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COMMODITY SCIENCE
IN A CHANGING WORLD

PROCEEDINGS

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PREFACE

Ladies and Gentlemen,

It is a great pleasure for me to welcome all scientists participating in the 20th IGWT Symposium. It is an extraordinary opportunity for us to organize the meeting of the members of the International Society of Commodity Science and Technology (IGWT) at the University of Economics - Varna (UE - Varna) which this year celebrates its 96th anniversary. The University of Economics - Varna is the first higher school of economics in Bulgaria. The foundations of the present-day University of Economics - Varna were laid back in 1911 when the Varna Chamber of Commerce and Industry management started planning the establishment of the Higher School of Commerce, whose launch was voted on May 14, 1920 at the Chamber's 25th session.

Currently the Commodity Science Department is one of the five fully-fledged departments of the Faculty of Economics at the University of Economics - Varna. The Commodity Science Department was established in 1948 simultaneously with the creation of the Commodity Science degree course. For the past 68 years the Commodity Science Department has been the only national center for training university students in the field of quality, expertise and control of goods.

It is a tradition that IGWT meetings are held at different prestigious scientific centers all over the world. This is the longest-standing and largest conference of Commodity Science and Technology which gives the floor for discussions in the most important areas of contemporary commodity science and technology. The IGWT Symposium is a unique event because it is an international forum which gathers together experts, acknowledged researchers from different countries and puts current scientific topics to discussion. The content of this book fully proves the prestige of this unique and unusual international symposium.

I am absolutely sure that the 20th IGWT Symposium, organized in the city of Varna, reputed as the summertime capital of Bulgaria, will meet your expectations, will present new research projects, will give rise to interesting discussions on current scientific topics and areas, will allow new contacts to be established and will open new ways to finding solutions to the commodity science and technologies in our rapidly developing and changing world.

Assoc. prof. Sabka Pashova, PhD
Chairwoman of the Organizing Committee

CONTENTS

I. COMMODITY SCIENCE: ACHIEVEMENTS, TRENDS AND CHALLENGES

II. PROTECTION AND SATISFACTION OF CONSUMERS

III. ECONOMIC, COMMERCE AND MARKETING ASPECTS OF COMMODITY SCIENCE

IV. ENVIRONMENTAL ASPECTS OF COMODITY SCIENCE

V. QUALITY MANAGEMENT SYSTEMS, STANDARTIZATION AND CERTIFICATION OF PRODUCTS

I. COMMODITY SCIENCE: ACHIEVEMENTS, TRENDS AND CHALLENGES

Commodity Science in Ukraine: Present and Future

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Abstract. Formation and development of commodity science and training specialists in this field in Ukraine are shown. The most important components of training highly qualified specialists in commodity science in KNUTE is analyzed. The basic tasks of commodity science development for the future are formed.

Keywords*: commodity science, trade, training specialists, standards of higher education, competences, professionalization*

Introduction

Training commodity science specialists in Ukraine have deep roots and more than a century unique experience starting from several specialized schools in the early twentieth century till now, when more than 150 educational establishments of different levels of accreditation successfully train specialists in commodity science (Mazaraki, 2008).

Commodity science is the knowledge that systematically examines goods at all stages of the life cycle, methods of evaluation of their consumer value, regularities of goods assortment and quality requirements for the efficiency of their production, turnover and consumption. The object of commodity science is the

goods as products of work are aimed to meet customer needs and methods of their theoretical and practical evaluation. The subject of commodity science is the consumer value of goods, regularities of expression and conservation (Standard of Ukraine 3993:2000). The system of means and methods of the study factors in the formation and conservation of consumer properties of goods during the life cycle is the basis of commodity science methodology.

Scope, objectives and functions of commodity science specialists are greatly enhanced, the social significance of commodity science research has been increasing as a result of transformation processes in education and the economy of Ukraine, the reform of state supervision on internal market, consumer protection, improvement of the legal and institutional framework for the implementation of the Association Agreement between Ukraine and EU, necessity for Ukrainian goods to entry into the new markets.

Apart from traditional evaluation of goods quality commodity science specialists, among other came to the management of goods quality and safety based on introduction of international standards, identification of forgery, peer review of legislative acts, and in fact – to the system work of the formation of a high level of life quality of Ukrainian citizens as consumers.

Training commodity science specialists

Providing highly qualified specialists is vital for sustainable growth of trade. The leading role in this process belongs to higher educational system. Kyiv National University of Trade and Economics (KNUTE) is the leader in training commodity science specialists and has been leading the development of appropriate higher education standards in Ukraine since 1993.

National state standards of education – educational qualification characteristics, educational professional programs, regulations evaluation of

students' knowledge have been operating more than ten years. Standards of higher education are based on competence approach.

The new list of field of knowledge and specialities, according to which candidates for achieving higher education in Ukraine are trained came into force in 2015 (Decree No. 266). According to this document training specialists in commodity science and trade entrepreneurship is carried out within the field of knowledge "Management and Administration" in speciality "Entrepreneurship, trade and exchange activities". In KNUTE training specialists is carried out in following specializations:

Bachelor educational degree:

- Commodity Science and Commercial Logistics;
- Commodity Science and Foreign Trade Organization;
- Wholesale and Retail Trade;
- Customs Affairs.

Master educational degree:

- Organization of Wholesale and Retail Trade;
- Commodity Science and Commercial Logistics;
- Commodity Science and Foreign Trade Organization;
- Customs Affairs;
- Safety and Quality of Goods Management.

Doctor of Philosophy (PhD), Doctor of Science educational degrees:

- Commodity Science of Nonfood Goods;
- Commodity Science Food Products;
- Technology of Food Products.

In KNUTE the program of measures was created to implement provisions and recommendations of the European higher education aimed at developing autonomy and quality assurance of higher education to meet the requirements of the Law of Ukraine "On Higher Education" 2014 (Law No. 1556-VII). On April 28, 2016 according to resolution of KNUTE Academic Council was approved the following:

- Higher education standards of KNUTE on training Bachelor, Master and PhD candidates in speciality "Entrepreneurship, trade and exchange activities" in the mentioned above specializations;
- Regulations on the educational process organization of higher education candidates in PhD degree in KNUTE;
- Regulation on the procedure of training of higher education candidates in PhD degree and Doctor of Sciences degree in the appropriate scientific specialities.

The conception of training higher education specialists in the field of commodity science includes:

- Safety and quality of goods management;
- Expert examination of the goods and services including customs purposes;
- Consumer protection at the state level;
- Supply chain management, logistics;
- Consumer product and services testing;
- Cooperation with employers, mass media, strengthening the social significance of scientific research and so on.

The role of commodity science is important for the improving of consumer products quality control, formation and improvement of the state policy on consumer protection as part of a social policy aimed at citizens and society social security formation.

A significant achievement is the preparation of the guidelines, which became the methodological basis for writing the final qualifying works by students in the speciality "Entrepreneurship, trade, exchange activities" in Master educational degree in KNUTE (Mazaraki, Prytulska, Osyka et.al, 2014).

Cooperation with NGOs, a permanent dialogue with employers (producers and retailers, industry associations etc.), government authorities, mass media and

other institutions and organizations is an important part of training highly qualified commodity science specialists in KNUTE.

Cooperation in the structure of non-government organizations (NGOs)

The KNUTE scientists initiative and with the support of civil society NGOs have been established and have been working successfully in Ukraine.

Ukrainian Society of Commodity Science and Technology (USCST) registered in 2006 and is a non-political, non-profit All-Ukrainian public organization. Representatives of USCST have significant experience of work in advisory bodies, public and scientific councils in the executive branch of power. USCST carries out ongoing work aimed at promoting the innovations in commodity science and technologies, ensuring consumer protection and other measures to improve standards of life.

The purpose of ***All-Ukrainian Consumers' Federation "PULSE",*** established in 2008, is a consolidation of the efforts of consumer associations from different regions of Ukraine for effective legal protection of consumer rights, equal access of consumers to quality and safe goods and services. The main tasks of the "PULSE" is to promote systematic consumer education of children and youth, expansion of the practice of effective protection by consumers their rights and strengthening the capacity of public associations of consumers and their partnership with consumers' organizations in the EU and the world.

Measures for the exchange of best practices, introduction of scientific developments to the practice, modernizing training of specialists of all levels of education are being constantly held under ***Ukrainian Culinary Union*** that brought together experts from 36 organizations of restaurant and cleaning business. Cooperation with similar organizations worldwide allows to harmonize approaches and to enrich the content of the organization activity.

Assurance of the permanent dialogue with employers

In KNUTE there has been developed and efficiently functioning information-analytical, scientific-discussion public platform of partnership "Trade of Ukraine", aimed at ensuring the balance of Producer-Consumer-Trade interests.

Actual trend of cooperation is participation in the professional standards development. Commodity science specialists are the members of developers of the first retail standard for the profession - professional standard for the position of "Seller of non-food goods". The standards for other key positions for the trade sphere are being prepared.

Practical Manual "Marking of Household Electrical Television and Radio Appliances: Guide to Retail Workers" is one of the successful examples of cooperation between scientists, educators and business workers. Manual was developed by scientists of Commodity Science and Customs department of KNUTE according to order of group of companies "Foxtrot. Home Appliances". The Manual was positively assessed by the European Business Association, the trade networks of Ukraine "Metro" and "Auchan" and by official importers of home appliances "Sony", "Electrolux" and others.

KNUTE representatives are the members of the International Society of Commodity Science and Technology (IGWT), Public Councils of executive authority, the Commission Codex Alimentarius. They participate in tasting sectoral commission, meeting of technical committees for standardization. The technical committee for standardization in the sphere of services in trade, tourism, restaurant, exhibition operates on KNUTE base. Considerable work on harmonization of Ukrainian and European standards is being carried out.

Educational Advisory Center in Safety and Quality of Goods management is successfully operating in KNUTE.

Attraction to work for the examination of legislative acts, documents and product samples; patent activity; numerous appearances in the mass media is a special directions of KNUTE teachers scientific competence.

The development of the commodity science theory and actualization of commodity science categorial apparatus

The last decade has shown that commodity science goes beyond traditional objects and subject of research. The list of commodity science objects has considerably grown. It includes the following new goods: flowers; feed; packaging materials and tare; vehicles and other goods; and large industry sector – services. Unifying the interpretation of the fundamental commodity science categories is an important today.

Knowledge of commodity science is in demand in different spheres of society life. Particular specificity has commodity science competencies of specialists in customs and antimonopoly activities. The State Fiscal Service carries out the commodity science expertise to cases of customs regulations violation; identification at customs control and clearance of goods; prevent customs risks. The Antimonopoly Committee of Ukraine carries out activities to detect fraud, surrogate product, analysis of assortment etc.

Joint projects with foreign HEEs

Considerable interest of KNUTE experts is in the realization of joint following activities with foreign HEE-partners: educational programs, scientific research, monographs and other scientific publications, preparing the base for the implementation of training programs for the degree of "EuroBachelor", "EuroMaster" in commodity science; getting a double degree diploma; modernization of training of commodity science specialists for certain specialities; teachers exchange aimed at giving lectures etc. Taking part in carrying out research in the field of education which is perspective for KNUTE and the priority for the EU.

Conclusion

Apart from traditional evaluation of goods quality commodity science specialists came to the goods quality and safety management, identification of forgery, legislative activity in modern conditions and so on. Providing of highly qualified specialists is vital for sustainable growth of trade. The leading role in this process belongs to higher educational system. Cooperation with NGOs, permanent dialogue with employers, government authorities, mass media and other institutions and organizations are the important parts of training highly qualified commodity science specialists in KNUTE.

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Innovative Approaches of Water Scarcity Management in the Apulia Region

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Abstract. The use of freshwater is a major issue in Mediterranean countries, due to not only the environmental but also economic and social implications on global and local scale. In this context, the correct management of water resources becomes a critical issue of public interest, in order to avoid losses and ensure the supply for the agricultural, industrial and urban areas. To manage water resources efficiently and minimise the impact of water consumption, it needs to define appropriate metrics and integrate them into tailored decision making tools able to monitoring the water flows in input and output. Despite many efforts were carried out to quantify environmental impact of water consumption, few experiences were done on decision making tools for water management. According to similar international experience, this paper aims to propose an integrated approach, based on Life Cycle Assessment and Water Footprint, finalized to calculating an indicator that put in relationship the water availability with the water needs and the reconstruction of the water stock. The Apulia Region was chosen as case study to analyse the background in water resource management system, and to evaluate the feasibility of a decision making tool.

***Keywords**: Water Stress Index, Water Footprint, Public Water Governance*

Introduction

The worldwide effects of managing water resources are becoming a very important issue. The Intergovernmental Panel on Climate Change (IPCC) report forecasts longer periods of drought and heavier extreme rainfall. The United Nations reported that several countries are close to their water limits, but also that food output must increase by up to 100% by 2050, if estimated population growth is to be sustained (CDP, 2013). According to FAO (FAO, 2014), around 70% of the total water use (70-90% of consumptive uses) is due to agriculture. Moreover, freshwater resource availability is rapidly decreasing and it is expected that more than two-thirds of the world's population will be affected by water scarcity over the next decades (Rijsberman, 2006). To manage water resources efficiently and minimize the impact of water withdrawals, it needs to define appropriate metrics and integrate them into tailored decision making tools able to monitoring the water flows in input and output. In the past 20 years many indices have been developed to quantitatively evaluate water resources vulnerability (e.g. water scarcity or water stress). The difficulty of characterizing water stress is that there are many equally important facets of water use, supply and scarcity, and these choices could affect as much a policy decision as a scientific decision (Brown & Matlock, 2011). Despite many efforts were carried out to quantify environmental impact of water consumption, few experiences were done on decision making tools for water management (Alcamo et al., 2003; Aldaya et al., 2010; Chaves & Alipaz, 2006; USA, 2016). On 23 October 2000, the Directive 2000/60/EC, also called 'EU Water Framework Directive', established a framework for the Community action in the field of water policy. Successively, some amendments have been introduced, and the Groundwater Directive 2006/118/EC was developed in response to the requirements of Article 17 of the EU Water Framework Directive (EC, 2016). On 28 July 2004, in Italy, the legislative Decree 152/06, recognized the goals of the EU Water Framework

Directive and established the guidelines for the accounting of water balance with a Ministerial Decree. In the Apulia region the water scarcity represents a well known problem, and since 2002, the Apulian Basin Authority was established by Regional Law, with the aims to correctly manage the regional hydro-geographical systems. This paper aims to analyze a possible development of sustainable management system of the Apulian water resources according to the international experiences about water scarcity accounting and the organization of the information about water availability and withdrawals.

Material and methods

The international experience in developing of quantitative metrics for the description of water resources principally focuses on two methodological approaches: water footprint (WF) and life cycle assessment (LCA) (Boulay et al., 2015; Jefferies et al., 2012; Finnveden et al., 2009; Hoekstra A. Y. et al., 2011; Milà i Canals et al., 2009; Pfister et al., 2009). Flury et al. (2012) defines different terms concerning the water use and water consumption. Starting from this definition, in order to calculate an useful decision making tool about the Apulian water scarcity, it needs to obtain data about water availability and withdrawals by distinguishing per sub-area (district or provinces), per month of the year and per type of use (domestic, industrial and agricultural). Data about rainfalls could be easily obtained from the official website of the Apulian Hydrographic Office. The principal sources of data about water and groundwater are the reports published by the Apulian Basin Authority (Apulian Basin Authority, 2012; 2015). The same reports contain a great number of useful data for the calculating of blue water. As for the accounting of the virtual water described by the equation of Hoekstra et al. (2011) as grey water, data coming from the regional mapping of Nitrogen Vulnerable Zone (Dir. 91/676/CEE), carried out in 2013 according to the limits of water quality defined by the Ministerial

Decree n°. 185/2003, could be considered. All these informations should be arranged in order to create a regional disaggregated dataset which could be enriched with qualitative data about water resources.

Results and discussion

The correlation between WFs and water availability, calculated according different geographical areas, type of use and period of the year could generate an useful index about the Apulian Water Stress (AWS). Geo-statistical maps could be integrated in the portal of Hydro-geomorphological maps of the Apulia Region (http://93.51.158.165/geomorfologica/map_default.phtml), in order to show the AWS in a more understandable way, and help the public bodies to develop water management policies in the short and long period. Management strategies could be carried out in order to optimize the water use by considering the trend of availability and consumption; or water recovery systems from rainfall could be examined. Globally, the Apulian water withdrawals are estimated at about 1,500 Mm^3 per year; almost 53% of them is the irrigation requirement, 37% for drinking water and the remaining for industrial use. As for the water requirement for irrigation, 655 Mm^3 are withdrawn from the groundwater. An improvement could be represented by the use of treated wastewater, which, after purification, could be adopted for irrigation use with a total volume of about 40 Mm^3.

Conclusion

An integrated approach for the management of the Apulian water scarcity, based on the differences in terms of time, space, and type of use, of the water availability and withdrawals, was proposed in this paper. Public policies could play a very important role for planning water governance. The adoption of a decision making tool, with clear indicators, could be very useful to monitoring the water flows in input and output. According to similar international experience, this

approach takes into account quantitative data for describing trends and geo-referenced maps. This approach represents a first step in the monitoring of the Apulian water resources. A future development of this tool aims to enrich quantitative data with qualitative characteristics of water flows. In this way further indicators, more exhaustive and comparable, could be calculated according to not only the environmental but also economic and social implications of the water scarcity.

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Information & Communication Technologies (ICT) for the engagement of the Commodity Science in Environmental Education: the Scatol8® System. (Part 1)

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Abstract. The Environmental Education (EE) has recently opened to the possibility of including, within its educational tools, the Information & Communication Technologies (ICT), media traditionally antagonistic to the direct experimentation of the natural environment. In a changing world, Commodity Science will maintain and even increase her importance in relation to the capability of integrating ICT in her own methodologies as far as research and didactics are concerned.

Witness the use of e-learning, which allows you to combine traditional teaching methods with devices that can both improve the knowledge and attitudes about environmental issues through simulated situations, is to track virtually natural environments not accessible directly. The growing popularity of mobile devices has offered the opportunity to experience even mobile-learning, useful to bridge the gap between virtual and direct use of the natural environment fruition which opened with the first uses of ICT, associating benefits with online learning the direct experience of nature. The EE can also make use of the recent deployment of the Internet of Things (IoT), which offers the possibility to real and virtual communication through the internet connection of commonly used objects. The described technological

trajectory may be useful to learn also the economic and social dimensions of sustainability, themes of interest of Commodity Science Scientists.

The paper is split into two parts. The aims of the first one are:

- the description of the Scatol8® system, a remote sensing network designed and realized in the Area of Commodity Science of the University of Torino to raise awareness of the contribution that each individual can make to the achievement of sustainability goals, encouraging a reflection on consumption and daily habits of users.
- the description of the experience "A Scuola con Scatol8®" (To School with Scatol8®), an educational project on Sustainability, Scatol8® system centered, funded by Regione Piemonte with the participation of secondary schools of four Provinces whose contents have been strongly influenced by Commodity Science.

The second part is based on the application of a simulation model, in NetLogo environment, with the aim of defining the best communication strategy to spread Scatol8® System over the schools, with the benefit of making them aware of the importance of Commodity Science approach to Sustainability issues.

In the findings it is revealed the importance of a combination of channels, both in the virtuality of the Internet and in the real world for growing the adoption of Scatol8® System and, thus, for the success of Commodity Science in a changing world.

Keywords*: ICT, IoT, Environmental education, Environmental tools, Agent-Based Simulation Model*

1.1 - Introduction - The new instruments in EE

The use of information and communication technology (ICT) in the area of Education is a proper challenge for educators: developing a new learning

environment designed to encourage communication skills, critical thinking, responsibility and independence (Stiles, 2000), making the *digital natives*[1] able to navigate the thick network of available information.

In recent years, EE embraced the possibility to adopt new tools such as computers and mobile devices, traditionally opposite to excursions used to educate through the direct experience of the natural environment. Interest in new technologies, especially among young people, has fuelled the debate in literature, encouraging the production of studies that analyse the comparison of these instruments and those that are the traditional means of Environmental Education (Ruchter M., 2010).

As students represent a sizable chunk of future energy consumers (Knol, 2011), they are often the target of these studies directed to verify the effectiveness of the new instruments. In many cases, the results show that the use of computers and mobile devices has the same ability to influence environmental behaviours as the use of classical instruments does, stimulating, especially among young people, their motivation to engage in environmental education activities (Ruchter M., 2010). Examples of new instruments are e-learning, mobile learning and the IoT.

1.2 - Material: The Scatol8® System

The Scatol8® is a remote sensing network for the detection of environmental, landscape and management variables, created in the Area of Commodity Science of the Department of Management in the University of Torino, entirely based on free and open technology (hardware and software) (Open Source), with a view of controlling costs, of openness and ease of access.

[1] The term was used for the first time by Prensky (2001), to describe the generation born between 1980 and 1994, native of the digital language of computers, video games and the Internet.

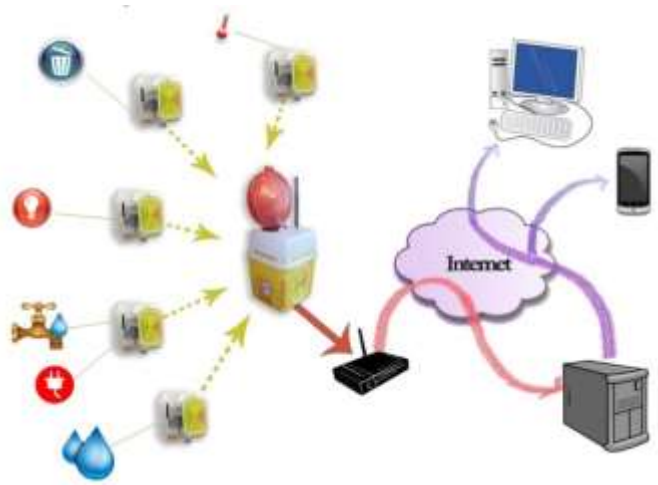

Figure 1. Example of Scatol8® network

The choice of the name Scatol8® (literarily a tiny, pretty box)conveys the idea of a friendlydevice, handmade, easy to understand and easy to use, so affordable.

Many sensors connected to nodes compose the Scatol8® sensor network. A special node called coordinator is the interface between these nodes and a remote server that offers a visual interface to consult the acquired data, Figure 1.

Designed in the perspective of sustainability, Scatol8® is inspired in its creation and implementation to various criteria, such as:

- *Modularity*. The system is constituted from time to time, according to the requirements and specifications of each application.
- *Accessibility and dissemination*. Hardware and software are fully based on open source technologies and software in view of cost containment, openness and ease of access, even for training purposes. Scatol8® is not only a product, but also an initiative to spread knowledge, which aims to involve young people in the creation of technology (and not only in its use), which is accompanied by information tools on the relationship between observed variables and sustainability and proposes.

- *Environmental compatibility*. When possible, all electronic devices are placed in recycled containers, coming mainly from food and electronics industry, transformed and adapted to their new function, or in containers made of wood (a renewable resource), or even cardboard.

1.3 - Methods: The Lab"A Scuola con lo Scatol8®" (To School with Scatol8®)

Structure and objectives

The Scatol8® system was employed in an educational workshop within the *Il risparmio energetico comincia dalla scuola*(Energy saving starts from school) initiative of Piedmont region during the academic years 2012-2013 and 2013-2014. The laboratory inclusion in the activities proposed by the regional initiative had the aim to complete the students learning process in a concrete way, taking advantage of the playful dimension, in order to approach young people to concepts that might have appeared complicated. The system was installed in 8 classes, belonging to five Istituti Comprensivi in Piedmont provinces of Biella, Turin, Vercelli and Novara and allowed to monitor the same environmental variables in each classroom: **air temperature and humidity, the amount of waste paper products, energy consumption**.

The start of the laboratory in the classes was preceded, in each school, by a meeting between the Scatol8® Team, the representatives of the institute involved in the project, and the regional manager, in order to agree on a work plan with the teachers. As for the proper teaching, this was divided into two moments: first of all, a front meeting has been organized and the features and functions of the system have been described. After that, the students have been involved in an operational mode in the design and realization of the "'dress" of the Scatol8®, that was to be developed during teaching hours. The basic principle to be observed for the

packaging was the eco-friendliness, through the reuse of materials and recovery packaging. The electronic components have then been placed inside the containers prepared by the students, allowing them to observe the variables monitored through the Crusc8 and discuss with the teachers about the environmental performance of the classroom. The system has been running throughout the entire year, allowing teachers and students to continue observing the evolution of the variables recorded in their classroom and comparing the values with those of the other class of the school using the system.

1.4 - Results and discussion

In November 2014 the teachers of those classes that have been involved in the workshop "A Scuola con lo Scatol8®" throughout the academic year 2013-2014, were contacted. Teachers were asked to respond to a short anonymous questionnaire to verify the activities, with the purpose of obtaining useful information to improve and consolidate the laboratory educational programme. The aim of the questionnaire was to test the effectiveness of the tools proposed by the developer of the project and their appropriateness in achieving the common goal of education, accepting suggestions from teachers. The survey was administered to a sample of six teachers, those who joined the 2013-2014 workshop. We already knew some characteristics of the sample: their origin (two teachers from Biella, two from Novara, one from Turin and one from Vercelli), their level of education and their employment status. Since the sample was very small, the survey was created in order to give the interviewees the chance to express their thoughts, inserting questions with the possibility to give advice and personal insights.

The analysis of the answers and the subsequent contacts with teachers show that involved educators consider the environmental education an important part of individual training, recognizing the workshop a valuable tool to sensitize students to

environmental sustainability. Besides, it emerges, on the whole, that the block of the proposed activities is adequate to achieve the proposed objectives, but the different aspects could be improved and developed in order to approach more students educational needs. Among the most popular aspects it needs to be underlined students involvement in creative activities, that can stimulate reflection on sustainability. Despite no part of the activity received a totally negative rating, it would be appropriate to increase the benefits of the online dimension of the system, which is still perceived as not sufficiently adequate for the achievement of the given objectives, partly because of its partial use with respect to that programmed. Finally, the success of the initiative is proved by its virality, capable of arousing interest in all those who come into contact.

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Information & Communication Technologies (ICT) for the engagement of the Commodity Science in Environmental Education: The Agent Based Model. (Part 2)

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2.1 - Introduction: NetLogo Environment

Computer simulations give the ability to implement theoretical models of social mechanisms that would be too difficult for a mental experiment, so allowing to study the emergence of macroscopic effects, starting from interactions at the microscopic level. In this article we describe a model built through NetLogo, a programmable environment for simulating natural and social phenomena, nicely able to reproduce complex systems evolving along the time. This open source software can be downloaded from NetLogo website, including version 5.1.0, used for the formulation of the model presented in this work, and the latest version, 5.2, released April 3, 2015. The software is continuously improved, thanks to the contribution of many users, whose number is continuously growing.

A programmer using NetLogo can:

- instruct a very large number (even thousands) of independent and heterogeneous agents that can also work on parallel
- monitor the connections among agents and behaviors at the micro level
- look at the emergence of patterns at the macro level.

2.2 Material and Methods - Description of the model

The model simulates the spread of Scatol8®System amongst the schools of four provinces in Piedmont. Provinces involved in the simulation form a section in the center-north of Piedmont, these are: Biella, Novara, Turin and Vercelli. The choice fell on these four in particular because of the location of schools already involved in the previous workshop *A Scuola con lo Scatol8®*. Schools potentially affected by the spread are those belonging to the *istituti comprensivi*, therefore the nursery (866), the primary (870) and junior secondary schools (294), 2,030 overall. The selection was done by considering the categories of school engaged in the workshop: these were junior secondary schools, so we tried to put into the model the actual environment of each school, i.e. the entire *istituto comprensivo*. Each school get in touch with the environmental education activities proposed by Scatol8® lab, through four different modalities:

• ***Membership contact***

People involved in the project act as facilitators of the adoption process. For example if a class is involved in the project all the *istituto comprensivo* class discover that it exists.

• ***Sponsor contact***

It occurs through the action of an animator (that is an external agency like Piedmont Region, University of Turin, etc.) who decides to bring such activities to a certain number of schools using some founds.

• ***Internet contact***

The third way concerns Scatol8® website, showing information about such activities.

• ***Contact through the "grapevine"***

The spread of such information through a non-structured institutional network, a social network where individuals come into direct contact with each other. For example, communications among teachers of different institutes, information exchanged among pupils outside school context or information suggested by parents interested in these issues.

While the model is running its rounds, these modalities try to put in contact Scatol8® system with the schools, that react according to the *concern* in the topic presented. At the end of every round, it is possible to see how many schools decided to adopt it (and be engaged in the project), through the interface, Figure 2.1

Environmental concern of each school is processed through a command, which contains the procedure that allows to assign a value to the three types of interest in environmental issues belonging to each school: the first relating to students, the second relating to the teachers and the last relating to the institute (thus representing both the choices of the leadership and environmental concern expressed by students' parents). Each type of interest is expressed through a numerical value, ranking from 0 to 4, relocated at every turn and randomly distributed among schools, excluding schools that already have adopted the Scatol8®, for which is already assigned. Schools that actually participated in the workshop are set at the beginning of the first round with the values expressed in the satisfaction questionnaires filled out by teachers. Simulation stops automatically after five rounds, equivalent to five years of activity.

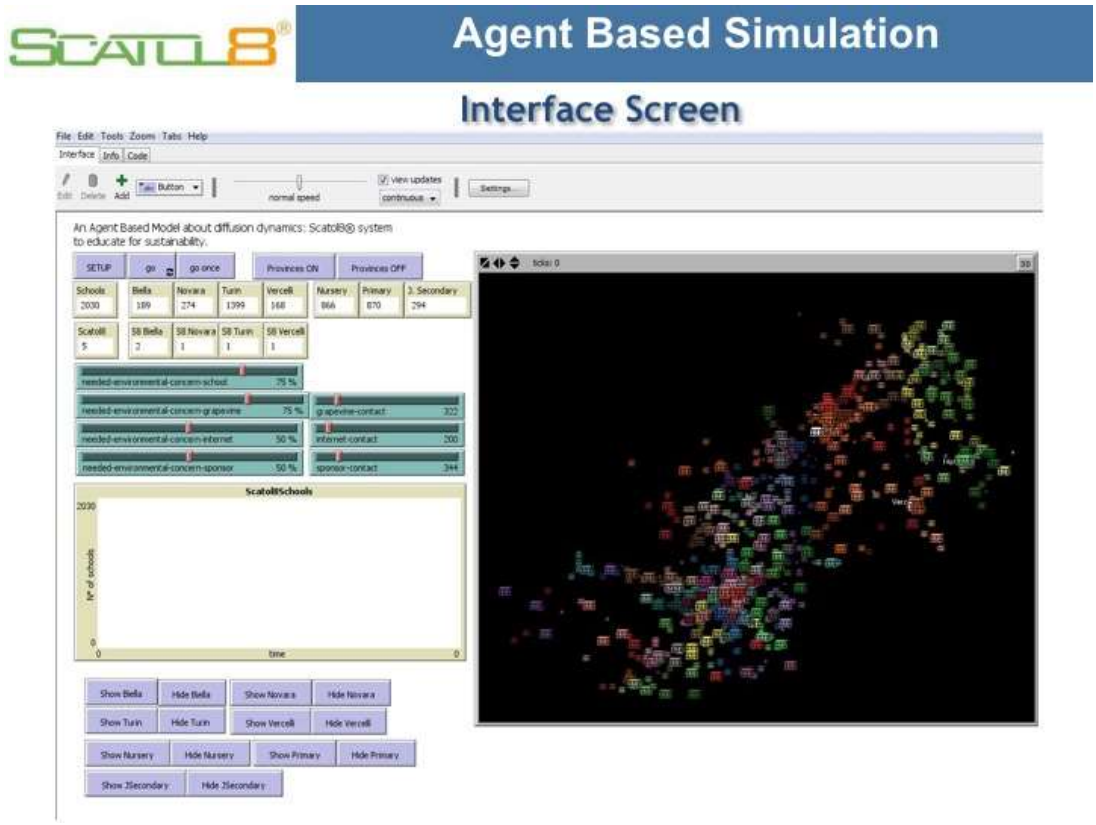

Figure 2.1: Interface screen

2.3 - Results and discussion - Experimenting with the simulation

NetLogo interface includes some sliders that allow to configure the model before running, like setting the number of schools engaged at each turn and the level of *neededenvironmental concern* to adopt the Scatol8®. This *needed environmental concern* represents the threshold of interest over which the contact by a modality succeeds in engaging the schools in the lab. If, for example, the *needed environmental concern* is equal to 25 per cent, it means that just a 25 per cent of interest (therefore all three entries of interest with a low level) is required to obtain a positive response from the schools contacted.

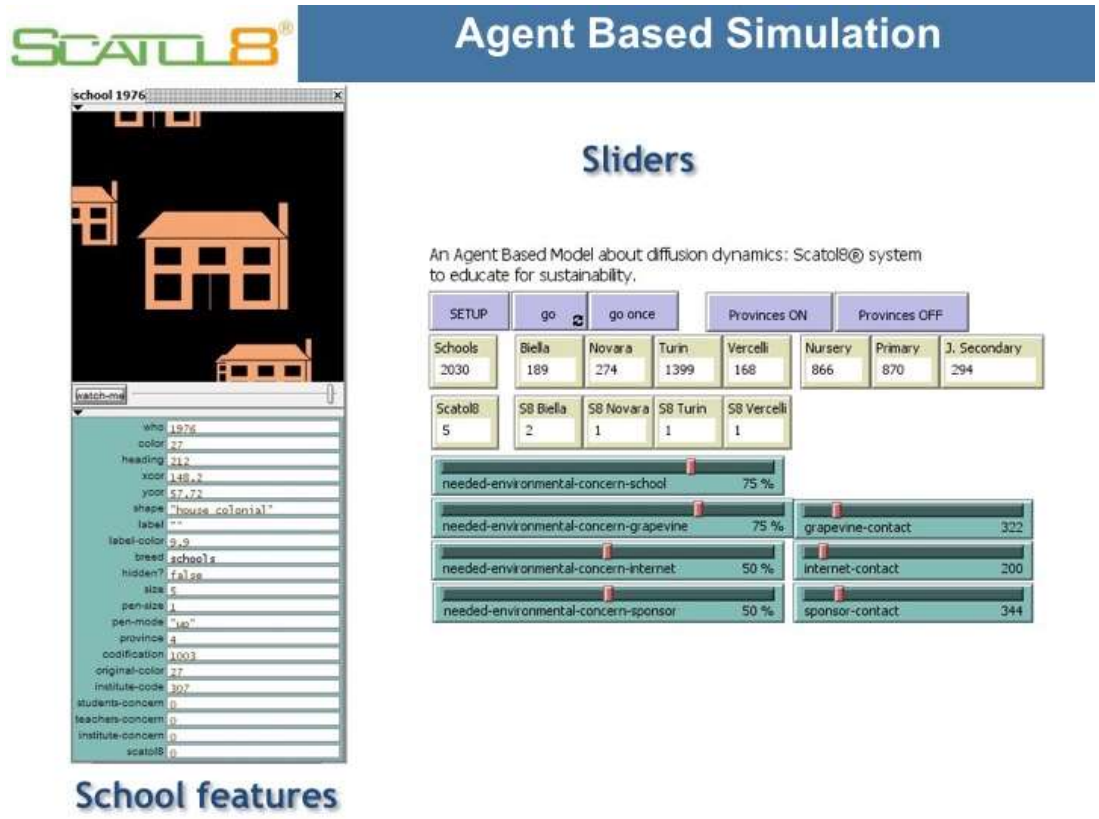

Figure 2.2 Sliders

Experiments goal was to investigate which combinations of variables for every modalities got more Scatol8® adoptions, so helping the diffusion of environmental education activities. The first experiment is the baseline model where the only channel through which schools become aware of the project consists in schools belonging to the same *istituto comprensivo* who have already adopted the system. Subsequent experiments try to add new modalities to the baseline model, with the purpose of verifying the ability of different communication channels to improve the diffusion and adoption of the system. Each experiment, with the exception of the first, foresees a first combination of the various channels with the same level of *needed environmental concern* for the adoption, and then comparisons combining different levels. Similar values have been set for parameters used in the

various experiments, to allow an immediate comparison. Each test inside the experiments was run 10 times, in order to get a significant sample to be further processed.

All the experiments, the list of combinations tested and their results are summarized in Table 1.

Tabella 1 Experiments and outputs list

Experiments with the simulation				
Baseline experiment/ Experiment #1	**Membership contact**			
needed environmental concern school	25%	50%	75%	100%
Average Scatol8® adoptions	**23,1**	**18,5**	**10,8**	**5,5**
Experiment #2	**Baseline + Sponsor contact**			
needed environmental concern school	25%	50%	75%	100%
needed environmental concern sponsor	25%	50%	75%	100%
N° of sponsor contacts	4	4	4	4
Average Scatol8® adoptions	**79,1**	**35,6**	**13**	**6**
N° of sponsor contacts	8	8	8	8
Average Scatol8® adoptions	**151,2**	**48,2**	**14,5**	**6,2**

needed environmental concern school	50%	75%	75%	100%
needed environmental concern sponsor	75%	50%	100%	75%
N° of sponsor contacts	4	4	4	4
Average Scatol8® adoptions	**26,8**	**17,2**	**10,1**	**6,4**
N° of sponsor contacts	8	8	8	8
Average Scatol8® adoptions	**24**	**27,4**	**10,8**	**8,8**

Experiment #3	**Baseline + Contact through the "grapevine"**			
needed environmental concern school	50%	75%	100%	
needed environmental concern internet	50%	75%	100%	
N° of contacts throught the grapevine	8	8	8	
Average Scatol8® adoptions	**476,5**	**31,4**	**5,7**	
N° of contacts throught the grapevine	16	16	16	
Average Scatol8® adoptions	**786,4**	**50**	**6,3**	

needed environmental concern school	50%	50%	75%	
needed environmental concern internet	75%	100%	100%	
N° of contacts throught the grapevine	8	8	8	
Average Scatol8® adoptions	**69,9**	**90,5**	**11,6**	
N° of contacts throught the grapevine	16	16	16	
Average Scatol8® adoptions	**152,9**	**194,6**	**11,2**	
Experiment #4	**Baseline + Internet contact**			
needed environmental concern school	50%	75%	100%	
needed environmental concern internet	50%	75%	100%	
N° of internet contacts	8	8	8	
Average Scatol8® adoptions	**51,8**	**15,3**	**6,4**	
N° of internet contacts	16	16	16	
Average Scatol8® adoptions	**85,6**	**22,2**	**6,4**	
needed environmental concern	50%	75%	75%	100%

school				
needed environmental concern internet	75%	50%	100%	75%
N° of internet contacts	8	8	8	8
Average Scatol8® adoptions	**30,3**	**30,1**	**7,7**	**10,2**
N° of internet contacts	16	16	16	16
Average Scatol8® adoptions	**37,7**	**41,5**	**11,1**	**10,6**
Experiment #5	**Combination of channels**			
needed environmental concern school	50%	75%	100%	
needed environmental concern internet	50%	75%	100%	
needed environmental concern sponsor	50%	75%	100%	
needed environmental concern grapevine	50%	75%	100%	
N° of internet contacts	8	8	8	
N° of contacts throught the grapevine	8	8	8	
N° of sponsor contacts	4	4	4	

Average Scatol8® adoptions	**639,2**	**39,1**	**6,8**	
N° of internet contacts	16	16	16	
N° of contacts throught the grapevine	16	16	16	
N° of sponsor contacts	8	8	8	
Average Scatol8® adoptions	**918,1**	**92,1**	**7,6**	
needed environmental concern school	50%	75%	75%	
needed environmental concern internet	75%	100%	75%	
needed environmental concern sponsor	75%	100%	75%	
needed environmental concern grapevine	75%	100%	100%	
N° of internet contacts	8	8	8	
N° of contacts throught the grapevine	8	8	8	
N° of sponsor contacts	4	4	4	
Average Scatol8® adoptions	**112,1**	**14,3**	**20**	
N° of internet contacts	16	16	16	
N° of contacts throught the	16	16	16	

grapevine				
N° of sponsor contacts	8	8	8	
Average Scatol8® adoptions	**307,4**	**15,8**	**32,9**	

Experiment #1 involves the spread of the initiative among schools from the same institute without any mediation by other agency. Results show a good success of this channel, indicating a doubling of Scatol8® adoption, compared to the project start-up, even with high levels of *needed environmental concern.* The weakness of this kind of contact consists in the fact that the spread remains bounded within the institute where at least one school already adopted the system.

Experiment #2 adds a sponsor able to engage new institutes in the initiative; we expect that its presence will increase the number of schools adopting the system. Organizer's presence has a great impact on adoptions, whether with four or eight contacts per turn, with lower levels of *needed environmental concern* (25 per cent and 50 per cent), as is clear from a comparison with the output of the baseline scenario shown in the table. By increasing *needed environmental concern* levels, average values of system adoption approach to baseline experiment results, with average values very similar whether if involving four or eight schools per turn. Modifying again such values, average adoptions number decreases instead of increasing, also with more schools involved by organizer, as shown in chart. This trend can be explained by assuming that in the second test schools randomly selected from NetLogo had smaller size of those in the first test, resulting a lower number of potential users. Another cause can be *environmental profile* value, given randomly by the software: a low value discourage initiative spread. These

considerations about "technical" features of the simulation provide useful tips for reality: accounting Institute *environmental profile* and size when contacting a school as organizer, to help the initiative spreading.

Experiment #3 tries to simulate "grapevine" channel, in addition to baseline model. First set of tests requires equal level of *needed environmental concern* for both channels, involving first eight, then sixteen schools, by grapevine. Results reveal an average number of adoptions much higher than in the baseline experiment, with intermediate/high levels of *needed environmental concern*.

The second set of tests endows different levels of *needed environmental concern* to the channels. Higher level of *needed environmental concern* for "grapevine" is used to simulate hurdles for an initiative promoted outside institutional channels. Table shows that high levels of *needed environmental concern* for the channel "word of mouth" causes a decrease in adoptions (compared with previous test) only in one case. Although number of new contacts is given randomly, this channel seems to foster Scatol8® adoption along new institutes.

Experiment #4 matches baseline model with internet, meaning information on internet about Scatol8®. As in previous experiments, the first tests run with same level of needed environmental concern to both channels, defining arbitrarily first eight and then sixteen contacts through the Internet, to allow comparison with previous channels. Average results show adoption values very similar to those emerged with sponsor channel, fixing the same number of new schools contacted per turn. Results report a mean number of new adoptions not very high even in this case, again comparable, in some cases lower than, what has emerged in the second experiment.

Experiment #5 The output in table shows that combined action of multiple communication channels is more effective than the action of the single channel or the channels pair, as it pushes the initiative to increase its virality along two spatial

directions: external to *istituti comprensivi*, which allows to contact new institutes each turn, and the inner one, which spreads activities within individual institute.

2.4 - Conclusion

Experiments highlight simulation constrains, like the need to enter the number of schools to contact, via "grapevine" and "internet" channels, for which we don't have empirical data. The choice fell on a low number of contacts, to allow comparison with a channel for which data are available instead, that of "sponsor". Experiments results report a number of medium-low adoptions of the system, a higher number of contacts would have allowed obtaining a larger amount but it would still be based on a hypothesis. Actually is impossible to assess these two channels, but it's possible to take two actions:

- Spread as much as possible the lead through the internet, to reach a high number of system potential users.
- Improve the initiative each year to support the dissemination of positive testimonials.

Situation is different for "sponsor" channel, on which we have the ability to act effectively. The suggestion for this channel, which originates from the results of the experiments, is to engage the energies both in enlarging the network of new contacts, both in presenting initiatives with previous positive experience support. Finally, last thing emerged from experiments concerns the spread within the *istituti comprensivi*. Baseline model reported a low number of new adoptions related to the total number of schools, but it is high when compared to the number of schools reachable from that configuration. Subsequent experiments have shown that when this channel is combined with the other, especially in the final experiment, new schools are affected by internal diffusion. This result, combined with the findings from the previously presented questionnaires about teachers' availability to witness their experience, can help to focus efforts toward quality experiences in schools.

Proven model is very simple; it can be implemented in future by changing or entering certain conditions within the architecture. Changes could include:

- Construction of agents "with mind", able to modify their *environmental concern* after Scatol8® adoption.
- Improve the use of the geographical dimension, in this case used as a simple visual support.
- Monitoring system spread along various education levels, providing appropriate activities to different types of school. This model allows to identify different types of schools but simulate a single type of activity in order to focus the attention on global adoption number.
- Include economic dimension, deliberately omitted in this model, as it would represent a constraint due to lack of funds, which effectively prevented the conduct of activities during this year. Latest statements of Environment Ministry Secretary indicate as mandatory the introduction of some hours for Environmental Education, within various school levels, this could result even in an economic support to activities, which could be incorporated within the model.

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Formation of Competitiveness of Products of Processing Fruits and Vegetables Ukrainian Production

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Abstract. Fruits, vegetables and derived products form the basis of a healthy diet. Statistics indicate that the consumption of fruit and vegetables in the world varies from 100 grams per day in less developed countries, up to 450 grams per day in Western Europe. According to the standards developed in Ukraine, the total daily intake of fruits and vegetables should be at least 600 grams, including fruit - 300 g, vegetables - 300 grams of actual consumption is somewhat lower and is about 500 grams Given the growing season of fruits and vegetables in Ukraine and an increase in prices for fresh produce in the off-season, particularly popular in the winter and spring uses frozen products like domestic and foreign production.

Analysis of the production of frozen fruits and vegetables (except potatoes) in Ukraine, in spite of their small volumes, proves the positive dynamics.

It contributes to this and the increase in the Ukraine issue of domestic industrial refrigeration and freezing equipment, whose growth rate in 2015 compared to the same period of 2014 amounted to 219.1%. However, statistical data analysis found that in 2013 Ukraine had sold 12013 tonnes of frozen vegetables and frozen fruits 4722 tons, developed their own raw materials, in 2014 slightly more - 13 701 tonnes and 5130 tonnes respectively. This indirectly indicates the relevance of comprehensive research in the field of formation of quality as a fundamental component of the competitiveness of quick-frozen fruits and vegetables.It should be noted that the problem of the formation and preservation of consumer properties of frozen fruit and vegetable products in Ukraine has been overlooked: by establishing specific and varietal suitability of fruits and vegetables for freezing through the study of technological methods to stabilize the initial properties of the product, to the determination of the optimal temperature freezing and storage.

Key words: *fruits, vegetables, frozen, quick-frozen*

Introduction

According to Rickmann (2007), Favell (1998) and Fennema (1982) frozen fruit and vegetable products in storage at a temperature below minus 24 ° C, nothing changes . However, recent research findings disprove this assumption. As noted by Orlova and Belinska (2005) changes in the frozen fruit and vegetable products occur even at much lower temperatures of storage , due to the phenomenon of recrystallization. Therefore, the study of natural losses occurring in the plant material in the process of freezing and refrigerating storage with a view to minimizing relevant. One of the most important physical change that occurs during freezing, is the change in mass , which is caused by the evaporation of moisture from the surface of the product (Osokina, 2007). Weight loss occurs during the process of freezing and during long-term storage and is not only the economic

aspect , but also affects the quality of frozen foods. Binding free moisture content in which fresh fruits on average 75 - 85 % can reduce the loss of mass during freezing and storage .

Among the most suitable tomato vegetables before freezing is sweet pepper and eggplant. Tomatoes are highly use-value, due to their organoleptic properties and characteristics of chemical composition: sugar, vitamin C, carotenoids, a wide range of mineral elements. However, due to the peculiarities of the anatomical structure of this type of vegetables practically not subjected to freezing in order to obtain marketable products and frozen only for further industrial processing, or in mixtures intended for cooking. Given the relatively large share of tomatoes among the vegetables grown in the Ukraine, a wide range of recognized varieties that significantly differ shape, color, taste properties, chemical composition, shelf life, etc., it is reasonable to conduct research to establish the impact of the freezing of their quality .

The aim is to study the effect of freezing and cold storage on mass loss and ability to retain moisture of different varieties of tomatoes.

Material and methods

Objects of research - zoned in Ukraine varieties of tomatoes Iskorka, Raisa, Rio Grande Original, Golda and Flora. Control - fresh tomatoes. Tomatoes, after inspection, washing and drying, packed in sealed plastic bags with zipper, net weight of 200 to 400 g tomatoes frozen at minus 35^0 C ± 2, stored at minus 18^0C ± 2. Research of weight loss and ability to retain moisture tomatoes conducted after freezing and after 2 and 6 months low temperature refrigeration storage. Mass loss was determined by the difference between the mass of frozen and thawed product, ability to retain moisture - the number of dedicated juice.

Results and discussion

Results. Fig. 1. The results of research weight loss frozen tomatoes, depending on the variety and longevity compared to fresh.

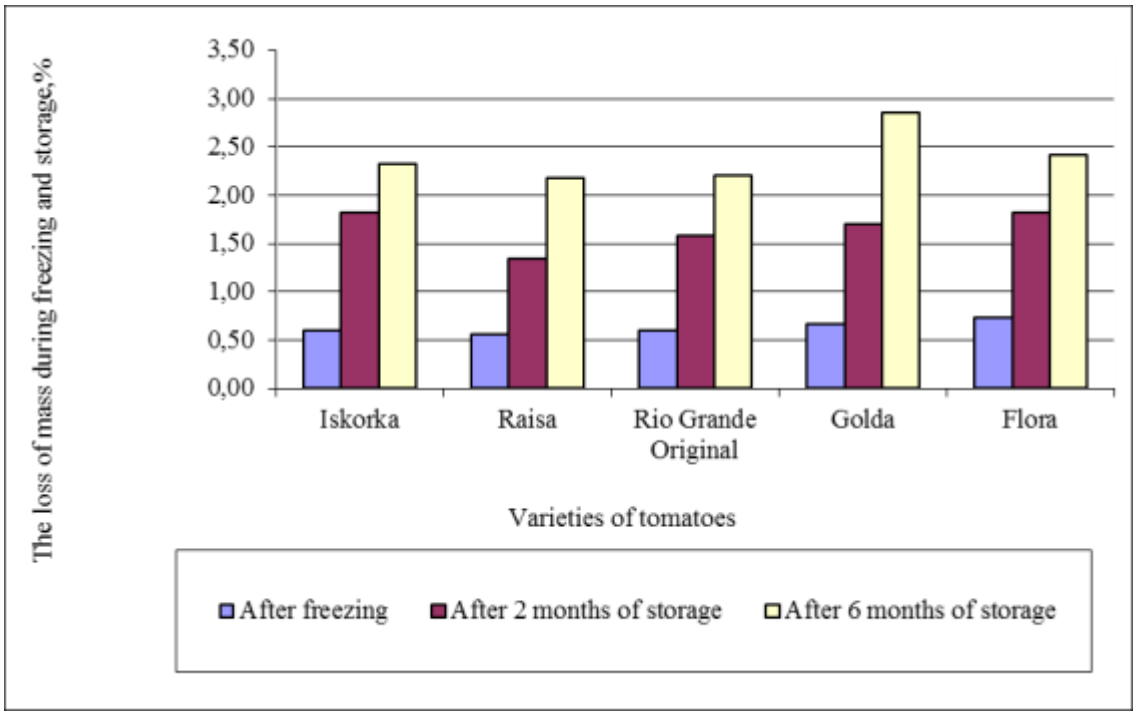

Figure 1. Loss of mass frozen tomatoes depending on the variety and duration of low temperature storage.

The loss of weight after freezing fruits and six months low temperature refrigeration storage averaged 2.4%. Reducing the weight of tomatoes during storage due to freezing and freeze free of moisture from the surface of the fruit. The highest weight loss was recorded in tomato varieties Golda and Flora (2.86 and 2.42%, respectively) (Fig. 1). Lowest mass loss 2.18 and 2.20% had such varieties of tomatoes Raisa and Rio Grande Original respectively. When comparing data on natural weight loss tomato varieties sparkle Iskorka, Raisa, Rio Grande Original, Golda and Flora, shows that losing weight class Raisa and Rio Grande were original

to 0.14 - 0.16% lower, due to the peculiarities of botanical varieties in particular, a strong peel, as evidenced by the strength of resistance to puncturing. Thus, freeze should be used for tomato variety Raisa and Rio Grande Original, as in the storage of mass loss were lower than in other samples. One of the important criteria of quality frozen fruits is their consistency in thawed form. Typically, the consistency of fruits, frozen in the traditional way, after thawing weakens, there is a strong selection of juice, indicating a low ability to retain moisture biocolloid of protoplasm and increase the number of free water, resulting in reduced nutritional value of frozen fruits.

We investigated the ability of tomatoes to retain moisture during prolonged freezing and refrigerating storage (for 6 months) depending on the varietals characteristics of fruits (table 2). The total water content in fresh tomato open ground is an average of about 93.5%.

Table 2

Change the ability tomatoes to retain moisture after freezing and storage for low %

Varieties of tomatoes	**After freezing**	**After storage, months**	
		2	**6**
Iskorka	96,18±4,81	93,87±4,69	88,43±4,42
Raisa	98,40±4,92	96,38±4,82	92,32±4,62
Rio Grande Original	97,78±4,89	96,80±4,84	90,84±4,74
Golda	97,15±4,86	93,23±4,66	88,74±4,44
Flora	96,77±4,84	93,86±4,69	89,80±4,49

The highest ability to retain moisture after freezing characterized tomato varieties Raisa and Rio Grande Original. During the low-temperature storage of fruits ability of tomatoes to retain moisture observed a significant reduction in capacity, due to the violation of tissue microstructure. Especially this tendency after

6 months of storage, the varieties of tomatoes, Golda and Flora. Varieties Raisa and Rio Grande characterized by higher ability to retain moisture original resolution (approximately 2.60%), due to the varietal characteristics of the fruit. Violation of the micro structure of tissues under low negative temperatures in the fruit reduces the number of bound and increase the amount of free water. As a result the ability of retain moisture reduced, increasing loss of value of cell sap, which has a negative impact on the organoleptic properties. Indirectly, this suggests we calculated the correlation coefficient between retain moisture ability and organoleptic properties of tomatoes, which averaged 0.85. This indicates the existence of a close direct linear relationship between these indicators and explains the trends of their changes.

Conclusions. The studies confirm the effect of freezing on weight loss and ability to retain moisture of tomatoes. Established that the abovementioned parameters most suitable for freezing and subsequent low-temperature storage are tomato varieties Raisa and Rio Grande Original. The use of stabilizers of natural origin tomatoes help to reduce weight loss and improve their retain moisture ability.

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Commodity Science in Bulgaria – Development and Topicality

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Introduction

The topicality of knowledge about commodities determines the role of commodity science for the development of economics, market relationships, protection and satisfaction of the customers.

The creation and development of the commodity science in Bulgaria is determined by the production and circulation of goods, the necessity of improving contractual relationships and customers' culture. The development of market relationships, cooperation and specialization in creating material values gives new problems and perspectives on the way of commodity science. The globalization of world economics needs more and more integration of specialists in solving problems and challenges for the commodity science.

Material and methods

Subject of the current study are different materials and documents related to the development of commodity science in Bulgaria as a school discipline and science, as well as the preparation of specialist with high qualification. The systematic and interdisciplinary approach is used in the study with application of methods of analysis and synthesis.

Results and discussion

The occurrence and development of commodity science in Bulgaria. The beginning of the commodity science as a scientific subject in our country dates from 1883, when it is included in the education plan of the first trade school in Svishtov. The first step of the academic commodity science is in 1920 as the start of the first higher school of Commerce (known as University of Economics – Varna these days) when it is one of the 13th obligatory disciplines for all students. That decision is made with protocol 28 by the Academic council of HSC [3]. The founder of the discipline in Bulgaria and first rector of the school is Tsani Kalyandzhiev, who is also first professor of commodity science in Bulgaria. He reads and leads the discipline till 1935 applying German, Austrian, Russian and Switzerland methods, which are well-known to him. He integrated the practical study in laboratories which gives the students better analytical and practical skills in qualification of commodities. In 1992 he released the first textbook of CS named "Notes of commodity science with chemical technology". Professor Tsani Kalyandzhiev justified the economical need of commodity science, related to preparing economists well-educated about production and falsification of many industrial and natural products. This is the main direction of commodity science till nowadays. With his active The faculty and ***specialty Commodity Science are set in 14th October 1948 (Protocol 68.19.10.1948)*** at the public university "St. Kiril Slavo-Bulgarian", which is renamed in 1953 in High institute for National Economy and now it is University of Economics - Varna. From its beginning till now for 68 years the "Commodity Science" specialty is the only one so-named specialty in Bulgaria.

A little later a standalone department of Commodity science is created in University of economics "Karl Marx" – Sofia, now University of National and World

Economy [2] and the lectures of commodity science are read in Academy of economics – Svishtov.

Training of specialist with high commodity science qualification. After a period of designing study plans and programs, creating material base, developing laboratories, etc. the commodity science gets bigger role as a teaching discipline with a great importance for the practice and many universities (Burgas Free University, Technical university of Gabrovo, University of Ruse "Angel Kyntsev") and technical schools started to read the discipline.

In 1948 with the beginning of specialty a new department of Commodity science is set. It is the only that teach students with high commodity qualification and stand as a only engine and keeper of the commodity science in Bulgaria. The first study plan is also designed by the new department [4]. The development of the department is tightly related to its personnel selection and management. Form its establishment until now 11 teachers have been leaders of the department [6]: prof. Dimitar Ganev (1948 – 1949); prof. eng. Boris Velikov (1949 – 1956 г. и 1958 – 1959); prof. Stefan Conev (1956 – 1958); prof. Vladimir Stanchev (1959 – 1968); associated professor Georgi Kanturski (1968 – 1973); associated professor eng.Stoyko Iankov (1973 – 1978); associated professor Angel Georgiev (1978 – 1987); associated professor Dimitar Sefanov (1987 – 1994); associated professor Hrsito Dontchev (1994 – 2003); associated professor Maria Jeliazkova (2003 – 2011); associated professor Temenuga Stojkova (2011-2015). The current director of the department is associated professor Sabka Pashova. Also form the foundation of the commodity science over 3300 students in three educational degrees –bachelor, master and PhD have graduated with the help of 27 teachers of special disciplines. Only for the last 10 years 450 students with higher commodity qualification have graduated as economists. For the same period 310 students have taken master degree in the deparment and 216 of them (69,7%) have graduated "The quality and expertise

of commodities" master program. That determines the topicality and quality of the education in the degree. After 1990 the commodity science department teaches 20 students in PhD. They develop topical subjects, related to the quality, safety and certification of commodities. All three educational degress in commodity science department are accredited by the government. Training takes place on topical curriculums, adapted to the current trends of the commodity science and market economy, but also conserving the traditions and international teaching experience. The unique knowledge of the students of commodity science gives them wide opportunities for carrier development as innovation managers, quality managers, experts, certifiers, etc. [5].

Research in commodity science. The first researches about fabrication of rose oil, safety of imported products and the importance of commodity analysis in quality date from the late 90-ies in the publications of Professor Tsani Kalyandzhiev [1]. The development of the commodity science, changing economic and market conditions determine the great need of active scientific work, joint international researches and performance. The tendency of scientific researches of the academic staff in the last years are focused on quality and safety of commodities, quality management, expertise of food and industrial products, certification of system and products, ways of improving nutritional value and extending storage time of food products, identifying and falsifying, packaging, minimizing products changes during transport and storage and many more. Most significant is the number of scientific works (treatise, studies and articles), published in Bulgaria and abroad and only for the last 5 years the publications abroad are more than 25. The inventions, inventors' certificates and patents are over 46, the scientific researches of RS are over 36. More than 155 textbooks for universities and technical schools have been written for the 68 years of the department by its team. Only in the 8-year period during 2007 – 2015 the academic staff of the department has published over 120 scientific researches. During its long life the Commodity science department has been developing and

approving its authority in Bulgaria and abroad, taking parts in and organizing many international activities in the area of commodity science. From 1970 until now twelve international scientific conferences with the participation of eminent scientist in the field of commodity science have been held. That is a major sign for the international recognition of Commodity science department and specialty [6]. The number of presentations in these conferences is 607 with 303 papers of international and 304 of Bulgarian scientists.

Topicality and guidelines for development of commodity science The topicality of commodity science is determined by: fast growth of production, scientific and technical progress, wide assortment of commodities that need identification, evaluation and control through the logistics chain; the need of guarantees between partners which can be achieved by the sustainable quality, conformity assessment by certain certification systems and standarts; the supply of safe and quality commodities; obligatory guarantees and responsibility to the customers and protection of their interests.

The major guidelines for development of commodity science at the current stage are: development of scientific principles, terminology, classification and coding of different commodity groups; quality management through all the stages of the life cycle of the goods; improving the methods of identification, quality evaluation and falsification of commodities; studying the problems of products recycling and creating environmental friendly products; improving standardization policy about voluntary and obligatory standartization, designing new standarts and certification schemes; protection of consumers interests.

Conclusion

The secret of the long life of the commodity science is its eternity and topicality. The success in the present and the prospects for the future are the foundations of its sustainability and innovation. The major for success and

sustainability are: qualitative academic staff, topical study programs and current researches. The commodity science in the current market conditions gains bigger importance, offering methods, resources and trained staff for solving different economic problems and increasing the competitiveness of commodities.

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Assessing the Microbiological Risk to Historical Parchment Documents

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Abstract. Cultural heritage resources are unique products which were made hundreds or even thousands years ago. Today, they are a rich source of historical, cultural and even technological knowledge. This study presents a broad spectrum of methods, based on both conventional microbiological methods and advanced techniques of molecular biology, for the assessment of biodeterioration hazard to parchment documents. The application of proper research methods is crucial to obtain accurate and reliable results which allow the implementation of appropriate preventive measures to protect these special products.

Keywords*: microbiological risk, parchment, biodeterioration, molecular methods*

Introduction

Collections of written documents are a particular type of cultural heritage objects, which are usually made of organic materials, such as paper, parchment or leather. Parchment, being the first carrier of writing, has played a crucial role in the development of culture and diplomacy. Also, as a specific kind of product made by men over the centuries, parchments are a rich source of information for history and technology (Cappitelli and Sorlini, 2005; Krakova et al., 2012; Piñar, Sterflinger and Pinzari, 2014; Piñar, Sterflinger, Ettenauer, et al., 2014). Parchment is prepared from

animal skin, and it is far more durable than paper or papyrus (Lech, 2016; Piñar, Piombino-Mascali, et al., 2014; Troiano et al., 2014). Deterioration of parchment documents can be due to a combination of exposure to light, elevated temperatures, humidity and atmospheric pollutants, but the greatest threat is posedby microorganisms,such as proteolytic bacteria and fungi (Carvalho et al., 2016; Pinheiro et al., 2011; Sterflinger, 2010). To overcome these problems, microbiological risk assessment of historical parchments should be conductedusing sensitive and appropriate methods which allow both airborne and superficial communities to be characterised without affecting the integrity of the object. In the last decade, molecular methods have been used and widely applied to the study of cultural heritage objects. Molecular techniques connected with metagenomics, transcriptomics and proteomics deliver valuable information about both recent and past microbial contamination as well as the level of biodeteriorative potential of microorganisms present on documents (Cappitelli et al., 2009; Piñar, Sterflinger and Pinzari, 2014; Sterflinger and Pinzari, 2012; Troiano et al., 2014).

Methods

All stages of the analysis should be conducted with observance of appropriate conditions in order to minimise any risk of contamination. Experiments with environmental microorganisms carry a risk of isolation of pathogenic microbes harmful to humans. That is why direct preventive measures should be undertaken to ensure that lab workers are adequately protected.

Sampling

Samples for microbiological analyses from documents and other parchment items are usually collected with dry swabs or, if possible, swabs dipped in sterile water. Subsequently, they are rinsed and inoculated onto selected growth media. Another sampling method is the usage of a commercially available sterile tape

(FungiTapeThermoFisher, USA) that enables sampling with minimal contact with the tested object. When collecting samples of documents stored in closed cases, sterile fragments of contemporary parchment can be placed on such items for spontaneous contamination which is followed by a microbiological analysis.

Microbial culture. Microorganisms are usually cultured on growth media: a casein soybean agar (TSA) for bacteria as well as malt extract agar (MEA) and Sabouraud glucose agar (SGA) for fungi. In order to isolate microorganisms with specific enzymatic properties, from fragments of contemporary parchment, a sucrose-free Weary&Canby agar can be used to culture proteolytic bacteria, and a Czapek Dox agar without sucrose can be used to obtain microbes with cellulolytic properties. Inoculated media are incubated at a temperature of 28± 2°C for 1–4 weeks, with periodical inspections and isolation of microbes to obtain pure cultures (Lech, 2016).

Species identification using genetic methods

The first stage of species identification is the acquisition of pure bacterial and fungal cultures. Subsequently, they are homogenised using appropriate equipment. The material prepared in such a way serves for DNA extraction, which is usually performed with the use of commercial nucleic acid extraction kits for bacteria and fungi. Genetic identification is mainly based on the analysis of selected genomic sequences: fragments of 16S rDNA gene are commonly used for bacteria whereas sequences in the non-coding ITS region (Internal Transcribed Spacer) are used for fungi. Amplification of the selected regions is carried out with the use of polymerase chain reaction (PCR) with specific DNA primers. The products obtained are then sequenced with the Sanger's method. For species identification, the nucleotide sequences are read and compared with available databases, the most popular of which are: NCBI (National Center for Biotechnology Information) with

DNA Basic Local Alignment Search Tool (BLAST) (http://blast.ncbi.nlm.nih.gov/Blast.cgi) and EMBL-EBI (European Molecular Biology Laboratory - European Bioinformatics Institute) with FASTA tool for sequence analysis (http://www.ebi.ac.uk/ fasta33/) (Krakova et al., 2012; Mesquita et al., 2009; Pangallo et al., 2013; Troiano et al., 2014).

Diversity analysis of microorganisms present on parchment surfaces or in the environment of their storage.

The most common method employed in a diversity analysis of microorganisms present in tested environments is polymerase chain reaction – denaturing gradient gel electrophoresis (PCR-DGGE). This method delivers information about the genotypic structure of a biocenosis based on the analysis of differences in selected genomic sequences. The greatest advantage of this method is that it not only enables microbial diversity to be tested, but also its changes to be traced over time. Moreover, it is possible to identify species without the need to conduct cultures. This is significant from the point of view of conventional microbiology since, as reported in the literature, only a slight percentage of microbes can be cultured in laboratory settings. The band pattern (fingerprint) obtained thanks to this method is typical of a given environment or tested surface. More detailed information can be obtained after its densitometric analysis. Specific taxons are identified by excising single bands from the fingerprint, subsequent re-amplification of the genetic material, purifying PCR products and their sequencing (Lech and Ziembinska-Buczynska, 2015; Lech et al., 2015; Michaelsen et al., 2006; Principi et al., 2011).

Determination of microbial biodeterioration potential.

The determination of the biodeterioration potential of microorganisms found on tested surfaces is very significant when evaluating the microbiological status of

parchment documents and other cultural heritage collections. The verification of bacterial and fungal ability to produce enzymes capable of breaking down organic components of which historical objects were made can be crucial for further biodeterioration prevention. To do this, numerous microbiological media that enable the identification of microbial enzymatic activity can be used, for instance: R2A medium and general broth with gelatine for testing proteolytic activity (Krakova et al., 2012; Lech et al., 2015), Feather Broth for checking keratinolytic properties, Fibroin Agar for fibrinolytic activity (Pangallo et al., 2013) as well as CMC (carboxymethylcellulose agar) or a medium for testing the ability to produce cellulases (Kasana et al., 2008). Degenerative properties of microbes can also be verified by testing the ability of fungi and bacteria to grow on organic materials using mineral media (Lech, 2016).

Conclusion

Microbiological analyses of cultural heritage objects are significant from both historical as well as social and cultural points of view. Appropriate protection of such valuable items will enable their preservation for contemporary and future generations to give a testimony to historical events. Appropriate protection of historical items from threats posed by microorganisms is of particular significance since, if conditions such as temperature and humidity are favourable, bacteria and fungi can start developing intensively leading to a complete destruction of these precious items. The usage of advanced techniques of molecular biology in microbiological studies on such objects can deliver a lot of interesting information in short time and enables appropriate preventive measures to be undertaken.

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Consumer Demands' Descriptors for Emerging Russian Sparkling Wine Market

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Abstract. The main thesis of this work is to argue that during blind tastings consumers and experts can identify flavor differences of samples, produced by the system of integrated chain from the samples of wines from domestic production based on its organoleptic characteristics and prefer national samples.

Keywords*: sparkling wine, demand descriptors, consumer behavior*

Introduction

Analyzing Russian alcohol market we can noticed that there is a trend of low-alcohol beverage sales growth based on vodka and other strong-spirit drink demand decline. Experts estimates that in the next 5-7 years it is possible at least three-fold growth of the Russian market of wine. The wine market will recover to the level of consumption of 14-15 liters per person per year in Russia. It should be

noted that this level of wine consumption, 16-18 liters per year, has developed in most European countries that are not traditional producers of wine.

Rather modest global consumption value of sparkling wine in the Russian market is accompanied by a very high value of average per capita consumption of pure alcohol: 8.9 liters per year in 2013 and 9.2 liters a year in 2014 with a forecast of 9.6 liters a year in 2015. In this regard, increasing the consumption of wine Russians will result in the replacement share of strong alcoholic drinks with moderately beverage shows positive changes in this trend.

According to research high demand for sparkling wines in Russia triggered a ban on the sale of alcoholic beverages after 23 hours. The majority of alcohol brands in the category of the fault of the ban were not included, as the level of alcohol does not exceed 13 percent. According to experts, the volume of sales on the Russian domestic market is dominated by cheap sparkling wine varieties (100-150 rubles) - its share is up to 70 percent of all alcohol products sold in this segment.

Main result of such demand growth is a shift of trade structure from quantity to quality of goods. Nowadays the middle supermarket has simultaneously from two hundred to four hundred different kinds of wines on shelves, although most of them present Russian or other domestic companies (Crimea, Moldova, Georgia). But due to rapid development of Russian sparkling wine market producer's proportion will change towards greater increase of foreign manufacturers share.

According to this tendency this article covers very important question of consumer demands' descriptors at emerging Russian sparkling wine market. Moreover the authors create a model of the consumer demands' descriptors for sparkling wines made in different regions of the world for systematization of the data in formalized model of competitive advantages. The main thesis of this work is to argue that during blind tastings consumers and experts can identify flavor differences of samples, produced by the system of integrated chain from the samples

of wines from domestic production based on its organoleptic characteristics and prefer national samples.

Material and methods

Analyzing the customers' behavior in terms of sparkling wine market the authors use two-dimension approach: blind-review of national and import beer and market trade offer analysis. Study of organoleptic characteristics of national and foreign wine was based on taste and aroma. These indicators have the most volatility for the 10 wine samples presented in 3 categories: foreign produced import sample, national produced licensed sample and national sample.

To analyze the trade offers structure and market demand character the authors collect data concerning sparkling wine offer in two dimensions: in Russian currency (rubles) and trade units in main Russian retailer's chains. Other objects of analysis were the main driving forces that determine the character of the goods movement: the level of retail prices selling proposition on the scale of the city, the volume of trade turnover, calculated in monetary terms, the number of trade units. Trade unit in this research means an indivisible formalized offer variety of goods on shelves, which serves as a minimum unit of the plurality of the assortment of goods.

Results and discussion

Based on carried researches it was found that the Russian market of sparkling wines is currently developed, dynamic, competitive and multi-segment; it's demand is implemented in the calculation of the volume in physical terms mainly due to the wines of Russian origin (84% of the total value of the physical volume of consumption), while the share of French champagne is less than 1%.

Customer behavior concerning domestic and foreign sparkling wines differs from each other too: in the first case, the traditional leaders in the total physical volume of consumer become white (98%) and semi-sweet (60%) samples of wine,

preferably without specifying their place of origin (74%), whereas in the second case – non-sweet samples(73%).

Another result of market analysis show that application of the International Classification of sparkling wine for the practice of the Russian consumer market is not feasible due to the nature of the technological uncertainties characteristic of the Russian national wine (except the way of wine carbonation); use of the national system of classification for the same purpose is unreliable too due to the same uncertainties because it does not allow unambiguous identification of the wine on the basis of product mix.

Russian sparkling wines are significantly different from the foreign and champagne in terms of sensory evaluation downwards due to differences in the regulation process; on this basis, for the use of their product line identification of the term "champagne" is not justified, although usage of the state "Russian champagne" is ambiguous with technological and legal points of view.

High and marked effect in the formation of significant consumer sensory evaluation parameters sparkling wines have 1-propanol (r = 0,5 ÷ 0,7), isobutanol (r = 0,6), acetaldehyde (r = 0,6 ÷ 0 7) phenylethanol (r = -0,6) and methyl acetate (r = -0,7 ÷ 0,8), with the first positively reflected in these properties of wines, and the last two – negative.

Conclusion

The experimental data justify the need to categorize sparkling wine at Russian consumer market based on technological (hierarchical) and product mix principles. In the first case the differentiating criterion becomes method of dissolution of carbon dioxide therein, in the second - the geography of their place of origin.

Using these indicators combination for consumer oriented trade offers it is advisable to form four product categories, which differ significantly according to the

parameters specified values: champagne, Russian sparkling wines, foreign sparkling wines and effervescent wines.

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The Sustainable Commodity and Products for Circular Economy

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Abstract. Circular economy is a new idea of European Union. A circular economy is an industrial system that is restorative or regenerative by intention and design. In a circular economy, materials that can be recycled are injected back into the economy as new raw materials. The paper describes the principles of circular economy, as well as the sustainable products and commodities from the point of view of commodity science.

Keywords*: sustainable commodity, sustainable products, circular economy*

Introduction

The concept of circular economy

The current European linear patterns of production, consumption and waste management reflect the myth that we live in a world of infinite resources. For several years, the Europeans, like the rest of the world, are increasingly living in ecological deficit by importing almost four times more materials than their exports.

A linear model of resource consumption, which was established in the early days of Industrialization, follows a ‘take-make-consume-dispose’ pattern called also the ‘end-of-life’ concept. Companies harvest and extract materials, use them to manufacture a product, and sell the product to a consumer, who then discards it

when it no longer serves its purpose. The limits of linear consumption outlines the limits of the current 'take-make-dispose' system and assesses the risks it poses to global economic growth.

The European Sustainable Development Strategy [1] points out that it is necessary to modify the current model. The transition from linear to circular economy is necessary. However, changing the pattern must go beyond the current goal of waste management policy in the EU. It should also include a reduction in the consumption of materials and energy in order to lead to the creation of a Zero Waste society [2].

On 2 July 2014. The European Commission has announced a Communication entitled "*Towards a circular economy: A zero waste programme for Europe"* [3]. It set out the basics and principles of the program as well as characterized the potential importance of the circular economy for sustainable economic growth.

A circular economy is an industrial system that is restorative or regenerative by intention and design. Circular economy: replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models.

The new European Commission - adopted in February 2016 the Circular Economy Package which consists of an EU Action Plan for the Circular Economy [4]. Mostly it includes revised legislative proposals on waste and establishes a concrete and ambitious programme of action. The proposed actions will contribute to "closing the loop" of product lifecycles through greater recycling and re-use. This will bring benefits for both the environment and the economy. EC assumes that it will stimulate Europe's transition towards a circular economy. This in turn will

increase global competitiveness, foster sustainable economic growth and generate new jobs.

Important contribution to the circular economy might have the EU product policy which promote re-use and stimulate industrial symbiosis - turning one industry's by-product into another industry's raw material.

The sustainable product in the circular economy

In a circular economy, materials that can be recycled are injected back into the economy as new raw materials. These "secondary raw materials" can be traded just like primary raw materials from traditional extractive resources. At present, secondary raw materials still account for a small proportion of the materials used in the EU. Circular economy needs sustainable products in order to succeed. There are several definition of sustainable products as well as their categories [5].

The clear definition of a sustainable product is given by Sustainable Products Corporation [6] according to which: "Sustainable products are those products providing environmental, social and economic benefits while protecting public health, welfare, and environment over their full commercial cycle, from the extraction of raw materials to final disposition.".

Michniewska described three different types of sustainable products [7]. First group consists of those products wich do not generate waste. They are an environmentally neutral products manufactured according to the concept of "cradle2cradle". To the second group belong products with the environmental impact reduced to a minimum. This group of products is called sustainable due to the environmental life cycle analysis of the product on their design stage. A third group of products is known as sustainable, because they have ecolabel or so-called eco-passport.

In order to determine whether a product is sustainable, it should be subjected to multicriterial evaluation, like ecological, economic as well socio-cultural.

The global Sustainable Brands Community [8] choose in 2015 five types of sustainable products to follow in the next 12 to 36 months:

1. Products that give new life to previously unused waste streams. These products **are designed in line with the fundamental principles of a circular economy**.
2. Products based on bio-materials and biomimicry.
3. Products resulting from crowdsourced innovation processes.
4. Products designed to exist in symbiosis with densely populated environments.
5. Products that would have to turn into services.

Smart companies turn sustainable products into billion-dollar businesses. Recently Williams [9] described the world's first several billion-dollar purpose-driven brands and name them as green giants.

Sustainable commodities

Almost one third of the global population depends upon commodity production for their livelihoods. Commodity production is one of the most important sources of environmental degradation. For this reason there is a need for a sustainable commodity production and trade at a global level.

Sustainable Commodities are defined as providing greater positive or reduced negative social, environmental and economic impacts along the value chain from producer to end user than conventional commodities. Benefits are realised either through the production, consumption or disposal processes, or accrue to the people involved in production [10].

Sustainable Commodities involve a wide range of commodities distinguishable because of their reduced environmental, social and/or ethical impacts. The United Nations Conference on Trade and Development (UNCTAD)

[11] defines an "Environmentally Preferable Product" as "industrial or consumer goods whose production, end-use and/or disposal have reduced negative, or potentially positive, environmental impacts relative to a substitute good providing similar function and utility".

A number of voluntary certification and labelling programmes exist based on defined social, economic and environmental standards for different commodities in order to specify commodities as sustainable. One of such initiatives is the Sustainable Commodity Initiative (SCI) [12], a joint initiative launched by the International Institute for Sustainable Development (IISD) and (UNCTAD) in 2003. The SCI was formed to facilitate the development of sustainable commodities production and trade sectors. The list of products, which devotes the most attention, includes so far the following: palm oil, cotton, soy, sugar, coffee, of fish meal, shrimp, forest supply chains, electronics.

Conclusion

The move to a circular economy has been identified as a significant opportunity for business. It will contribute towards a resource efficient and low-carbon economy, reducing costs and supply chain risks, while generating economic and social value.

The Commodity Science can play an important role in the implementation of circular economy in areas such as:

- ecoinnovation and ecodesign,
- development of ecofriendly and sustainable products,
- identification of sustainable products by using life cycle based metrics,
- providing LCA of products,
- qualifying the products into sustainable purchasing categories.

A very important role of commodity science could be facilitating the acquisition of skills and knowledge for green entrepreneurship by educating T-shaped specialists as well as green collars [13].

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II. PROTECTION AND SATISFACTION OF CONSUMERS

Nutrition and Quality of Life for the Safety and Human Health

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Abstract. The food can be used in a therapeutic way, since the developing of the cancer disease needs a fertile soil and, through a healthy nutrition, those factors that are associated with an increased risk of cancer and a poorer prognosis can be relieved. In order to study the correlation between cancer and nutrition in Europe there is an important study, EPIC -The European Prospective Investigation into Cancer and Nutrition. This study is one of the largest cohort studies in the world, with 512.000 participants recruited across 10 European countries and followed for almost 15 years. EPIC was designed to investigate the relationships between diet, nutritional status, lifestyle and environmental factors, and the incidence of cancer and other chronic diseases. In Italy another project -Tuscany Naturben- was developed to realize a new class of foods, herbal teas and supplements, enhanced or strengthened by active principles with high antioxidant and antiradical properties,

and suitable features to restore the mineral salts and water balance in the human body. The aim is to organize a proper diet and an integration of minerals and biocomponents on patients under chemotherapy, to prevent and minimize the side effects of invasive treatments, and to delay the onset of aging-related diseases, in order to improve the quality of life. For this reason, the study of quality of life and well-being, should be further integrated with news values with respected GDP, such as quality of food, sustainability of production, type of nutrition and correlation with health.

Keywords*: food quality, cancer prevention, oxidative stress*

Introduction

The Food has been the leading actor of Expo in Milan, this choice represent the world important of this element. The food is important for many sector, for example well-being and health. It can be used in a therapeutic way, since the developing of the cancer disease needs a fertile soil and, through a healthy nutrition, those factors that are associated with an increased risk of cancer and a poorer prognosis can be relieved. The food has a central role in the promotion of sustainable well-being in the societies all over the word, it is the indispensable resource for the survival of biological species, including our own, it is a distinctive feature of social life. The fallout of eating habits on the quality of life of citizens is, therefore, clear all its evidence. About half of adult Italian population is normal weight, about 13% is underweight or obese, overweight people are more than 1/3 of Italian adult population. (Facioni F., Filomena M. and Corazziari I.) United Nations 2013: Human well-being is the ultimate goal of sustainable development. (Bachelet M., Maggino F., Riccardini F.) Although several studies have investigated the association of the Mediterranean diet with overall mortality or risk of specific cancer, data on overall cancer risk ore sparce.

The Italian Project -Tuscany Naturben- was developed to realize a new class of foods, herbal teas and supplements, enhanced or strengthened by active principles with high antioxidant and antiradical properties, and suitable features to restore the mineral salts and water balance in the human body.

The aim of the project is to organize a proper diet and an integration of minerals and biocomponents. The experimental design involves 2 groups of women. The first group is composed by healthy women, used to attend surveys on diet and life style (survey performed in cooperation with ISPO, Firenze), and the second one of patients (women of 30-45 years old) under preventive chemotherapy after breast cancer surgery, to hinder or minimize the side effects of invasive treatments, and to delay the onset of aging-related diseases. In this second bunch, both the patients under controlled diet and a control group will be monitored, by measuring the oxidative stress with the automatic hematology analyzer CR4000 (Callegari™, Parma, Italy). The allocation of patients to one group or another will be on a random basis sequence generated before the start of the enrollment, and unknown to either the medical staff or the patients, before the accomplishment of the formal procedure of recording. The measured blood parameters are reported in Table 1.

Table 1

Blood parameters	*Glucose, cholesterol, triglycerides, transaminases (ALT and AST)*
Profile Wellness / Free radicals	*Uric acid, FORT (oxidative stress), FORD (antioxidant barrier), lactic acid*

The blood samples will be collected in both groups of patients, the control and those following a diet of the selected foods. The selected foods are reported in table 2.

Table 2

Selected Foods	
first course dishes	*Ribollita (a typical Tuscan soup), Spelt soup, Pappa al Pomodoro (tomato and bread soup)*
sauces	*Pesto (a typical Italian sauce), Artichokes*
fats	*Extra Virgin Olive Oil from Tuscany*
herbal teas	*Four different types: Digest, Relax, Light and Detox*
jams	*Rosehip and kiwi, Grapes*
juices	*Grapes, Olive leaf)*
Food supplements	*Containing prunes, grape pomace and saffron extracts*

The foods listed above have been characterized by HPLC/DAD/MS methods for their content in biophenolic antioxidants and their hydroalcoholic extracts have been evaluated for their antiradical by DPPH test.

Material and methods

In order to study the correlation between cancer and nutrition in Europe there is an important study, EPIC -The European Prospective Investigation into Cancer and Nutrition. This study is one of the largest cohort studies in the world, with 512.000 participants recruited across 10 European countries and followed for almost

15 years. EPIC was designed to investigate the relationships between diet, nutritional status, lifestyle and environmental factors, and the incidence of cancer and other chronic diseases. In the British Journal was published (Couto E. et al) a study where the researchers examined the association between adherence to Mediterranean dietary pattern and overall cancer risk using data from the Epic and nutrition a multi –center prospective cohort study. Adherence to Mediterranean diet was examined using a score considering the combined intake of fruits and nuts, vegetables, legumes, cereals, lipids, fish, dairy products, meat products, and alcohol. Association with cancer incidence was assessed through Cox regression modelling, controlling for potential confounders.

Antiradical activity (DPPH method) The extracts previously analyzed by HPLC were then used for the DPPH• (1.1-diphenyl-2-picrylhydrazil radical) assay. The antiradical capacity of the sample extracts was estimated on food extracts opportunely diluted. An amount equal to 1:1 of the diluted extract was added to an ethanol solution of DPPH (0.025 mg ml^{-1}). Measurements were carried out at 517 nm with a DAD 8453 spectrophotometer. The EC50 of the extracts was determined through the use of five-point linearized curves [AR%-ln (concentration in polyphenols)], built determining AR% for five different dilutions of each extract and then by calculating the molar concentration in polyphenols of the solution that inhibits the DPPH activity to 50%.

Results and discussion

In the Epic study published in British Journal of Cancer the results in all. 9.669 incident cancers in men and 21.062 in women were identified. A lower overall cancer risk was found among individuals whit greater adherence to Mediterranean Diet for a two-point increment of the Mediterranean diet score. The apparent inverse association was stronger for smoking-related cancers than for cancers not known to be related to tobacco, In all, 4.7% of cancers among men and 2.4% in women would

be avoided in this population if study subjects had a greater adherence to Mediterranean dietary pattern, in conclusion there is a greater adherence to a Mediterranean dietary pattern could reduce overall cancer risk (Couto E. et al)

DPPH test

Table 3 shows the food quantities able to scavenge 50% of the radical activity of 1 mg of DPPH (EC50), calculated for five different dilutions of each extract.

Table 3

Food extracts	**EC50**
Pappa al Pomodoro (tomato and bread soup)	2.819 g
Pesto sauce	5.067E-02 g
Artichoke sauce	6.561E-02 g
Rosehip and kiwi jam	332.95 mg
Olive leaf juice	0.136 mL

Conclusion

Ecological evidence in the 1960s suggested that the traditional Mediterranean diet could have beneficial health effects. EPIC investigators operationalized adherence to the M. diet through a simple scoring system and have documented, in a series of papers, that closer adherence to this diet is associated with reduced overall mortality as well as incidence of and mortality from cardiovascular diseases and cancer. In order to define the correlation with the food diet and the incidence of breast cancer risks the Tuscany Naturben project, in collaboration with the team of EPIC (ISPO-Florence Italy) have been in progress the

experimental design that involve one group of women, with high-risk, that using the selected Tuscany foods in our diets for 3 m.

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Consumers with Sight Disabilities as a Packaging Industry Point of Interest

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Abstract. According to the estimations of World Health Organization on the world there are 39 million blind persons and 246 million have low vision (Visual impairment and blindness, 2014). This substantial group of consumers cannot be neglect by packaging industry and consumers good market. Because of sight problems packaging for visually impaired must be equipped with additional elements, enabling the identification of the product by the sense of touch. This kind of elements are Braille system marking with full name of the product, what is mandatory on pharmaceutical products packaging or with other tactile warnings of danger in the form of equilateral triangle which is expected on the packaging of chemical substances.

The aim of the paper is an overview of elements ensuring safety use of packaged products by blind and partly-sighted persons. The considerations also takes into account legal requirements, market trends and offer.

The use of such elements significantly increases the safety of products use by persons with sight problems. Tactile warnings are important in recognition of

dangerous substances in packaging. Braille marking which is also perceptible through assures that medicines and other pharmaceutical products are recognized by blind patient and taken according to recommendations. It is also important to encourage visually impaired people to conduct basic activities like shopping or meals preparing what is possible with properly labeled packaging.

In the market offer besides products which by legal regulation should be labelled in tactile way also food product with Braille system marking.

Keywords*: visually impaired consumers, Braille system, pharmaceutical packaging, packaged chemical substances and preparations, food packaging*

Introduction

Traditionally, packaging is seen as mean of assuring quantity and quality of packed product. In the last years packaging has also played an important role in products' promotion and had special marketing character. Nowadays packaging is starting to be understood much wider, social aspects of packaging are also been noticed (Lisińska-Kuśnierz, 2010). One of the most important attribute of packaging is safety. Safety packaging is not only characterized by the lack of hazardous substances in packaging material or lack of interaction between material and packed product. Packaging has important role in safe product use. That safe use concern lack of sharp edges, first opening protections and other elements that ensure safety and originality of the product (Kawecka, 2014). In packaging safety assurance is also important to take into account packed product users and their requirements and needs. There are group of consumers with special requirements, these groups are for example children, seniors and persons with disabilities.

For packaging industry most important groups of consumers with disabilities, to take care of are blind or visually impaired persons. According to the

estimation of World Health Organization on the world there are 39 million blind persons and 246 million have low vision (*Visual impairment and blindness*, 2014). These are substantial groups of consumers which should be considered by industry inter alia by special packaging designing and additional elements on packaging.

As additional element on packaging used for visually impaired person Braille might be used. Braille is reading and writing system for visually impaired persons widely widespread on the world. Braille is not a language, it is just a technique to read and write a language. The system was founded by Louis Braille, in 1825. Braille consists of arrangements of dots which make up the letters of the alphabet, numbers and punctuation marks. The basic Braille symbol is called the Braille cell. Due to the reason that there are differences in Braille in different countries, the type of Braille letter (size of Braille cell) has to be standardized. The use of Marburg Medium is highly recommended (*Guidance concerning the Braille*, 2005).

The aim of the paper is a review of elements ensuring safety use of packaged products by blind and partly-sighted persons. The analysis also takes into account legal requirements, market trends and offer.

Legal regulation concerning packaging for visually impaired persons

In law regulations pharmaceuticals are one group of products were Braille marking is used. Pharmaceuticals are very special group of products, while taking the medicine consumers must be cautious. The name of pharmaceutical product, its strength and form must be known to the patient. That is way in European Union Directive 2001/83/EC on the Community code relating to medicinal products for human use, as amended by Directive 2004/27/EC impose that "The name of the medicinal product (…) must also be expressed in Braille format on the packaging". Moreover the name of the medicinal product, should be followed by its strength and pharmaceutical form, and if appropriate, whether it is intended for babies, children

or adults (Directive 2001/83/EC, Directive 2004/27/EC). The photo of painkiller packaging with Braille labelling is presented of figure 1.

Figure 1. Packaging of painkiller with name and strength of the active substance in Braille (Apap 500mg)

The law also requires that whole leaflet added to pharmaceutical product in form affordable for blind and partially sighted persons. For blind people the text has to be provided in an appropriate format, it is recommended to provide the text in a format perceptible by hearing (CD-ROM, files accessed in Internet or helpline). In certain cases the appropriate format may be the package leaflet available in Braille. In Poland pharmaceutical products full leaflets are also available through free of charge helpline. On the phone number 800 706 848 full leaflet of medicines are possible to be heard by persons with sight problems (not only blind but also seniors). The helpline guarantee the proven and the most current version of information and access is constant, possible 24 hours a day, 7 days a week (www.medsync.pl).

Also chemical substances offered to consumers on the market should be labelled in the way visually impaired persons might be aware of their possible

danger caused. According to Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 "Where the packaging contains a substance or mixture (…) it shall bear a tactile warning of danger". Where substances or mixtures are supplied to the general public and classified for acute toxicity, skin corrosion, germ cell mutagenicity, carcinogenicity, reproductive toxicity, respiratory sensitization, or Stot, aspiration hazard, or flammable gases, liquids and solids the packaging of whatever capacity, shall be fitted with a tactile warning of danger. The technical specifications for tactile warning devices shall conform to standard EN ISO 11683 as amended "Packaging. Tactile warnings of danger. Requirements" (*Directive No 1272/2008*). The appearance of tactile warnings of danger is presented of figure 2.

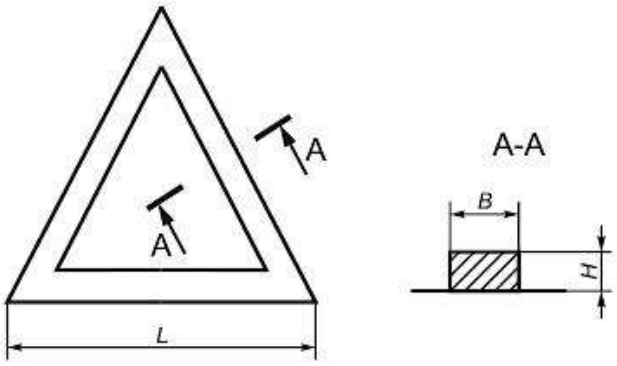

Figure 2. Tactile warnings of danger

Source: EN ISO 11683

Voluntary Braille use on packaging

Visually impaired persons are consumers of all types of products. Significant group of persons with these disability make shopping without assistance of family members or shop personnel. Moreover they are active users of packaged products,

especially such as cosmetics and food or beverages. Visually impaired persons are indicating that such facilities as Braille on food packaging are also needed and required. In research made by Sahingoz (2012) the blind and partially-sighted persons were indicating that on food packaging information in Braille are also desirable. Type of information connected with safety of use, welcomed by research group together with the percentage of indications are presented on figure 3.

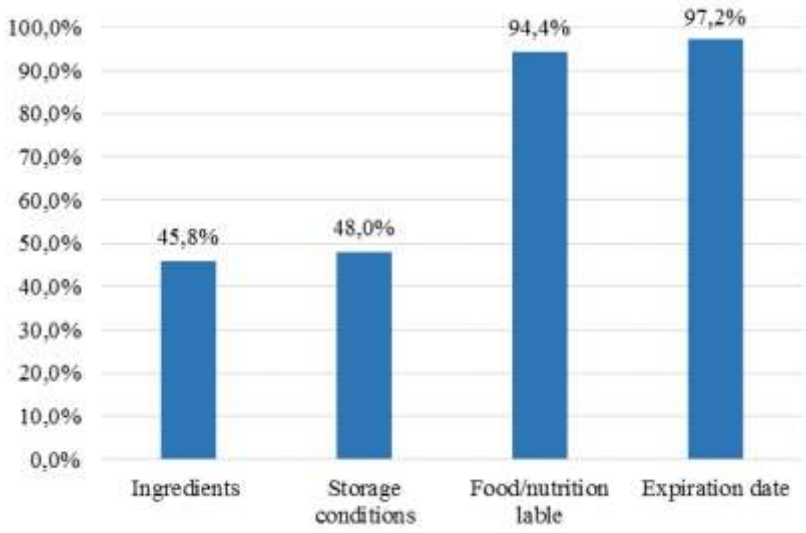

Figure 3. Information that visually impaired consumers demand to be placed on packages in Braille

Source: Sahingoz (2012)

As research showed, not only the name of the product is highly desirable. Also information like expiration date or nutrition obtained more than 90% of indications as desired information in Braille on food packaging. Other interesting for visually impaired persons information are storage conditions and ingredients (Sahingoz, 2012).

In Poland the first food product launched on the market with name in Braille system on the packaging was Irving. This brand of tee has appeared on the market in

2008. In 2009 the brand has also conduct social campaign turning the attention on the problems of visually impaired persons during everyday activity (*www.irving.pl*). On figure 4 packaging of Irving green tea with Braille marking is presented.

Figure 4. Packaging of Irving green tea with Braille marking

Summary

For persons with disability everyday activities are very challenging. Because some of the products may cause danger to users, pharmaceuticals and some of the chemical substances available for consumers should be marked in tactile way. For dangerous chemical substances there is a sign, equilateral triangle, distinctive this kind of products, so persons visually impaired is aware of holding product which might be dangerous. That prevents unintended use of such product. For medicines the full identification is very important. That is way, the name, strength and form is mandatory. Also full pharmaceutical leaflet should be available in audio version. For blind and partially-sighted food, cosmetics and other elementary products shopping might be problematic. First of all identification of desired product is possible only by touch. This is the reason why Braille system should be used also on food packaging. The number of products marked in Braille system is very minor, but rising society and industry awareness might improve the situation.

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Tendencies of Mineral Water Packaging Changes Preferred by the Elderly Consumers in Poland[1]

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Abstract. Mineral water market characteristics in Poland and tendencies of mineral water packaging changes, have been presented in this article. The research results, concerning the elderly consumers preferences as far as mineral water packaging is concerned, have been also presented.

Keywords*: mineral water, packaging, older consumer*

Introduction

The mineral water market in Poland has been developing dynamically for the last few years. One of the development factors of this market is the fact that Polish people want to take care of themselves and have a healthy lifestyle. Healthy, mineral, bottled water perfectly lives up to their expectations.

In Poland, people drink about 80 litres of water every year, while our neighbours consume much more of it, for example an average Czech drinks about 120 litres of water per year and German almost 140 litres.

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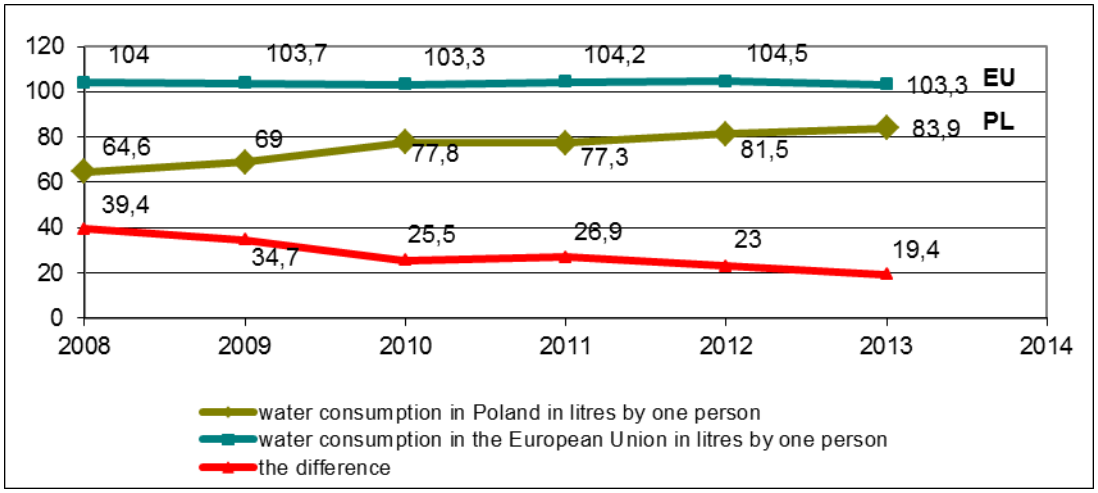

Figure 1. Water consumption by one person in the European Union and in Poland in the years 2008-2013
Source: own elaboration

While bottled water consumption in the countries of the European Union has remained stable for the last few years, noting slight increases and decreases, in case of drinking bottled water in Poland, we deal with the growing trend. After a weaker year, we can observe systematic growth of mineral, bottled water consumption.

Growing consumers` awareness, which concerns mineral water and its influence on organisms and health, is a crucial determiner of the changes on the water market. These changes not only concern the characteristics and properties of the mineral water offered on the market, but also its packaging. Products such as mineral waters (bottled, canned, or "bag in box"), appearing in direct packaging, create so called integrated products (Lisińska-Kuśnierz, Ucherek, 2006). Packaging as an integral part of a product is thus, one of the factors deciding about its market success. In order a product was competitive on the market, not only must it be competitive itself but also its packaging, which repeatedly is the showcase of an article, it gives it "personality" and enables recognition among other products (Walden-Kozłowska, 2005). Changes in packaging may consist in, among others,

refreshing the products` labels, the use of new materials, the change of bottles` shape, etc.

The factors determining these changes are, among others, the increase of the level of lifestyle, culture, the growth of demands in the range of the products offered on the market and customers` consumption habits. Therefore, mineral water producers compete with each other by introducing new, more interesting, ergonomic and meeting the customers` expectations products.

As far as packaging is concerned, the above changes should, however, be introduced after the identification of consumers` preferences. At present, the important segment of consumer research in Poland is the elderly consumers segment. 8,5 million people at the age of 60 and older lived in Poland, in 2015 (Central Statistical Office in Poland, 2016). According to the forecast, this number will increase in the following years. Older consumers are a considerable number of consumers of offered products and services on the market and more frequently become a subject of the scientific research (Moschis, 2003; Carstensen, & Charles, 1998; Yap, & Yazdanifard, 2014; Świda, 2013). Efficient reaching to older consumers with the offer of mineral water, requires knowing their specific needs in relation to the packaging of these products too.

The aim of the article is to present the tendencies of changes in mineral water packaging in Poland and the analysis of consumers` preferences at older age in the rage of mineral water packaging types.

Material and methods

The research was conducted in the period November-December 2015, in the group of 600 consumers at the age of 60 and older, who live on the territory of małopolskie voivodeship. The sampling had quota character. The majority, 59,3% of the respondents, were women. The rest, 40,7% of the group were men.

The research was done with the use of the CATI research questionnaire method. The survey questionnaire consisted of two parts. The first one included questions concerning the identification of the needs and expectations of the elderly consumers in relation to the foodstuffs packaging, among others: preferences relating to the choice of packaging type for a certain foodstuff, including mineral water. Questions describing the respondents were in the second part of the questionnaire. The presented results are only a small part of the research done by the authors.

Results and discussion

Within the conducted research, the respondents were asked, among others, to show preferences in the scope of types of mineral water packaging. The research results have been presented on the drawings below.

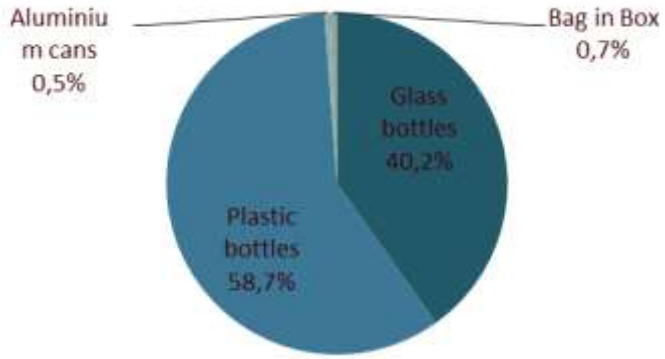

Figure 2. The elderly consumers` preferences in the scope of the mineral water packaging. Source: own elaboration

The most frequent answer to the question about the preferred mineral water packaging were plastic bottles – 58,7% of the answers. Two out of five of the respondents (40,2%) chose glass bottles. Aluminium cans were chosen by 0,5% of the people questioned and 0,7% of the respondents voted on a Bag in Box.

Men, more often than women, claimed that in case of mineral water, they prefer packaging in form of a glass bottle (46,3% vs 36,0%). Women, however, more often than men, chose plastic bottles (63,2% vs 52,0%). The importance of these dependencies was confirmed with the use of the chi-square test for $p<0,05$.

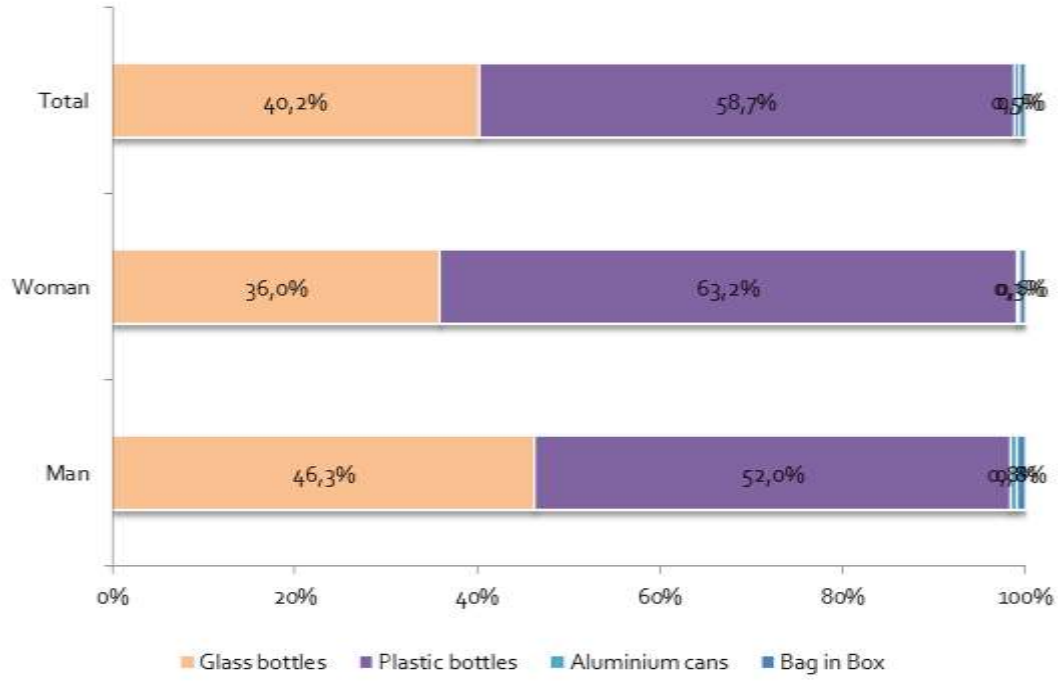

Figure 3. The elderly consumers preferences in the scope of mineral water packaging
Source: own elaboration

Conclusion

Dynamically developing, showing increasing tendency, mineral water segment in Poland makes the producers introduce changes in products themselves, as well as in their packaging. The changes should be introduced including the preferences and expectations of mineral water consumers. At present, the elderly consumers are an important group among them. The research, in the scope of mineral water packaging, among the elderly consumers, will allow their better

adjustment to the specific needs and expectations of this group of recipients. One of the research aspects, which should be included when the mineral water packaging changes are introduced, are the older consumers` preferences in the scope of packaging types. As it results from the conducted research, the elderly consumers prefer plastic and glass bottles – the glass ones more often preferred by men.

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Case Study of FREITAG Brand

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Ⅰ. Introduction

Bags that are loved by everyone, average price of ₩500,000, and made of used truck tarps were different. None of products have the same design, leading company to huge success. Other bags are cheaper and used new material, but they do not have any specific story that attracts customers. Beyond recycling, it is 'Up-Cycling'. Second-hand containers were used to make stores, and rainwater was used to wash.

1) Recycling is a process to convert waste materials into reusable material to prevent waste of potentially useful materials. Recycled products are made of discarded products so it is difficult to give customers impression of new products, and the types of products that can be made through recycling are limited.

2) Up-cycling, also known as creative re-use, is not a process of simple recycling but a process of transforming waste materials into new materials or products of better quality by adding creative idea and different materials.

When people see the bag for the first time, they treat the bag as old and dirty bag. However, as soon as they find out the bag is made of recycled material they praise about its creativity and design. This company does not have any pink bags

because none of trucks of transport companies use pink for truck tarps. Un-popular bags are collected by headquarter and re-distributed to different countries' market so they can be sold. This bag smells like chemical mixture. In fact, this bag has made of used truck tarps, second-hand belt, and rubber tube from bicycle tire. Another word, this bag is the mixture of wastes. This is the story of FREITAG. Even it is made of wastes, many young people at the street of Hongik University and Itaewon own FREITAG. The price range of FREITAG is ₩160,000 to ₩600,000. Yes, it is expensive but more than 20 million FREITAG bags are sold all over the world. Why so many people pay such high price for wastes? There are more than 3000 fans of FREITAG like Harley-Davidson club in Korea. This study focuses on the critical success factors, marketing strategies, and management philosophy of FREITAG.

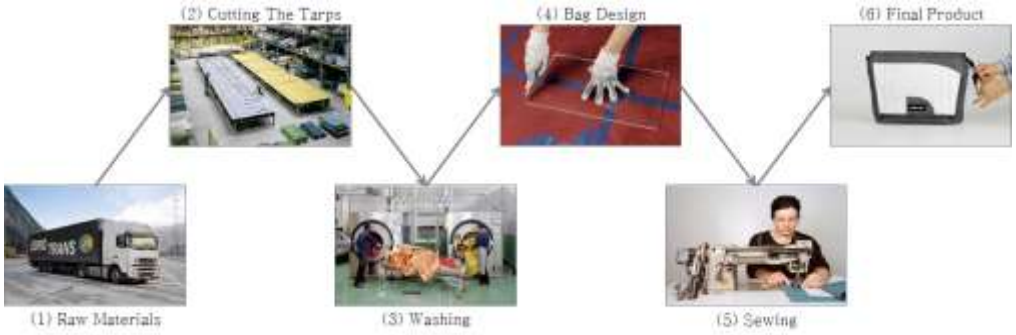
Ⅱ. Background of FREITAG

Switzerland is the country where it rains a lot, and Zurich citizens worthy of the name travel by bicycle – 'velo', they call it. When it rains, bags get wet. To solve this issue, the Freitag brothers wanted a functional and water-proof bag to carry. They found out that truck tarpaulin can be a good solution. In 1993, they established FREITAG shop at Zurich-Oerlikon by using used container.

<Figure 1> Headquarter of FREITAG

source: http://www.freitag.ch/media/stores/zurich

Ⅲ. Production Process of FREITAG



<Figure 2> Production Process of FREITAG

source: http://www.freitag.ch/about/production

Ⅳ. Marketing Strategies of FREITAG

One of the most common question that Markus Freitag, one of the founder, is that why Freitag product is so expensive. Its design and quality is okay, but it is made of waste and recycling materials. To convince customers, and to make Freitag one of the most popular luxury brand Freitag brothers used following strategies.

1) Uniqueness

One of the main materials of FREITAG product is used truck tarps. FREITAG never uses new truck tarps. They always use second-hand truck tarps that is more than 5 years old. Therefore, none of the products have the same feel, design, and patterns, giving special uniqueness to each product.

2) Story

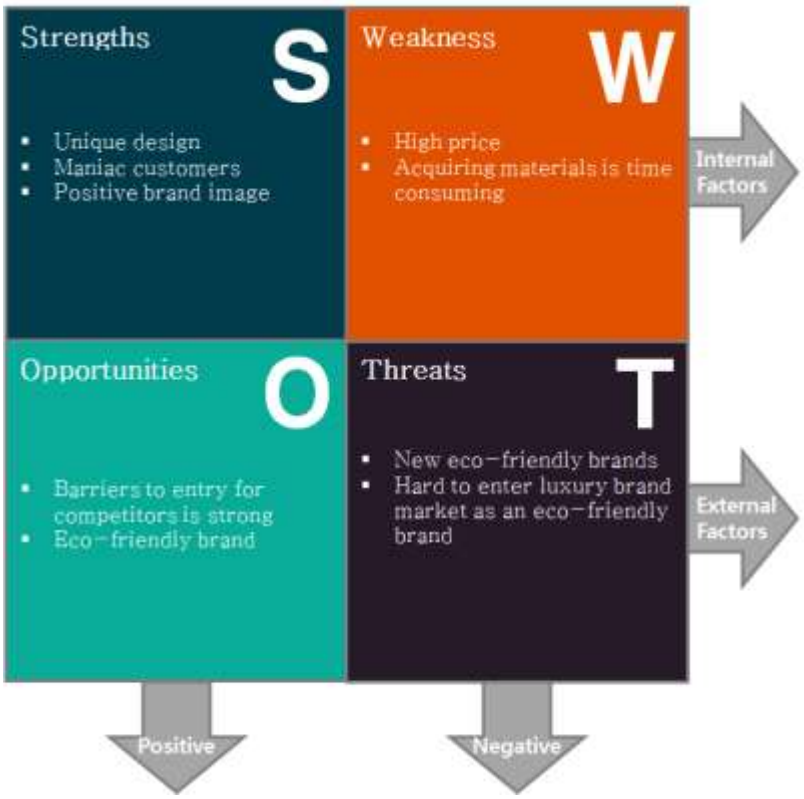
A FREITAG use only used truck tarps and does not use new materials. Many competitors and other companies use new materials to develop and produce new lines of products, but FREITAG keeps its originality. They provide the story of the product. FREITAG provide the information of the truck, telling what kind of the truck it was and what kind of work it did. FREITAG emphasizes the fact that the user of the bag is the one who is writing a new story of used truck tarps.

3) Integrated Marketing Communication

Recent popular trend of bag is eco-bag rather than luxury bag. Trend followers use tumbler rather than disposable cup and other eco-friendly products. Therefore, up-cycling products are getting more and more attention these days. To meet customers' want and follow trend, FREITAG is focusing on the integrated marketing communication.

<Figure 3> Logo of FREITAG

V. SWOT Analysis of FREITAG



Vl. Critical Success Factors of FREITAG and Analysis of Competitors

1. Critical Success Factors of FREITAG

1) Customers have to choose their own product.

None of the product has the same design. Therefore, customers have to search through FREITAG retail and online shops to get the one they really want. The factor that makes customers to search products by themselves rather than provide one for them attracts more customers.

2) Functionality

It is different from expensive, luxury bags. Luxury bags are expensive and vulnerable, so it requires extra care. However, since FREITAG's material is strong, it is highly functional.

3) Natural Vintage

Some manufacturers intentionally make vintage style bags by process new materials. However, FREITAG uses vintage material on the first place, giving natural vintage style to the final product.

4) Efficient utilization of retail shops

Unsold products are collected by headquarter and re-distribute to other areas. Although some products are un-popular, they could be preferable model to other people at different area since every single product of PREITAG has different design.

5) Durability

Bag is one of fashion items, but it is also one of the most functional items for people. Therefore, durability is one of the most important factors. PREITAG is made of used truck tarps, which is one of the strongest materials that can be used for bags. Fashion is important, but it is also important to keep products' functionality.

6) New story

FREITAG cut a messenger bag out of an old truck tarpaulin. As the carry belt, FREITAG used second-hand car seat-belt webbing, and an old bicycle inner tube provided the edging.

2. Analysis of Competitors

Competitors		Products	Results of Analysis
1) VAHO			▪ Up-cycling company, which uses truck tires and burlap coffee bags.
2) Touch4Good			▪ Up-cycling company, which makes bags and accessories by using used banners and subway billboard.
3) Fabrikr			▪ Company that uses second-hand furniture and fabric to create new furniture.
4) MatterandMatter			▪ Use second-hand trucks and old houses in Indonesia to produce new furniture.

V. Conclusion

To keep its management philosophy, FREITAG only uses second-hand products or used materials for its products. FREITAG also strives to provide real value to customers with real story of the brand.

FREITAG successfully built positive image of eco-friendly brand, so it became one of the most successful and competitive brand in the world fashion market.

To become more successful and one of the most valuable company, FREITAG has to solve the issues of high price, vague brand awareness, and low production output, which is only 30-40 million bags a year.

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Edible Insects – A New Challenge for the Diet of European Consumer

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Abstract. Entomophagy (the consumption of insects) has been part of the human diet since the dawn of humanity, being influenced by cultural and religious practices. The strongest argument in favor of edible insects as food, besides poverty reduction through food security, the potential for income generation, pesticide avoidance and conservation of biodiversity and cultural traditions, is their nutritional value that support a balanced diet for improving health, also emphasized by our paper.

***Keywords**: food, edible insects, nutritional value*

Introduction

Nowadays, as FAO reports, about 1900 species of insects are commonly consumed as a food source in many regions of the world. More than 2 billion people across the world are eating insects, as parts of numerous traditional dishes, especially in Africa, South-East Asia and South-America.

Because edible insects have great nutritional values, they are considered by FAO a credible food alternative.

Even though the subject of entomophagy has started to capture the public attention in developed countries, the consumption of edible insects in Europe is just at the beginning. Lately, on the European market, snacks, snack bars and protein

powders are the top application areas of interest for edible insects. Starting with November 2015, in European Union, edible insects are considered "novel foods" and their status is regulated by the new Regulation 2015/2283 on novel foods, which will be applicable two years later. According to this, the producers of edible insects whichs intend to sell their products on the EU market should obtain an authorization from the European Commission.

Material and methods

Globally, the most commonly consumed species of insects are beetles (31%), caterpillars (18%), followed by bees, wasps and ants (14%), grasshoppers, locusts and crickets (13%), cicadas, leafhoppers. With a smaller share in global consumption are termites (3%), dragonflies (3%), flies (2%) and others (5%) (Harrison – Dunn, 2015).

Edible insects are an excellent source of highly digestible proteins (35 % to over 60%), containing all the amino acids necessary for the body, that can completely replace meat consumption (Rumpold and Schluter, 2013). Insects represent a source of fiber, because of their high content of chitin, a carbohydrate found in invertebrate exoskeletons (about 10% of the whole dried insect) (Belluco et al., 2013). Most of insects' fatty acids are unsaturated, generally comparable to those of poultry and fish. They are also low in saturated fats (Harrison – Dunn, 2015). Edible insects also have high content of vitamins (especially from B group) and provide many minerals (iron, magnesium, zinc, phosphorous, selenium, copper). It was demonstrated that the content of vitamins and minerals in edible insects can be controlled through the feed (Pennino, Dierenfeld and Behler, 1991; Rumpold and Schluter, 2013).

Thus, insects can be compared to other foods of animal origin, such as crustaceans, fish, and meat, which form the Western diet (Belluco et al., 2013).

Before processing, insects pass through a dehydration process which makes them clean and hygienic and also keeps intact most of their nutritional value. As for taste, most of them don't have a weird taste. Some taste like almonds or nuts (crickets), other more like bacon (silkworms) or smoked bacon (beetles), other like grilled corn (bamboo worms) or baked potatoes (grasshoppers).

Apart from the numerous attributes listed above, that make them an attractive sources of highly nutritious food, edible insects are equally a sustainable source of food, especially because their breeding has little impact on the environment.

The main aim of our paper is to demonstrate, through a calculation of nutritional value using the "Covering degree method", that edible insects are really an alternative source for some foods of animal origin. In this respect, we have chosen two menus for calculating the nutritional value, one which includes only traditional ingredients (meat, cheese and vegetables) and the other one where the ingredients of animal origin have been replaced by edible insects (Table 1 and Table 2).

The calculation of the caloric intake and the degrees of covering the recommended daily energy and nutrients are based on the following formulae:

$Q = 4,1xP + 4,1xGl + 9,3xL$	where: Q - energy value of the product (kcal); P, Gl, L - amounts of proteins, carbohydrates, lipids (g).

The covering degree of recommended daily intake of energy is calculated through ratio between the calculated energy value (kcal) and the recommended daily energy intake (kcal). The covering degrees of recommended daily intake of each nutrients are calculated through ratio between the amount of each nutrient and its daily recommended intake.

Results and discussion

Table 1 and Table 2 show the results obtained following the application of "Covering degree method".

Table 1.

The traditional menu – chemical composition and covering degrees

Ingredients		Quan-tities	Chemical composition and covering degrees					
			P (g)	Gl (g)	L (g)	Q (kcal)	Ca (mg)	Fe (mg)
Salad	Lettuce	250 g	4.75	7.25	0.75	56.18	62.50	2.5
	Cucumber	50 g	0.65	1.45	0.10	9.54	11.5	0.5
	Onion	20 g	0.2	0.7	0.04	4.06	27	0.2
	Cheese	40 g	7.76	0.4	8.16	109.34	198.4	0
	Olive oil	15 g	0	0	15	139.5	0	0
Grilled Turkey with rice and vegetables	Turkey meat	200 g	39.2	0	13.6	287.2	17	5.27
	Rice	100 g	7.29	67.95	1.08	318.53	27	1.17
	Peas	20 g	1.44	2.52	0.09	17.07	4.68	0.27
	Bell pepper	20 g	0.23	1.38	0.07	7.25	0	0.14
TOTAL			**61.52**	**81.65**	**38.89**	**948.67**	**348.1**	**10.05**
Recommended intake			47.5	180	45	1350	400	9
Covering degree of recommended intake (%)			**129.52**	**45.36**	**86.42**	**70.27**	**87.02**	**111.67**

Table 2.

The edible insects menu – chemical composition and covering degrees

Ingredients		Quan-tities	Chemical composition and covering degrees					
			P (g)	Gl (g)	L (g)	Q (kcal)	Ca (mg)	Fe (mg)
Salad	Lettuce	250 g	4.75	7.25	0.75	56.17	62.5	2.5
	Cucumber	50 g	0.65	1.45	0.1	9.54	11.5	0.5
	Onion	20 g	0.2	0.7	0.04	4.06	27	0.2
	Mealworms	20 g	11.08	3.08	3.82	93.64	0.16	0.01
	Olive oil	15 g	0	0	15	139.5	0	0
Crickets with rice and vegetables	Crickets	100 g	58.51	8.4	24	497.53	1.1	0.03
	Rice	100 g	7.29	67.95	1.08	318.53	27	1.17
	Peas	20 g	1.44	2.52	0.09	17.07	4.68	0.27
	Bell pepper	20 g	0.23	1.38	0.07	7.25	0	0.14
TOTAL			**84.16**	**92.73**	**44.96**	**1143.31**	**133.94**	**4.82**
Recommended intake			47.5	180	45	1350	400	9
Covering degree of recommended intake (%)			**177.17**	**51.52**	**99.9**	**84.69**	**33.49**	**53.5**

Comparing the results presented in Table 1 and Table 2 it can be observed that the covering degrees of recommended daily intakes of macronutrients and energy calculated for a lunch meal are higher in case of the alternative menu based on edible insects. This was possible even in the conditions that the quantities of edible insects included in the alternative menu represented a half of the quantity of ingredients of animal origin from traditional menu. So, the statement regarding the high nutritional value of edible insects has been demonstrated. But, if the high nutritional value and the sustainability are sufficient to pique consumer interest in insects, this is not enough to ensure that the insect will become a daily consumed item.

Conclusion

Despite its long tradition among at least half of the world's peoples, in European countries entomophagy is viewed mostly with disgust and associated with primitive behavior (Huis et al., 2013).

By giving numerous arguments on the high nutritional value of edible insects, another aim of our paper is to arouse the interests of European consumers for this subject; we do not advocate the inclusion of edible insects in the daily shopping list, we only want that European consumers to be open minded. Insects are important elements of other food culture and as a proof of the respect for these foreign culture, enthomophagy should not be regarded with disgust and considered a barbarian or a primitive eating habit. Otherwise there is a risk that the human who make such judgments become a barbarian himself. The negative impressions and the disgust associated with edible insects can be overcome through an effort of changing the ethnocentric mentality, which is possible through consumer education. We consider that our paper could be a valuable instrument for consumer education on the subject of entomophagy.

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Valuation of Quality Changes

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Abstract. This article attempts to determine the nature and direction of consumer reaction to the changes in quality considering the obtained results in terms of Prospect Theory. The increase and decrease in quality in relation to the contractual reference point were analyzed as gain and loss. The declared purchase price was used as a measure of consumer attitudes towards changes in the level of product quality. A statistically significant difference between the average purchase prices declared for different relative levels of quality tested has been proven. To assess the significance of differences, a Kruskal-Wallis rank sum test has been used.

Keywords*: prospect theory, quality and price, evaluation of quality changes*

Introduction

Classical microeconomic theories assume that consumer choices are based on maximizing the utility function, determined by the amount of goods consumed within the existing financial constraints [1]. In recent years, however, these assumptions have been subject to severe criticism. The main point of criticism is the fact that the neoclassical theory of consumer demand does not include the actual quality of the goods and thus is not able to cope with problems such as the introduction of new products on the market or changes in their quality. The first one to observe these restrictions to the idea of *homo oeconomicus* was the author of that

concept – Adam Smith – himself. He noted a disparity between the assessment of improvement and deterioration of the situation arising from the decision being taken. This phenomenon was further examined by Kahneman and Tversky in the twentieth century and called the positive-negative asymmetry effect [2, 3].

The phenomenon of positive-negative asymmetry is part of Prospect theory, which assumes that when assessing whether something is or is not good for the consumer, it is crucial to establish a reference point first and then the proposed offers are defined either as a gain or loss in relation to that particular reference point [4]. It is, therefore, of major importance for the consumer to determine the quality of the purchased product. In general terms, the gains that the product brings strongly depend on its quality. If buyers make bad purchase decisions, not only is their satisfaction lower than expected, but in an extreme situation the whole idea and sense of the purchase might be undermined [1].

More and more often consumers make their buying decisions based on but scant information – using simplified rules for assessing the products' quality and usability. They oftentimes lack the time, energy and intellectual skills to engage in more complex comparisons [5]. In the absence of information directly related to the quality, the consumer may assess it with the use of other available information e.g. the level of prices [6]. When speaking of price as a factor influencing buying decisions two issues should be considered: the relation between the price and the perceived quality of the product [7, 8], and the reference price [4, 9].

This article presents an attempt to use the price, as a declared purchase price, to measure consumers' attitudes toward changes in the level of quality.

Material and methods

In the course of the study 400 answers (n = 400) to the following question were collected: *The quality of the product which normally costs 100 PLN has*

decreased / increased by 10 | 20 | 30 | 40 | 50 %. How much would you be willing to pay for such a product?

The survey was carried out through the website with implemented original script to draw variants of questions. The variants were: the nature of the quality change (a decrease/increase) and the level of such change (from -50% to 50%). The survey group, in the vast majority, were students and graduates of the Faculty of Commodity Science at the Cracow University of Economics. The demographic characteristics of the study sample is presented in table 1.

Table 1.

Characteristics of study sample

Sex	***n***	**%**	**Age**	***n***	**%**
female	259	65	18-25	171	43
male	141	35	26-35	162	41
			36-50	50	13
			50+	17	4

The frequency histograms of the declared purchase prices categorized relative to the different levels of quality, and the values of Shapiro-Wilk probability tests indicate that only at the level of "-50%" there is no basis ($p = 0.067$) to reject the hypothesis of normal distribution. Since the normality of distribution is one of the objectives of analysis of variance, another assumption was thus decided to be checked: the homogeneity of variances in the compared groups. Due to the different number of subjects in groups, the Brown-Forsythe test for homogeneity of variance was used: $F (9, 390) = 4.485$ $p = 0,000$. The statistical significance of the test ($p < 0,05$) indicates a lack of homogeneity of variance.

Results and discussion

The resulting curve (figure 1), showing the evaluation function, runs straight in the area representing an increase in product quality and is convex in the area representing a quality decrease. The course of the evaluation function suggests that the preferences of decision-makers will depend on how the problem is formulated. If the reference point on the graph is thus selected that the result is considered as a gain, the evaluation function of the decision-maker will be a rising straight line ($y \approx 0{,}5x$). The decision-maker will then show the aversion towards risk, and will be less likely to be satisfied with the product of better quality than it might be assumed from the proportional increase ($y = x$). There was no evidence, however, of the consumer's decreasing sensitivity with increasing gains. The respondents declared higher purchase prices for subsequently rising levels of quality.

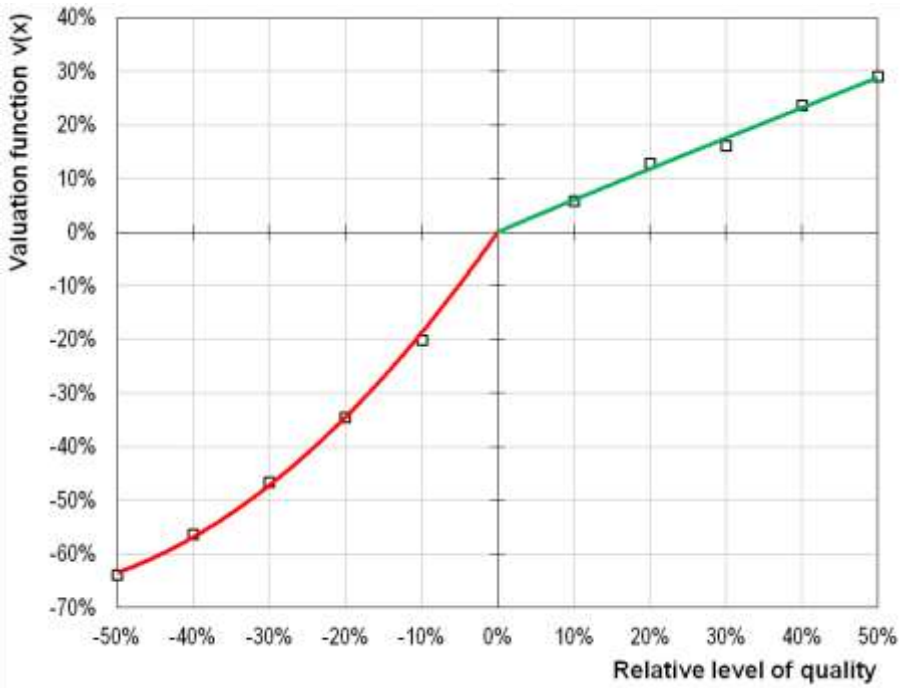

Figure 1. Evaluation curve for the losses (a decrease in quality) – red line, and gains (an increase in quality) – green line.

If, on the other hand, the reference point on the graph is thus selected that the result is considered as a loss, the decision-maker will show the tendency to avoid the loss (especially at the initial values of reduced quality against the reference point). Aversion to loss makes the evaluation function asymmetric i.e. it is steeper on the side of losses than on the side of gains.

Conclusion

The empirical studies described in the literature on the subject show that with an increasing level of satisfaction of a specific need, the importance of the further growth of the level of satisfaction decreases. This phenomenon is analogous to the law of diminishing utility. Surprisingly, a similar tendency was not observed in case of an increase in the level of quality. The respondents declared the willingness to pay more as the level of product's quality went up. The evaluation curve, therefore, requires a closer look in terms of the quality growth. A linear relationship obtained in the study suggests a lack of compliance with the Prospect theory – an increasing sensibility towards gains. Subjective marginal utility (value) for both gains and losses should, according to the theory, decline with their increase. When changing the direction towards reducing the needs, a reduction in the value is disproportionate, as was also confirmed in this study. A steeper line in terms of reduction in quality means that the losses created by its decrease are felt more strongly than the gains within the same absolute values due to the increase in quality.

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III. ECONOMIC, COMMERCE AND MARKETING ASPECTS OF COMMODITY SCIENCE

Marketing Product Lever in The Luxury Goods Sector

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Abstract. In the article we analyze marketing product lever in the luxury goods sector; vital element in the choice of a non-sectorial and specialist development outlook wich compare vaviables such as quality, price and customer approach. In such a period where excessive specialization tends to prevail in many fields, the key to success lies in reasoning in counter-trend. Hence , after enunciating the so-called "anti-laws" in the marketing of luxury goods an identifying the proper and direct features of a luxury goods, we examine the "brand" feature by referring to brand extension an co-branding phenomena and broaden this analysis to other proper and direct features of a luxury good. The aspect that most differentiates the luxury product from all others is its strong relationship with the "dream". The luxury product, did not respond to a need or a want but at a "dream".

Keywords*: luxury goods marketing, marketing product lever, proper and direct attributes, brand, brand extension , co-branding*

Introduction

In the luxury goods sector, the parameters that are traditionally used to identify the target audience and the correct positioning are now obsolete and outdated because of the sociological and economic changes in the current global market. The following article has analyzed the lever "product", that with respect to variables such as quality, price and customer approach is essential to adopt a non-sectoral perspective and specialized. Specifically,after declaring the so-called antilaws in marketing luxury goods and identified the attributes and direct a luxury item, it has analyzed in depth the "brand attribute", with reference to the brand extension phenomena and co-branding , which it can be understood in each case as a "composite brand extension", as a particular case of brand extension, in which the brands involved are two instead of one.

1. The anti-laws of marketing

The luxury is a social dynamic that has characterized human life from the earliest civilizations organized. In the luxury goods sector, not only they are not traditional marketing techniques adapted to luxury, but can actually damage it. In this regard we analyze the eighteen anti-laws of marketing identified by Kapferer and Bastien to operate in the world of luxury (1):

1. Forget about ‘positioning’, luxury is not comparative
2. Does your product have enough flaws to give it soul ?
3. Don’t pander to your customers’ wishes
4. Keep non-enthusiasts out
5. Don’t respond to rising demand
6. Dominate the client
7. Make it difficult for clients to buy
8. Protect clients from non-clients, the big from the small

9. The role of advertising is not to sell
10. Communicate to those whom you are not targeting
11. The presumed price should always seem higher than the actual price
12. Luxury sets the price, price does not set luxury
13. Raise your prices as time goes on in order to increase demand
14. Keep raising the average price of the product range
15. Do not sell
16. Keep stars out of your advertising
17. Cultivate closeness to the arts for initiate
18. Don't relocate your factories.

2.The product

"A product or service is a set of tangible and intangible attributes offered to the market to meet the needs of the consumer."

The product concept of a well with a high symbolic value is characterized by:

• First-level attributes, which provide consumers the satisfaction derived from obtaining functional and primary benefit of the same;

• Direct attributes, aiming to increase the value to the consumer and are made from the set of tangible elements that go beyond the mere functional benefits, but are still part of the product. Among these the most important are (2):

- brand;
- the country of origin;
- high quality and preciousness;
- design, style and aesthetics;
- packaging;
- historical legacy and personal history;
- high price;
- scarcity and uniqueness.

• Intangible attributes, affecting all those intangible characteristics, especially in the luxury products, are crucial to the purchase agreement.

Here we are analyzed the brand.

3.The brand

The brand name for a high-end property is the strongest differentiating factor and positioning that allows the application of a premium price over the long term.

All operational marketing activities, in particular the variable communication, should be addressed to strengthen the brand image. The brand and its value (brand equity) is an intangible asset, difficult to imitate, which gives the company an enduring competitive advantage.

3.1. Stretching in luxury: the brand extension

Every day we hear of luxury brands that come out of their native expertise and extend their reputation in other sectors: Baccarat will associate its name to a range of luxury resort-hotel, Bulgari and Armani have already done. The brand extension can be defined as "the choice of wanting to be associated with a new product an existing brand, defined parent brand, individually or in combination with a new brand"(3).

The brand extension allows for a number of important advantages (4).

The brand extension will significantly reduce deployment costs and follow-up, allowing the company to exploit the image of the capital and reputation of an existing brand and to develop any production synergies, distribution and communication.

One of the main risks related to the extension of the category is the potential loss of brand recognition with a specific class of product that occurs when the breadth dilutes the meaning of the brand, weakening the associations to a category of products (5)

3.2. The co-branding

The co-branding term is used frequently, but the meaning of co-branding is not always unique For example, according to Park, co-branding can be defined as "the strategy which combines two or more brand products (such brands constituent) to form a separate and unique product (brand said composite)"(6). To Interbrand, the co-branding can be understood as "a form of cooperation between two or more brands with a significant degree of recognition from consumers. This form of collaboration has usually lasts for medium to long term and the net value potential that can generate is still too small to justify the launching of a new brand, and / or a legal joint venture "(7).

The co-branding is the association between a "host" brand and "invited" brand, which implies a collaborative relationship that involves(8):

- the co-definition of the functional benefits and / or symbolic offered by the product;
- the co-signature of the product by the brands involved in the agreement.

The co-branding can be understood in each case as a "composite brand extension", as a brand extension special case, in which the brands involved are two instead of one (9).

The co-branding allows to obtain a series of benefits, such as (10): increase in the traditional customer satisfaction scores; the conquest of new market segments; a higher reputation of the products involved in the agreement; easier access to distribution channels with reduced brokerage costs; the reduction of the costs due to increased sales and, consequently, of the production volumes; the reduction in advertising and promotion costs; strengthening the company's position compared to the competition; improving brand image.

We can conclude by saying that luxury companies to become bigger and bigger, must expand in emerging countries, must implement policies of co-branding

and brand extension, enhance and strengthen its brand identity, differentiating itself more and more by competitors (11) .

Conclusion

The aspect that differentiates a luxury product from all others is its strong relationship with the "dream". The luxury product, in fact, does not respond to a need (basic product) or a wish (product brand) but at a "dream". Dreams are an integral part of the lives of human beings, they do not necessarily have to be satisfied and often last for ever. Another feature that distinguishes and differentiates a luxury product, already mentioned in the anti-law number two, is the presence of defects. The luxury product, on the basis of the above, must be lived as a sacred product. The luxury product is also characterized by its relationship with time: it lasts a lifetime ... and beyond. The duration is the variable that justifies the high price. Last, but not least, it is the luxury product personality. Every luxury product, regardless of its product group concerned, has its own name. See, for example, the full range of Louis Vuitton (Speedy bags, Palermo, Alma, Tivoli ...) or the rooms of the Maison Moschino in Milan (Room Alice, Little Red Riding Hood...). The luxury product concept can be summarized in the aphorism of Oscar Wilde “Give me the luxury! I will make less than necessary”. Clothing, footwear, accessories, jewelry, but also purchasing behavior, lifestyles, trends, passions: everything points to the concept of "take care of yourself".

In conclusion, the consumer buys a luxury item not only because it is a product /service aesthetically beautiful and high-quality, but also because it is able to excite and gratify.

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Marketing Activities Management of Trading Companies

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Marketing of the goods is not possible without effective use of management functions such as planning marketing activities that enhance the interest of potential customers; methodological support for projects and programs of its promotion and improvement of marketing communications with customers; the regulation of relations with partners and contractors involved in the formation process, sales and product support; motivation of sellers and consumers with personalized sales tools for different market segments; control and coordination of relations with the consumer.

Marketing activities management of trading companies and selling domestic and foreign production has great economic value. In fact, the effective management marketing activities of trading companies directly depends on the volume of sales, profit and economic growth. In the current conditions, there is the need for effective marketing activities management of trading companies in order to

enhance product innovation and the development of effective promotion programs based on trade company intangible brand value. Development of marketing activities in this field will satisfy a wide range of consumer preferences due to an objective assessment of the cost and expanding investigated market segments.

It is important to take into account objective factors of environmental influences and improve the customer focus of trading companies. It requires a methodical approach to the effective marketing activities management, ensuring the improvement of rules and methods of pricing and quality customer service. Thus, the necessity of solving the problem of increasing customer focus of trading companies, needs systematic study, synthesis and critical review of existing forms and methods of their marketing activities management.

When you study fashion trends it is important to examine related materials for essential goods, the expected color gamut range of the season structure, the construction of basic goods, ways of presenting and promoting fashion trends. Also, when carrying out market research you should explore the possibility of equipping the fashion trade company [1]. Keep in the mind the main task of equipping fashion - an image support, a concept created specifically for clothing, footwear, promoted in the framework of commercial enterprise. To complete the presentation features (spectrum) studies of consumer goods or evaluation phase of the commercial enterprise you should use effective

software solutions. [2] The program of market research to assess the success of the trading activity of the company consists of four stages.

The goals the 1st stage (the measurement of the human stream for retail space enterprises) - the total size of the visitors flow to the division into men and women, the size of the people flow with shopping.

The methodology (counting technology) provides measurement of passing a week stream of visitors through the interval (2 continuous counting to 15 minutes per hour) at the inputs / outputs during the workday commercial enterprise. The results are discussed in the dynamics of the day time and of the day week information in blocks of [3]:

- The total number of visitors of commercial enterprises;

- Sex structure of visitors of the shopping company;

- Sex structure of commercial enterprise customers.

The goals of the second phase (portrait visitor of commercial enterprise) who visits the company; who is the buyer; aims of visit (why walking); estimated the company (strengths, weaknesses); satisfaction from the visit (range, service, location, prices, etc.); what was bought; why did not buy; parameters of consumer behavior (experience and frequency of visits, frequency of purchase, who is the competitor, where to buy the most purchased goods); basic consumer preferences

(enterprise selection factors, vintage and price preferences, the main competitors); knowledge and attitude to the projects in the retail market.

The methodology of the stage - a survey using personal interviews in the areas of trade companies. In order to achieve all possible subgroups of the survey visitors of 15 minutes is carried out for 1 week on the results of the 1st stage. Quotas on the floor of the respondents determined in proportion to the measurement of human-stream (on the basis of the 1st stage of the data).

Standard quality control procedures for field studies:

- Professionalism of interviewers (work experience);

- Testing of questionnaires (1-2 preliminary interviews with representatives of the target audience of businesses, grinding of the structure and the questionnaire);

- Instructed interviewers with test interviews;

- Control supervisor of interviewers;

- Repeated telephone calls (at least 25%) of respondents to re-complements of the sets of questions;

- A second input of each operator (at least 50%);

- Check all users to statistical significance.

Goals of the 3rd stage (level of knowledge and assessment of the

effectiveness of the retail market projects):

- Assessment of the dynamics of knowledge (spontaneous and on the tip) before and after the pro-reference project in the retail market;

- Assessment of the dynamics of the relationship to the commercial enterprise;

- Determination of the differences / similarities of the enterprise features, with the main competitors;

- Assessment of the level of knowledge of the project in the retail market (spontaneously and tip);

- Assessment of memorability slogan;

- Assessment of the memorability level of the various elements of the project in the retail market;

- Evaluation of the project perception in the retail market in terms of its attractiveness for consumers;

- Determine the effectiveness of promotional channels.

The first wave (first measurement of knowledge) occurs before the start of the project in the retail market. The second wave - not earlier than one week after the end of the project in the retail market and not later than a month. The ratio determines the performance efficiency of the project in the retail market.

Methodology of the 3rd step - step by step survey of telephone interviews with representatives of the target audience for about 15 minutes.

Step 1: a random sample, representative with a total n = 800 for a single wavelength;

Step 2: transoms of the target sub-groups by a snowball with a total of n = 200 for a single wave.

The results of the study on the 3rd stage become:

- Assessment of the effectiveness of communication and channels;

- Update on the position of the company;

- Planning further marketing activities based on the effect of the implementation of the retail market projects.

The goals of the 4th stage (determination of actual directions of positioning and building a successful commercial enterprise development strategy): mechanisms of decision-making on purchase location; motivation to attend; relationship to the company, advantages and disadvantages; image of the company and its competitors; related to re-branding; related to the new logo; customer dissatisfaction; barriers to attending; information channels and reference groups; assessment of options for positioning concept or concepts of new projects in the retail market.

The methodology of the stage is qualitative market research - focus groups with representatives of the target audience (customers / not customers - 4.6 persons). Group dynamics and the use of special equipment reveals preferences and motivations of consumers with access to a wide range of ideas and opinions. Also, for optimum measuring the success of the strategy development of commercial enterprise and the effectiveness of marketing efforts it is recommended introduction of special indexes [4]:

- Loyalty index = number of repeat visits / total number of visits;

- Efficiency index = number of purchases / total number of visits;

- Return from the visitor = (number of purchases * average check) / total number of visits.

A necessary condition for the effective use of indexes is regular measurements (1 every six months) by 1-2 steps. Binding measurements to specific marketing activities allows to evaluate their effectiveness.

It should also be noted that the characteristics of marketing activities in the retail market, as a rule, have a significant impact on the processes of the organization of marketing companies that sell analyzed products. All this leads to the need for selectivity when choosing long-term partners, branding agencies, contractors, media, and close the rational interaction of internal departments. It should be noted that Russia's lack of specialized professional branding agency, with sufficient experience in the

organization of marketing activities in the retail market, leading to the need for effective management of marketing activities by increasing the customer focus of enterprises, rational use of internal resources, the definition and regulation of areas of cooperation between members of the marketing activity (Figure 1).

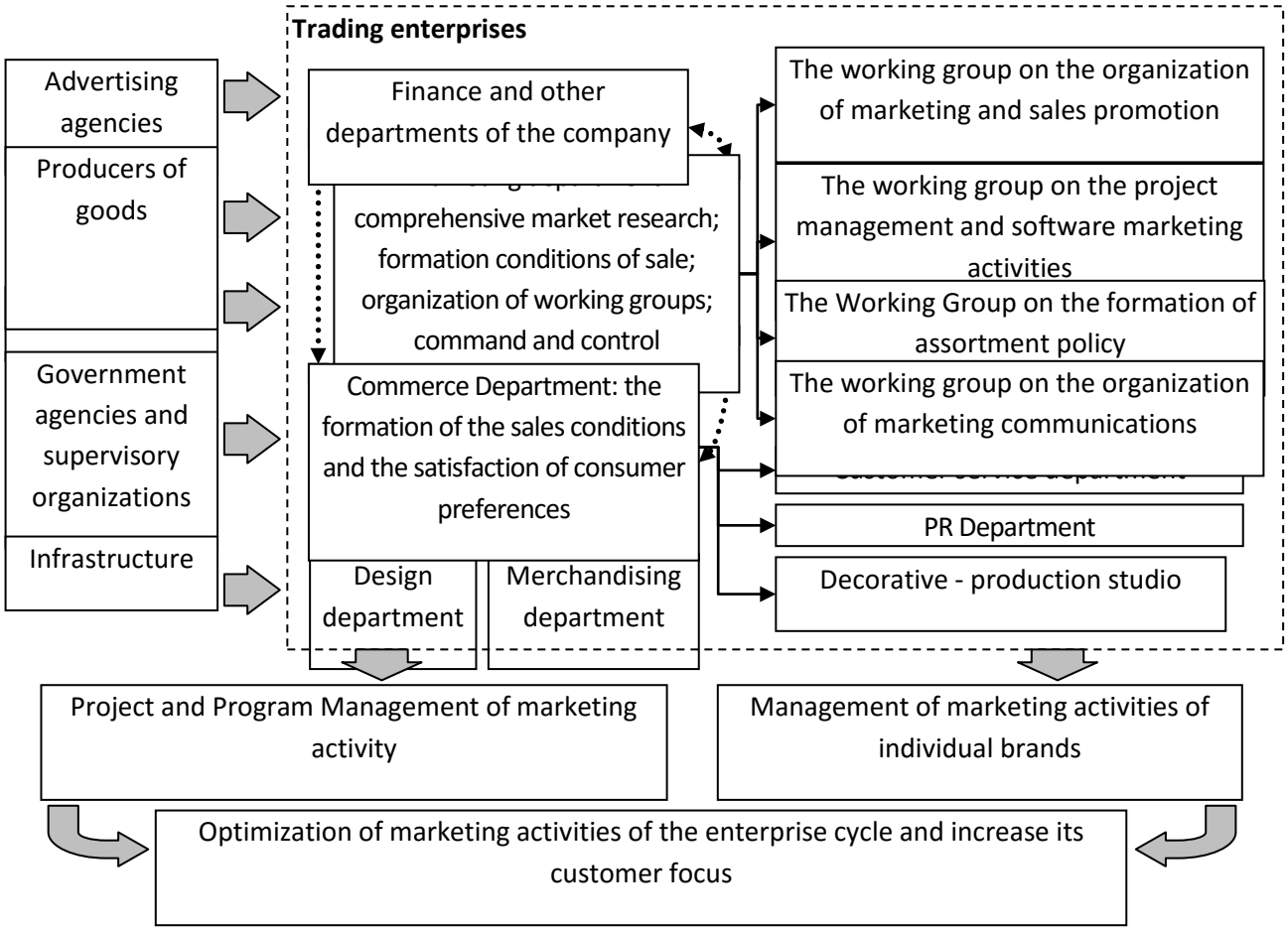
Organization of marketing activity effective management of commercial enterprise, can be represented by the following basic forms with further variability in these forms:

- Create your own Marketing Department;
- Recourse to the services of a branding agency;
- The transfer the coordination functions of marketing activities to concurrently employees of other departments (Department of Trade and representatives of brands).

For large multi-brand retail enterprises are most common the first two forms of marketing activities organization, the latter form is characterized by mono-brand retail outlets, a multi-brand retail outlets, reports the partial powers of co-ordination of marketing activities branding agency, followed by the need to exercise control on the part of companies [5].

The organization of your own marketing department for a commercial enterprise is the most stable form, which eliminates all risks that may be associated with a lack of knowledge of the retail market, and especially the organization of marketing activity of the enterprises of the investigated market.

Figure 1. Scheme of organization of management of the enterprise



effective marketing

The important and most essential parameter of the marketing activity organization of the trading companies in the optimization of marketing activities of the cycle is to understand the rules and methods for establishing and changing prices for the products [6]. The peculiarity of the pricing policy of commercial enterprise is mainly in the business of philosophy, therefore, aims and objectives

of pricing is almost always in the high-risk zone: hold or increase market share; search for the highest possible price (for prestige and removing cream); ensuring continued buying interest; achieve maximum, for short, and high for a prolonged period of time, return; maintain the image of trade enterprise.

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Research Models, Education and Dissemination of the Best Practices Applied in the Activity of Domestic and International Tour Operators

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1. INTRODUCTION

International tourist arrivals grew by 4.4% in 2015 to reach a total of 1,184 million in 2015, according to the latest UNWTO. Some 50 million more tourists (overnight visitors) travelled to international destinations around the world last year as compared to 2014. 2015 marks the 6th consecutive year of above-average growth, with international arrivals increasing by 4% or more every year since the post-crisis year of 2010. Looking at the figures there are positive prospects for 2016!

Results from the UNWTO Confidence Index remain largely positive for 2016, though at a slightly lower level as compared to the previous two years. Based on the current trend and this outlook, UNWTO projects international tourist arrivals to grow by 4% worldwide in 2016. Looking at the long-term prospects, international tourist arrivals worldwide are expected to increase by 3.3% a year between 2010 and 2030 to reach 1.8 billion by 2030, according to UNWTO's long term forecast Tourism Towards 2030.

2. CURRENT APPROACHES/SCIENTIFIC CONTEXT

In business-oriented tourism research, tourism is often viewed as the organization and conduct of tourism activities as well as the facilities and services that are necessary for meeting the needs of tourists (Williams 2009). Thus, tourism is a process formed by the interaction between tourists and the tourism industry

Tour operators function as intermediaries in the tourism distribution system linking producers and consumers.

Their expertise in packaging tourism products allows for more offerings to a wider range of tourists (Gartner and Bachri, 2010)

The enormous growth of international tourism since the 1950s has been fueled by the development of the package tourism industry (Räikkönen, 2014).

The history of package tourism is often traced back to Great Britain and Thomas Cook, who had a mission to popularize and democratize tourism by targeting tours to the lower middle and working classes. He saw the railways as an opportunity to create "travel for the millions" and organized the first domestic package tour in 1841. Later, his offerings covered also international destinations and even journeys around the world (Räikkönen, 2014).

The emergence of the package tourism offered by tour operators, was fundamentally influenced by the social, economic, political, cultural, and technological development in the Western societies after the Second World War. The increasing economic affluence, the growing amount of leisure time, and the technological innovations were significant contributors.

Experiences are the main resource of tourism (Tung & Ritchie 201) and the "raison d´être" of the whole tourism industry (Pizam 2010). The experiences that tourism organizations seek to offer range from mundane everyday experiences to emotional and extraordinary peak experiences.

The larger the operator, the more important it is to exert massive effort to secure and sustain a regular flow of customers to purchase the available capacity. This explains much of the modern focus on the role of marketing by these larger organizations (Middleton et al., 2009).

Watching at the top spenders in international tourism, China has been by far the fastest growing source market in recent years and has been the world's top spender in international tourism since 2012. Chinese travelers spent a record US$ 165 billion abroad in 2014 – an exceptional 27% increase over 2013 and US$ 36 billion more in absolute terms.

Boosted by rising disposable incomes, an appreciating currency, improved travel facilitation and an easing of restrictions on foreign travel, Chinese outbound travel has been growing exponentially over the last two decades. China currently generates some 13% of global tourism receipts (UNWTO, 2015).

3. RESEARCH OBJECTIVES AND METHODOLOGY

The aim of the research is an exploratory analysis about the best practices of the domestic and international tour operators

The methodology is analytical, consist of research on product development, marketing strategies, marketing campaigns, consumer relationship of the domestic and international tour-operators.

The main requirement of marketing activities is to respond to customers' needs, balanced against the growing requirement of organizations to make the most sustainable as well as the most profitable use of existing assets and to achieve integration of management functions around customer-orientated objectives that respect sustainable goals. But marketing techniques are always essential inputs to specifying revenue-earning objectives that are precise, realistic, achievable and measurable in the markets or audiences in which an organization operates (Middleton et al., 2009).

A tour operator must decide whether to concentrate on selling its brands to those who are already looking for a holiday or to try to expand the market by persuading others that they could indeed afford a holiday.

4. RESEARCH RESULTS

The results of this study indicate that the active role should include a focus on tourism's distribution channels (Gartner and Bachri, 2010). The key elements in any marketing system are the attitudes and thought processes of the two parties – buyers and sellers in an exchange process.

It should be noted that there is no natural or automatic harmony between what consumers want and will pay for and what producers are able or willing to provide. In practice there is usually continuing tension between a producer's need for profit, the need to operate efficiently and sustainably with available assets and resources, and the customer's search for low cost, best available value and satisfaction in the experiences they seek.

Therefore marketing managers have to use judgement in balancing between these conflicting needs in the exchange process and to do so with imprecise knowledge about markets, distribution channels and their competitors' decisions.

Their judgement is expressed primarily in the third element of the system, communicating, distributing and delivering products, on which the bulk of marketing expenditure is spent.

The better the balance between the interests in the exchange process, the smaller the marketing expenditure will need to be as a proportion of sales revenue and vice versa. For example, if a car manufacturer or a tour operator has accurately designed, priced and judged the capacity of its production process, distribution and sales will be achieved at a relatively low promotional cost. If, for whatever reason, the price is too high, the product design uncompetitive or the capacity excessive for the available demand, only massive promotional expenditure and discounting will bring supply and demand back into balance (Middleton et al., 2009).

Typically, package tourism refers to mass tourism. During the past few years, the European tour operators have had to respond to the presumed crisis in the traditional package travel sector by creating more individualized, diversified, and flexible packages.

This has provided tourists with a greater freedom and flexibility in their choices while the underlying demand-side motivations, i.e., cost savings and reduced risks, have been met. (Shaw & Williams 2004.)

The arguments about the decline in mass tourism, however, seem to be overstated and package tourism is not considered to be a disappearing phenomenon (Shaw & Williams 2004).

However, the development of information and communication technologies has considerably changed the role of the travel agents and also that of tour operators,

from being providers of advisory functions and transaction processing to the direction of providing consultative services (Cheynel, Downes& Legg 2006).

In the current trend of "do-it-yourself" travel arrangements, the opportunities in the tour-operating business seem to lie in the concentration on certain markets and on tailor-made services instead of relying on mere scale economies.

Related to demographic characteristics and stages in the life cycle, the links between attitudes, perceptions and actual buyer behavior, combine to determine the lifestyle which individuals adopt.

An understanding of the lifestyle of target customers has obvious advantages when formulating new products, developing branding or creating messages designed to motivate such people.

Among international operators in travel and tourism, Sandals resorts and Royal Caribbean cruise line, for example, clearly understand and have single-mindedly adopted a lifestyle segmentation approach, as any consideration of their websites and product brochures will confirm.

Sandals targets the 'thirty somethings' offering an indulgent romantic holiday experience and Royal Caribbean focus on luxury, status and style for affluent empty nesters and younger wealthy couples (Middleton et al., 2009).

5. DISCUSSION AND CONCLUSIONS

The tour operator's role is to provide the best possible prerequisites for the experience: an attractive idea and description of the product, a successful service process, and a reliable, functioning service system.

The challenge of package tourism is that even though the tour operators bundle the experience products, the tourists still use the services offered by multiple individual service providers. Ideally, each module and process in the service delivery system should bring added value to either the service or the experience and the tourists should feel that they are getting added value by not having to pay attention to details, allowing them to focus instead on enjoying their holiday Räikkönen, 2014)..

However, if some part of the package tour product does not provide the promised and expected service to a satisfying degree, it may decrease the overall

value of the experience and lead to dissatisfaction. To ensure positive, satisfactory, and value adding experiences, companies must endeavor to control their service process in its entirety, even if they do not have direct control over all parts of it.

6. FUTURE APPROACHES

1. In order to offer sustainable services, and to shift the whole tourism industry, tour operators *should offer more "green" services* and educate in the same time the travelers. They need to incorporate the Sustainable Development Goals into their activities, join professional organizations like Global Sustainable Tourism Council, for having access to a platform with good practices in applied sustainable practices.

2. *Go-mobile:* 148.3 million bookings were made online last year, and 65% of same-day hotel reservations were made via a smartphone. Consumer confidence in mobile, along with the industry's ability to provide real time pricing information, combine to create a growing wave of mobile bookings.

3. *Offer authentic experiences:* the trend for authentic experiences has broken the surface in the past year as travel mentality has shifted from 'tourist' to 'traveller'. Digital connects people across the globe, with new companies helping travellers find accommodation, guides and other services within the local community to satisfy the consumer's desire not to feel like a tourist.

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Images of Korean Beauty Perceived by Vietnamese and Chinese Women

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Abstract. This study examined and compared images of Korean beauty perceived by Vietnamese and Chinese women. Thirty seven women in Hanoi and twenty six in Beijing participated in online focus group interviews. The group discussions were conducted for four weekends during March, 2015 with Vietnamese women in Hanoi and November, 2015 with Chinese women in Beijing. "Natural" was among the most prominent images of Korean beauty in both China and Vietnam. Korean cosmetic brands and items frequently mentioned by Chinese and Vietnamese women suggested geographical, economic and cultural differences between two countries.

***Keywords**: K-beauty, Korean cosmetics, Korean wave*

Introduction

During the past few decades, popularity of Korean movies, TV dramas and music has been spreading worldwide. The term "Korean wave" first appeared in the headlines of Chinese newspapers in 2002 when the performance of a Korean male vocal group sparked sensational responses from the audience in Shanghai, China. Korean wave has been used to refer to the acceptance and popularity of Korean popular culture (Jung, 2006). At the beginning, Korean wave was limited mainly in

Asian countries, but with the help of unexpected success of PSY's "Gangnam style", the influence of Korean wave has been spreading all around the world. Also Korean wave not only is confined in the entertainment such as the Korean popular media but also has expanded to the wide range of products and services including fashion, makeup, food, plastic surgery and etc. Many previous studies have shown that Korean wave has positive influence on the image of Korea (Han, Chen and Rhee, 2011), the acceptance of Korean culture, and the sales of Korean products(Hong, Kang, and Ohya, 2007). Amidst of Korean wave, Korean entertainers' look including fashion, makeup, hair styling, and so on was noted as "Korean beauty". Korean beauty has become aspiration for many women mainly in Asian countries, and the popularity of Korean beauty has been a driving force underlying the rapidly increasing demand for Korean cosmetics (Kim, Yu and Kim, 2012; Wu and Yu, 2015). A large number of previous studies have examined the influence of Korean wave, but research on Korean beauty (K-beauty) is still sparse.

Therefore, this study as a part of larger project "An interdisciplinary approach to understanding K-Beauty: Identifying factors of K-beauty and developing the prototype of cosmetic products" funded by Korean National Research Foundation, explore and compare the images of K-beauty perceived by Vietnamese and Chinese women focusing on cosmetics. China, the main target country for K-beauty, and Vietnam as a newly emerging market were chosen in this study.

Material and methods

Online focus group interviews were conducted with thirty seven women in Hanoi and twenty six in Beijing. All participants with wide spectrum of occupations were between 25 to 35 years old. The Vietnamese participants were divided into five groups. One moderator and two researchers led the group discussions through mobile group messaging service, Kakao Talk. A test-bed with participants was run

on February 27th and 28th, and the online FGI lasted three hours from 5:00 pm to 8:00 pm during Friday, Saturday and Sunday for four weeks from March 6th till 29th. A list of semi-structured questions were prepared and different themes including cosmetics, fashion, entertainment, and other Korean products/services were dealt each weekend.

Online FGI was conducted with Chinese women in a similar manner. The Chinese participants divided in four groups completed group discussions using Wecha during November, 2015. Vietnamese participants communicated in English, while Chinese discussed in Chinese. The FGI results were transformed in word files, and the contents were analyzed and the frequencies of vocabularies used by participants were analyzed using the software program Word Cloud.

Results and discussion

Different vocabularies the participants used to describe Korean cosmetics were analyzed. Chinese women frequently said Korean cosmetics are "great" and "satisfactory" which are general terms describing any products consumers use. Besides those terms, "moisturizing", "effective", "natural" were also often mentioned. "Whitening", "non-greasy", "smooth" were other terms that were frequently used. All these terms are related to functional characteristics of cosmetics. Therefore it seems that the perceptions Chinese women have on Korean cosmetics are mainly involved in quality or effectiveness of the cosmetics. It is interesting to note that they commented both "expensive" and "economical" with regards to price. These conflicting responses seem to indicate that Chinese women are exposed to both expensive and mass brands of Korean cosmetics.

On the other hand, "natural", by far, was the most frequently used in describing Korean cosmetics by Vietnamese women. Besides the general terms such as "suitable", "famous", and "popular", frequently used are "cute", "beautiful", "attractive" which may be related to packaging of Korean cosmetics or models. In

addition, "smooth", "fresh" were relatively often mentioned. These perceptions of Vietnamese women differ from those by Chinese women whose comments are mainly clustered around functional or physical characteristics of Korean cosmetics. At the same time, "natural" was frequently used in both countries.

The brand names of Korean cosmetics often mentioned by Chinese and Vietnamese women were also analyzed. In China, Hera and Whoo were the dominant brands followed by Sulwhasoo. Whoo is one of the most well-known brands by LG Healthcare, while Hera and Sulwhasoo are by Amore Pacific. They are the biggest Korean cosmetic companies who own wide range of both inexpensive and luxury brands. In Vietnam, the FaceShop was by far the most frequently mentioned, and the skin food was next in the order. Other brands such as TonyMoly, Innisfree, Etude House, and It's skin were also mentioned. All these brands are not luxury brands but mass brands, which may indicate gap in economy between two countries. Wide recognition of the FaceShop that promotes naturalness in the brand may be related to the previous analysis where "natural" was dominant image of Korean cosmetics in Vietnam.

When we asked about specific cosmetic items they use, sunblock was most frequently mentioned, and aircushion was the next in the case of Chinese women. Cleanser, mask sheet and essence were also frequently used by Chinese women. On the other hand, lipstick was the most frequently used Korean cosmetic item in Vietnam, along with moisturizer. Cream, body cleanser, bb cream and body lotion were also widely used items. These differences can be attributed to different cosmetic culture as well as differences in geographical and economic environment.

Conclusion

This study examined and compared how Vietnamese and Chinese women perceive Korean cosmetics. "Natural" was among the most prominent images of Korean cosmetics in both China and Vietnam. Vietnamese women had strong

image related with packaging of Korean cosmetics but Chinese women seemed to focus more on functional characteristics. Even though many Korean dramas/movies and entertainers were well known to Chinese women, their influences on the image and use of Korean cosmetics seemed limited, whereas Korean cosmetic brands were strongly associated with Korean celebrities. The results of this study indicate image of Korean beauty may vary depending on economic and cultural environments as well as user experience of Korean cosmetics and other products/services.

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An Exploratory Study on Marketing Strategy of Korean Car Companies in Eastern Europe

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Abstract The Korean motors companies, Hyundai-Kia has a foreign plants in the China, India, Turkey, Russia, Brazil, U.S.A. and Eastern Europe(Czech Republic, Slovakia). Especially, Hyundai-Kia pay attention to European market. So, the purpose of this study will rigorously search market strategy of Korean car in the Europe and global market. In particular, I will intensively study eastern European automotive market and provide significant implications to Korean car companies.

Keywords*: Car Industry, European Market, Marketing Strategy, Hyundai-Kia, Eastern Europe*

I. Introduction

Since 2006, Korea has been ranked fifth largest car manufacturer in the world owing to Korean car companies Hyundai and Kia motors. Nowadays, Hyundai-Kia brands are globally marketed and they are also famous for their high technology and driver-friendly setups(Kim 2008).

The Hyundai-Kia has a foreign plants in the China, India, Turkey, Russia, Brazil, U.S.A. and Europe after 2000. The Hyundai-Kia motors group globally sold a combined 7,760,000 cars in 2015. This data means that Hyundai-Kia got a sales of

the world's fifth largest car company. The Hyundai-Kia has an ultimate goal that become a world's top car makers by enhancing brand value to satisfy their customers. Especially, Hyundai-Kia pay attention to European market, because Korea-EU FTA officially went into effect on end of 2015.

Therefore, this study focus on status of world automotive market and suggest enlarging strategy from a Korean company standpoint. Especially, we look into eastern European automotive market.

II. Materials and Methodology

This research is exploratory study about global automotive industry. So, I used mainly secondary data to achieve purpose of study. So, I look over global journals, newspapers, special reports, statistics and websites.

III. Overview of automotive market in the world

The global automotive big 4 market is China, United States, Japan and Europe.

First, Chinese automotive market has been the largest in the world since 2008. China had the biggest car market in the world for the seventh consecutive year. Nearly 25 million vehicles were sold in China in 2015, an increase of 4.7 percent from 2014, and accounting for more than one quarter of worldwide sales(Korea Times February 10, 04, 2016).

Second, the United States automotive market was the second-largest market in 2015. Approximately more than 17million cars were sold, up to 5.9 percent from 2014, marking an all-time high owing to the economic recovery, low interest rates and low oil prices.

Third, more than 5million cars were sold in Japan which is third largest automotive market in 2015. Following the big three markets were Germany(3.54 million cars were sold), India (3.42 million cars were sold), Britain (3.06 million

cars were sold), Brazil (2.57 million cars were sold), France (2.35 million cars were sold) and Canada (1.94 million cars were sold).

IV . Korean Automotive in Eastern Europe

The Hyundai-Kia has plants in China, the United States, Brazil, India, Czech Republic, Turkey, Slovakia and Russia. Especially, Czech Republic(Hyundai) and Slovakia(Kia) are the important production facilities in Europe(see Figure 1). Therefore, Hyundai(64 million) and Kia(36 million) got accumulate global sales of a total of 100 million vehicles until April 2016 through global plants. The more than 78 million cars have been sold since Hyundai Motor Group was established in 2000. This means that about 80 percent of the company's accumulated global car sales(Kim 2010).

As a consequence, Hyundai-Kia reached the world's top ten automakers in sales with 24 million autos for the first time in 2000. And, Hyundai Motor and Kia Motors totally sold more than 8 million vehicles in two consecutive years since 2014(Korea Times, April 10, 2016).

Figure 1. Hyundai-Kia Eastern Europe Factory

Around 0.6 million cars per year are made from Korea along with production centers in Zilina, Slovakia and Nosivice, Czech Republic. For a long time, the car industry of Eastern Europe has been controlled by investment from the Germany, France, U.K., Japan and United States. Also, the Korean manufacturer Hyundai-Kia

expected the potential power of auto industry in Eastern Europe. So, they made a new production factories in 2006 and 2007. And all the while, more than 80 Korean suppliers invested in this region. The Hyundai motors in Czech Republic made 313,505 cars and Kia motors in Slovakia produced 309,500 cars in 2015. This figure is the best record since each company founded in Eastern Europe. The Korean automotive industry is in competition with those of other countries in Eastern Europe(IHS Automotive 2014).

The Hyundai and Kia have been very successful sales from other carmakers over the past 10 years by offering a lot of car for relatively little money. European potential customer concerns that the low price comes at the expense of reliability and quality are eased by Hyundai's five-year unlimited warranty and Kia's seven-year limited-mileage warranty. Most car makers competing in Europe offer a warranty of two to three years. The Hyundai-Kia has a goal that become the leading Asian car brand in Europe. Now, Hyundai-Kia have a 6 percent share of the European market. As we have seen, Hyundai-Kia making them the world's fifth-largest auto company. Consequently, Hyundai-Kia motors are very popular to some reasonable consumer. From now on, Hyundai-Kia motors pay attention to raise brand image in Europe(KAMA 2016).

V. Discussion and Conclusions

Up to now, this paper study about car industry not only global market but also Europe market. As I stated earlier, Hyundai-Kia brands is one of the most popular car in the world.

To increasing the car sales of Korean car in Europe, Hyundai-Kia must create various idea as they declare "new thingking new possibilities". And also, to adapt itself to the rapidly changing each market's circumstances, Hyundai-KIa

should focus on developing appropriate strategies continuously. So this paper suggests some strategies to develop Korean car manufacturer. Because decreasing of car sales is detected in global market. As a results, Hyundai-Kia must be keeping an eye on global competitors and Korean car makers should bear it in mind that as follows.

First, Korean car makers should introduce car which has a sophisticated design and high quality with reasonable price. Especially, Hyundai-Kia must be research new model constantly, because global competitors continuously launch new models. If new designed model such as Hyundai i20 or i30 and Kia Sportage are not diversified, most European consumers turn their back on Korean cars.

Second, Korean governments must fully support in a variety of sectors. If they do not heartedly support, Hyundai-Kia and parts suppliers will get in big trouble. The extension of mutual cooperation is enhancing industrial synergy and will get increased revenues. As a results, not only European consumers but also other consumers will buy Korean cars.

Third, Hyundai-Kia must be closely watching all competitors such as Toyota, Honda, Nissan, Renault, GM, FORD and so forth. If they don't do so, Hyundai-Kia will be outstripped by competitors. So, Hyundai-Kia always research new technology such as electronic cars and hybrid car.

In sum, it is obvious that Hyundai-Kia need lots of Research & Development to increase global sales volume.

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The Global Challengeres and Illigal Goods in New Marketing Era

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Introduction. Objective of the Study

During the digital Vortex in 21 c., the developing global terrorism is shaping the Criminal opportunity. Today consumerism is often the genesis for illegal products in the marketplace (Schornstein,S.,2013). The terrorism in demand of the products is often created from successful counterfeiters by marketing activity and campaigns of the authentic brand and products without a trademark and its low price (Sillivan, B.,Chermak, S.,Wilson, J. M., Freilich, J. D., 2014) Many marketing activity (MA) - polity, and strategies by low-cost technology-times, cleaning, painting, labeling, packeging, and distribution, are all that is necessaty to make the illigal product appear new and legitimate.[1] In this global situation, the objective of the study is to represent the new marketing competency to creative combat such illigal products that poses many consequences. The study focuses on the quistions:" *What is the contribution of new marketing wave in 21 c.?".; What is consumerism determined impact by illeigal products";If current marketing activity and policy in the business do not change, what will need to change in the companies".*

[1]Bulding a Digital Economy: The Importance if Sving Jobs in the EU's creative Industries. TERA consultants. International Chamber of Commerce/BASCAP, 2010).

Methodological grounds: hub methodological activities

In the modern"fluid" society, global conflicts and terrorist risks are defining for the creation of marketing protection and security[1]. Global resistance against illegal economy and terrorism is needed as well as business reconstructions of the criminalized social and business networks. Moreover the architecture of these networks for legitimate standardized products requires sophisticated marketing aggregated offer communications, *anytime, anywhere, with an address database*.[2] But through accelerated criminal communication illegitimate new products are being introduced with high speed and mobile criminal capacity for the companies. This brings new endpoints for technology transition from traditional to digital markets, from silo to social media, from „outbound" to„inbound" customer technologies, from communications of trust by the means of „**say**" to expertise and experience through „**do"**. It's urgent to implement digital marketing diagnostics through marketing engineers, technologists and other specialists providing integral part of any modern business – a new marketing technology in accordance with the mobile business

[1]Global Terrorism Index 2015, Measuring and Understanding. The Impact of terrorism. Institute for Economics and Peace. START, 2015.

[2]2015.Information Economy Report, Unlocking the Potential of E-commerce for Developing Countries, UNCTAD, 2015.

Figure 1.1. Global trade (import / export) and structural growth of GDP by reducing distribution barriers

Figure 1.2. Global flows of organized transnational criminality

(The Globalization of Crime. A Transnational Crime Threat Assessment. Interpol, UNODS, 2010).

models. Today the required marketing re-branding generates new emergent business area leaning towards its adaptation *as one quickly changing business area (*Brinker, S.,2014), in which conflicts and risk от lack of information[1] and terrorism are growing by leaps and bounds.[2] Situations of criminal business and global product piracy are emerging Heather Mann, Ximena Garcia-Rada, Lars Hornuf, Juan Tafurt (2016), (fig.1.1., 1.2.), with massive unlicensed sales, leading to a gray business zone between war and peace, justice outside of each country. This poses a serious threat and requires global MA on the basic tasks of INTERPOL: *Reformations and ascertainments* of global and regional clandestine networks; *Building* global and regional institutions for security and protection; *Providing* transnational legally-logistic regimes and security applications (fig.3,4).

[1]2015 Connected Risks: Investing in a Divergent World. Foreign Direct Investment Confidence Index. A.T. Kearney, 2015.

[2] 2015 Terrorism & Political Violence Risk Map- a guide. A on Risk Solutions. A on Broking, 2015.

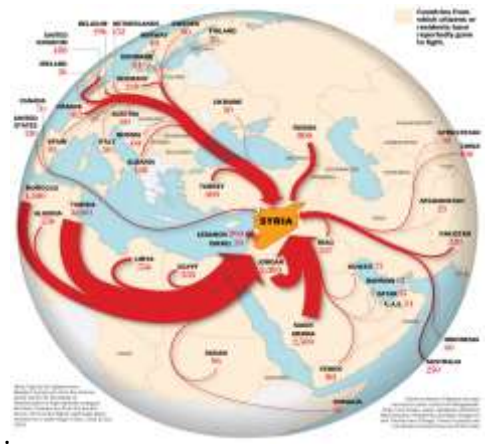

Figure 3. Dynamic global terrorist situations in citizenship and residence of the population (2014) (http://soufangroup.com/wp-content/uploads/2014/10/Foreign-fighters-flow-to-Syria.jpg)

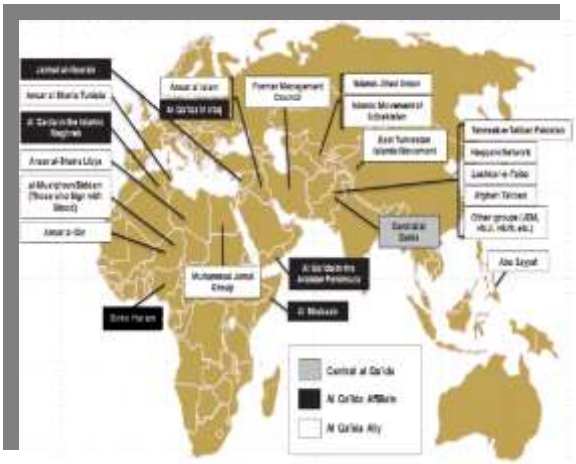

Fig. 4. Map of the branches of Al Qa'idah and Ally (2014) source: National Consortium for the Study of Terrorism and Responses to Terrorism A Department of Homeland Security Science. RAND, Ligon, G., Hunter, S., & Harris, D. 2012, **(http://counterjihadreport.com/tag/al-qaeda-in-the-arabian-peninsula11)** -Syria.jpg

For this purpose we need professional marketing management and control over global distribution networks for all types of resources. This causes a creative change in the business models of companies and reorganizing of their business culture In this connection, marketing, legalizing organizational risk in terrorist terms (IRM–ISO 31000;2009), we define *as vital business managerial „**membrane**"* protecting the communication exchange value/benefits between different partners in networks. The success of this exchange are vital emergent marketing competencies – the secret of modern competitiveness**.** These competencies are directly dependent on "terrorism" (L. Bonnie (2013), and its politicization in business (Greener, B. (2009) (tabl. 1) with prevention resources (Donald, N., Shull, D., Houlder, 2006).

[1] Amedeo Policante. (2013). The new pirate wars: the world market as imperial formation, Global Discourse, 2013.3:1,
52-71 (http://dx.doi.org/10.1080/23269995.2013.804760).

[2] Global Governance Monitor from the International Institutions and Global Governance program. Jine 19,2013**.**

Table 1. Impact of the terrorist activity on pirated brands and roducts

№	Types of impact	Scope of impact
1	**Economic**	Sales volume, risks, prices, brands, reputations, expenses, communications, operations, fees, finance, image, information systems, media and others.
2	**Innovative**	Level of investment, technology, economic growth, declining resources, standards, markets, public and business interests, etc..
3	**Customer**	Quality standards, health, security, protection, loyalty, satisfaction, image, social responsibility and others.
4	**Intellectual property**	Patents, designs, trademarks and trade names, competitiveness, trade agreements, contracts
5	**Product, Brands**	Satisfaction, quality, uniqueness, benefits / value, life cycles, prices, identificati health, loyalty, security, and more.
6	**Market**	Technologies; competitors; urbanization mega-cities (more than 5 mln.); Mega-regions (over 10 mil.) mega-corridors (over 20 mil.); re-segmentations, distribution, logistics, risks, adaptation, standardization and others.

In this regard, global and regional studies of the impact on industries are highly alarming. More than 36 % of Co have experienced economic crime, morphind into different forms depending on industrial sectors and region in 2016 (table.2). In Bulgaria the main divergent

Table 2. Industries at economic crime risk in 2016

№	Industrial sectors	% at economic crime risk
1	Financial services; government/state-owned; retail and consumer; transportation and logistics.	**50-40 %**
2	Communications; aerospace and defense; insurance; energy, utilities, mining; engineering and construction; manufacturing; entertainment, media.	**39-30 %** (Eastern Europe region)
3	Automotive, pharmaceutical; live sciences; hospitality and leisure; chemicals, technology.	**29-20 %**
4	Professional services.	**< 19 %**

factors includes the countrywide rate are: unknowing marketing requirements (60%); local law enforcement agencies (58%); implemented control and/or quality (52 %); conducted transactions (43%); aligned people, technology, processes(43%)[1]. In order to minimize those threats certain authorized organizations

[1]2016.Adjusting the Lens on Economic Crime. PwC's Global Economic Crime Survey 2016. PricewaterhouseCoopers International Limited.2016 (www. pwc.com.)

and individuals are authorized to perform various roles with counter-marketing activity (table.3).[1]

Table 3. Specific collaborative roles for counter-marketing activity

Basic subjects	Specific roles/responsibilities of the work places
Customers – actual, potential	Pro-active raising of the information awareness and training to identify and attempts for recognition
Leaders, owners, managers	Calculation of problems, programming for internal and external brand protections; skills for legal protection
Industrial leaders, boards / councils	Collaborations for dedicated intelligence, influence and brand resource solutions specific to different industries
Firms,companies entrepreneurs, investors	Creating new anti-piracy technologies, control systems products, brands, processes, etc. multi-legal protections
Off-/On media/ intermediaries	contemporary w-pages assist customers in the evaluation and selection of products for purchases
Controlling, banking institutions / entities / persons	Preventive and current control for speed reactions against the shadow economy-abuse violations, cyber attacks etc..
Financial and banking institutions, departments,entities	Strategic, tactical and operational monitoring / control target indicators for illegal business activity
Civil (non-governmental org. / People	The development and monitoring of joint pro-active strategies, providing legal products brands in distribution channels, logistics
Audit- expert individuals, institutions	Development and implementation of methodologies for off / on controlling an informed choice and protections, trust and success
External experts, auditors, with leadership experience	Monitoring and auditing of threats, accelerating protection and security against pirate products in global and international processes, systems.

This way the new role of MA originates from the need for shared marketing leadership influences when chosing business missions, goals, and diagnostics and strategies (Francisco, R., 2010). Application of this new role, marketing capacity to protect and define security as target selection and application of analytical algorithm harmonizing these creative and valuable "genes" to protect: Gen G 1. "Market Leadership" - marketing interventions in changing market circulation used between tangible and intangible resources; Gen. G2 "Industrial Leadership" - marketing invasion by a portfolio of jobs in accordance with their business models; Gen. G3 "Leadership Knowledge" - creatively valuable marketing skills business models and strategies exchange between partners. (table 4).

[1] 2013.OHIM, European Citizens And Intellectual Property: Perception, Awareness And Behaviour, 2013: https://oami.europa.eu/tunnelweb/secure/webdav/guest/document_library/observatory/

Table 4 Creative-valuable forces in the capacity of defense and security "3G" genome

Creative power	Specific forces
Open power for protect and security of market leadership	Corporate intervention for sustainable business positives through the membrane policy dynamic communication capacity to market changes, through coordination between contractors, minimizing piracy threats.
Hidden power for protection and security for Industrial leadership	Corporate Invasion for Business positives in structural policy for protection and secur Hidden competitive force synchronizes changes in the design of business models, jc brand and marketing solutions bench in markets.
Creative power for Protection and security Functional sufficiency	Diagnostics of the results of investigations conducted on functional market competencies based on priority business decisions on short, long term innovation resista and investing in the development of intellectual property and personal brand leadership[1]

By marketing cards for resizing signals of disharmony between the three creative forces in the genome "Capacity for protection and security" 3G "reveal the critical points protections (CPP), using the funnel" Marketing diagnosis".[2, 3] (fig.5).

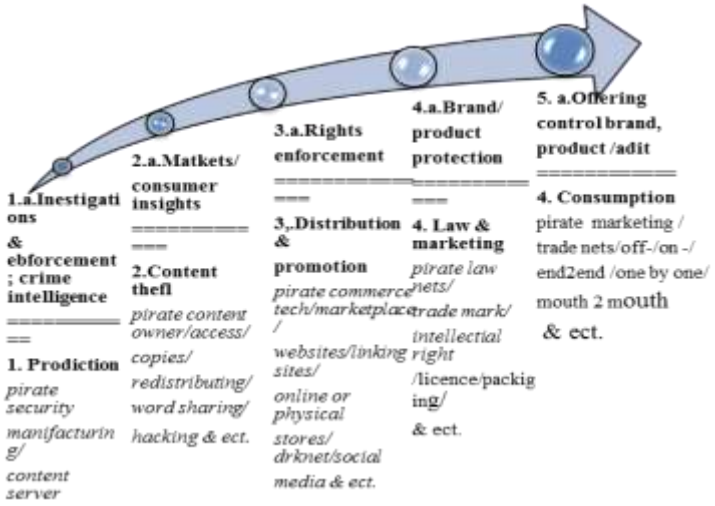

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Figure 5. Critical protection points (CPP) in marketing-anti-pirate value chain

When designing and selecting those strategies for protection and security CPP protections (1.a-2a-3a-4a-5a) and CPP piracy (1-2-3-4-5) are being diagnosed (fig. 6).[4] Diagnosis of the balance between them is the key for choosing anti-terrorist

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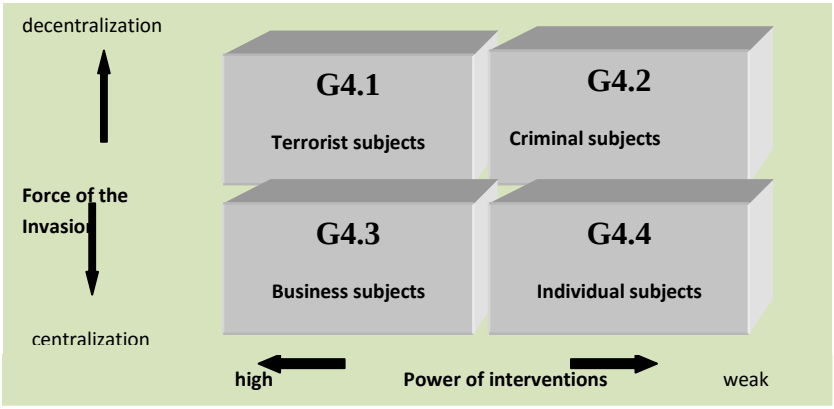
strategies (Gi) against individual, business, criminal and terrorist organizations (Miklaucic, M., J., Brewer (2013) (sch. 1).



Scheme 1.Matritsa "Basic Strategies" 4.0. Gi "anti-terrorist effects

(adapt. :Schneider, F., G. (2010).The (Hidden)financial from of terrorist organization: A Literature reviewand some preliminary empirical results. Forschungsinstitut zur Zukunft der Arbeit, # 4860).

The implementation of Gi strategies require compliance with the collective anti-piracy responsibility (table 5)

Table 5. Drivers of collective anti-piracy responsibility (for year 2040)

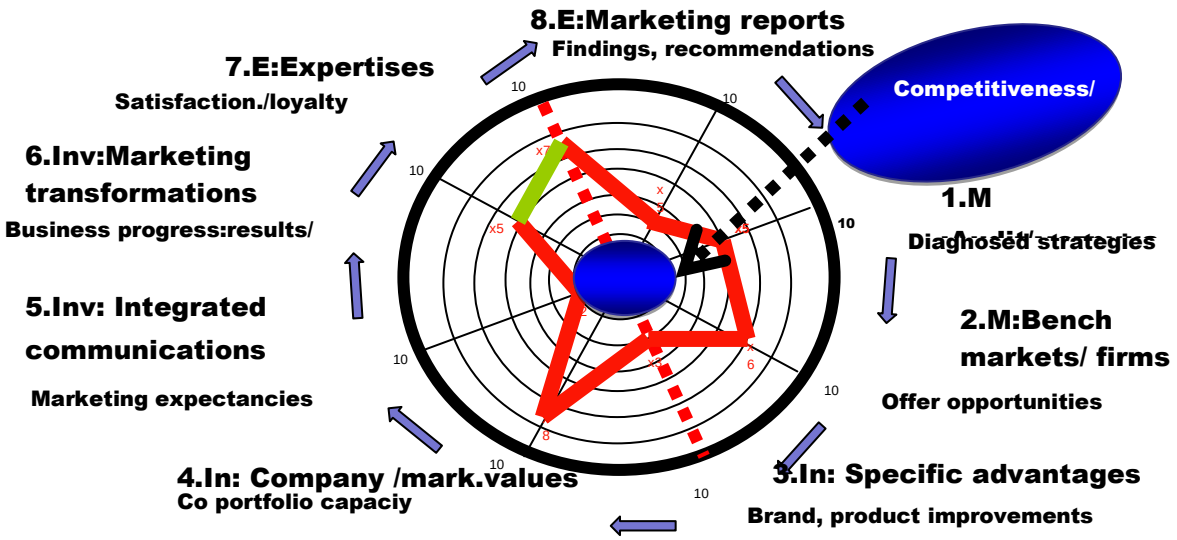
	Drivers with priority values	Collective anti-piracy themes	Scope of anti-piracy responsibility in collective cases
1	**Trust**	Equality and development of the community	Equality of communities, genders, genetaions
2	**Populism**	Caring for the environment	Customer rights
3	**Equality**	Better life for fewer	Protection of workers' rights
4	**Stability**	Health and well-being	Minimizing pollution / increase in recycling
5	**Compliance**	Collaborative consumption	Shared Culture

adapt**.** 2038. Six Trends for the Next 25 Yeats.Zenith Optimedia. The ROI Agency.2015.

Basic summary, results

According to the logic of counter-marketing diagnostic process, we conducted a survey at company level. In the process of analyzing MA with significant deviations CA following results with low scores (below 5 tons. max. 10 tons.): **First**. 1.M "Marketing

audit and metrics" (95% of ans.); 3.In "Competitive advantages through improved brand" (75.4% of ans.); 5.Inv "Integrated communications based on expected market growth / size" (78% of ns.); 8.E "Marketing reports findings Recommendations" (81.7% of ans.). **Secondly** what stands out is a threatening disharmony in MA between "policy market leadership" (1.M; 2M), "Strategy of Industrial Leadership" (3.In; 4.In); "Tactics of leadership through knowledge" (fig. 6). Conducted theoretic- practical research increasingly require their target refinement, especially in terms of 1) the transformational design of technology research depending on the type of business models, 2) synchronization between the measurement of marketing competencies and their digital revision, 3) international marketing capacity by fluid knowledge and metrics for competitive defense and security in terms of global terrorism.



Legend: Marketing activity (MA)
M: Membran; In: Interventions
Inv: Invasions E: Expertises

Legend: Corporate protection and security

1-policy	Market Leadership =1.M; 2M
2-strategy	Industrial leadership= 3.In;4. In
3-tactic	Leadership through knowledge= 4.Inv; 6.Inv; 7.E; 8.E

Figure 6. The „Competitive defense and security „3G"model

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Company Product Range Formation Using MS Excel and SPSS

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Abstract. Commodity science deals with different aspects of products. One of the most interesting aspects is the formation of the company product range. The purpose of this paper is to describe a methodology for analyzing sales data in order to formulate changes in the company product range. The main method used for literature review is content analysis. The proposed methodology shows a unique approach for product range analysis in MS Excel and SPSS. This methodology consists of the application of standard MS Excel functionality for sales data analysis at an aggregated level as well as the application of statistical methods such as correlation analysis, one-way ANOVA, K-independent samples and the Kruskal-Wallis test within SPSS. The practical application of this paper concerns other researchers and businessmen who want to analyze product range within electronic spreadsheets and statistical software.

Keywords*: commodity science, k-means clustering, repeated measures ANOVA*

Introduction

Product range formation is a specific task performed in each company offering goods. Commodity science deals with different aspects of goods. One of them is the product range formation. Dynamic markets and fluctuations in demand force managers to be innovative and apply well-known as well as new methods for product range formation.

Product range formation is an important process that reflects the company mission and style. This process aims at satisfying the customers' needs and keeping with the market requirements and trends. Product range matters for the company's productivity and long-run growth. Therefore, the product range is an essential component of business success.

The formation of an appropriate product range requires the exploration of different groups of factors. The analysis of the information, obtained from various sources, is also very important (past sales, customers' opinions and demands, products of competitors). Researchers seek innovative methods for improving the formation of the product range.

Literature review

The product range formation is a key element of the company strategy. Recent theoretical and empirical studies indicate that one of the major issues facing product range managers is the optimization of the product range.

A recent article (Sima, 2010) presents an optimizing procedure of the product range of a company which produces and sales bakery products. The author applies a linear mathematical model that uses three objective functions: maximum profit, maximum workers income and minimum expenditures. As a result the company can make significant increases in order to obtain optimum production for its products.

Another group of authors (Chauhan et al., 2012) develops an optimum product range for a company in the steel industry. They propose two methods for optimization of the product range. The first approach is making product portfolio matrix which shows the most convenient products for manufacturing. Then, a multi objective goal programming model is applied for getting a solution of an optimal product range.

A linear programming model is used by Figueiredo (Figueiredo, 2011) to select the optimal product and customer range. The author describes a mathematical optimization model in which the objective is to maximize contribution to profits. The researcher develops a framework for analyzing different product/client pairs and describes how this information can be helpful for increased integration among different areas of the company.

The topic for the pricing behaviour of a multiproduct firm is studied by Rhodes (Rhodes, 2012). He shows that the size of a company's product range determines the position of the company as an "everyday low" pricer or as a "high-low" pricer. The author also finds a positive relationship between a company's advertised and unadvertised prices.

Other researchers (Wan et al., 2014) investigate the sales and logistics service performance associated with two dimensions of the product range: product line and pack size. They use time-series data from a major soft drink bottling company and examine the possible linear and nonlinear impacts of product line variety and pack size variety strategies on fill rates and sales. The authors find that product line variety has a positive effect on sales, but pack size variety has a negative effect on sales.

Material and methods

This article proposes a new method for product range formation. A sample dataset with sales data is used (Contextures, 2016). The dataset consists of the

following columns: order date, region, representative, item, units, unit cost and total. The dataset has 43 rows.

The dataset is analyzed in MS Excel and in SPSS.

Pivot Tables, Pivot Charts and AutoFilter are used in MS Excel. Pivot Tables are one of the most easy-to-use and powerful tools in MS Excel. They are usually used for organizing and summarizing datasets in a wide variety of ways. Pivot Tables offer flexible and intuitive analysis of data. They break the data down by categories so that useful information can be seen – for example, average sales by regions of a country, by items, by months of year or any combination of these. Thus, they are a suitable tool for sales data analysis.

Pivot Charts and Pivot Tables are connected with each other. A Pivot Chart is the visual representation of a Pivot Table in MS Excel. It is similar to the traditional chart, but has some additional features useful for data analysis.

Datasets usually contain a lot of content and it can be difficult to find information quickly. AutoFilter can be used to narrow down the data in a dataset and to find only the necessary information. The filtered data displays only a subset that meets specified criteria. This tool is also useful for product range formation.

Pivot Tables, Pivot Charts and AutoFilter are used for sales data analysis, which can determine the best-selling products by region and the products that have the highest profit for the company. Sales trends on specific quarters, regions or products can be identified too. All analyzed dependencies may be used for the formation of a company product range.

The dataset is copied into SPSS. An appropriate measure is given for each column.

We assume that some items are well accepted at some regions. This assumption may be accepted or rejected by calculating the nominal by nominal contingency coefficient.

Another assumption concerns the dependency between "representative" and "item". We may assume that some items are not widely spread, e.g. some items are sold only by some representatives. This assumption may be accepted or rejected by calculating the nominal by nominal contingency coefficient.

A check for normal distribution of "units" and "total" variables is done. If data is normally distributed, parametric methods may be applied. If data is not normally distributed, nonparametric methods may be applied. The check for normal distribution is done by the one-sample Kolmogorov-Smirnov test.

The sold item may be a factor influencing the sold quantity and the total amount of each sale. We may assume that some items are well accepted by the market, others – not. To accept or reject this assumptions one-way ANOVA, K-independent samples test and the Kruskal-Wallis test may be used.

Results and discussion

The analysis of the dataset in MS Excel shows the following dependencies.

The Pivot Table, presenting the total sold quantity of each item by region, shows that some of the items are not sold in some regions. This means that there is no demand for these items in these regions. The company may decide to change its product range for some regions.

The analysis of another Pivot Table (table 1) shows the least-selling item in all regions. The sold amount of this item is significantly less than the sold quantities of the other items. Moreover, this item has the lowest income for the company. This means that the company may conclude to remove this item from the product range or to replace it with another one.

Table 1.

A Pivot Table for total sold quantity of each item by regions

Sum of Units	Region			
Item	**Central**	**East**	**West**	**Grand Total**
Binder	424	234	64	722
Desk	7		3	10
Pen	27	175	76	278
Pen Set	243	152		395
Pencil	498	130	88	716
Grand Total	1199	691	231	2121

Another Pivot Table (table 2) shows the items sold by each representative. We can notice that there are items which are not offered by all representatives. Only one item is sold by all representatives. The item, which is sold by the lowest number of representatives, is the least-selling item. This means that the company may determine whether this item should be included in the product range.

Table 2.

A Pivot Table for total sold quantity of each item by representatives

Sum of Units	Items				
Representatives	**Binder**	**Desk**	**Pen**	**Pen Set**	**Pencil**
Andrews	28				155
Gill	126		27		60
Howard	29		96		
Jardine	105			50	126
Jones	124		64	78	130
Kivell	50	5		138	
Morgan	28			55	90
Parent	81		15	74	
Smith	87	2			67
Sorvino	7	3	76		56
Thompson	57				32

The analysis (the existence if a lot of empty cells) shows that there are significant differences in the total quantities of the various items. This leads to major differences in the company's income. We may conclude that the best-selling items bring the highest income for the company.

The trend analysis by quarters for the total sold quantities and the income from the various items shows that all items have a lack of sales in certain quarters. The two best-selling items don't have income only in one quarter. For the other items income is missing in four and five quarters. We may notice an increase in the sold quantities and income of some items and decline of other items for the examined period. The obtained results may be used for the company product range formation (figure 1).

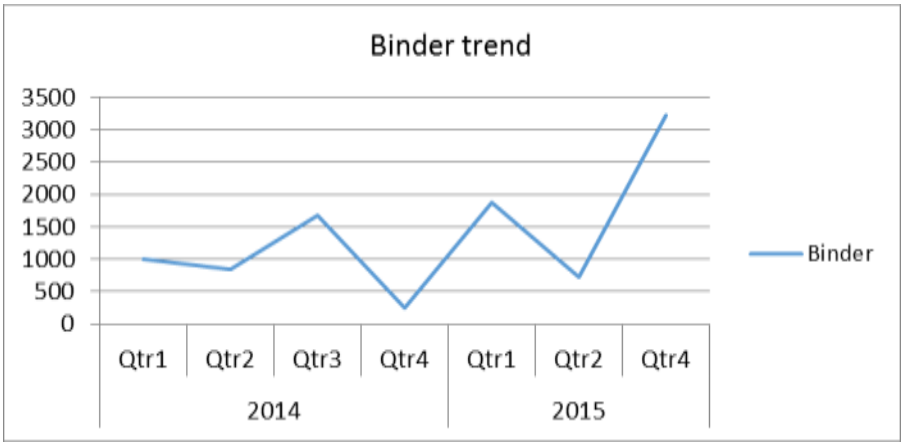

Figure 1. Pivot Chart for Binder trend

The analysis of the dataset in SPSS shows the following dependencies.

The nominal by nominal contingency coefficient between region and item is not statistically significant ($p>0.05$). It means that all items are widely spread in all regions.

The nominal by nominal contingency coefficient between representative and item is not statistically significant ($p>0.05$). It means that our initial assumption that some items are sold by some of the representatives is rejected. All items are sold by several representatives.

The asymptotic 2-tailed significance of the one-sample Kolmogorov-Smirnov test ($Z=0.647$, $p=0.797$) for normal distribution of "units" is not statistically significant ($p>0.05$). It means that the values in the column "units" are normally distributed. The asymptotic 2-tailed significance of the one-sample Kolmogorov-Smirnov test ($Z=1.227$, $p=0.099$) for normal distribution of "total" is not statistically significant ($p>0.05$). It means that the values in the column "total" are normally distributed.

The one-way ANOVA test (Sig. = 0.079) with factor "item" and dependent variable "units" is not statistically significant ($p>0.05$). This means that there is no statistically significant difference among sold quantities of different goods. If a difference is found a post hoc test has to be made (e.g. a Tukey test). Using the Tukey test we may find an item that has significantly different variance in sales than the other items. The Kruskal Wallis test (χ^2 ($df=4$)$=8.62$, $p=0.071$) says that there is no significant difference in the sold quantity of different items ($p>0.05$).

The one-way ANOVA test (Sig. = 0.053) with factor "item" and dependent variable "total" is not statistically significant ($p>0.05$). The Kruskal Wallis test (χ^2 ($df=4$)$=11.958$, $p=0.018$) says that there is a significant difference in the amount of different items ($p<0.05$). We may conclude that even though there are no statistically significant differences among the sold quantities of different items, there are statistically significant differences among the income they generate.

Conclusion

This study shows an innovative approach for analyzing sales data in MS Excel and SPSS. The purpose of the analysis is to find the best product range. The

analysis of the sale data reveals some dependencies between the variables in the dataset.

The analysis of the sample dataset in MS Excel shows the following information. Some of the items are sold only in some regions. The least-selling item in all regions has the lowest income for the company. Some of the items are sold by some representatives. The item, which is sold by the lowest number of representatives, is the least-selling item. There are significant differences in the total quantities and income of the various items. The best-selling items bring the highest income for the company. We may notice increase in the sold quantities and income of some items and decline of other items for the examined period. The obtained results may be used for the company product range formation.

The analysis of the sample dataset in SPSS shows the following interesting information. All items are widely spread in all regions. All items are sold by several representatives. There is no statistically significant difference among sold quantities of different goods. There is a significant difference in the amount of different items. Even though there are no statistically significant differences among the sold quantities of different items, there are statistically significant differences among the income they generate.

Future research may focus on analyzing sales datasets with more columns and applying other methods. Since we extracted valuable knowledge about items in the process of the product range formation, future research may focus on creating knowledge database about product range formation.

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The Relationship among SNS Quality Factor, Satisfaction, Flow, and Usage Intention

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Abstract. The Using online consumer samples accessing social networking service(SNS), this study explored the relationship of SNS service quality, flow, consumer satisfaction, and users' intention. Based on the literatures of service quality and consumer behavior theory, this study derived five determinants of SNS service quality and determinants of consumer behavior. The results found that all the dimensions of SNS service quality and consumer behavior in Korea. The study provided evidence for companies to better understanding of cultural influences on Social Networking Service and also provided practical implications to Internet companies offering services internationally.

***Keywords**: SNS quality factor, flow, customer satisfaction, usage intention*

Introduction

Social relationship has been extended in the on-line community since the use of SNS(Social Network Service) increased with the further development of Information and Communication Technology and smart phones. Most of the studies that have been done so far are mainly about the motivation of the SNS usage, the studies on different types of SNS, the impact of SNSs, and the analysis theory in social network. Although these studies have contributed to figure out the motivation

of SNS usage, acceptance and diffusion, optimal experience, behavior after SNS acceptance, they have limitations on how to develop a theoretical background on how people in different countries use and evaluate the SNS.

Accordingly, the purpose of this study is to find out the relationship among the service quality, flow, the users' satisfaction, and the usage intention.

Theoretical Background and Review of Empirical Studies

1. SNS Quality Factor

The service quality of SNSs is defined as the totality of ability, features, and characteristics to meet the needs of customers. The existing researches on the SNS service have been conducted mainly in service quality in SNSs and users' behavioral perspective to the SNS service provided, such as users' persistent use, word of mouth (WOM) behavior, commitment, satisfaction, and loyalty.

Ko et al,.(2011) subdivided the quality of SNSs into service quality, information quality, system quality, and emotion quality, and found that these qualities significantly affect users' persistent usage intention. They also found that users' satisfaction was the parameter between SNS service quality and persistent usage intention. Park et al. verified that the openness and personalization of the SNS services in the tourism industry could be an important strategy where time and place are key constraints. They classified the SNS service quality into system quality, information quality, and service quality and investigated the relationship between independent variables with users' trust and satisfaction. The result of the research showed that the interest in SNS services was at an early stage, the interest in SNS systems was high, and the information in SNSs was very widely spread, but the awareness on front and back end services of SNSs that makes SNS services easily available to users was not high.

Lee and Kung(2014) classified SNS quality into practical aspects which include information quality and system quality, and empirical aspects that include aesthetic quality and entertainment quality. They investigated how SNS quality affects users' satisfaction and

the results of the study show that all the quality factors significantly affect users' satisfaction. Among the quality factors, information quality affected aesthetic quality, then aesthetic quality affected entertainment quality, and then entertainment quality affected system quality in order.

Many of the proceeding research on SNS quality investigated practical aspects of service quality such as information quality, service quality, and system quality, but there were few studies exploring both practical and empirical quality at the same time. Thus, this study investigates SNS quality upon consideration of both practical and empirical aspects. This study obtained its SNS service quality factors through comprehensive review of proceeding research. The research dimension proposed by Parasuraman et al.,(1988),was used to compose sub-dimension and other dimensions found in earlier studies on Internet service quality were added to the SNS service quality of this paper]. More specifically, the study utilized interface quality found in Kim et al., ease of use used by Dabholkar et al.,(1996) information quality used in Fan and Kim's research. Service quality was from Ko et al.' study, and interface quality was derived from Fan et al.' interactivity.

2. Flow

Csikszentmihalyi(1997) defined that Flow is a "state in which people are so intensely involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it". Previous research demonstrates that the theory of optimal flow is a useful framework for describing the experience of individuals when interfacing with computers from the context of web environments (Huang 2006), computer-mediated communication (Trevino and Webster 1992). Further, it serves as the central component in our proposed model.

Huang(2006) defined that flow "is unique in terms of control, varying in enjoyment and attention focus, and holds the quality of interest in common with the other constructs". Huang(2006) and Zhou, Li, and Liu (2010), views flow as encompassing three distinct dimensions.

In computer-mediated environments, researchers generally find that the flow experience influences both attitudes and behaviors. A number of authors focus on the impact that flow has on attitudes, including attitudes toward purchasing, attitudes toward playing an online game, and attitudes toward the use of the internet.

3. Customer Satisfaction

Oliver (1997) defined consumer satisfaction as the consumer's fulfillment response. It is a judgment that a product or service provided a pleasurable level of consumption-related fulfillment by means of under- or over-fulfillment. The antecedents of satisfaction include such constructs as expectations, performance, disconfirmation of expectations, attribution, and equity (Oliver, 1980, 1997). Bitner and Hubbert (1994) found that satisfaction can be considered at two levels: the service transaction and encounter level and overall satisfaction. In addition, quality appears to be only one of the service factors contributing to the customer's satisfaction judgments (Cronin and Taylor, 1992).

Users' satisfaction means that customer expectations are met by, at least, a predetermined level. In consumer behavior research, the users' satisfaction is emphasized as a key element of a post-purchase period, because users' satisfaction generates repetitive purchase or use. Therefore, loyal customers who were experienced with satisfaction from companies' services contribute corporates' profitability and influence customers' intention of behavior such as word-of-mouth to other customers. Park et al.'s study identified that system quality and information quality influenced users' satisfaction and Kim and Hwang's paper revealed that information quality and service quality significantly influence users' satisfaction.

4. SNS Usage Intention

Intent refers to the intention of buying goods or services in marketing. Generally, intent means intention of showing verbal plan for any specific behavior. Kim and Hwang found that hotel franchises' SNS service quality influenced hotel users' satisfaction and the intention of rebooking at the same hotel franchises. Park

revealed that users' satisfaction affected usage intention in her SNS service quality study in the tourism industry.

5. Research Method and Testing Hypotheses

The sample included 299 Korean consumers whose gender distribution is 184 males (61.5%) and 115 females (38.5 %). The consumers ranged from young to middle-aged. In addition, 124 (41.5%) of the Korean consumers indicated that they have been using SNSs more than 3years.

For this study, an initial theoretical structural model was examined with four SNS contents constructs and consumer psychologies constructs.

The current study used Anderson and Gerbing (1988) two-step approach to structural equation modeling (SEM).

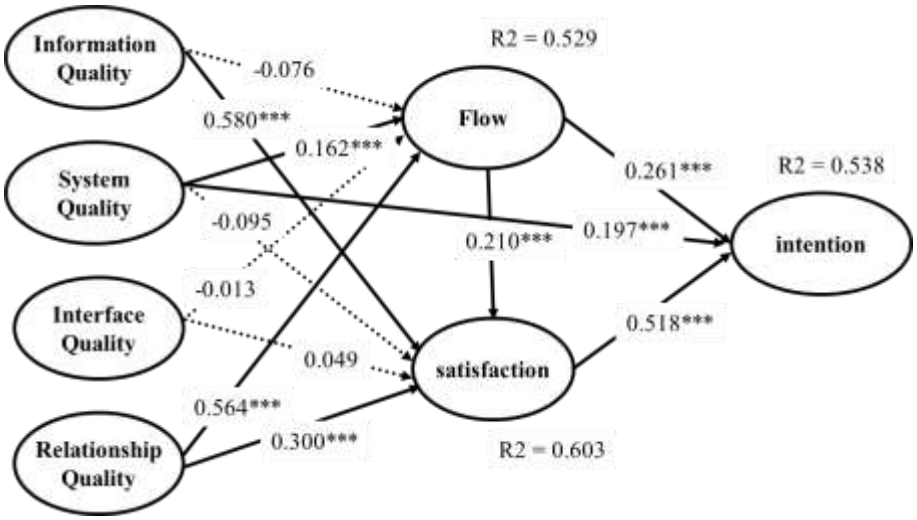

Figure 1. The Path Coefficients and R^2 for the Constructs

Conclusions and Discussions

The research model was explored to verify the relationships among SNS service quality, flow, satisfaction, and usage intention.

As a result, the study finds that interface quality and relationship quality had positive and significant impact on flow. The research model assumed that SNS quality had a positive impact on satisfaction. As shown in Figure 1, information quality and relationship quality were significantly related with satisfaction. Flow had a positive impact on satisfaction and intention. At the same time, satisfaction also was significantly and positively related with intention.

The results found that all the dimensions of SNS service quality. The study provided evidence for companies to better understanding of SNS quality and also provided practical implications to Internet companies offering services internationally.

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The Feature of Strategies for Japanese Corporate Activities in the East Europe Region

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Abstract. 11 years have passed since eastern European countries joined EU in May 2015. Poland, the Czech Republic, Hungary, Slovakia joined in 2004, were called Visegrad Group (V4) with diplomacy as the center, and is raising its status high. Besides, due to impact of Lehman financial shock or European Sovereign Debt Crisis, overseas direct investment to V4 market is on the decrease, but considering that potential growth rate is high in East European markets, Japanese companies plan to expand investment to the region continuously. In this study, we intend to analyze investment environment of countries in the East European region, and investment status of Japanese companies.

Keywords*: Eastern European market, Global strategy, VisegrádGroup (V4)*

1.Introduction

11 years have passed since eastern European countries joined EU in May 2015. Poland, the Czech Republic, Hungary, Slovakia joined in 2004, were called Visegrad Group (V4) with diplomacy as the center, and is raising its status high. Besides, due to impact of Lehman financial shock or European Sovereign Debt Crisis, overseas direct investment to V4 market is on the decrease, but considering

that potential growth rate is high in East European markets, Japanese companies plan to expand investment to the region continuously. In this study, we intend to analyze investment environment of countries in the East European region, and investment status of Japanese companies.

2. Investment environment in East European region, and investment status of Japanese companies

2.1 Investment environment in East European region

2.1.1 The Czech Republic

The Czech Republic is located at the center of Europe, and an export-led industrial nation adjacent to many Western countries, and to East European countries such as Poland and Slovakia. It is a small country with 10,510,000 people, but its per capita GDP is maintained at highest level among the Middle East and East European countries. Among Czech's major industries are automobile, electricity and machineries, and as historically established industrial nation, its technology level remains high, inexpensive labor forces are available, and foreign investment for major industries has been promoted for a long time.

First, Czech as investment market has an edge with the location. It is located in the center of Europe, and known as strategic place of European market in the region. In addition, transport infrastructure is developed as a traffic network element of neighboring countries, with many manufacturing areas and industrial complexes developing. In terms of labor force, Czech has advantage to secure highly educated or technical talents (human resources) at lower cost in comparison with western countries. As one third of domestic graduates are from natural sciences and engineering field, talents can be easily secured, and as its another strength, labor productivity is at the highest level in East European countries. Besides, it offers attractive investment environment for foreigners such as active foreign capital attraction promotion, tax break implementation, and others.

2.1.2 Hungary

With about 9.9 million people, Hungary borders with 7 countries including Austria, and became a mid scale nation among the Middle East and East European countries. After changing to market driven economy system, foreign capital introduction has been promoted actively. In addition, since joining EU in 2004, based on wage level at relative edge in comparison with western countries, it accelerated entry to manufacturing industries such as automobile, electricity, and others, affecting economic growth a great deal. Recently, due to aftermath of European financial crisis, economic growth rate tended to slow down with export stagnation, but with increase of corporate investment and recovery of European market, GDP growth rate over 3% was recorded with 3.58% in 2014 and 3.0% in 2015 respectively. Moreover, Hungary actively improved transport infrastructure using EU funds, and as a strength, retains superior expressway network and distribution network in comparison with other Middle East and European countries.

2.1.3 Poland

With 3.8 million people, Poland is adjacent to Germany, located in the East, the 6th largest country among EU member countries and the largest among the Middle East and European countries. Its stable growth has remained over 10 years in terms of economy. After joining EU in 2004, the country maintained steady growth, and recorded plus economic growth among EU member countries even at time of financial crisis after Lehman shock in 2008. Economic growth rate was slowing down with 2.0% in 2012, and 1.6% in 2013, but started recovering from second half of 2013. The main cause was export expansion along with recovery of European market. According to announcement by Poland national bank, the country recorded 3.53% in 2014 from 3.44, and exceeded prediction of previous year, 3.2% in 2014 and 3.5% in 2015.

2.2 Japanese companies' investment status

Japanese companies' investment to Middle East region has been stagnant since Lehman shock, withdrawal or M&A agenda is on the increase. In Poland, for the first time in history, investment environment is deteriorating, such as investment amount exceeding withdrawal amount, and others. However, Japanese companies are still equipped with strong competitiveness in auto industry. In particular, direct investment is made by Hyundai Motor Company in Czech and by Kia Motors, VW, Peugeot, and others in Slovakia. Thus, foreign investment is promoted. In Hungary, luxurious cars such as Audi and others besides Suzuki are actively promoted. Recently, there is a sign of new model factory construction through Suzuki's additional investment in Hungary, and VW's new production system restructuring in Slovakia. For auto related distribution industry trend, in addition to logistics connecting East Europe and Asia through existing Suez Canal, a route using port of Koper, Slovenia was added, resulting in a change transporting from East Europe to Asia besides importing from Asia. For LCD TV sector, many enterprises enters into the markets in Poland and Czech, but due to stiff competition with Korean companies, Japanese companies' competitiveness is weakened, resulting in closure of many of their factories. Furthermore, Europe financial crisis and stagnant high-performance TV demands seemed to be derived from such slump.

For aircraft industry, Poland southeastern region is well known as a supplier cluster. Because in the era of old communist bloc, it was used as a place for fighter jet parts production, there was plenty of talent pool due to organization of infrastructure of aircraft related industry. However, for ten years to come, to constantly expand overseas direct investment to East European countries including V4 market, problems such as foreign companies' dissatisfaction and others should be addressed. In particular, Japanese companies' complaint is lack of competitive

supplies, Eastern European countries' technology and difference in management philosophy (not sensitive to defect issue). Continuous FDI inflow for coming years will depend on how to resolve such problems.

3. Conclusion

In the future, for Japanese companies' direct investment to East European region, even though there is not much of investment as parts supplying base of brands other than Japanese products, it seems that SMEs entry to the market will be increased as partial Green Field Investment continues. In particular, auto related industry will be promoted focusing on overseas direct investment in the future. In addition, it is expected that in this region, full scale market expansion strategy, which is differentiated from the past, will be sought through cross-border M&A or Merger with European companies, and others. For Japanese companies, East European region is an important strategic base associated with social infrastructure. For waste treatment plant business, advanced technology of Japanese companies will be in high demand because disposal of alcoholic beverages landfill is not allowed due to tightened law enforcement. Besides, electricity industry such as offshore wind power, water treatment project and others have been vitalized.

As far as food related industries, regarding increase in demand of Japanese health food, since events such as exhibition or PR activity by food business operators, and marketing strategy driven by Japanese government are actively promoted, it is expected that Japanese food or liquor (sake, hard liquor) related industry will take advantage of such opportunity.

As result, in addition to industries with such demand, Japanese companies' entry to Eastern European countries will be vitalized naturally once market expansion environment for Japanese companies is created. By joining Korean companies, which always competed with Japanese companies in third countries,

excellent marketing ability and market expansion ability of Korean companies can be utilized. In addition, targeting at Eastern European market by both Korea and Japan can be another strategy as a flexible method.

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The Effects of Message Type on Consumer Attitudes for Coffee Shops

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Abstract. This research explored the effects of message type on consumer attitudes. Specifically, the study examined the metaphor effect on brand identification. Experiment 1 says metaphor could help the incongruent brand image with the actual self. Also, experiment 2 contends that even if metaphor is presented, it is less possible to link the incongruent brand with the ideal self.

This study gets theoretical implications. First, metaphor may induce a specific mindset – similarity-focusing. Second, brand identification effect may be various, and the effect is dependent on advertising context. Practically, the brand which has far image from target customers' actual self image is proper to select metaphoric message. But this positive effect is interacted by actual self image, not by ideal self image.

***Keywords**: message type, metaphor, brand identification*

Introduction

"My heart is a lake. I want you to oar into me."

This metaphor is a part of a famous Korean poetry. If the metaphor can be translated as the literal message – "I feels weary. I want you to dash to me," – the readers would be less deep emotion.

It is possible, by the way, that consumers who strive for understanding the metaphor would be more flexible, creative, or likely to focus on the similarity among the related events than be they who are in contact with the literal message. If so, the metaphor advertising may make consumers not only exciting but also ready to be a unique mindset. We would like to call this metaphoric mindset – "The Similarity Mindset."

In short, consumers who have been contact with the metaphor might prefer to focus on the similarity between two events. Because the basic structure of the metaphor is composed of 'A is B,' only consumer who can catch the similarity between A and B could comprehend the message. In this way, the similarity-focused consumer by contacting with the metaphor may focus on the similarity between events thenceforth. Theories of the mindset contend that the prior mindset could influence the frame of comprehension for the following event (Fujita et al. 2006).

In respect of above, the effects of brand identification may dampen under the metaphor condition in comparison of the literal condition. Brand identification means that the congruency between a brand image and self image makes consumers more favorable for the brand (Graeff 1996, 1997).

Even if the congruency between the brand image and self is not salient, under condition of 'similarity' mindset caused by metaphor processing consumers may perceive the brand as more similar with their self image. In result, they prefer the brand under metaphor condition to the case which is depicted by the same literal message.

Theoretical Background

Once consumers have their mind set on a specific task, it is likely to be induced to a mindset which is suitable to the task. This mindset, also, might influence the following cognitive processing for the events that are irrelevant with prior event (Fujita et al. 2006; Freitas et al. 2004).

In this point, metaphors may induce a specific mindset through consumers' processing for the metaphor comprehension. Consumers can understand the meaning of metaphor by mapping between metaphoric base and target (Morgan and Relchert 1999). For example, in the metaphor of 'this ball point pen is a camel,' consumers must link the ball pen (=target) with a camel (=base). In fact, the ball pen cannot be similar with a camel at all in surface level. But, in respective of the relational similarity, the ball pen may get with a camel – 'durable.'

Consumers are likely to prefer the brand whose image is consistent with their self image to the case of inconsistency (Graeff 1996). The reasoning of 'the brand identification effect' can be summarized as two psychological motives according to the prior research.

First, consumers could perceive purchasing of a brand as a self-extension (Belk 1988). They hope to show their inner value by purchasing or by using a specific brand. Brand identification as the self-extension, especially, fits to explain the motive for the symbolic brands.

Second, they could perceive a brand image as a human's personality (Aaker 1997; Shavitt 1990). People are likely to feel familiar to another whose personality is similar with theirs. If a brand could be personified, brand identification in respect of similarity of personality may make sense.

Congruence through brand identification, by the way, is grouped into two classes – actual and ideal congruence (Graeff 1997). Actual congruence depicts that the brand and 'actual' self image are congruent each other, and ideal congruence is the consistency between the brand image and 'ideal' self image. In this way, ideal

congruence is more liable to variation because the concept of 'ideal' is dependent on context.

Actual image, according to the construal level theory (CLT), fits with the low level construal – concrete, feasible, and instrumental aspect (Trope and Liberman 2003). Ideal image, in the other hand, is related with the high level construal – abstract, desirable, and goal-relevant aspect.

The cognitive processing for metaphor comprehension needs to focus on the similarity between base and target of the metaphor (Morgan and Relchert 1999). So, metaphoric processing may induce a mindset of similarity-focusing. Researches of consumers' mindset suggest a mindset influences the following judgments (Fujita et al. 2006; Freitas et al. 2004). In this viewpoint, brand identification may be amplified after contacting with metaphor rather than the case of literal message. Because metaphor could induce the similarity mindset, this similarity-focusing mindset may help the brand image to link with consumers' self image. But in the literal message condition, consumers may be difficult to link the brand image with their self image in comparison with the case of metaphor.

H1: Brand identification for the inconsistent brand image is more positive in metaphor advertising condition rather than in the case of literal advertising.

Self image consists of actual and ideal self image (Graeff 1997). Actual image is real and objective image, and ideal image is desirable image. Construal level theory says that actual, feasible, and concrete aspect fits with low level construal, but that ideal, desirable, and abstract aspect is related with high level construal (Trope and Liberman 2003). Maybe metaphoric mindset fits with high level construal because of relational, abstract, and flexible similarity-focusing.

So, brand identification between brand image and 'ideal' self image may be different from the case of 'actual' self image. Under metaphor condition,

specifically, brand identification for ideal self is likely to be more sensitive than to be case of actual self. If metaphor makes consumers focus on more ideal and desirable aspect, then brand identification between ideal self and the inconsistent brand image may shrink.

H2: Under metaphor advertising condition, brand identification for the inconsistent brand image is more positive for actual self image rather than for the case of ideal self image.

Material and methods

Experiment 1

Purpose and Design

Experiment 1 has been executed for the purpose of the verification for the first hypothesis. H1 proposed that the perceived similarity between self image and inconsistent brand image is greater in metaphor condition than in the case of literal condition.

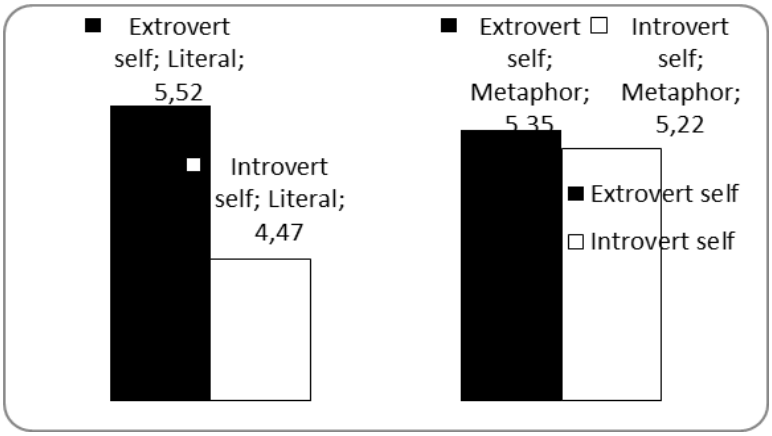
Experimental design is a two-way between-subject design. The first variable is the type of advertising headline (=metaphor vs. literal). The second variable is the valence of self image (=introspective vs. extroverted image).

Manipulation and Procedure

Subjects were introduced about the research. First page of the questionnaire is consisted of introductions and notable message. Second page presented the advertising message “this coffee shop is a green pasture” (vs. ““this coffee shop services fresh coffee.”) The former manipulated metaphoric processing, but the latter manipulated literal condition. Items of advertising attitudes are followed. And, actual images of self were measured. Finally, demographic questions were followed.

Results

The 2×2 (=headline type×self image) ANOVA test was executed. The headline type is originally between-subject variable (=metaphor vs. literal). The measures of self image are consisted of six variable, and unified into one factor – "extrovert." This factor is divided into two conditions by median split – "introvert vs. extrovert."



<Figure 1> Consumer attitude for the extroverted brand

Experiment 2

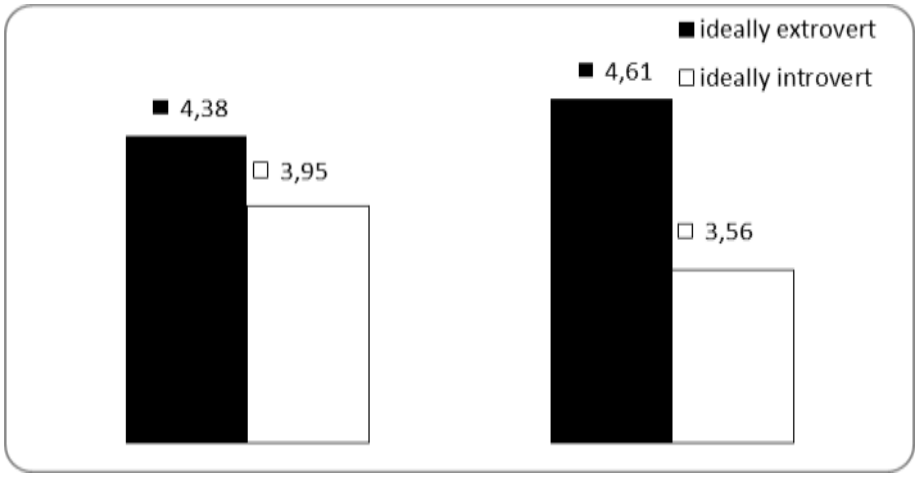
Design and Procedure

Experiment 2 is similar with prior experiment except a few points. First, this study includes not only actual image measures but also ideal image measures. Second, only metaphor condition is included because of parsimonious examination of H2. Third, another metaphor is selected for external validity – "this coffee shop is internet." (vs. "this coffee shop gives modern and rapid service.")

Results

The 2×2 (=actual vs. ideal image) ANOVA was tested. Only the main effect of ideal image was appeared ($F(1, 156)=6.75$, $p<.02$). Any other main effect or interaction effect was not significant. Consistently with H2, metaphor made the

actual self link with the incongruent brand, but could not make the ideal self link with the brand. These results depicts by figure 2.



<Figure 2> Consumer attitude for the extroverted brand in respect of ideal self

Results and conclusions

This research explored the metaphor effect on brand identification. Experiment 1 says metaphor could help the incongruent brand link with the actual self. Also, experiment 2 contends that even if metaphor is presented, it is less possible to link the incongruent brand with the ideal self.

This study gets theoretical implications. First, metaphor may induce a specific mindset – similarity-focusing. Second, brand identification effect may be various, and the effect is dependent on advertising context. Practically, the brand which has far image from target actual self image is proper to select metaphoric message. But this positive effect is interacted by actual self image, not by ideal self image.

This study has some limitations – only student sample, only paper questionnaire, so simple design, and weak external validity. But these shortcomings would motivate passion of researchers.

We hope someone would explore the effects of CLT on brand identification or metaphoric effect. Also, another mindset caused by metaphor must be explored. The intrinsic differences between actual and ideal self may be a hot issue.

In conclusions, the heterogeneous brand generally gets less intimacy, but metaphor may arrange a match between actual self and the incongruent brand.

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Is There an Ethnic Market Niche for Immigrant Entrepreneurs, Active in the Bakery Industry? Focus on Turkish Immigrants in Romania

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Abstract. Phenomenon with major implications in all areas, migration is in the attention of both scholars and policy makers, being approached from diverse perspectives. Even though, in general - especially nowadays - there is a tendency to associate migration mainly with its negative impacts - such as tensions on the labour market, development of the shadow economy and black market, ethnic conflicts etc. - through a proper management, this may bring many valuable contributions to the development of both the sending and the receiving countries. Referring only to the latter, entrepreneurship represents a valuable means in this way. Fostering immigrants' entrepreneurial spirit and encouraging immigrant entrepreneurship development may bring important positive outcomes for the receiving country.

Immigrant entrepreneurs tend to aim, with their new venture, small niches of consumers belonging to the same ethnic group with them. In Romania this may be the case with Turkish entrepreneurs. Therefore, our paper investigates such a market niche and its characteristics, targeted by Turkish immigrant entrepreneurs, active in the bakery industry. In the specified framework, we have focused on exploring the Turkish community of immigrants in Romania, as bakery products consumers. We

researched the hypothesis of an orientation towards consuming mainly Turkish bakery products and also if there are any changes that occurred in their bakery products consumption habits after migration. Among others, the results of the interview-based qualitative research we have carried out revealed that, in general interviewees consume both Romanian and Turkish bakery products. However, the latter category is more preferred; culture is an important factor impacting the bakery consumption habits of the interviewees.

Keywords*: migration, immigrant, entrepreneurship, consumer, consumption habits*

Introduction

During the past periods, the migration phenomenon has reached great amplitude becoming one of the most important issues addressed on main policymakers' agenda and in scholars' research areas. In a context of a very pronounced mobility, various cultures intersect one with another, individuals being exposed to "the products, lifestyles and behaviour patterns of consumers belonging to another culture" (Douglas and Craig, 1997, p. 380). Food consumption habits are one of the most exposed to change when individuals from one culture intersect with others from other culture. "Despite the fact that the ethnic factor is considered as a category of identity with a strong influence on consumption decision, immigrants' consumption behaviour represents a poorly researched phenomenon" (Hamlett et al., 2008, p. 92). On the other hand, the scientific literature offers a wide variety of studies on the relationship between acculturation and consumption (Sutton-Brady, Davis and Jung, 2010); in general, the majority of them are focused on groups of immigrants in North America, especially Mexicans, Chinese or Koreans. However, important efforts are made in order to overcome this gap and to enrich the scientific literature with studies based on Europe (Douglas and Craig, 1997).

In the present paper we investigate if any changes occurred in the consumption habits of Turkish immigrants in Bucharest, Romania, aiming to emphasize if they may represent a market niche for Turkish entrepreneurs active in the bakery industry. In this sense, the paper is structured into two main parts. The first part briefly puts forward a series of methodological aspects, while the second one outlines the main research results. The paper ends up with a series of final remarks.

Research methodology

Starting from the premises of a research carried out in 2012 (Petrescu, 2012), in 2015 we have developed an interview based qualitative research among Turkish immigrants in Bucharest with the main aim to identify if there are any changes that occurred in their bakery products consumption habits after migration. As, in general, immigrant entrepreneurs tend to aim ethnic markets for business start-up (Dinu, Grosu and Saseanu, 2015), we also intended to analyze if there is an ethnic market niche that Turkish entrepreneurs may target and to provide a valuable information necessary for structuring their offer of bakery products.

We have interviewed 37 Turkish immigrants that were mainly chosen using the snowball technique; based on confidentiality reasons, their identity is not revealed. The method we used for gathering the information was the semi-structured interview. This was formal and based on an interview guide. However, the number of the addressed questions and the order in which they were addressed varied from on interviewee to another, depending on the interview's way of development. In general, the interviews were face to face, one-to-one type, they were carried out in public places, especially in various dining outlets with Turkish cuisine, and they lasted, in average, for 45 minutes. Our role was of interviewers and during the interviews we have taken notes. Based on them, using the inductive approach,

further on, the main information obtained during the interviews is analyzed and presented.

Results and discussion

The interviewed sample was composed of both male and female Turkish immigrants, aged between 24 and 50, in general, with a higher education; however, man were more representative. They immigrated in Romania in different years – from 1992 until 2012 – and they mainly adopted an integration acculturation strategy.

Considering the consumption of bakery products, the sample is somehow divided in two categories: immigrants that mainly consume Turkish bakery products and immigrants that mainly consume Romanian bakery products. However, the second category is better represented. The ones that mainly consume Romanian bakery products manifest this trend because these products are very easy to purchase, compared to the ones with Turkish influence that cannot be found at every bakery and are more expensive. Turkish bakery products are consumed, in general, twice or three times a week, while the Romanian ones are consumed daily. However the willingness to consume Turkish bakery products is very pronounced; interviewees would want to consume those more – daily, if possible – and to have a more facile access to them. Turkish immigrants that mainly or even only consume Turkish bakery products do this as they live very close to Turkish bakeries.

Turkish bakery products are associated by almost all the respondent with their culture and with the the idea of “saint” and “home” and they are considered tastier, better, healthier, better baked, and of higher quality compared to Romanian ones. Turkish immigrants strongly believe in Turkish bakery products, in their preparation process, and in the quality of the used ingredients. However, their high inaccessibility and quite high prices make them very difficult to procure. These aspects, along with the idea of necessity, and the existence of Romanians in their family or in their living places, represent important arguments for the interviewees

that mainly consume Romanian bakery products, even though they are, in general, considered as not salty and not tasty at all.

Interviewed Turkish immigrants mainly prefer the bakery products specific to their country of origin, compared to the ones specific to their country of destination. Also, they are very conservative in what concerns their food consumption behavior; culture plays an important role in this respect.

Considering their conservatism, their strong cultural influences, their orientation and keenness on Turkish bakery products, Turkish immigrants may represent an important market niche for Turkish entrepreneurs active in the Bucharest bakery industry. However, in order to see if introducing more Turkish bakery products in their offer is a very feasible business opportunity, other aspects need to be approached, such as the ethnic community's dimension, dispersion, income etc.

Conclusion

In general, the scientific literature promotes the idea according to which when starting a new venture, immigrant entrepreneurs tend to aim small niches of consumers belonging to the same ethnic group with them. In order to investigate if this may be the case with Turkish entrepreneurs active in the bakery industry in Bucharest, Romania, we have focused on exploring the Turkish community of immigrants, as bakery products consumers.

The outlined research results revealed that, in general interviewees consume both Romanian and Turkish bakery products. However, the latter category is more preferred. In this respect, culture represents an important factor that impacted the bakery products consumption behavior of the interviewees.

Interviewed Turkish immigrants are very willing to consume Turkish bakery products, but their quite high inaccessibility – mainly because of a very narrow offer and of high prices – make them very difficult to purchase and consume.

As a final remark, it can be assess that there is an ethnic market niche that Turkish entrepreneurs active in the bakery industry in Bucharest may address and exploit. However, in order to see if introducing more Turkish bakery products in their offer is a very feasible business opportunity, other aspects need to be approached, such as the ethnic community's dimension, dispersion, income etc.

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Analysis of the Attractiveness of Investments in Solar Heating Systems in Slovenia

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Abstract. Limited quantities of fossil energy sources, the need for increased energy independence and increased environmental awareness lead us to increased use of renewable energy sources. In Slovenia many unused potential exist in the field of exploitation of renewable energy sources, particularly for the utilization of solar energy. When solar thermal system is correctly designed, that delivers significant savings. Therefore, in this paper we review the most commonly used technology for the utilization of solar energy as a source of heating. The supply of solar thermal collectors on the Slovenian market will also be reviewed. In addition, the economic viability of solar thermal collector constructed under own management will be evaluated and the costs with the price of commercially available collectors on the market will be compared. Based on the data provided by the Slovenian Environmental Public Fund (Eco Fund), the technologies for solar energy use as a source of heat which attract the Slovenian investors will be reviewed and the extent of particular investment will be presented. Based on the research, we can conclude whether investors in thermal solar systems made rational decisions, based on maximum energy efficiency and whether the public funds for incentives for investments in alternative heating systems were used effectively.

***Keywords**: Solar thermal collectors, Self-construction, Incentives*

Introduction

A fast development of our civilization over the past two centuries has been mainly due to the intensive use of fossil fuels (Novak and Medved 2000, p.5). According to the International Energy Agency (2015), global primary energy consumption amounted to 13,541 Mtoe in 2013, which is 122% more than in 1973. Fossil fuels are still the prevailing energy-generating products used. In 2014, primary energy consumption amounted to 1,777 Mtoe in Europe, to 2,476 Mtoe in North America, to 861 Mtoe in Latin America, to 5,545 Mtoe in Asia and to 737 Mtoe in Africa. The proportion of fossil fuels in total primary energy supply has been gradually decreasing; in 1973, it was 86.7% whereas in 2013 it fell to 81.4 %. Oil consumption represented 46.2% of total primary energy consumption in 1973 and 31.1% in 2013. A lower consumption of oil was substituted by a higher consumption of natural gas, nuclear energy, coal and hydro energy (IEA, 2015). In Slovenia, primary energy consumption had been continuously on the increase up to 2008, when it reached its peak (7.65 Mtoe). After 2008, the economic crisis influenced a decrease in this consumption and in 2012 it amounted to 6.98 Mtoe. Slovenia is not self-sufficient as regards energy supply and is particularly dependent on the import of fossil fuels (natural gas and oil). The highest rate of domestic primary energy supply was in 2009, when Slovenia produced 52.2% of all energy needed. In the time period between 2000 and 2012, Slovenian energy dependence was between 47.5% and 54.8% (SURS, 2013).

As regards renewable energy sources (RES), Slovenia can exploit geothermal energy, wind energy, hydro energy, biomass and solar energy. Entire Slovenia has a relatively equal and rather high solar energy potential. The average annual value for Slovenia is 1100 kWh of incident solar energy per m^2 of horizontal surface. The total solar radiation potential in Slovenia exceeds its primary

energy consumption by 300 times. Today, Slovenia exploits only 3% of the entire estimated technical potential of solar energy (ApE, 2013, p.1). Because of favourable natural features of Slovenia and its low utilization rate of solar energy, this paper presents the potentials for the use of this renewable energy source in solar thermal systems. The contribution thus examines the supply of the existing solar thermal collectors on the Slovenian market. We estimate the economic viability of self-construction of solar energy collectors by considering the prices of commercially available solutions. Based on the data provided by the Slovenian Environmental Public Fund (Eco Fund), we review which technologies for solar energy use as a source of heat attract Slovenian investors the most and in what scope. Based on our research, we will be able to make conclusions whether the investors in thermal solar systems make rational decisions (based on maximum energy efficiency) and whether public funds for incentives for investments in alternative heating systems were used effectively.

Methodology

The main aim of this paper is to analyse the possibilities for the utilization of solar energy as an alternative source of heating. The analysis of the supply of solar thermal collectors and associated equipment on the Slovenian market was performed via an online search. The economic viability of self-construction of solar thermal collectors was studied based on the information provided to us by self-constructors and based on the analysis of the offer of solar thermal collectors on the Slovenian market. We calculated the costs of a solar thermal collector installed on a 'self-construct basis' by taking into account the prices from 2012 and the list of all the component parts needed for making one's own solar thermal collector, which was obtained from Slovene ENSVET programme (i.e. 'Energy advice network for residents' programme launched by the Slovene Ministry of the Environment and

Spatial Planning). The attractiveness of solar thermal technologies which appeal to Slovenian investors will be reviewed based on the data provided by the Slovenian Environmental Public Fund (Eco Fund). The scope of particular investments will be presented, too.

Results and discussion

Solar energy can be exploited in buildings in a number of different ways. The most common one is the passive use of solar energy where the sun heats the indoor spaces directly through transparent and semi-transparent surfaces such as windows, glasshouses, facades with transparent thermal insulation, etc. This approach does not require any mechanical parts. The other way is an active exploitation of solar energy whereby the system comprises solar thermal collectors, heat storage units and all other component parts as well as the medium for the transfer of heat from the collector to the heat storage unit (AURE, 2013). A solar thermal collector is the most important component in a system for active use of solar energy. The selection of the type (installation) of solar thermal collectors therefore depends mainly on the solar system itself or on the required temperature of the solar medium (Papler, 2012).

Nowaday, several types of solar thermal collectors are available on the market: unglazed collector, air heating collector, flat plate collector, evacuated tube collector, 'heat pipe' evacuated tube collector and high temperature collector. When examining the supply of solar thermal collectors on Slovenian market, we established 10 different producers of flat plate solar collectors and also 15 different manufacturers of vacuum solar thermal collectors, 7 of which produce vacuum solar thermal collectors and 8 of which produce vacuum 'heat pipe' solar collectors.

Prices of solar thermal collectors in Slovenia are in range between EUR 102.12 and EUR 867.18 per m^2 of their aperture surface area. Prices depend on type of collector,

collector efficiency and country of origin. We assessed meaningfulness of self-construction of solar collectors.

The project of self-construction of solar thermal collectors began in Slovenia in 1993 based on the examples of good practice in Austria. The project is carried out with the help of the Energy advice network for residents' programme ENSVET. If solar thermal collectors are constructed under the supervision of an advisor in the ENSVET programme, it is possible to receive the Eco Fund grant. (Malovrh, 2013). The sample solar thermal collector is made up of 4 75 x 200 cm panels, which is 6 m^2 of surface in total. This is a flat plate solar collector, which is easy to construct as one only needs some hand skills and the willingness to do it. A list of material needed for a self-construction of a solar thermal collector is based on the manual for a self-constructed tinox solar thermal collector (Malovrh, 2013). The price of a self-constructed solar thermal collector which complies with the conditions to obtain the Eco Fund grant is EUR 968.53 per piece; that is, the price is EUR 161.42 per m^2 of aperture surface and is higher than one would pay for a flat plate solar collector available on a Slovenian market. The Eco Fund grant for a self-constructed solar thermal collector would be EUR 450 (EUR 75 per m^2), which means that the price of a self-constructed solar thermal collector including the Eco Fund grant would be EUR 518.53 per item or EUR 86.42 per m^2. The biggest costs are the costs of a tinox energy absorber (EUR 286.22), solar collectors pipe (EUR 166.2) and glass (EUR 283.20). Our calculation has shown that under these conditions the self-construction of a solar thermal collector is not cost-effective.

Table 1.

Eco Fund loans and grants given for the installation of solar thermal collectors (Ekosklad, 2016)

		Grants			Soft loans		
		TRANSFERRED			**GRANTED**		
YEAR	Type of solar collector	Number of investments	Surface [m^2]	Grant amount [1000 EUR]	Number of investments	Surface [m^2]	Loan amount [1000 EUR]
2008	Flat plate	463	3,539	507.5	98	844	866.8
	Evacuated tube	263	1,971	343.2	54	371	451.5
2009	Flat plate	1,864	13,985	2,080.1	19	186	138.2
	Evacuated tube	789	6,212	1,096.7	7	96	69.2
2010	Flat plate	993	6,831	999.6	14	89	90.1
	Evacuated tube	341	2,396	420.7	4	29	24.8
2011	Flat plate	1,252	8,062	1,152.6	12	89	84.4
	Evacuated tube	452	2,397	441.7	5	50	40.7
2012	Flat plate	1,597	10,180	1,465.8	23	178	195.3
	Evacuated tube	531	2,759	517.2	9	63	84.6
2013	Flat plate	954	6,092	864.6	12	77	96.6
	Evacuated tube	352	1,672	311.2	6	26	63.3
2014	Flat plate	438	2,687	384.5	14	103	110.2
	Evacuated tube	148	641	119.3	6	26	43.5
2015	Flat plate	302	1,881	290.3	7	48	52.8
	Evacuated tube	90	433	79.7	2	5	11.4
Total		10,829	71,738	11,074.7	292	2280	2423.4

The number of investments, the grants given and the Eco Fund loans granted for the installation of solar thermal collectors are shown in Table 1. Table 1 also shows the types of solar thermal collectors which the investors opt for. Most investors decide to install flat plate solar collectors, because it is the cheapest solution available and it satisfies the needs for sanitary water heating from spring to autumn.

Conclusion

On the Slovenian market, it is possible to buy solar thermal collectors made by domestic and foreign producers. Prices of solar thermal collectors are in range between EUR 102.12 and EUR 867.18 per m^2 of their aperture surface area. For collectors with the Solar Keymark certification mark or self-constructed uder supervision of ENSVET advisor it is possible to obtain Eco Fund incentives or soft

loans. The price of a self-constructed solar thermal collector is comparable to prices of the cheapest collectors available on the market.

Between 2008 and 2015, there were almost 11,000 grant-based investments in solar thermal systems and almost 300 loan-based ones in Slovenia. Overall, a bit more than 11 million euros of grants were given and almost 2.5 million euros of loans were granted. About three quarters of investors decided to install flat plate solar collectors. On condition that investors have enough space for the installation of a solar collector, flat plate solar collectors are the right choice. By choosing this type of collectors, the investors make a rational decision because they satisfy their need for heating in a cost-effective way.

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Market Fish Products: Problems And Prospects

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Abstract. The authors of this article have made the assessment of the overall condition, determined the versions of the reformation policy, advantages and disadvantages, expected results, specific actions, which are necessary to do for the sustainable development of the fishery of Ukraine. The purpose of the branch reformation has to be the provision of the state ration safety on the assumption other sustainable development of the fishery by means of the legislative, financial, institutional transformations and establishment of strategic actions concerning the real economic sector development, social and ecological stabilization.

The main directions of reforming in Ukrainian fishery industry are the following: modernization of public administration system and restructuring of Government body of executive power in the field of fishery; accumulation of

Ukrainian aquaculture capacity and its realization; fight strengthening with illegal, not accountable and unregulated fishery; studying and introduction of experience of the countries of the European Community in Ukraine in questions of recreational fishery and the sphere of fishing tourism; realization and development of the sea and oceanic fishery direction with involvement of the investor; attraction of financial and technical assistance and profile international experts for studying and an assessment the conditions of sea and fresh-water species of fish for the purpose of increase of accuracy and a representativeness of researches results concerning the fish population; legislative initiatives which will give incentives for development and accumulation of fishery capacity of Ukraine on the basis of responsibility, industrialization and efficiency of natural resources use.

Keywords: *food security, stable development, industry of fishery.*

Introduction

Over the past few decades it is observed the deep structural deformation in the domestic fishery, the fall of fish production and consumption of expected quality level and its consumption level by the Ukrainian citizens (from 20kg/year in 1991 to 9.5 kg/year in 2014), with excessive deal of imported fish on the domestic market and fish products, which are potential dangerous in case of absence of the efficient professional state regulations.

Material and methods

The research was used a complex of general scientific and special methods: abstract-logical (general theoretical bases of government regulation), analysis and synthesis (are investigated aspects of national policy of fishing industry), system analysis (analyzed functions of central control body), experimental (improved the system of government control tools), constructive and design (the mechanism of government control)

Results and discussion

Ukraine is a maritime power and historical has a considerable fishery potential (table1).

Table 1.

Fishery water resources of Ukraine

reservoir	**area,** *ha*	**remark**
Internal reservoirs	200.000	Pounds, rivers and storage reservoirs
Threat of the Dnieper reservoirs	690.000	The six biggest reservoirs
Estuaries and lakes	410.000	Fresh and briny
Sum total:	***1.30.00***	Useful area 1.000.000 ha
Black sea	5.500.000	Continental shelf
Sea of Azov	3.600000	Closed sea of two states
Sum sea total :	***9.100.000***	
Total:	**10.400.000**	

However the active state administration system expects the determination functions of bioresources supply, industrial shares distributional between the aquatic bieresources users, state control of their use, regulation of fishery and realization of centralized control. The main reformation directions of fishery of Ukraine are determined:

1. Establishment modernization by means of delegacy of some state administration functions to local authorities.

2. Accumulation of aquacultural potential of Ukraine and its realization by means of the taxation pressure decrease on the producers of aquacultural goods [4]**.**

3. Intensification of the struggle against illegal, unreported and unregulated fishing (IUU) by means of the establishment in the legislation of Ukraine of principles of the regulations EU 1005/2008 and 1224/2009 and their implementation.

4. Studying and establishment in Ukraine of international practices regarding the recreational fishing [2].

5. Realization and development of the sea and ocean fishing direction with the help of investor on the basis of reestablishment of scientific explorations, creation of the scientific basis for the distant fishing with appropriate funding on account of the state and entrepreneurs.

6. Attraction of the financial and technical support and specialists of European Union for the studying and valuing of the inventory state of the sea and freshwater fish species in order to increase accuracy and representativeness of the population state research results.

7. Legislative intentions are necessary to give incentives for development and intensification of the fishery potential of Ukraine, on the basic of responsibility, industrialization and effectiveness of natural resources utilization.

Conclusion

Reformation of the fishery branch of Ukraine is the urgent question of the present time in order to ensure the state food safety under condition of sustainable development of the branch by means of legislative, financial, institutional transformations and establishment of many strategic measures concerning the development of real sector of economy, social and ecological stabilization**.**

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Customers‘ Preferences in Perfumed Shower Gels

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Abstract. When buying cosmetic-hygienic products, like shampoo, shower gel, bath foam and liquid soap, customers have no opportunity to test the product thoroughly in the shop. So when customers make decisions they can judge from the outer appearance, the quality of the packing, the listing of the cosmetic ingredients and the image of the producer. But apart from all these the fragrance of the cosmetic product is the most important characteristic which makes the customer subjectively think that the product is „attractive“, „pleasant“, „acceptable“, „unpleasant“, „disturbing“ and so on.

This article describes an attempt to structure and categorise scents which are used when perfuming cosmetic hygienic products, especially shower gels. This was done by studying likes and preferences of potential customers on the Russian perfume-cosmetic market and by determining the relationship of customers to current trends in perfumed shower gels. Such trends include e.g. unusual and original fragrances.

In order to solve the task of structuring and categorising scents used in cosmetic hygienic products the authors made a survey with persons at different ages and of different gender from January 2015 to November 2015. The survey was done in two ways: an online interview where the respondents had to complete a questionnaire and personal talks during fairs.

At the end of this research a unique classification of fragrances of shower gels was established which can be used as an effective instrument for perfume-cosmetic companies when managing their products. With the help of this classification they can judge better the acceptance of intensity of scents of shower gels. Furthermore they can also see which products are preferred by which gender and age group of the customers. Additionally they are able to analyse the reactions of people to original and unusual fragrances.

Keywords*: shower gels, fragrance families and scent families, natural and fantasy aromas, traditional aromas, fashion trends, original and exotic fragrances, customers' preferences, character and intensity of fragrances of shower gels*

Introduction

Not having the possibility to thoroughly test a product before buying, customers make decisions judging from the outer appearance, the quality of the packing, the listing of the cosmetic ingredients and the fragrance of cosmetic-hygienic articles, like shampoo, shower gel, bath foam and liquid soap. And very often especially a pleasant fragrance makes the customer pay attention to exactly this product and plays an important role when buying it.

The broad variety of shower gels that is offered nowadays on the Russian perfume-cosmetic market is mainly possible because of an expansion of the fragrances variety of the products, which includes new fashionable varieties of unique and original fragrances.

Material and methods

The study was done on behalf of the Russian branch of the company "Cosmo Fragrances SGI, S.L.U" (Spain), which was opened in Moscow in January 2014. Its

aim was to find out how much Russian customers use specific perfume-cosmetic products (especially shower gels).

The main tasks were the following:

- to establish a classification of aromas of shower gels, which customers can understand intuitively, even though they are not specialists for perfume-cosmetic products

- to conduct a social opinion poll to study the Russian customers' preferences when buying shower gels

- to find out about the opinion of Russian customers towards fashionable trends in aromas for shower gels (i.e. non-standard and original aromas).

The completion of these tasks was done in two steps. At first 12 stores in Moscow that specialise in selling cosmetic-hygienic products, among them shower gels, were chosen and an opinion poll was conducted. With the help of multiple choice questions, that were established by the authors of this article, a bit more than 100 customers were questioned, among them women and men of different social groups (pupils and students, workers and public servants, pensioners) at the age of 16 to 65.

The percentage of male and female respondents is depicted in figure 1.

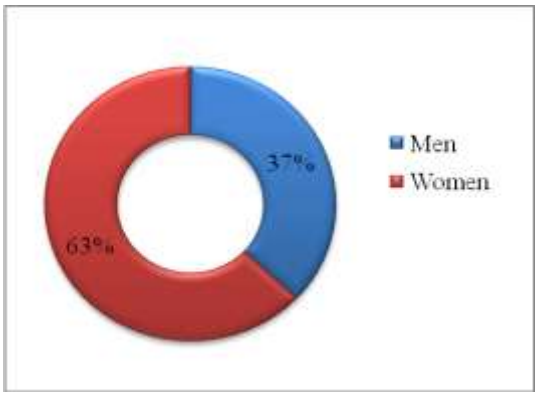

Figure 1. Male and female percentage of Srespondents

As one can see, two thirds of the respondents were women. The reason for this is that the biggest part of customers of perfume-cosmetic products, including shower gels, are women. They buy perfumes and cosmetic products not only for themselves but for men, children and other family members as well.

As for their age, the respondents were divided into six groups (see figure 3 further down).

The results of the opinion poll were processed with the help of statistic standard methods.

In the second step a testing of different aromas was done. The potential customers were to test 10 aromas of 4 new collections of shower gels of the company "Cosmo Fragrances SGI, S.L.U" (Spain).

Results and discussion

1. Classification of aromas

It is important to mention that there is no common classification of perfume-cosmetic products. The basis of all known classifications is the classification of aromas that was established in 1990 by the French Society of Perfumes. According to PAVIA, F, (1996) and JELLINEK, J. St. (2000) this classification includes seven basic families: 1. Citrus; 2. Floral; 3. Fougere; 4. Chypre; 5. Wood; 6. Amber; 7. Leather.

When looking at the current Russian perfume-cosmetic market the authors of this article found out that the most common aromas in shower gels are the following: floral, fruity-berry, fresh, woody, green, gourmet (edible), fantasy and perfumed. There are subgroups in every of these groups, which expand the array of today's aromas. The designations of the families and subgroups that classify aromas are designations that producers use to characterize their cosmetic production.

As one can see from the classification that is given in figure 2, the broadest family is the ***fruity-berry*** group, which is subdivided into 5 groups: fruity (peach, apple, pear, melon); berry (strawberry, raspberry, blackcurrant, cherry); citrus (orange, lemon, grapefruit, lime); tropical (mango, papaya, kiwi, banana, pineapple); fruity mix (combinations of aromas of different fruits and berries, e.g. multifruit, garden berries and so on) .

Examples for this group are the shower gels "Green apple" from The Body Shop (Russia); Palmolive "Summer melon" and others. Among this aroma some of the most popular ones are "Mango" (The Body Shop), "Malaysian coconut" (Yves Rocher), and "Avocado" (FA).

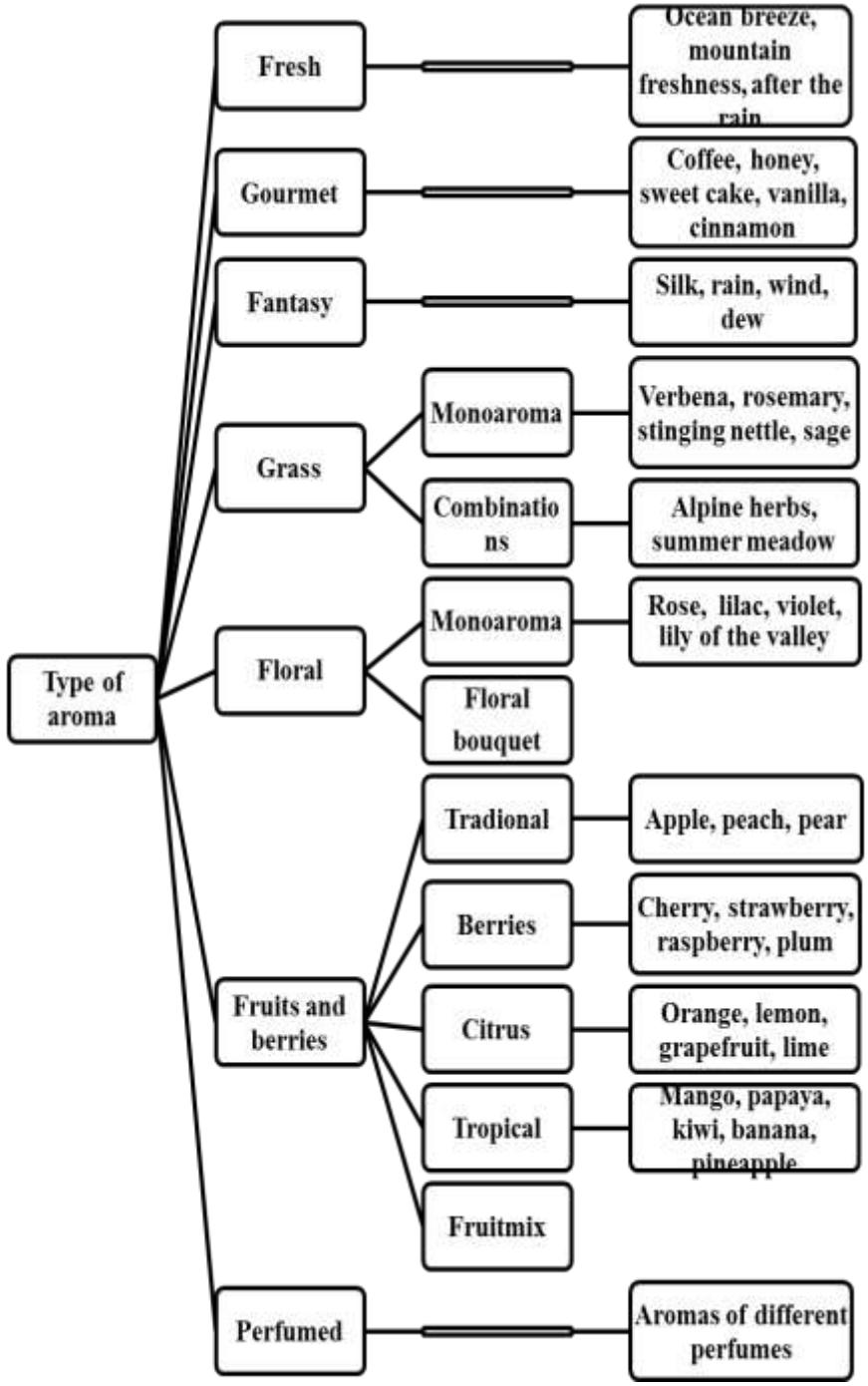

Figure 2. Classification of aromas of shower gels

The aromas of the ***grass*** (or "green") group are subdivided into two groups: gels with one aroma and gels with a combination of aromas. The first subgroup includes: verbena, stinging nettle, sage and others. In the second one you can find: alpine herbs, summer meadow and others.

In the group of ***floral*** aromas, like in that of grass, there are gels with one aroma (rose, lily of the valley, violet, lilac, lavender) and with combinations of aromas (bouquet of flowers, field of flowers, summer garden and others).

The aromas of the group of ***fresh*** aromas are those with a scent of cool, water and freshness: ocean breeze, waterfall and others. These aromas are mainly popular in shower gels for men.

Gourmet (or "food") aromas evoke associations with the customers of food, drinks or cakes. These aromas include vanilla, cake, coffee, cacao, chocolate and others. They belong to the most popular kinds of aromas nowadays. Shower gels for children include aromas like creamy toffee, ice cream, duchess pear, coke, chewing gum, fresh bakery and others. There are shower gels like "Strawberry ice cream" and "Apple strudel" produced by the Russian company Faberlic. Among the products for adults there are shower gels with aromas like honey, milk, chocolate, coffee, cappuccino, soufflé, cinnamon, combinations of fruits with cream (like strawberry with cream), cocktail aromas (like mochito) and others. Examples for these aromas are "Chocolate" and "Mint chocolate" by DolceMilk (Russian), "Chocomania" by The Body Shop (Russia), "Vanilla" by LE PETIT MARSEILLAIS (France).

Exotic aromas are complicated combinations that consist of various scents, like "lavender and honey", "hibiscus and cranberries", "aloe vera and tropical fruits" and "basil and peach".

Fantasy aromas are those that offer unusual scents like silk, but also invented scents like "Persian night", "Early morning awakening", "Pot-pourri" and others.

Perfumed aromas are those that contain much perfume, which are used in expensive shower gels of well-known brands like "Lancôme", "Chanel", "Kenzo", "Dior", "Givenchy", Dolce and Gabbana" and others.

2. Study of customers' preferences

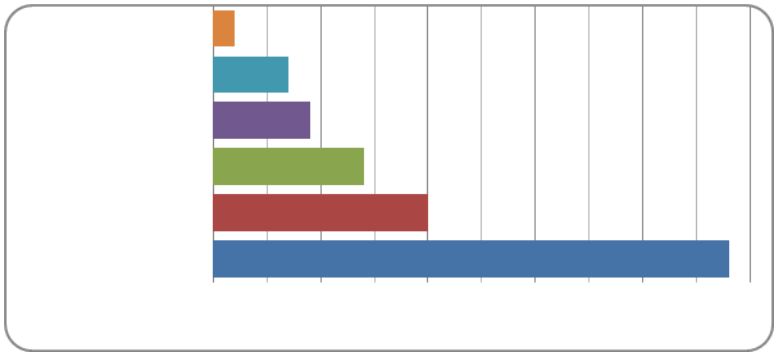

Figure 3. Percentage of respondents according to their age group (%)

The given study reveals a typical portrait of the Russian customer of shower gels - women at the age up to 30. Figure 3 depicts the percentage of customers that use shower gels according to their age group.

The statistics show that the most active users of such products today are children, teenagers (of secondary school), students and young people. All of them together make up about 50%. Girls and young women buy shower gels for themselves or as a present. Lately the number of young males and men up to 33 years that actively use shower gels is rising. Mothers very actively buy shower gels for children (for girls as well as for boys). People older than 50 less often use shower gels since they prefer to use bar soap when washing.

The results of customers' preferences in aromas in shower gels are shown in figure 4.

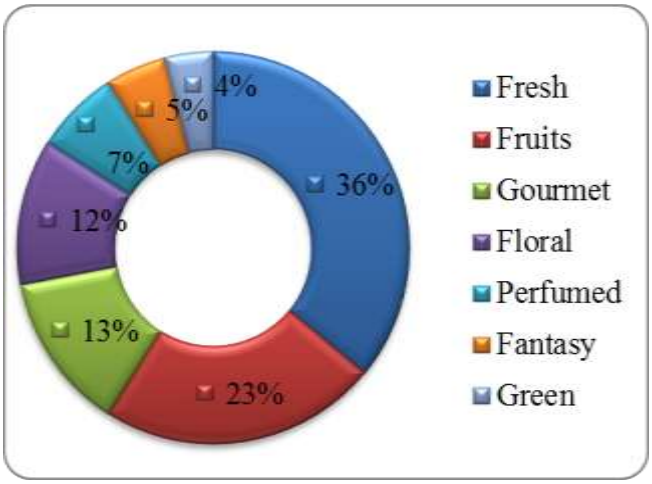

Figure 4. Customers' preferences in aromas in cosmetic shower gels

The results of the analysis of customers' preferences in aromas for shower gels show that:

- 36 % of the respondents choose a shower gel with a fresh aroma (e.g. ocean, which is an example for a unisex aroma);

- 23 % of the polled persons prefer shower gels with a citrus or tropical fruit aroma;

- 13 % of the respondents choose shower gels with a food aroma (e.g. chocolate, vanilla etc.);

- 12 % of the questioned persons prefer floral aromas (aromas of only one flower as well as combinations of different flowers, like 'bouquet of flowers');

- 7 % of the interviewed persons choose shower gels with a perfumed aroma;

- 4 % of the respondents prefer grass ("green") aromas;

- 5 % of the surveyed persons choose shower gels with fantasy aromas with a pleasant exotic scent.

When asked which shower gel made by Russian producers they bought most of the time, the respondents named the following: Chistaya Linia, Grandma Agafis recipes, Faberlic, Natura Siberica, Green Mama, Red Line, Lactimilk, Fruit Opening, Dolce Milk. Among the most popular shower gels made by foreign

producers are: Avon, Palmolive, Oriflame, Nivea, Yves Rocher, L'Occitane, Fa, La Petit Marseillais, Dove, Timotei, Camay, Safeguard, Axe, Amway.

3. Customers' opinion of the current trend of scented shower gels

Data from GORJUNOVA, O. & VODORESOVA, E. & TCHALYCH, T. (2015) show that nowadays a lot of producers of cosmetic products expand their range of articles on the basis of the current trend of scenting products. Additionally to traditional aromas they offer products that have unusual, but original and memorable aromas, like those of vegetables, spices and exotic fruits.

To find out what customers make of the trend of scenting shower gels they were asked to test 10 aromas provided by the company «Cosmo International Fragrances» *(Spain)* that were chosen from 4 new collections of fragrances:

- «Berries with seeds», among which popular aromas of berries and fruits are used that contain seeds of kiwis, grapes, pomegranate, plum and others;

- «Vegetables» (with a scent of grass and vegetables), among which you can find unusual aromas like courgette, pumpkin, squash, cucumber, carrot and other vegetables;

- «Pepper varieties» are aromas with a scent of red, black and green pepper and other spices;

- «Tropical» are aromas of exotic fruits, among which there are those of pitahaya, star fruit, rambutan, tamarind, guava, dragon fruit, carom and others.

These new aromas, which are easily associated with natural products and a healthy way of living, are becoming the more and more important in our time. GORJUNOVA, O. & PUTSCHKOVA, T. & ZOLOTOVA, S. (2014) already described the trend of using natural cosmetic as getting more and more popular.

The assessment of aromas by the customers was done with the help of a scale from 5 to 1:

«5» – liked aroma very much,

«4» - liked aroma;

«3» - did not know whether they liked aroma or not;

«2» - did not like aroma much;

«1» – did not like aroma at all.

The results of the study are shown in table 1. The respondents older than 40 years gave a general assessment on the aroma according to how "fresh", "sweet", "green" and "fruity" it is or described it as pleasant or unpleasant. Young people up to 30 years were more interested in the determination of exotic scents and their unusual composition. That is why they were more interested in aromas from the "Vegetable" and "Pepper variety" groups than older people.

Regardless of their age, all respondents assessed the aroma Mango & Grapefruit of the "Tropical" group (description by the producer: fruits, mango, kiwi) as very pleasant, harmonic and a bit sweet with an assessment of 4,9. The description of the scent corresponds with how it is perceived by the customer. All the respondents found it to be a harmonic scent of exotic tropical fruits.

All three aromas of the group "seedfruit" were assessed positively. GRAPE got an assessment of 4,5 and was described as sweetish and reminding of Isabella vine. STRAWBERRY was judged with 4,3, as was RASPBERRY, which was described as pleasant and sweet.

Table 1.

Assessment of aromas in shower gels by customers

№	Name of aroma	Group	Description of aroma by customers	Assessment of respondents	
				Average assessment	Comment
1	MANGO & GRAPEFRUIT	Tropical	Fruits, mango, kiwi	4,9	Very pleasant, harmonic, a bit like sweet tropical fruits
2	YELLOW BANANA	Tropical	Maracuya, sweet banana, yellow kiwi, jelly bears	2,9	Aroma too sweet, intrusive, chemical touch
3	STRAWBERRY	Seedfruit	Lemon zest, freshly picked strawberry, summer fruits, strawberry leaves	4,3	Sweet aroma, fresh strawberry, pleasant acidity, fruity, smooth

4	GRAPE	Seedfruit	Black grapes, wild cranberry, sweet blackberry, vineyard	4,5	Isabella Grapes, a bit too sweet, a bit reminding of vine aroma
5	RASPBERRY	Seedfruit	Fresh raspberry, forest berries jam, red currant, sweet musk	4,3	Pleasant aroma of raspberry, sweet raspberry jam, forest berries
6	PINK PEPPER	Pepper variety	Grapefruit, lemon zest, pink pepper, ginger	4,6	Unusual aroma, but leaves pleasant impression, fruity with a bitter note, citrus, fresh
7	GREEN PEPPER	Pepper variety	Lemon zest, green pepper, cardamom seeds, fine green tea	3,2	Sharp aroma, hurts the nose, rough, gets more pleasant after some time
8	ZUCCHINI	Vegetables	Sun kiwi, courgette, slush of melon, sun musk	4,6	Pleasant aroma, refreshing, slight note of melon
9	CUCUMBER	Vegetables	Grapefruit, slice of cucumber, aloe vera, water-melon	4,4	Fresh aroma, light, green, reminding of cucumber lotion
10	CARROTS	Vegetables	Vegetable seeds, carrot, fig tree, pumpkin	3,5	Unusual aroma, vegetable, scent of carrot soup, fresh note (cucumber)

The cucumber aroma was also assessed positively (4,4). Here the aroma was described as fresh, light and green like that of a natural cucumber. PINK PEPPER was also among the popular aromas (4,6), being described as unusual and fruity with a bitter citrus note, but leaving a pleasant impression.

The combination of kiwi, zucchini and melon, which gives a pleasant, fresh scent to the ZUCCHINI aroma of the "Vegetable group", was not only popular among young people, but also among older people. It was assessed with 4,6 and described as pleasant and refreshing.

Sharp and insistent aromas were not very popular and got an assessment of 3,5 or lower. Examples are: YELLOW BANANA (2,9) with a sweet, insistent and chemical aroma and GREEN PEPPER (3,2) with a bitter and sharp aroma. There were different opinions as to the assessment of the aroma CARROTS. Young

respondents (more than 50% of all respondents) noticed an original aroma with its freshness reminding them of the leavy tops of carrots. Older people were more reminded of carrot soup, which, according to their opinion, does not fit for a cosmetic product and thus had difficulties giving it a positive assessment (average 3,5).

The respondents were also asked to judge shower gels according to an «Intensity scale of aromas in cosmetic products» (table 2), which was established by GORJUNOVA, O. & TCHALYCH, T. (2015).

Table 2.

Intensity scale of aromas in cosmetic products

Intensity of aroma	**Characteristics of aroma**
1	Almost no scent, smooth, light, subdued, quiet, subtle
2	Pleasant scent, recognizable, not sharp, relaxing
3	Slightly noticable scent and able to evoke associations. Light, unintrusive, pleasant, bright, with a high recognition value
4	Scent that draws attention to itself; able to evoke associations. Too intrusive, too sweet, stuffy
5	Scent too intense, sharp, evokes unpleasant feelings

In general the respondents thought that the intensity of an aroma of a shower gel should not be higher than 3. The customers did not like stuffy, heavy and scents that were too sweet. The majority think that the ideal aroma should be pleasant, light, not sharp and unobtrusive, but at the same time it should be bright and remain in one's memory.

Conclusion

The given study shows that the most popular shower gels among today's customers are those that have an aroma that can be classified as unisex with a refreshing note of water and freshness like ocean breeze and waterfall, but also traditional fruity aromas. Cosmetic products with an unusual aroma evoke a lot of interest among young people, but older ones do not like them too much.

The aroma is a determining factor for all of them when choosing a shower gel. An aroma that is assessed as pleasant not only increases its attractiveness, but also shows characteristics that influence positively the general state of a person's organism while and after taking a shower, improves the mood, relaxes or tones up.

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The Effect of Color on Perceived Taste of Aqueous Solutions

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Abstract. The aim of the study was to investigate whether the color of a solution affects the perception of its taste. The study of product color is important not only in terms of sensory tests and scientific research in itself, but above all it has a significant impact on food consumption and as such touches everyday life. A thorough review of research literature related to the impact of color on taste perception and general acceptability of the product has been conducted. The next stage of the study focused on the sensory analysis of the effect of color on taste perception of different aqueous solutions. The results, do not clearly indicate that the observed effect stems from associations between a particular color and taste.

Keywords*: sensory analysis, color, taste*

Introduction

The ability to detect and perceive images – shapes, colors and movements occurring in the surrounding environment – has been crucial for human beings since the very beginning of the existence of the species, because it increases the chance of survival. It has enabled the use of tools, finding edible food, and escaping from predators. Nowadays, the sense of sight not only helps consumers assess the quality of purchased goods, but also receive product-related information (e.g. presented on

labels or in visual advertisements). (Gawęcki and Baryłko-Pikielna 2007; Konturka, 2009).

Color and taste associations are based on previous experience, thus the food color causes immediate reaction: e.g. when eating yellow or green fruit, we expect a sourer taste than when eating red fruit. This is confirmed by research conducted by Tomasik-Krótki and Strojny (2008). The *sour* colors are yellow and green, whereas red and orange are associated with the sweet taste, blue with salty taste and violet – umami. Similar results were obtained by Koch and Koch (2003), also indicating the white color as associated with salty taste.

Consumers have preconceived associations regarding different products and their colors. If the product has a different color than usual, it may cause consumer's reluctance towards the purchase of the good or even lead to its rejection. Of course, nowadays, food manufacturers use different ways to attract customers to their products, and thus they oftentimes deliberately change to color of the product, just to surprise the customer and to make their goods stand out among the products offered by competition (Gawęcki and Baryłko-Pikielna 2007).

Some studies suggest that a change in color of a product may lead to misinterpretation as to its taste. DuBose C.N. et al. (1980) showed that a change in the color of a beverage significantly hinders the recognition of taste. Panelists were given fruit drinks of grape, lemon, cherry and orange flavors in two color variants: in the first case the original color of the drink was retained, while in the second the color was non-specific for that particular type of drink. The assessors were expected to identify and correctly detect the taste samples of these beverages. For example, the taste of the cherry drink when presented as yellow solution was only detected by 30% of assessors, as many as 40% of them identified the taste as lemon.

Delwiche (2003) showed the existence of significant differences between the rosé and the red wines. It is worth noting that the group of assessors in Delwiche study boasted above average sensory experience – they were professional wine

tasters/sommeliers. They were asked to evaluate three samples of the same wine, colored in white, rosé and red, and then rate each wine in terms of sweetness, dryness, fruitiness, maturity and richness of taste. Rosé colored wine was assessed as fruity, whereas the red wine obtained highest ratings in maturity, roundedness and richness of taste. According to Delwiche, similar observations would not have been possible if the assessors had been recruited from among ordinary consumers, since - unlike professional wine tasters – they did not have necessary experience in associating different types of wine (white, rosé and red) with sensory qualities. Kappes et al. (2006) showed the effect of color on the taste and how it feels in the mouth. A trained sensory panel was given a set of lime flavored fizzy drinks in original color and with caramel coloring added. The results showed a difference in the perception of taste and feeling in the mouth depending on the coloring. Adding the coloring to the beverage samples increased the feeling of fullness of taste and the drink seemed to be less fizzy, which also reduced the stinging sensation on the tongue. The colored samples were also assessed as more vanilla in taste rather than lemon/lime compared with original samples. Zampini M. et al. (2007) showed that almost every color in the test (except for red) was clearly associated with a particular flavor.

In another experiment, it was confirmed that the color of the solution influences the identification of its flavor. If the solution had a color which is generally associated with specific taste (e.g. an orange solution had an orange flavor), the assessors would detect the flavor more accurately than if the color of the solution did not correspond with the commonly associated taste (e.g. a green solution had an orange flavor. (Zampini, 2007).

Material and methods

Studied the effect of color on the sensitivity of taste. Used linear scaling. In two sets of five samples (in each set the concentration of the samples was:

0,25/0,31/0,38/0,48/0,6 citric acid g/l). The concentrations of the samples were taken from the ISO 3972:2011 Sensory analysis – Methodology – Methods of investigating sensitivity of taste. One set was colored green and the other red. The purpose of the evaluation was to determine the intensity of sour taste on a linear scale of 10 centimeters. All samples were coded with a three-digit number and evaluated in random order. It was assumed that the color of the set may influence the perception of intensity of the samples.

Results and discussion

The evaluation of two sets of samples was performed by 86 assessors (62 women and 24 men). Each person assessed both the green and the red set. It was assumed that if the color had a significant effect on the perception of intensity of taste, it would affect the distribution of results in assessed sets. Only coherent rankings were analyzed (Spearman's rank correlation coefficient $r_s=1$) – and such requirements were applied in both sets. Thus, the responses of those assessors for whom lower concentration samples were characterized by greater intensity of taste than the samples of higher concentration were rejected and not analyzed any further. It was assumed that if someone ranks the 0,25 g/l sample as sourer than the 0,48 g/l sample, most probably does not perceive any difference in the taste between the two samples. In the final analysis, the ratings of 26 assessors were included. The results of the study are presented in the following histograms (figure 1).

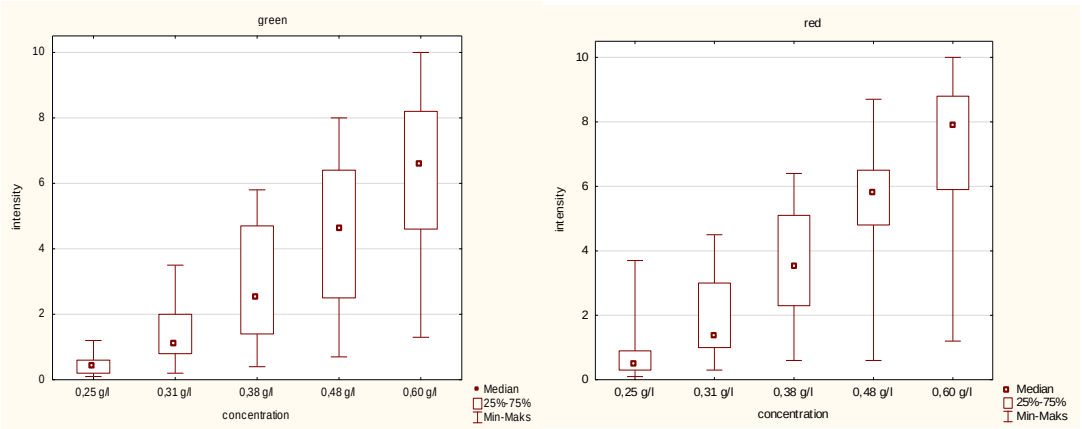

Figure 1. Distribution of responses for green and red color.

Source: author's own work

Analyzing the histograms, a slight shift in the distribution of responses can be observed for red and green sets. The mean intensity scores for the red samples were higher for all concentration variants – and were assessed as sourer.

For the purpose of this study, the following hypotheses were formulated: H_0 – there is no difference between the mean scores in the compared pairs of samples of the same concentration but different color, H_1 – there are differences between the mean scores. Statistical calculations (Mann-Whitney U test) showed that despite a significant shift in the results (red solutions were assessed as sourer), there are no grounds to reject the null hypothesis. (Rabiej, 2012).

Conclusion

Apparently, the results are not convincing enough as to make direct color/flavor associations. The tests and experiments conducted in this study failed to confirm the effect of color on the perception of taste. The fact that the association of different flavors with basic colors does not simply translate into the research results,

might be connected with more than one flavor being associated with a particular color. It is possible that certain associations which have a strong effect on the perception of complex flavors are of little importance in the case of basic ones. The influence of color on the basic types of taste is a relatively unexamined field of study and more research should be conducted in the future.

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Hydroponics: New Perspectives for the Global Food Supply

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Abstract. The rise in food costs, the increase of world trade and the continuous increase of population are the most important problems about the food supply for many countries. Hydroponics is a method of growing plants using mineral nutrient water solutions without soil. Until now, hydroponics has been an uncommon cultural method and although it represents a low-grade technology, it can represent an agronomic innovation for producing more food and to avoid local production crisis. Moreover, it could be implemented in areas where the composition of the soil is not ideal for the desired crop and in particular in local contexts with limited space, such as the urban areas. In the future, it could play a key role in agriculture, because it can overcome some economic and environmental problems of the agro-industrial sector. When combined with "controlled-environment agriculture" (CEA) methods, it has led to an appreciable improvement of the greenhouse growing techniques, giving to growers an extraordinary ability to control crop growth and to produce year-round crops. CEA and hydroponic methods could optimize the use of resources such as water, energy, space, capital and labor in advanced facilities, for example, with fully automated glasshouses with computer controls for watering, lighting and ventilation.

Keywords*: hydroponics, food, CEA, environment*

Introduction

The current world food crisis is a global emergency according to the World Food Program (WFP), due to the rapid increase in human population, estimated at 7,432,663,000 people, with the expectation of exceeding the threshold value of 9.5 billion people by the middle of this century [1]. At the same time the total current cultivated surface is about 41.4 million km^2 [2], which tends to decrease due to human factors and adverse climate conditions (desertification, deforestation, irrigation, terracing, landfill, human expansion), with a loss of habitat which involves loss of biodiversity as well. Almost 795 million people worldwide do not have enough food to lead a healthy active life [3] and about 700 million people in 43 countries suffer today from water scarcity [4]. This implies an increase in food productivity that needs to be implemented by diversifying the methods for growing food in all conditions, maximizing the yield per hectare, using fewer resources, in order to recover all the possible arable land. In addition, the perception of the affluence of the world is increasing and this means that consumers food demand will require additional superior resources in the future [5], with a negative impact on biodiversity, which in turn contributes to climate change, linked to the fragmentation and reduction of terrestrial habitats converted to farmland.

In this framework, applications, such as hydroponics, of out-ground cultivation techniques are numerous in the modern agriculture, in order to improve food production in any environmental situation. Even if hydroponic systems are ancient practices [6] [7], they have been subject of systematic study since the late '20s of the twentieth century [8]. During World War II they have been used by the US Army for the supply of fresh vegetables to the troops [9]. This has led later to research and testing of a wide range of alternative farming techniques, which came to fruition in the '70s.

Aim of this paper is to assess the sustainability and efficiency of the most advanced hydroponic techniques and the subsequent economic and environmental implications in the global food market.

Material and methods

The research has been conducted, primarily, through the analysis of the scientific literature available on the hydroponics in general and, subsequently, on the most innovative techniques now applied. As regards as the application of new hydroponics system, most of the useful information come from companies reports.

Results and discussion

Hydroponics is an agriculture system that uses mineral nutrient solutions dissolved in water, rather than tap into nourishment for the plants from the soil [10], therefore it doesn't require fertile land or natural precipitations, and can represent for people who live in disadvantaged regions a mean of food self-production and profit. The re-use of nutrient water supplies doesn’t give origin to the eutrophication and reduces the overall pollution of land and water. Hydroponic crops combined with "controlled-environment agriculture" (CEA) methods do not require pesticides, require less water and confined spaces than conventional agricultural systems, and can be stacked and organized in vertical farming systems [11]. This makes them optimal for use in cities, where space is limited and the demand for fresh products which are cultivated closer to home is increasing. In the same time commercial growers are developing new ways to turn urban, arid, hostile and indoor landscapes into the verdant farmlands of the future, so agriculture is expanding into new territories to meet current and expected future demands. New hydroponic crops are grown on the walls of the buildings, on the roof top, but also on the water surface, under the sea, and in the future “Greening the Cosmos”, a project of NASA which has confirmed its plans to place a greenhouse on Mars in 2021 [12]. For some

techniques, agriculture merges with the urban ecosystem with the possibility to realize a vertical cultivation system using and expensive new material with an appreciable aesthetic result. In other cases waste materials have been recovered using the technique of simplified hydroponics, as it has happened in many cities "of the South", to remedy the chronic malnutrition of overcrowded suburbs which are usually disconnected from the fruit and vegetable markets, often too expensive for the most disadvantaged class of the population. This is the case of Dakar, in Senegal, but also of Cairo in Egypt, of Bethlehem in Palestine and numerous cities in South America, where this technique has been refined and streamlined [13].

In Italy during the Milan Expo 2015, ENEA, the Italian Agency for New Technologies, Energy and Sustainable Economic Development, presented a sustainable vertical greenhouse that does not use pesticides and soil, consisting of a room enclosed by windows, completely sterile, where insects and parasites cannot get in, so product quality is excellent. This technique of hydroponics provides a production almost double compared to traditional crops, from six to fourteen cycles per year of harvesting and obtaining a 95% saving of water. The plants grow thanks to the use of a LED, high efficiency and low consumption, artificial lighting system, which reproduces the conditions necessary for photosynthesis. Every hour a watering cycle is activated, allowing plant roots to absorb water. This type of computerized system of fertigation is composed by a mixing unit that integrates in water the required amount of nutrients and periodically checks the pH and the salinity of the solution. The major advantage of this technique is to produce in very different climatic characteristics and where there are water scarcity problems and reduce transport costs [14].

A floating hydroponic greenhouse, named Jellyfish Barge, is the brainchild of Studiomobile, an Italian design firm working with University of Milan. It relies on distillation technology, using a solar panel to power the apparatus that removes salt from seawater and can also be used to remove minerals and other pollutants

from fresh water. The water treatment equipment on-board can produce nearly 150 liters of fresh water daily, which is added with some seawater to reintroduce mineral salts to the growing media. The Jellyfish Barge contains a growing area that can house up to 1,200 plants. It uses both interior and exterior space to accommodate a wide variety of fruits and vegetables [15].

An underwater farming, named the Nemo's Garden project, consists of a series of five underwater biospheres, made with vinyl capsules, off the Italian coast in Noli Ligure. These particular greenhouse environments have been designed to take advantage of stable temperature and easy access to carbon dioxide as they are placed on the ocean floor to grow outstanding plant specimens. Within the biosphere it is present a stable climate control and humidity, as well as a stable temperature of about 25°C. In addition, the chlorophyll cycle maintains acceptable levels of oxygen and carbon dioxide. In this type of crops the absence of insects and pests thus ensures a naturally organic cultivation since it is not necessary the use of any type of chemical pesticide. The project is not commercial but is thought to be optimal for the countries that have scarce freshwater resources by supporting changes in the coastal countries where agriculture is not widely feasible (such as sub-Saharan Africa coastline) [16].

Growing Underground is a network of 10,000 square meters of steps used during the Second World War, located in London Underground, now used as a "urban farm" with zero consumption of soil, and zero carbon emissions. This space is entirely dedicated to the fruit and vegetable production, where salads and cooking herbs are grown throughout the year and are aimed at restaurateurs and wholesalers. The peculiarity of the cultivation system is its hydroponic operation, thanks to which the water, rich in nutrients, irrigates the green beds once a day, to then flow out slowly without the aid of the ground. The system makes use of LED energy-saving lights, to remedy in this way to the lack of direct light. The energy needed for operation of the facility entirely comes from renewable sources. This artificial

cultivation system is possible also thanks to the reduced temperature, about 16°C, which is kept constant at 30 meters below ground level, and that allows this type of production to be active throughout the year. The benefits of the project are numerous such as zero CO_2 emissions for transport of goods and also the reuse of spaces otherwise abandoned, in a manner alternatively useful for the community [17].

Conclusion

Hydroponics is a worldwide known reality [18]. In hydroponic crops, a quality product cannot be separated from an advanced technological level inside the greenhouse, so the first obstacles to the adoption of hydroponic systems are the high initial investment costs and the energy costs required by cultivation mode in a protected environment. In fact, the successful practical applications, for hydroponic food production, have been limited so far to the high economic value crops in specific regions and in countries that have sufficient material capabilities, high degree of competence in the field of plant science and engineering. Unfortunately, these conditions are limited to a few countries such as the US, Canada, Europe and Japan. In developing countries, materials and technological conditions have allowed only the use of simplified hydroponic techniques, which recover waste materials, permitting to build a more economic system. FAO, since 1999, has introduced in its programs, simplified hydroponics techniques for the production of quality vegetables with the aim of improving food security of the urban populations in unstable conditions of access to space, lack of arable land/fertile and need of water saving [19]. The examples reported in literature of new hydroponic crops, undoubtedly constitute new prospects for the production of top quality food in a context of environmental sustainability, even if some of them are difficult to apply because of their implementation costs. The hope is to make hydroponics economically accessible as soon as possible, especially to countries suffering from the food problems.

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Reasons for Designing the Layout of a Jewellery Store According to the Concept of a Functional and Decorative Zoning

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Abstract. The main principle of the concept of a functional and decorative zoning is the consistent segmentation of the store's space into parts for specific uses and accordingly, parts with specific design. These parts are either meant to be functional (which means that they provide a comfortable surrounding for the customers and the personnel of the store) or are related to the products (that are placed in a way that is most profitable for the store). Construction, design and equipment of the store's space for products depend on many factors. A decisive influence is the product range policy of the company, because when stores are planned it has to be very clear which kinds of products are to be sold, in which way different products are grouped together and in which way to present the whole range of products to attract the customers to the store and thus to meet the sales figures that were planned.

The following research was done to study the typical product range of a jewellery store that is mainly focussing on the costumers of the mass-market. The structure of the product range of 12 big and medium-sized companies that sell jewellery products on the Russian market was analysed. Furthermore a poll among specialists of the jewellery business was done. In September and October 2015

online interviews were conducted to get to know the opinion of potential customers as to their preferences. Moreover information was collected from open sources. The result of this research is an overview of the customers' preferences and an assessment of the attractiveness of different types of jewellery products for the customer. Additionally, as a recommendation for planning and organising a jewellery store's space, classifying characteristics are given to assess which demands are basic, important and most important.

Keywords*: assortment of jewelry according to their type; retail; category management; assortment planning, functional and decorative zoning*

Introduction

The application of a functional and decorative zoning as a way to stimulate retail sales of jewelry is a relatively new trend. However, the general principles of how to use the internal space of premises for different functional purposes have long been known and elaborated in the framework of the theory of environmental design. Nowadays these principles are beginning to be applied in the design of retail outlets in various formats and are gradually developing into one basic component of modern merchandising. (KANAYAN, K., 2005; SIDOROV, P., 2014)

In an earlier article the authors already discussed the possibility to use functional and decorative zoning in a jewelry store and the advantages for a commercial enterprise. It has been shown (KALMIN, N. & ZOLOTOVA, S., 2015) that the implementation of the method cannot only be used in the jewelry trade in various forms of the sale of goods, but also to make changes in the layout of the trading floor, fully or partially transforming it, when needed. This allows you to react flexibly to the demand of the moment, for example, during the Christmas sales, when the jewelry departments traditionally have the maximum number of customers

and the trading floor personnel need to cater for a drastically increased flow of customers, maintaining the quality of the service at a level corresponding to the expectations of the consumers.

The practical implementation of the method of a functional and decorative zoning in a retail trade enterprise involves the separation of a single shop space into separate zones, which are accented with special means of zoning. At first there is a differentiation between functional zones and commodity areas. The main task to be solved when organizing functional areas is the creation of optimal conditions for visitors to make a purchase and for the store personnel to carry out the necessary commercial and technical operations. The main purpose of commodity areas is to present the range of products in a most advantageous way.

Thus, the decisions related to the planning and organization of commodity areas are directly determined by the assortment policy of the company. This work is devoted to the peculiarities of the formation of the assortment of a retail jewelry enterprise, taking into account the current trade practices, the use of the principles of functional and decorative zoning and modern consumer preferences.

Research methods

In the study 12 large and medium-sized companies realizing jewelry on the Russian market were analyzed in order to obtain relevant information about the typical assortment structure of products of a modern retail jewelry enterprise and to identify classifications necessary to separate the trading space into specific areas and their ranking in order of importance. In addition, on the basis of the product range presented in the online stores of these companies, indicators and the assortment structure according to the most important single features were calculated. During the trade fairs «Junwex Moscow" in May and September 2015 individual talks with

jewelry retail specialists on open issues related to the formation of the product range of jewelry stores refined estimates of the specific product range structure.

In September and October 2015 an online survey with multiple choice questions was done that gathered consumer opinions. 86 profiles were filled, 54 of them being of women (63%) and 32 (37%) of men. Such a distribution of respondents by gender is fairly common for studies of consumer preferences in the field of jewelry as women traditionally are more interested in jewelry than men.

In addition, the researchers collected and analyzed information using public print and Internet sources, as well as conducted "field observations" of customers in jewelry stores.

Discussion and results

It should be noted that the general issues of the formation and management of various goods received considerable attention in the works of researchers from around the world. Among the works of Russian scientists are those of Neverov A.N., Raikova E.Y., Chalyh T.I., Nikolaeva M.A., Kiselev V.M. (NEVEROV, A. & TCHALYCH, T., 2011; RAYKOVA, E., 2012; KISELEV, V. & NIKOLAEVA, M., 2013; NIKOLAEVA, M., 2015) and many others. Moreover, several scientists studied different approaches as to the effective management of the product distribution of different product groups (food and non-food items) as well as theoretical aspects of the management of trade flows as a whole.

It is believed that there are two independent concepts in the area of inventory management. One is the concept that is largely based on classical merchandising tools and the other one that in the field of category management, which formed an independent direction at the end of the 20th century. At that time Professor Brian Harris of the American USC (University of Southern California) coined the term "category management" and suggested an original concept of assortment

management, which now bears his name – the Brian Harris Model (NORDFÄLT, J., 2011). This article is not intended to carry out a comparative analysis of the above-mentioned concepts, but such a study, of course, could be interesting. The authors believe that these concepts are not contradictory and consider the category management to a certain extent as a further development of the classical theory of commodity research.

Arranging any large sets (objects, phenomena, concepts, etc.) begins with its systematization and classification. That means that there is a separation into distinct groups (or categories) according to some selected (significant) features, followed by an alignment of these groups in a particular, often hierarchical, system. In the classical commodity research a set of goods is divided into classes, groups and types that are defined in the national standard of the Russian Federation. As auxiliary classification steps subclasses, subgroups and kinds of species can be used. Category management combines all nomenclature of goods in classes, groups, product categories and product varieties.

The classification of jewelry which is officially valid on the territory of the Russian Federation is presented in the National Classification and is useful for an automated data processing in the field of state regulation of certain types of economic activities, the collection and processing of statistical data at a national and international level in the field of taxation, as well as the standardization and certification of products. However, this classification is not very applicable to control the range of products in retail trade enterprises. You need a tool that allows you to analyze in detail the range of products and make informed decisions about it or update the rotation, based on the total store concept and its positioning on the market. In this context, the principles of the classification of goods used within the category management are more useful, as they allow a greater mobility of individual elements, so you can quickly make changes in accordance with, for example,

seasonal fluctuations in demand or changes in operating conditions with certain suppliers. At the same time we must not forget that such flexibility can have a downside.

In the Russian industry standard the term "jewelry" is defined as products made of precious metal alloys using different types of artistic treatment, with inlays of precious and semi-precious gemstones and other materials of natural or synthetic origin, or without them, used as various ornaments, or different household items and (or) for decorative purposes.

In the classical commodity research classification the group jewelry (SAMARIN, V. & ZOLOTOVA, S., 2011) can be divided into three main subgroups: personal ornaments (those worn directly on the skin and those worn on clothes); interior decoration and tableware and coins, medals, commemorative badges, etc. Each subgroup contains certain types of jewelry. For example, the largest subgroup of personal ornaments include: wearable (tiaras, earrings, chains, necklaces, pendants necklaces, rings, bracelets) and personal ornaments for clothes (brooches, pins, side chains, cuff links, tie clips). In turn, each type is represented by different varieties, like jewelry made of alloys with various contents of the main precious metal (millesimal fineness), with jewelry inserts from natural minerals, artificial and synthetic materials or without inserts and a variety of methods of manufacturing and processing. Within the framework of the application of category management the classification features for the product categories, subcategories and products are established, as already mentioned, on the basis of the specific needs of a particular commercial enterprise.

As a result of the study of the product assortment in jewelry stores it was revealed that retail outlets most commonly used the following features of classification: the kind of precious metal and its content in the alloy (millesimal

fineness), the presence of an insert and its material. However, the basic product category in all retail organizations is the category according to the type of jewelry.

Results of the study of the assortment structure by type of alloy and its millesimal fineness

As main elements in jewelry alloys, besides the classical gold and silver, platinum and palladium can be used. Products from palladium alloys are unusual for Russian consumers and are only rarely found on the domestic market (less than 1% according to 2013 sales data), although such alloys possess all the necessary properties and in some countries, such as Japan or the United States, there is a steady demand for such products. Platinum alloys are traditionally used in diamond products. Platinum, compared to gold and silver, has a higher hardness and wear resistance, which means that products are more durable and retain better their "marketability." Furthermore, unlike yellow gold, such alloys do not give a diamond this apparent yellowish hue that obviously cheapens it. On the Russian market platinum products can be found in small quantities in boutiques, realizing the luxury and premium jewelry segment, but they almost never occur in Russian chain stores. A survey of consumers showed that only 1.5% of the respondents would choose a platinum product as their desired purchase.

Thus, almost all consumers surveyed expressed a preference for products made of gold and silver. It should be noted that the basic product assortment of jewelry companies mainly shows products made of gold and silver, whereas an absolute majority of retail outlets and online stores only sell these two categories of products.

In the past two years the consumers' demand shifted more and more towards silver that, compared to gold, is available at more affordable prices. This trend is normal in times of crisis, when companies survive thanks to the implementation of

cheap silver jewelry. The ratings of a survey of trade specialists in the period of the global economic crisis in 2009 suggest that consumer preferences also shifted in the direction of light-weight products of the low price range, including products made of silver (ZOLOTOVA, S. & NIKOLITCHEVA S., 2014). But in 2012 a backlash was to be observed. The market being oversaturated with silver, the demand for it decreased dramatically.

According to surveys of retail trade specialists in 2015, on average approximately 70% of sales accounted for silver and 30% for gold. Whereas when looking at the revenues it is the other way around and thus is proof for the Pareto rule: 70% silver jewelry sales brought about 30% of the revenues of a commercial enterprise and 30% of gold jewelry sales provided 70% of revenues.

The vast majority of Russian consumers surveyed (72%) stated that when planning a purchase of precious jewelry in the next time, they would primarily consider 14 carat gold articles. For silver jewelry such unanimity in the preference for a particular millesimal fineness could not be observed. The most popular silverware was sterling silver with a millesimal fineness of 925, but many consumers said that when choosing jewelry made of silver it was not important for them of which millesimal fineness it was and some of the respondents (18%) were not even aware of the fact that there are silver products of different millesimal fineness available on the market. The authors do not believe that such a result should lead to the conclusion that it is not important for Russian consumers of what millesimal fineness the silver product is, however, when applying the method of a functional and decorative zoning, this fact should be taken into account when planning the commodity area and the display of goods.

Results of the study on the assortment structure of the insert's material

When studying the typical structure of the assortment of jewelry commercial enterprises on the basis of "the material of the jewelry insert" certain problems

occurred. They are related to the fact that many terms used to describe the jewelry inserts are rarely unanimously defined and documented and thus interpreted very freely, not only by the consumers surveyed, but often by the representatives of the jewelry business themselves. For example, all experts believe that the concept of "gemstone" and "jewelry inserts" are not identical, but explaining what exactly the difference was caused difficulties in some cases.

The consumers' knowledge on jewelry inserts and their properties was extremely low. In almost every fourth case the knowledge of the subject was limited to the fact that there are "natural" and "not natural" stones. The term "semi-precious stone" was very broadly interpreted. There were for example respondents who attributed even phianites (a synthetic material that has no natural analogues) to this category. However, it should be noted here that if the nomenclature of gemstones on the Russian market is fixed by Federal law, the term "semi-precious stone" is not defined and is extremely vague. Perhaps this is why international practice (CIBJO standard, 2015) for commercial transactions using the term "semi-precious" is expressly prohibited as it is leading astray the customer. In this study the authors used the terminology of the classical commodity science that used the classification of jewels by E.Y. Kievlenko as a basis.

The first thing that should be noted as a feature of the Russian market is that there is about the same ratio of products with inserts and without, while there were a bit more products with inserts in gold jewelry in 2015, it was the other way around for silver jewelry. Secondly, the nomenclature of natural jewelry inserts is very limited.

The analysis made by the authors in 2015 and the study of different years in different regions of the Russian Federation (USHNITSKAYA, G., 2009; ZOLOTOVA, S. & NIKOLITCHEVA S., 2014; TVERDOKHLEBOVA, T. & ZDANOVICH, M. & DANILOVA, L., 2015) show that the Russian consumer's preferences in the field of jewels have been virtually unchanged over the past 10

years. Traditionally the first place among the gold products with inserts belongs to diamonds: a bit over 40% of all inserts. After those there are colored gemstones (about a quarter of the product range) in the following order: emeralds, rubies and sapphires. From natural stone jewels that do not belong to the 'precious stones' group there are those of the quartz group: amethysts, citrines, chrysoprase, agate, rose quartz and others that all together make up about 6-7%. And about the same share belongs to all the others occurring varieties.

For silverware about 90% of the products with inserts are synthetically grown crystals, mainly phianites, and the rest of the gemstones and semi-precious stones are natural minerals.

Results of the study of the assortment structure according to the 'type of jewelry product'

Specific preferences of buyers in Russia are not as obvious as in the US, where the first position is firmly held by rings, which is connected to the tradition of acquiring them not only for an engagement or a wedding but also for other events in life, e.g. graduation.

If you try to analyze the data from individual studies on the preferences of the type of jewelry in different regions of the Russian Federation over the past 10 years it can be said that in fact no comparison is possible. This is due to the fact that during studies of supply and demand on the jewelry market according to the type of jewelry, the authors of those studies used their own, quite original classifications, often violating the principle of hierarchy and mixing the types and varieties. In those studies, for example, they compared earrings, chains, rings with inserts and smooth engagement rings with each other. It also happened that they compared rings and sets consisting of a ring and earrings or earrings and pendants. Using incorrect source data in an analysis leads to erroneous conclusions. This is an example of the limited application of the classification based on the principles of category

management. When designed for internal management and accounting purposes, a flexible and easy to use own classification restricts the capabilities to use this classification beyond the point of sale for a more extensive analysis.

In the present study special attention was given to the problem of naming the types of jewelry when surveying and analyzing the data. The concept of a particular type of jewelry and its varieties was used in strict accordance with the definitions of the industry standard.

Table 1.

Typical assortment structure according to the type of jewelry of the jewelry store mass-market segment (%)

Type of jewelry	For gold jewelry	For silver jewelry
Rings	38	20
Earrings	21	27
Chains	10	21
Pendants	11	16
Bracelets	6	14
Others	14	2
Total	100	100

The average data on the assortment structure according to the type of jewelry, obtained by calculation during the analysis of the product range of online stores, are shown in Table 1. These values can be taken as typical for the assortment structure according to the type of jewelry for large and medium-sized stores, based on the "mass market" category in 2015.

A consumer survey showed that as plans for the next jewelry purchase rings (51%), earrings (28%) and a chain (8%) are named most often. Whereas the ring is definitely the leader for men, women's preferences vary between rings and earrings in roughly equal proportions.

Thus, it can be concluded that the ring is currently the most popular jewelry product on the Russian market. This is consistent with research data from five years ago, according to which in 2010-2011 people often bought rings, chains, earrings, making up 64% of all purchases (ZOLOTOVA, S. & NIKOLITCHEVA S., 2014). As to the changes in the structure of what types of products were sold it is worth mentioning that there was a growth in the sale of pendants. It seems that the increase in demand was mainly due to the existence of fashion charms (pendants) for bracelets.

Conclusion

Having analyzed the characteristics, used in commercial enterprises to organize and manage the product range, without a doubt, the most important one in the jewelry industry is the type of jewelry. A significant portion of the purchases of jewelry is not spontaneous in the sense that the majority of potential buyers entering a jewelry store in advance imagine that the purchase will be a ring, earrings or a bracelet. If the customer of a grocery store plans to buy oranges and the proposal of the store does not satisfy him, may it be because of the quality or the price, it is very likely that instead of oranges he will buy another kind of fruit, such as tangerines or apples. If a customer comes to a jewelry store to buy an engagement ring, it is likely that, in the absence of something of this category of products that meets his requirements, he will not consider earrings or a chain as a substitute and go to another store. Within the category of type it is also important to have a range of

varieties, taking into account other important indicators that influence customers while choosing.

Considering what was said before, one can sum up that when applying the principles of a functional and decorative zoning in order to achieve an optimal planning of the marketable area of retail trade enterprises, first of all, you need to analyze and understand the logic of the customers and follow it. That in turn should affect the increase of the number of potential customers and increase sales.

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Modification of Customers' Behavior at Points of Sales Using Multisensory Marketing Communications

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Abstract. In this article the authors covers the topic of multisensory marketing communications at points of sales and its influence on customers' behavior.The authors of this paper analyze the practical experience of different tools of sensory marketing communications usage at points of sales. As it is proved in this article it is possible to correct consumers' behavior in shops, restaurants, bars and other points of purchase using marketing message encoded in the form of a sensory signal and directed by sensory channels of perception.

Keywords*: marketing communications, sensory channels of perception, consumers' emotional behavior, value creation at point of sales, competitive advantages*

Introduction

Nowadays marketers pay more attention to modern ways of communication with their customers using Internet-channels as social-media communities, applications and mobile marketing. But all of these forms of communication have a weak point – they influence only one channel of sensory perception.

In this article the authors covers the topic of multisensory marketing communications at points of sales and its influence on customers' behavior.

The authors of this paper analyze the practical experience of different tools of sensory marketing communications usage at points of sales. As it is proved in this article it is possible to correct consumers' behavior in shops, restaurants, bars and other points of purchase using marketing message encoded in the form of a sensory signal and directed by sensory channels of perception.

The result of this method can be performed as residence time increase or decrease at the sales area, increase of the perceived value of trade offer and loyalty to the goods or point of purchasing.

In order to develop unified results of different tools analysis the authors create synesthetic paradigm of multisensory marketing based on direct influence of aromatic and kinesthetic marketing methods and indirect impact of audio and visual forms of marketing communications.

The results of this exploration can be of interest for specialists at marketing and branding area and can serve as a basis for future research in the field of sensory marketing.

It is possible to determine "Multisensory marketing" as a set of tools, methods and procedures to improve competitive advantages through non-price forms of competition, improve management decision-making process and improve brand loyalty.

"Multisensory marketing" can be performed as five communication channels corresponding to the five human senses, aimed at the consumer:

• visual communication channel;

• auditory communication channel;

• olfactory communication channel;

• tactile communication channel;

• flavoring communication channel.

The message encoded in a certain way, for example, color and color combination, shape, text, size, and also at the selected location, extends with emphasis on visual perception.

Such understanding does not contradict the notion of "neuromarketing" because this concept is a form gf a special case of "multi-touch marketing". Usage of its tools opens broad prospects for the creators of marketing communications and particularly the creators of the brand.

Material and methods

The authors of this work carried out studies of the effect of sensory marketing communications at point of sales. For this purpose experiment as a method of marketing research was used.

An important aspect in the evaluation of the obtained results of the research was the development of criteria for evaluating the effectiveness of sensory marketing communications. The criteria for the following components were selected:

- economic (indicators of changes in sales volume, increased prices and profits),
- investment (return rate performance of investments in the olfactory channel marketing communications),
- communication.

Communicative indicators represent an estimate of the perception of consumers of messages, showing the accuracy achieve communication objectives:

- increase the perception of value of commodity supply;
- «return» of customers at points of sale;
- attracting new consumers through the dissemination of information by word of mouth;
- removal of odors, inappropriate location of sales;
- impact on the labor activity of the personnel.

Results and discussion

Based on carried experiments the authors proved that:

- usage of visual marketing communications (for example, color usage for menu background at HoReCa business) can increase perceived offer value from +17 up to 33%,
- usage of auditory marketing communications at retail trade (for example, by mix of background music style on the trading floor) can increase sales from +15% for wines up to +89% for low alcohol cocktails,
- usage of olfactory marketing communications for HoReCa can increase customer residence time up to 75% and boost value of trade offer for customers up to +33% (for wines) for retail trade,
- usage of flavor marketing communications can increase the value of trade offer from +18% up to 60% for women business suit,
- usage of tactile marketing communications can enhance value of trade offer for wine up to +45%.

This results shows that utilization of traditional channels of marketing communication creates the need to find non-traditional communication channels. Visual communication tools called "visual merchandising" are one of the most

developed both theoretically and practically. Less work is devoted to auditory marketing communications. The main one relates to the issues of music usage in commercial and marketing purposes, however, suppressed from the destination of reliable data on the specificity of the effect of music on the perceived value of the shopping offer in the field of sales.

Olfactory communication channel effects in marketing are also studied and presented in a number of works of domestic and foreign authors, but has not received such wide circulation in practice of trading enterprises, as a visual and auditory sensory channels. As new channels are such marketing communications as a flavoring, tactile. The innovative aspect of the application in this case is a rational use of different sensory channels simultaneously - multi-touch marketing communications.

Generally every sensory perception channel can be employed to attract customers, creating a special sensation in the purchase, implementation of the hidden desires of the buyer. However, this is impossible to perfom, if run with each sense and channel individually. The objective of such marketing is to ensure holistic effect on all touch points of contact with the consumer product or store.

Conclusion

The implementation of an integrated approach of multi-touch marketing communications for the brand allows the consumer to cause emotions associated with it. This approach allows to:

- Use emotional involvement in the history of the brand, and the brand becomes part of the life of the consumer;
- Reinforce differentiation among similar products;
- Create additional competitive advantages;
- Increase of the number of trial and repeat purchases;
- Provide added value goods.

However, in order to receive these benefits, not enough to simply give the brand additional sensory attributes. It is necessary to constantly monitor changes in the specifics of the target audiences, analyze the emotions and perceptions of the brand. In addition to the effective management of consumer perception should:

1. Elaborated the concept of brand - a clear understanding of brand image formed under the influence of sensory stimuli. This means that all the senses should reinforce the key idea of the brand. Otherwise, if the sensory impressions are not connected with each other to cause ambiguous or disjointed associations, the consumer will be confused and disappointed.

2. Following the development of a clear concept it is necessary to focus on the use of the same sensory attributes. Only this allows you to call and fix the emotional distress associated with the brand. The change of attributes should be performed only when absolutely necessary: in connection with significant cultural changes (some taste, odor or color is out of fashion or for some reason, evoke associations unacceptable for a brand) or because of the sensory attributes of copying competitors. An example of imperceptible changes in the visual image of the brand is a long-term work on the company's marketers Mercedes narrowing of the star.

3. Relevance of sensory attributes needs and preferences of the audience. These attributes should be appreciated by the consumer and at the same time to cause the desired association, namely the consumers, not the company executives.

The emotional impact - is too powerful tool to use it properly. The product or service can buy, even if consumers do not like advertising, but if the product causes unpleasant tactile sensation, irritating smells or sounds - the probability of success will be minimal.

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Consumer Emotional Evaluation of Russian Red Merlot Wine Market

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Abstract. Nowadays Russian wine market becomes an interesting area for entry for producers from different regions. As a marketing source they use majority of studies concerning consumers' behavior at Russian wine market reflects the issues of social and emotional consumer preferences and setups not organoleptic or chemical demands' descriptors. This article covers the study of the consumer emotional evaluation of Russian red Merlot wine market offers based on economical indicators and calculated correlation between the retail price of wines and their attractiveness for buyers, calculated on the number of bottles (or other packages).

***Keywords**: emotional branding, wine market, consumers behaviour*

Introduction

Russian emerging wine market grows extremely fast and become more and more interesting for foreign companies. In 2014 offer on Russian wine market constituted 75.1 million USD in volume, lower for 6% against 2013. Decline was observed both in segment of domestic wine (-5%) and imported wines (-7%). Reduction of offer was driven by growth of retail prices due to increased excise tax; another reason was decline of disposable incomes of consumers. But share of domestic products on Russian wine market constituted 43% in volume; respectively share of imported wines was 57%. Moreover domestic production of wine in Russia went down to 32.1 million USD at 2015 which was for 5% less than a year before. In 2010–2014 volume of domestic production of wine was declining by 8% annually on the average.

The main hypothesis of this article is an assumption that systematic analysis of the structure of wines trade offers in supermarkets reveals its inconsistency for consumer expectations: buyers would react to the range and the retail prices of wines indifferent, authors suppose that customers don't expect positive emotions from their purchases and choose the wine without emotional intention in the process.

To prove or decline the hypothesis the authors covers the study of the consumer emotional evaluation of Russian red Merlot wine market offers based on economical indicators and calculated correlation between the retail price of wines and their attractiveness for buyers, calculated on the number of bottles (or other packages).

As a result the hypothesis was proved and the authors proposed that these problems require a rational resolution in order to increase the level of customer satisfaction and efficiency of participating trade channels (chain "production-supply-realization"), reflected in the growth of turnover.

Material and methods

In order to check hypothesis of this study price structure at Russian wine market trade assortment of more than 10 national distributors were analyzed. To analyze the trade offers structure and market demand character the authors collected data concerning wine products offer in two dimensions: in rubles (Russian currency) and trade units in main Russian retailer's chains. Other objects of analysis were the main driving forces that determine the character of the goods movement: the level of retail prices selling proposition on the scale of the city, the volume of trade turnover, calculated in monetary terms, the number of trade units. Trade unit in this research means an indivisible formalized offer variety of goods on shelves, which serves as a minimum unit of the plurality of the assortment of goods.

Moreover as a next level of research more than 300 customers buying red Merlo wine were surveyed in order to explore reasons for choosing a particular product they buy. Majority of respondents (about 78%) indicated as a reason of their purchase price level of the particular product (43%) and its package design (35%).

Results and discussion

Speaking about social and emotional descriptors we can noticed that wine as a product has a unique situation of categories perception: it is organically combines diametrically opposed concepts. Firstly, consumers consider wine as a product for socialization (big parties and holidays) and for personal consumption to relax and rest. Secondly, wine perceived both as traditional alcohol drink and integral part of modern life-style with reduction of spirit in beverage. Thirdly, wine has a strong image of alcohol drink with all negative effects for health but despite this fact a great amount of consumers accept the idea that wine has a positive impact on heart and blood circulation.

Analyzing the interview concerning the question of emotional involvement in wine branding it can be mentioned that consumers' pay much attention to taste and smell of wine production as well as its color saturation.

Based on theoretical background of Russia wine market the authors can make such typology of wine offers from the consumers view:

1. Price and quality relation

1.1. low-cost: from 60 – up to 350 rubles, places of origin - Russia and Moldova

1.2. middle-level: from 300 – up to 500 rubles, places of origin - Bulgaria, Hungary and sometimes Spain

1.3. high-level: from 600 – up to 1000 rubles, place of origin – France,

1.4. premium-level: more than 1000 rubles for a bottle.

2. Reason (holidays and parties, outdoor leisure and dates),

3. Emotional brand-involvement:

3.1. Classic wine: expensive extra high-quality wines from France, Italy and Spain,

3.2. National classic wine: middle-cost good quality wines from Georgia and Crimea,

3.3. Exotic wines with good quality and low-middle cost from Chile and Argentina,

3.4. Mass-consumer wines with low-cost and low quality from Moldova and Russia,

3.5. Obscure wines from USA (California) and Australia

Summarizing we can mention that based on the previous researches the main points for wine offer differentiation for today were price and place of origin with no systematical blind tests on the organoleptic characteristics.

Speaking about trading platforms analysis the authors prove the fact what during surveys at marketplace consumers mostly stressed the importance of wide

range of assortment and price and absence of fakes. The majority of respondents, both in Moscow and other cities, prefer to buy wine in the big chain stores - a wide range and variety of prices at supermarket make it the most popular place for wine buying. Moreover consumers suggest that wide chains protect consumers from the dangers of counterfeit purchase and defective products. Another important reason for buying wine in a supermarket is that in most cases the purchase of wine is carried out simultaneously with the acquisition of food.

Analyzing Russian trade offer (see Figure 1) we can noticed that main offers consists of mean (18,2%) and high-mean (47,2%) wine segment. This result noted a higher of the lowest retail prices segment (12% of the total value of retail trade turnover) in comparison with foreign markets results.

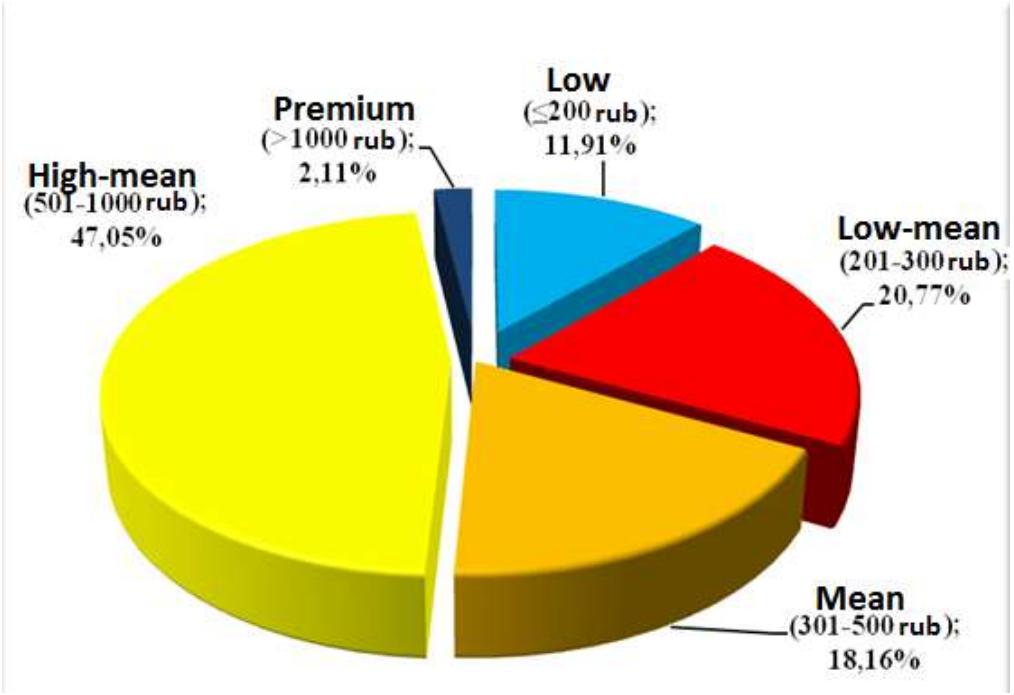

Figure 1. Wine demand structure based on price (calculated in sold liters)

Conclusion

This situation characterizes Russian regional wine market as a stable to industrial economy turbulence and dynamic developed. In this regard, reduction of the commercial offer saturation and be a measure of suppliers economic pressure to consumer demand, and characterizes the dominant influence of the economic vector of market relations on the orientation meet consumer needs.

Thus, a systematic analysis of the structure of trade offers wines in supermarkets showed it's inconsistency to consumer expectations: buyers react to assortment and retail price indifferent, do not expect to get positive emotions by their purchases and perform their choice indifferent. These problems require permits management to enhance the level of customer satisfaction and efficiency of businesses participating trade channels (chain "production-supply-realization"), expressed in the growth of turnover.

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The Current Problems of Sustainable Production and Consumption

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Abstract. Sustainable development is linked to balancing consumption with sustainable production. When considering its interrelations and cause-and-effect relationship sustainable consumption and production should be expected. In practice it is impossible and paradoxically the existing discrepancy between mutual non-matching of production and consumption is deepened by the same factors that enhance sustainability individually within production and consumption spheres. Moreover, this discrepancy is deepened by such positively perceived factors as the process and product innovation being a motive power for launching new products on the market, and increasing competitiveness. This is noticeable when considering an increasing quantity in product supply and developing new ranges of hitherto unknown products as well as accompanying global increase in consumption of raw materials, energy and waste. Production brings a strong stimulation of consumer needs and demands as well as puts pressure on consumers through marketing activity, advertising and promoting consumption lifestyle patterns. In this paper the actions targeted at developing sustainable production and consumption in two areas are described. The factors of mutual unsustainability between production and consumption within the cycle: environment - resources – production –distribution – consumption – waste - environment.

Keywords*: consumption, design, production, sustainable development, technology.*

Introduction

Achieving sustainable production and consumption requires consistent actions of economic, ecological and social actions to be undertaken in many areas of human activity that can be defined as follows:

- economic prosperity and continuity for business and its stakeholders,
- environmental protection and resource conservation,
- social well-being and equity for both employees and affected communities.

Economic actions include economic growth and creating value for shareholders through securing a competitive return on investment, protecting the company's assets, and enhancing the company reputation and brand image through integration of sustainable development thinking into business practices. Also capacity building for economic development in the communities, regions, and countries in which the company operates is to be expected. Environmental actions comprise environmental impact reduction by minimizing and striving to eliminate the adverse environmental impacts associated with operations, products and services, and also natural resource protection by promoting the sustainable use of renewable natural resources and conservation and sustainable use nonrenewable natural resources, including ecosystem services.

Social actions involve spheres covered by business ethics by supporting the protection of human rights within the company’s sphere of influence and promoting honesty, integrity and fairness in all aspects of doing business. They also significantly improve employee well-being as an effect of protecting and preserving the fundamental rights of employees, promoting positive employee treatment, and contributing to employee health, safety, dignity and satisfaction (Clark 2007).

Also increasing quality of life working with public and private institutions to improve educational, cultural and socio-economic well-being in the communities in which the company operates and in society at large (Rumpala 2011). Achieving

these objectives require a comprehensive approach and compromise solutions necessary to reach a synergistic effect.

Towards sustainable production and consumption by product design strategies

The expected synergistic effects result primarily from actions in the areas of sustainable consumption and production based on the Life Cycle Thinking (LCT) paradigm of complex profiles in the triad of sustainable development.

1. Economic life cycle thinking:

- total life cycle costs incurred by the enterprise, including capital and operating costs, and impact on long term profitability,
- total cost of ownership to the customer, including purchase or leasing of equipment and ongoing supplies or services,
- economic efficiency in terms of resource productivity and net energy production over the product life cycle,
- economic growth or entrepreneurship opportunities enabled by the product introduction,
- regional economic benefits of production due to sourcing of materials, suppliers and services,
- new jobs created both directly and indirectly via the multiplier effect.

2. Ecological life cycle thinking:

- energy consumption and energy efficiency of supply chain operations,
- depletion of nonrenewable resources, including materials and fuels, involved in transportation, production and distribution,
- impacts upon local and regional ecosystems, including habitat integrity, biodiversity and distribution of natural cycles,
- potential loss or degradation of agricultural lands, forests, water bodies, fisheries or other natural resources critical to human subsistence,

- airborne emissions, including hazardous air pollutants, particulates, smog forming chemicals, and greenhouse gases,
- solid or liquid waste streams associated with supply chain operations, maintenance, disposable supplies,
- potential risks associated with accidental spills, leak-age, fire, explosion or other incidents that could threaten human safety or ecosystem integrity.

3. Social life cycle thinking:

- benefits of product or service availability upon community quality of life, including improvements in health, nutrition, education, access to resources, sanitation, mobility and recreation,
- impacts upon employees and families, including skill development, education, and personal health and safety,
- potential adverse effects of new business operations and facilities upon existing cultural and community activities,
- potential impacts upon esthetics, including landscape changes, noise, odor or other effects of industrial activities.

It is easy to see the production (product) side of sustainable manufacturing in LC convention consists in coexistence of physical and business cycles (KOM, 2008). In practice LCT is accepted and completed by designers, constructors and technologists. The premise of LCT comprises also the sphere of consumption, but according to studies, this more likely results from design assumption instead of conscious consumer's choice. The natural consequence of LCT is Design for Environment (DfE). This design concept of crucial importance for sustainable consumption and production is completed by four groups of strategies according to different industries and product systems. The aim of these strategies is to reduce resource consumption, while maintaining economic growth. (Fig.1).

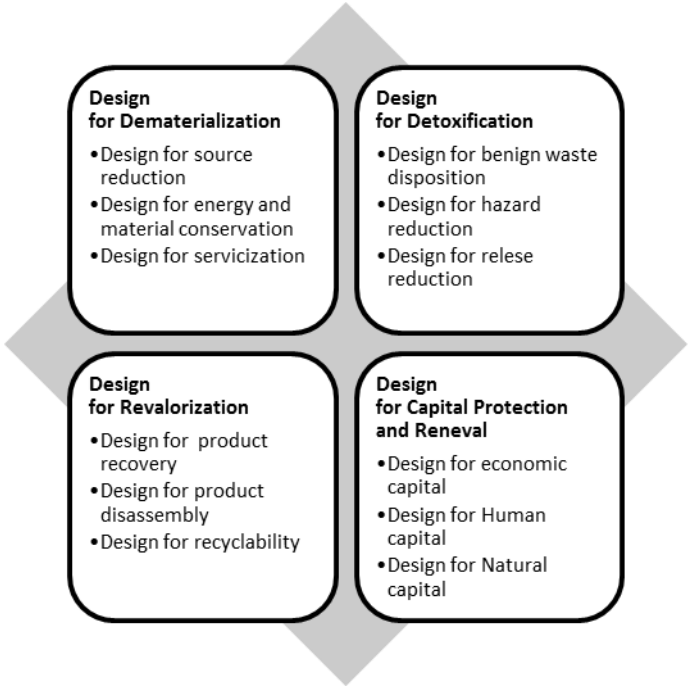

Figure 1. General strategies of Design for Environment
Source: own research

The product design process realization is based on design dichotomy assuming consistency between these two design forms that is a necessary condition for success. This consistency relates both to the selection of means for achieving the goal, i.e. the transition from quality of design and manufacturing to product quality. At each of these stages ecological issues understood not only as a direct environmental impact but also its indirect consequences remote in time and space. At this point it is necessary to refer to an important role of LCT, especially life cycle design, assessment and analysis (LCA), modeling methods and scenario techniques that together with Environmental Management Systems and ISO/TR 14062 general guidelines create another system influencing both sustainable production and consumption (Bostrom&Klintman 2008). Achieving the DfE strategy may be seen as a troublesome and costly undertaking, however its effect is not only an idealistic desire for sustainable production and consumption (Keane 2011). DfE initiates a

complex process that finally creates sustainable value for enterprise and shareholders (Fig. 2).

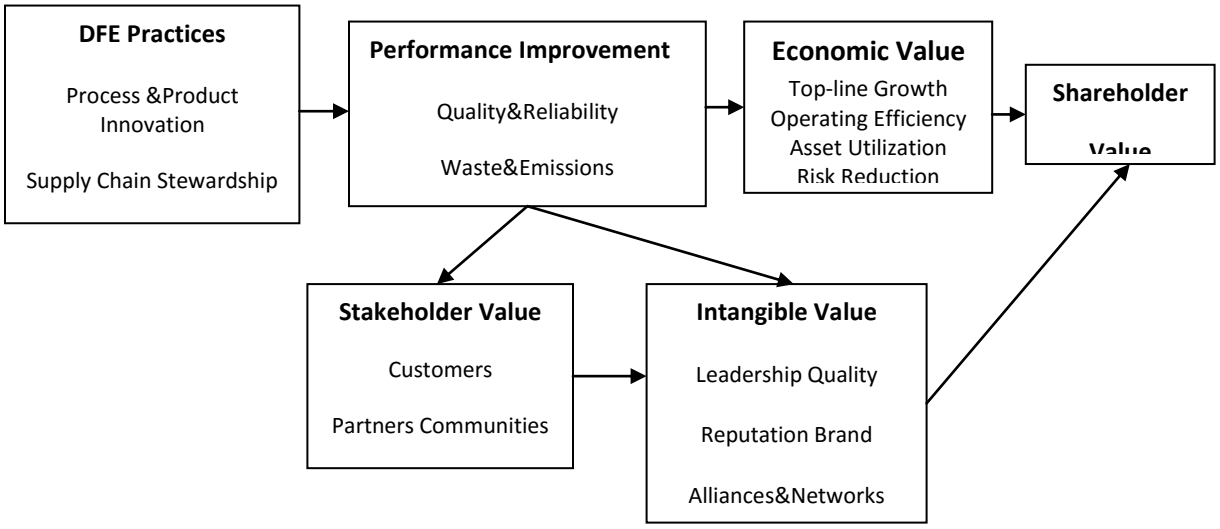

Figure 2. Process from design for environment to sustainable shareholder value creation

Source: own resarch on: Fiksel J., Low J., Thomas J., (2004), *Linking Sustainability to Shareholder Value*, Environmental Management (6).

Achieving DfE requires also various tools accompanying preparation and the design process. There are mostly concepts and tools used in realization of the concept of sustainable development in many sectors (Table 1).

The concepts that integrate production and consumption, such as QFD (quality function deployment) integrating consumer preferences with the process preparation activities so that the required level of product quality, in particular Ecolabeling and its inspiring manufacturers and consumers take an important role.

Table1.

Concepts, tools and sectors of activities for sustainable production and consumption

Concept	**Tool**	**Sector**
•Circular economy Cleaner production •Climate change mitigation •Consumer engagement and communication •Corporate social responsibility •Eco-efficiency •Ecolabeling •Ecosystem services •Ethical investment and consumption •Green public procurement •Green/sustainable chemistry •Industrial ecology •Intra/Intergenerational equity •Life cycle management •Life cycle thinking •Life cycle sustainability assessment •Producer responsibility •Rebound effect •Supply chain management •Sustainable design •Sustainable lifestyles •Sustainable policies •Sustainable procurement •Sustainable products and services	• Carbon and water footprinting • Analysis of consumer preferences and attitudes • Economic instruments • Integrated product policies • Internalisation of environmental and social costs • Life cycle assessment • Life cycle costing • Material flow analysis • Multi-criteria decision analysis • Quality function deployment • Scenario analysis • Social life cycle assessment • Stakeholder analysis • Sustainability indicators • System optimization	• Chemicals • Construction and buildings • Energy • Financial • Food • Health • Manufacturing • Resources and feedstocks • Retail • Tourism • Transport and mobility • Waste • Water

Source: own research

Conclusion

Despite of common interest in sustainable development and supporting strategies covering specified areas of activities, their current performance cannot be considered satisfactory. The pursuit of sustainability is never-

ending. The positive effects of sustainable development result primarily from the involvement in the design and manufacturing areas, i.e. production, and to very small extent form consumers who attach insufficient significance to environmental issues when making buying decisions. Distributors and retailers play an important supporting role by shaping supply chains and consumer behaviors. Moreover, manufacturers and retailers more and more often agree that sustainable production and consumption give the chance to develop innovations and improve competitiveness. It is also necessary to perform informative and educational activities for consumers to make sustainable consumption their lifestyle. Long-range activities should bring a positive effect in the form of sustainable consumption, although this is a long-lasting process. Low environmental awareness, no common understanding of the concept of sustainable production and consumption and developed consumptionism induced, for example by a wide market offer postpone sustainable developed.

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Systemic Analysis of Marketing Paradigms

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The aim of the article is to present a systemic analysis of the major marketing paradigms.

The author points out several marketing paradigms, such as classic 4P marketing mix focused on sellers; modified 4C marketing concept orientated on buyers; 4R concept of partner relationship marketing; empirical marketing concept with 4E mnemonic formula. The author reviewed both positive and negative aspects of each marketing paradigm, referred in detail to possibility of further extension of the list of the existing concepts to the complex of transformational marketing based on the behaviourism theory included into it. Summarizing the analysis of the marketing paradigms, it can be stated that marketing is an ever-changing process, based on both changes in the technological mode of economy and on the changes of the buyers themselves, their attitude to commercial service, distribution, ease of shopping, after-sale support of goods, etc. However, these changes have never been perceived by the market participants as unambiguous and for this reason any marketing paradigm has its own alternative. Consequently buying audience has an option to select any selling proposition formed according to one of the alternative marketing paradigms.

***Keywords**: Marketing paradigms, 4P, 4C, 4R, genesis*

Introduction

Marketing science basically contains the principle of diversity of the marketing techniques, each of which has its own individual effectiveness and field of application. At the same time, simultaneous use of these techniques provides for the final synergistic effect. As a result, such marketing definition as the "marketing complex" or the so-called "marketing mix" was assumed and developed.

Material and methods

The marketing mix strategy as the quantitative accumulation of information was turned into concept, where the notion of the marketing mix, proposed by the Harvard Professor from the USA Borden (1953) on the basis of Culliton's (1949) work in the middle of the last century, was recognized as the most valuable one. Since then this definition has not only been widespread and accepted, but is a regular subject for discussion in the marketing science.

Professor McCarthy (1960) points out, aiming at formalization of the marketing mix, is the most widely recognized and the first in order. The work covers four marketing tools, called for simplicity, brevity and ease of remembering by their initial letter "P": Product, Price, Place, Promotion. Due to its simplicity, the 4P being the essence of the marketing mix concept is not only widespread and recognized, but also appears to be a marketing imperative.

Subsequently, the author of the heuristic concept of the marketing mix Borden offered his own more extended model of the marketing mix, comprising 12 elements (product planning, packaging, pricing, branding, distribution channels, physical movement of goods, advertising, promotion, demonstration, personal selling, customer service, information search, analyses of facts).

Everybody was attracted by the facility of understanding the concept of McCarthy - names of all tools begin from the same letter. By this simplified formula

McCarthy identified four different classes of tools illustrating four principal marketing functions. As it is well known, McCarthy did not describe each of the elements of the marketing mix in detail, and confined himself only to the wording description of the classes of these elements. It is widely believed by the followers of his concept that he did it deliberately for the purpose of these classes being evolutionary filled and adapted to any changes in the overall marketing situation. In our view, currently this conceptual principle by Borden and McCarthy allows to consider each of the elements of the marketing mix as a collective category of marketing techniques, tools that can be used both independently and jointly with other marketing techniques of this category while observing the principle of substitution (interchangeability) and synergistic strengthening of joint actions within this category.

This form of marketing mix classification began to spread more quickly and successfully than the concept proposed by Borden, literally replacing it. Under such circumstances, McCarthy's adherents persistently attempted to extend 4P to make them acceptable for efficient practices developing quantity of its P-elements firstly up to five elements, and later as noted by Booms and Bitner (Booms, Bitner, 1981) and later Kotler, with the approval of the scientific community, added three more supplementary P-elements: People, Process, Physical Evidence.

Ultimately, easy-to-remember formula by McCarthy became as complex as the formula by Borden. This illustrates the viability of the oldest proverb -"Hell is full of good meaning and wishing".

Relying on the immense popularity of the marketing mix concept, its less recognized modifications began to flourish which might be applicable to individual branches of economic activity: in e-commerce, Internet, green marketing, social marketing, direct marketing, customer- oriented marketing, etc.

According to the opponents to the 4P concept, marketing, unlike the economy, must be mostly based not on the material flows but on the management of

consumer behavior, since end-users were initially acknowledged as the core marketing concept in business, and the modern approach to it presupposes the management of consumer values as suggested by Porter (1985).

The second most attractive concept was 4C, proposed by the Professor of the Columbia University in the USA Lauterborn (1990), who modified the marketing mix from 4P to 4C: Customer value, Customer cost, Convenience, Communication. Herewith, he noted that these elements of the marketing mix orientate a company towards the buyer, whereas 4P of the marketing mix by McCarthy orientates a company towards the seller.

Emergence of a new concept of the marketing mix meant, essentially, the change of the paradigm focusing the marketing efforts of the companies from manufacturers and suppliers of 4P goods to the 4C paradigm, called "4C neoclassical paradigm". Bearing in mind that 4C concept is fully consumer-centric, some marketing theorists viewed it as the customer-orientated concept. However, this concept allows to judge about the category of "values" in marketing rather lopsidedly, with the only value offered by the company to its customers and consumers from the use of such concept, not assuming that clients have different "value" and "cost" for the company.

In response to the criticism of the numerous opponents of the classical 4P marketing paradigm, who were not satisfied by a newly created 4C neoclassical paradigm due to its low recognition by the members of the marketing scientific community, at the end of the 20th century the next marketing paradigm (the third in order, post-economic) - relationship marketing - was formed. For the first time, the name of this concept (Relationship Marketing) was mentioned by the American Marketing Professor Berry (1983) in the context of service marketing to describe a new approach to marketing, orientated to more long-term interaction with consumers.

In the development of this concept modern marketers - promoters of the concept of the Relationship Marketing - offer to rename it into the Customer Mix, Portfolio of Customers. Along with the aforementioned 4C, they include other elements into it bringing the number of elements to 11C: Customers, Categories (categories - category management tools), Capabilities, Cost, profitability and value, Control of the contact to cash process, Collaboration and integration, Customization (customization of the selling proposition), Communications, interaction and positioning (interaction with buyers and suppliers, positioning of the company), Customer measurement (evaluation of the company's activities by the buyers), Customer care, Chain of relationships (chain of relationships - a tool of relationship marketing with suppliers and buyers).

Prerequisites of the genesis of the post-economic relationship marketing began to emerge at the end of the 20th century in response to the outlined growth of commodity production and crises of the merchandise distribution at that time. Interaction of the integrated participants of the marketing channels becomes their competitive advantage. Besides, it is the interaction of the participants, rather than the physical process of the physical movement of goods, that becomes a key value for a new marketing paradigm.

The period of formation of the post-economic approach in marketing (1980-1990) is characterized by a significant increase in the amount of research in the field of relationship management in which such non-economic categories as trust, relationship commitment, communication, value come to the fore. It created new understanding of the competitive advantages - due to formation of the intangible assets of companies, such as brand, positioning, creating of consumer values, etc. Trout with his colleagues Ries and Rivkin (2003) developed the concept of positioning, according to which a selling proposition should be perceived by consumers as if it is a unique one, i.e. the only one. At the same time this proposition must differentiate, i.e. differ, from other selling propositions in the same

target markets. Concurrently, these authors formulated the key slogan for business: "Differentiate or die!" Herewith, the developers of this concept suggested that the uniqueness provides for the advantage while the positioning and differentiation exist not in the market reality, but in the minds of the target consumer segments: "It is better to be the first in the mind of the buyer than in the market!" This conceptual approach to communications with consumers was aimed at deliberate modification of their behaviour through modification of their psyche (unconsciousness).

To be fair it is worth noting that the concept of positioning under discussion defined as an imperative of the post-economic marketing by Trout, Rivkin and Ries at the turn of the twentieth and twenty-first centuries, relied on the already proposed marketing concept of the Unique Selling Proposition (USP), suggested by the Director of the American advertising agency, a leading figure in the American advertising, Reeves (1960). The concept by R. Reeves implied the maximum consideration of perceptual psychology of the selling proposition by the target consumer audience.

Works by Gordon (2001) added to the development of the heuristic paradigm of the relationship marketing. He presented the chain of values by M. Porter through a continuous cyclical process of identifying, creating, presenting new values together with buyers, and further on, joint receipt and distribution of benefits from these activities among the participants of interaction. This paradigm (4R - Relationship, Relevancy, Retrenchment, Rewards) is the third in order and includes understanding, focusing of attention and management of the value generated through joint activities of the suppliers of the selling proposition and buyers chosen by them in the presence of their interdependence and mutual adaptation, as professor Kiselev points out (2011). Unlike the concept of the value chain by Porter, consumers become a part of the value process in the works by Gordon.

Emergence of the new (the fourth in order) marketing paradigm called empirical / experiential marketing (experiential marketing — based on experiences,

impressions, emotions, feelings, etc.) was due to the awareness of the need and the possibilities to play on sensations, feelings, experiences of consumers with a view to achieve a synergy effect. The name of this marketing paradigm was given by American Professor Schmitt (2001). He outlined basic marketing imperatives of the turn of the third millennium and suggested achieving a holistic (generalization, perception) consumer experience as the target of the experiential marketing, and identified five key elements of the communication complex, called strategic emotional modules: sensations, feelings, reflection, empathy and action.

The author thinks these five modules by Schmitt can be specified through 4E mnemonic formula - Experience, Emotions, Empathy and Excogitation.

Simultaneously with the work by Schmitt, American marketing consultants Pine (II) and Gilmore (2005) published their work, where they defined this new marketing paradigm as the "experience economy". They predicted evolutionary growth from economic proposals to experience: "... when a person buys experience, he pays for unforgettable moments of his life, prepared for him by the company, i.e. for the feelings and sensation granted to him..."

Results and discussion

It should be emphasized that currently all four marketing paradigms do exist, and market participants make the choice of the marketing concept paradigm for their business by themselves. In its turn, buyers are also free to choose any selling proposition generated within various marketing paradigms.

Marketing theorists and practitioners suggest that under modern circumstances there is every prerequisite for the formation of the next (the fifth in order) marketing paradigm, transformational in its nature, involving not only creation of consumer experiences and impressions, but also their education via a curatorial assistance for better perception of entertainment experiences and completeness of their sensations. Open access publications have already had

references to this possibility. Thus, the authors Pine (II) and Gilmore cited above have predicted a quick transition of the experiential marketing paradigm to the transformational paradigm based on the behaviourism theory.

In commercial practice, the emergence of transformational marketing communications can be illustrated by the communications with buyers in supermarkets teaching them to prepare unique dishes made of the goods offered in this particular point of sale. These innovations cause positive feedback from buyers tracked by sales growth of goods in the list. Similar communications demonstrating buyers different ways of using purchased goods in domestic practice are actively being used by IKEA.

Conclusion

Summarizing the analysis of the marketing paradigms, it can be stated that marketing is an ever-changing process, based on both changes in the technological mode of economy and on the changes of the buyers themselves, their attitude to commercial service, distribution, ease of shopping, after-sale support of goods, etc. However, these changes have never been perceived by the market participants as unambiguous and for this reason any marketing paradigm has its own alternative. Consequently buying audience has an option to select any selling proposition formed according to one of the alternative marketing paradigms.

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IV. ENVIRONMENTAL ASPECTS OF COMODITY SCIENCE

Emas and BEMP: new Applications

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Abstract. EMAS, since its first application, has evolved over time. In its last review, it promotes the best environmental management practices through the development of sectoral reference documents that have to be taken into consideration by the "EMAS-registered organizations" in assessing their environmental performance. Many organizations and companies have a wide margin to improve their environmental performance. With the aim to improve their eco-efficiency and thus its reputation and the sustainability of their business, many companies want to lower their impact on the environment. To help organizations achieve this goal, the CCR identifies, evaluates and documents best environmental management practices (BEMPs) for the different sectors, in collaboration with stakeholders. This activity is part of the European Commission's work to implement the system of EU management and Audit Scheme (EMAS), a voluntary framework for enterprises and other organizations to evaluate, report and improve their environmental performance. In this context, the EU decided in 2009 to promote best environmental management practices through the development of sectoral reference documents.

Keywords*: Emas, Environmental, Best practice, Industrial Organizations*

Introduction

The introduction of the voluntary tools, what the EMAS Scheme, has changed radically the approach of the productive world towards the environment passing from the logic of the "command and control" to that for a "reactive approach". The EMAS Scheme, created for the industrial sites, has seen in the time the possibility of application to all the organizations, is deprived how public, offering the possibility of adhesion, in the last version, also to the working organizations out of the European confinements, through the formula of the Global EMAS [1]. The EU has, also, integrated sustainable development policies through the European Union Strategy for Sustainable Development (SDS), as well as the action plan for environmental technologies for sustainable consumption and production (SCP), also highlighted in Europe as a strategy for 2020. SCP is in this context, aimed at promoting economic growth and social cohesion without compromising the quality of the environment. Many organisations and companies have a large scope for improving their environmental performance (eco-efficiency, reputation, concerns about the sustainability of their business). Than, to help organisations, the JRC[1] (Joint Research Centre) sustains this objective through the analysis of the relationship between technological change, scientific developments, the environment, the economy and political approaches. For this reason, it produces

1 1 The Joint Reearch Centre (JRC) is a Directorate-General Joint Research Centre (DG-JRC) which has seven research institutes located in five EU Member States (Belgium, Germany, Italy, The Netherlands and Spain).

The JRC provides scientific and technical support for the design, development, implementation and monitoring of European Union policies. Unlike European universities, it is directly funded by the European Union (it is a service of the European Commission), in order to ensure the independence of research activities from private interests or national policy - an essential condition for pursuing its international mission.

The JRC has a coordination and research role in numerous community networks of national research institutions, universities, advanced industrial member states of the European Union, in addition to conducting a wide range of independent research that makes use of the best European scientists' skills, working directly in the centre or performing periodical research. Complex studies and experiments on behalf of European institutions are conducted in its laboratories. The JRC collaborates with non-European organisations and global networks in the scientific and regulatory fields.

technical and economic analyses of technological options and socio-economic analyses based on analytical modelling. identifies, evaluates and documents best environmental management practices (BEMPs) for different sectors in close co-operation with the stakeholders concerned. To do so, the JRC follows the so-called frontrunner approach, measures or actions that are implemented by the organisations within the sector that are most advanced in terms of environmental performance in each of many areas, such as energy efficiency, resource efficiency, emissions, but also supply chain management. The results of this work are Sectoral Reference Documents (SRDs) on best environmental management practice [2].

Sustainable production: best available techniques

Industrial production processes account for a considerable share of overall pollution in Europe. Product consumption and production is responsible for a large number of environmental problems, ranging from air, water and soil pollution to an increase in resource consumption as well as negative impacts on health. The EU has a common set of rules for the control of industrial plants, described in the Industrial Emissions Directive 2010/75/EU (IED). The JRC manages the European Integrated Pollution Prevention Control (IPPC) Bureau that produces reference documents on best available techniques, used by the competent authorities in the EU Member States for issuing operating permits.

The European standard EN16001:2009 and the international standard ISO 50001 (draft published in 2010) on Energy Management Systems integrate energy in the typical business structures. These standards are quite similar to ISO 9001 and ISO 14001 and they are based on a Plan, Do, Check, Act (PDCA) approach, which is a continuous improvement scheme. The standard for the energy management was developed to be a complement of the environmental management system with enhanced focus on the economic aspects of energy performance [3]. The European Commission has addressed this problem for some time through a series of policy

instruments which are subsumed under the policies of the Sustainable Consumption and Production Plan of Action COM (2008). The JRC manages the European Office created to support this work through the ability to scientifically assess the environmental performance of a wide range of product groups, and through operational management of the policies' implementation process for the promotion of Ecolabel Regulation EC 66/2010.

Best environmental management practices (BEMPs)

Many organisations and companies have significant possibilities and potential to improve their environmental performance. For reasons ranging from eco-efficiency, reputation and concerns about the sustainability of their business, many of them therefore intend to reduce their impact on the environment. The environmental impact of energy consumption should be taken into account when retailers implement new energy efficiency measures. In a first step, it is recommended to reduce the energy demand (e.g. reduce heat demand by increasing building insulation). Then, shift to a better energy use through improved efficiency (e.g. an efficient boiler) should be performed. The use of cleaner energy sources (e.g. biomass) should be performed after the aforementioned consumption minimization [4].

To help organisations achieve this goal, the JRC identifies, evaluates and produces the documents and necessary guidelines to promote best environmental management practices (BEMPs) for different sectors while in close cooperation with stakeholders. To do this, the JRC follows the so-called leader approach, namely studying the techniques, measures or actions which are implemented by the most advanced sector organisations in terms of environmental performance in each of the various areas, such as energy efficiency, resource efficiency, emissions, but also Supply Chain Management.

This activity is part of the European Commission's work towards the implementation of the Eco-Management and Audit Scheme of the EU (EMAS), a voluntary framework for companies and other organisations to evaluate, report and improve their environmental performance.

Priority areas

The envelope is particularly important for increasing the energy efficiency of a building, as a good envelope minimises the need for heating and cooling power. In Europe, Directive 2010/31/EU on the energy performance of buildings, EPBD, gives a framework for the Member States to set minimum requirements for new buildings and those undergoing major renovations. This regulation was adopted on 19 of May of 2010 and is more restrictive than the last one. The Directive sets the minimum requirements for the energy efficiency aspects in national codes, where the building envelope plays a very important role. [7,8] The building envelope is defined as those integrated elements which separate the building interior from the outdoor environment. These elements are classified in this document as:

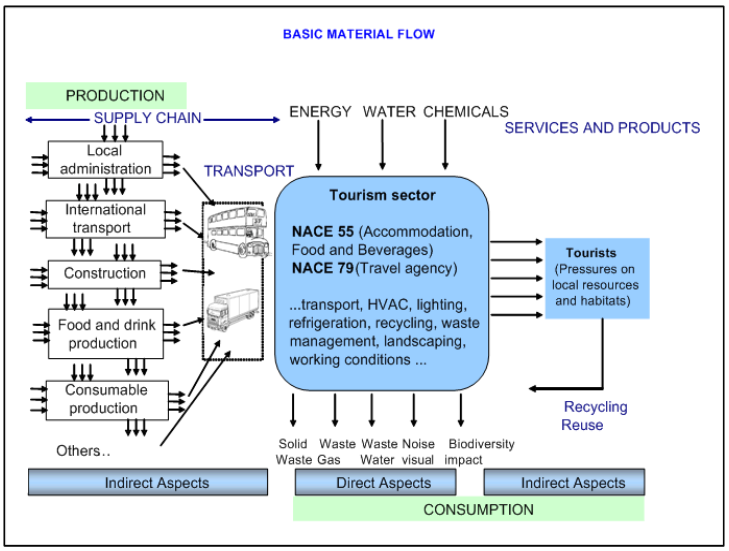
- insulation system (e.g. walls, façade, roof, floor)
- windows/glazing system (e.g. windows with single, double and triple pane)
- shading devices (e.g. external or internal blinds)
- air tightness (e.g. sealing, doors).

Sectoral reference documents on best environmental management practices are being studied and will be developed for a list of priority sectors. The first sectors being considered are: retail trade, tourism, construction, public administration, Agriculture - Crop and Animal Production and Food and beverage production. The European Commission has set an indicative list of priority sectors for which reference sectoral documents should be developed. The prioritized sectors are as follows: Retail trade, Tourism,Construction, Public administration, Agriculture - Crop and Animal production, Food and beverage production, Automobile

manufacturing, Electrical and electronic equipment manufacturing, Waste management, Metal products manufacturing, except machinery and equipment, Telecommunications.

BEMP related to the tourism sector

Tourism is an important economic sector in Europe, in the EU alone there are1.7 million companies classified as hotels and restaurants, employing more than 9 million people and generating an annual turnover of 430 billion euro. Europe is the largest tourist region in the world, which hosts 53% of international tourist arrivals. Five European countries enter the top ten in the world for international arrivals: France, Spain, Italy, the UK and Germany. The average long-term growth rate of the European tourism sector is 2.8% [6]. Tourists have a large environmental impact compared to residents: long travels and especially elevated environmental footprints come from their focusing often on "hot spots", where they can create local environmental pressures through the demand for development, water and energy, and mass production of waste. The main direct and indirect environmental aspects of the sector are described in the following input / output scheme:



Through a targeted and conscious choice, "green" facilities management and a change in services offered, tourist business management can produce a positive environmental influence on a broader scope, and well-managed tourism is able to generate income from natural resources in a truly sustainable way [12,14]. Best Environmental Management Practices (BEMPs) are the best practices identified at the process level, targeting key stakeholders to address the most significant environmental aspects:

- BEMPs for destination management (development planning and conservation measures).
- BEMPs for tour operators and travel agencies (cooperation with destination managers to improve destinations' environmental conditions).
- BEMPs to minimize energy use in accommodations.
- BEMPs to minimize water consumption in tourist accommodations.
- BEMPs to minimize and manage waste in accommodations.
- BEMPs for food and drink suppliers (management of food products).
- BEMPs for campsites (site's environmentally friendly management, efficient hygienic services, the use of renewable energy sources).

For each BEMP, key indicators of environmental performance have also been identified (for measuring the environmental performance in each area), and benchmarks of excellence (an indication of the level of environmental performance achieved by the best players in the industry) [9,11]

Conclusions

In light of the above and of the environmental improvements implemented by the Commission and the various European organizations towards a process of implementation of best practices and performances in the environmental field, we can see that EMAS has entered a phase of refinement and finalization of processes and objectives [5,10]. All this is taking place in a clear and straightforward path,

even if long and complex, giving more body and substance to a scheme with voluntary membership, which is precisely EMAS, but that has long ago become a full part of the technical rules in the environmental field.

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2. 1.

Waste Recovery in Steelmaking Sector: An EU Overview

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Abstract. Waste management in the iron and steel industry is an evolving activity that has begun to take into consideration the advantages of recycling and reuse of waste material and energy. Nowadays there is still a low rate of recovery of the steel industry waste flows, collected throughout the different steel production stages, in terms of reuse as secondary raw materials. The aim of this work is to analyse the actual reuses of the integrated steel industry waste in order to have a EU mapping of industrial symbiosis activities related to such waste flows. The identified recovery activities represent an initial step of the steel sector towards the development of a circular closed-loop model of economic growth, based on the reduction of raw of material use and the reuse and recycling of materials. Seven integrated steelworks (responsible for 27% of the overall EU crude steel production) declare quantitative data concerning the waste recovery, as secondary raw materials, of 8.6 Mt/year which correspond to 26.6% of the total EU waste produced. Nine other steel mills declare that they are involved in recovery activities but do not provide quantitative data. Thirteen other companies do not declare any recovery practices involving the generation of secondary raw materials. The main reuses identified in this study concern primarily LD slag reused as secondary raw material in civil engineering, in road construction and cement and agriculture production.

Keywords*: Circular Economy, Industrial Symbiosis, Waste Management, Steelmaking Secto, By-Products, Slags, Waste Reuse*

Introduction

Eco-innovation can be obtained by implementing approaches that are part of the Industrial Ecology paradigm (Frosch and Gallopoulos, 1989). One of the tools of this paradigm is Industrial Symbiosis (IS) that involves industries of several productive sectors for the physical exchange of energy, materials, water and by-products in order to have a mutual benefit (Chertow, 2000). This is a practice that the steel industry has begun to take into consideration as a means to making the steel product system more environmentally sustainable.

Steel is a durable, versatile and flexible commodity that is used in different sectors such as building, energy, construction, automotive and transportation, infrastructure, packaging and machinery. An environmentally friendly use of such widespread material is crucial for sustainable development and thus the steel sector must take in to account an efficient use of resources and the recycling of waste flows. In 2014, the world crude steel production amounted to 1,665 million tons. China represents around 49.4% of the global steel market, followed by other Asian countries (12.2%), European Union (EU) (10.2%), NAFTA countries (7.2%) and Japan (6.6%) (WSA, 2015). Steel production is implemented via the use of iron ore (integrated steel mills) and scrap (Electric arc furnaces – EAF) based practices. Seventy-four percent of the above mentioned steel production occurs in integrated steel mills that make use of iron ore. In 2014 in the EU, the steel derived from the integrated steelmaking process amounted to 101 Mt (61%), compared to 66 million tons (39%) of steel produced via the electric process (WSA, 2015). The integrated steelworks have a greater impact on the environment than the electric arc steel mills, due to their more complex production cycle involving significant air emissions and the continuous flow of by-products. Given this high amount of material resulting from the

integrated steel mills, and considering the many potential waste re-uses (Notarnicola et. al., 2016), the purpose of this work is that of developing a EU mapping of the practices currently implemented to reuse waste, as secondary raw material, generated by the integrated steelmaking process.

Material and methods

The research is based on the collection of data concerning the reuse of waste generated by integrated steel mills implemented at EU level, as a means to shift steel production practices towards a zero-waste paradigm. The first step of this work involved the definition of the most important integrated steel mill waste types. To define such types the ILVA plant (the largest integrated steel mill in the EU, located in southern Italy) waste production was analysed and the waste classes that involved at least 1,000 t/year were regarded as significant in terms of potential reuse. The main waste types selected for this study are steel slag, mill scale, refractory material, track ballast, soil and stone, mixed waste from construction and demolition operations, sludge and filter cakes, waste from gas treatment, landfill leachate, oily water and welding waste. Next, by considering data from environmental reports and official statements on the web of each steel mill, the annual production of waste was quantified. Whenever data was not available the waste production was estimated by using the annual steel production of the mill and correlating it to the waste percentages of the ILVA mill. Finally the waste reuse practices were analysed. These are described and discussed in the next section.

Results and discussion

Only the most efficient waste recovery activities, involving the reuse of waste as a secondary raw material, in view of an IS exchange for the production of other goods, were considered in this work.

The twenty-nine analysed EU integrated steel mills produce annually more than 115 Mt of crude steel and the waste generated (concerning only the above mentioned

types of waste), in terms of mass, represents 28% of this production (totalling 32,326,818 t/year). The seven integrated steelworks that declare quantitative data concerning their waste recovery, as secondary raw materials, represent 27% (30.6 Mt/year) of the overall EU crude steel production and their waste production amounts to 8.6 Mt/year (26.6% of the total EU waste produced). Nine other steel mills declare that they are involved in recovery activities but do not provide quantitative data. Thirteen other companies do not declare any recovery practices involving the generation of secondary raw materials. The table 1 summarises, for each EU nation with integrated steel mills, the collected data concerning steel and waste production and waste reuse. The seven integrated steel mills that declare waste recovery, located in six EU nations, recover a total of 1.84 Mt/year of waste as secondary raw materials (21.4% of the total 8.6Mt/year of waste produced by the same companies).

Table 1.

EU ranking of countries that reuse waste as secondary raw material

EU Nation	Number of integrated steelworks per nation	Crude Steel Production (t/year)	Waste Production (t/year)	Actual Waste Recovery. Declared Quantities (t/year)	Waste Recovery Percentage (%)
Spain	2	5,000,000	1,565,706	1,000,000	63.9
Belgium	1	5,000,000	1,405,372	360,625	25.7
Czech Republic	2 (*)	4,534,056	1,311,578	206,721	15.8
Finland	1	2,546,000	514,058	79,000	15.4
Slovakia	1	4,500,000	1,264,834	81,221	6.4
Italy	1	9,056,000	2,545,409	110,879	4.4
Subtotal	**8**	**30,636,056**	**8,606,957**	**1,838,446**	**21.4**
Germany	6	35,100,000	9,865,708	-	-
France	3	10,930,000	3,072,142	-	-
Netherlands	1	7,000,000	1,967,520	-	-
United Kingdom	4	14,600,000	4,103,685	-	-
Hungary	1	1,600,000	449,719	-	-
Romania	1	3,000,000	843,223	-	-
Poland	3	5,000,000	1,405,372	-	-
Austria	2	7,160,000	2,012,492	-	-
Total	**29**	**115,026,056**	**32,326,818**	**-**	**-**

(*) Only one integrated steelworks declares quantitative recovery data

Spain is the country that carries out the most waste recovery (63.9%), followed by Belgium (25.7%), Czech Republic (15.8%), Finland (15.4%), Slovakia (6.4%) and Italy (4.4%). ArcelorMittal is the steel company that recovers the most LD slag, in fact, in Spain, in 2014, the company sold one million tonnes of this slag to the cement industry and in Belgium approximately 25.7% of the waste produced concerns LD slag that is converted into LD gravel used in road construction (ArcelorMittal Gent, Geel & Genk, 2014). In ArcelorMittal's mill in the Czech Republic the 15.8% of waste recovery regards LD slag which sold to external construction companies and refractory materials used in the construction industry (ArcelorMittal Ostrava, 2014). Other recovery activities of LD slag are carried out by U. S. Steel Košice (2015) in Slovakia that sells 81,221 t/year of such slag to external companies and the Raahe steel works in Finland that sells 79,000t/year of its LD slag for reuse as a soil conditioner (Rautaruukki Oyj, 2007). In Italy, the 4.4% of waste produced concerns mill scale and track ballast. Part of the mill scale is sold to the local cement factory, while the remainder is shipped to China and Israel. The track ballast is reused for construction of railway tracks.

Steel slag, mill scales, refractory materials and track ballast represent 67.6% (21,833,286 Mt/year) of the overall EU integrated steelworks waste production and LD slag alone represents 88% of this. Table 2 illustrates the data concerning the main waste types recovered by the EU integrated steelworks. Six of the above mentioned steel mills recover 1,676,410 t/year of LD slag which represents an 8.7% recovery of the overall EU LD slag production. The mill scales recovery (72,955 t/year) represents a 7.9% recovery of its overall EU production and this is the same recovery percentage for track ballast (37,924 t/year of recovery). Refractory materials represent 3.6% (1,149,479 t/year) of the EU integrated steelworks refractory waste production and its recovery (51,157 t/year) represents a 4.5% recovery of its overall EU production.

Table 2.

EU ranking of the main waste type recovered as secondary raw materials

Waste Type (CER Code)	Waste Production (t/year)	Waste Production Percentage (%)	N. of integrated steel works for which there is reuse/7 plants	Actual Waste Recovery - Declared Quantities (t/year)	Waste Recovery Percentage (%)
Steel slag (CER 100202)	19,275,458	59.6	6	1,676,410	8.7
Mill scales (CER 100210)	926,648	2.9	1	72,955	7.9
Track ballast (CER 170508)	481,701	1.5	1	37,924	7.9
Refractory materials (CER 161104)	1,149,479	3.6	1	51,157	4.5
Subtotal	**21,833,286**	**67.6**	-	**1,838,446**	**8.4**
Soil and Stones (CER 170504)	7,938,789	24.6	-	-	
Mixed waste from construction and demolition operations (CER 170904)	777,867	2.4	-	-	-
Other sludges and filter cakes (CER 100215)	515,627	1.6	-	-	-
Waste from gas treatment (CER 100208)	108,675	0.3	-	-	-
Landfill leachate (CER 190703)	104,039	0.3	-	-	-
Oily Water (CER 130507)	73,653	0.2	-	-	-
Welding waste (CER 120113)	59,969	0.2	-	-	-
Other waste	914,913	2.8	-	-	-
Total	**32,326,818**	**100**	-	-	-

Finally, integrated steelworks that declare recovery activities for the production of secondary raw materials in their environmental reports without quantifying them, mention practices concerning steel slag reuse in different business sectors such as road construction, civil engineering, cement industry and the agricultural sector.

Conclusion

This work indicates that, among the analysed EU integrated steelworks, industrial symbiosis activities are not yet widespread. In fact, only 7 steel mills declared and quantified a reuse of their waste for the production of other goods. Such practices mainly involve LD slag which is the waste produced in the largest amounts that also has the highest recovery rate among the reused waste types. Other waste types reused as secondary raw materials are refractory materials, track ballast and mill scales. Thirteen out of the 29 analysed steel mills do not declare any data concerning waste reuse, whilst nine mills declare a reuse of waste but do not quantify it. The analysed waste recovery activities should be encouraged among all steelworks and extended to other main waste categories in order to fully exploit the sustainability advantages of the IS paradigm.

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Public Environmental Instruments and Their Impact on the Environmental Policy of Bulgarian Companies

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Abstract. The world economy has marked a significant upward trend in the last couple of decades of the 20th century and a noticeable expansion in the pace as well as in the quantity of the world trade has been observed. The incremented economic activity has caused also considerable pollution and deterioration of the living conditions. However, the observed negative tendency can still be reversed if the humanity undertakes the necessary actions and makes the required efforts to achieve sustainable growth and to decrease the negative impacts. To fulfil those goals the government applies various instruments to imperatively enforce compliance with certain norms and standards. On the other side, the business more and more often refers to different voluntary approaches – one of the most popular ways to define, monitor and control the negative environmental impact are the Environment management systems (EMS).

The current article aims to explore the influence and significance of the public instruments on the environmental policy of the enterprises committed to environment protection and preservation. The statistical information in the article is

gathered through personal interview with 137 companies with certified EMS in Bulgaria. The results clearly shows that the public instruments have medium influence on the ecological policy of the companies with most significant impact bared by the taxes on resources and energy, emission levels standards and taxes on emissions and waste waters.

Keywords*: public environmental instruments, EMS, environmental policy, environmental performance, Bulgarian companies*

Introduction

The world economy has marked a significant upward trend in the last couple of decades of the 20th century and a noticeable expansion in the pace as well as in the quantity of the world trade has been observed. Along with the rise of the income and life quality of the mankind, the rapid economic growth, supported by the intensive industrial growth of the countries worldwide, has resulted in changes with negative impact, as well. The economic expansion has been accompanied by increase in the demand and use of natural resources, significant increment of the carbon footprint and strengthening the pressure on the planet. According to the ninth edition of the report "The living planet – 2012" for one year the mankind consumes 1.5 more resources than the Earth can regenerate (WWF, 2012). The report, however, indicates that it is still not too late this tendency to be reversed – the key is to achieve sustainable growth where the business and the people realise their influence on the environment and undertake measures to lower their negative impact.

Responding to the challenges related to the environment protection, the European Union (EU) has developed a specific legislature during the '60s and '70s of the last century. The public bodies have developed various documents for restricting the pollution levels according to enforced standards and requirement for

application of the Best available technology (BAT). Different instruments have been developed and implemented by the state authorities to imperatively oblige the business to comply with the defined environmental norms and standards.

The experience in these two decades, however, has shown a series of regulatory failures related to the so call "command-control" approach. Different authors have analysed the reasons for the collapse of this type of regulation (Russel & Vaughan, 2003; Eskeland & Jimenez, 1992). The researches reveal that such legislative measures have gaps and inconsistencies. Besides, the regulatory bodies in the field of environmental protection often experience shortage of funding, expertise and personnel. A report of the European Environmental Bureau identifies as disadvantages of the approach the economic ineffectiveness, low efficiency of the environmental instruments and violation of some democratic principles (Scheuer, 2005).

In the last decades in the field of EU environmental legislature a new wave of entirely new environmental instruments has appeared – the voluntary approaches. They have been created and developed by practitioners i.e. policy makers and business specialists. They are a voluntary commitment of the business to improve and enhance their environmental performance. Significant increase in the interest towards implementation of such voluntary instruments is observed in the last decades worldwide. According to Alberini and Segerson (2002) this increase is due to the existing potential for expenses decrease thanks to the greater flexibility of those instruments compared with the ineffective regulatory control and to the advantages from the diminishing of the confrontation. The voluntary instruments enable the polluters to choose the strategy to reach the ecological objectives that will allow them to do that at minimal cost. One of the most widely implemented voluntary approach for defining, monitoring and controlling the negative impact of the enterprise is the Environment Management System (EMS) according to the

international standard ISO 14001 and the Eco-management and audit scheme (EMAS). Both are voluntary instruments that the enterprises introduce, follow and maintain due to various internal and external reasons.

The current article aims to explore the influence and significance of the public instruments on the environmental policy of the enterprises committed to environment protection and preservation declared through the implementation of EMS under ISO 14001and /or EMAS.

Material and methods

The statistical information in the article has been gathered through individual interview with a representative of the company – manager either authorised to take decisions related to environment protection or directly engaged in the conduction of the environmental policy of the company.

The sample methodology is random selection of companies with introduced EMS according to the requirements of ISO 14001 or EMAS with more than 10 employees. The general aggregation includes 1 373 companies (ISO, 2015), 137 companies (out of 160 planned) have taken part in the research.

Results and discussion

Almost all companies that have taken part in the research have certified EMS according to ISO 14001 (90 %). Only small fraction of the participants have registration under EMAS (5 %) and 5 % more have both ISO 14001 certificate and EMAS registration. In the most of the cases (85 %) the first certification has been made in 2007 or afterwards i.e. the companies have introduced and certified their EMS as an important step towards their adaptation to EU legislature and common market. Three-fourths of the companies have developed their EMS alongside with external consultants. Approx. 15 % of the companies have managed thanks to the competence of their own employees and only 6 – 7 % of the companies have entrusted the preparation of the documentation entirely to external experts.

The results of the survey have revealed that the majority of the companies (73 %) expect the significance of EMS to increase in the forthcoming years. The enterprises attach great importance to the role of the state in that field not only through its legislative framework and the environment protection norms but also through provision of support and conduction of active campaign for their promotion. Actually, over 95% of the participants have shared the opinion that the state should introduce mechanisms for financial support and assistance to the business for introduction and maintenance of such EMS. All respondents consider that the government should put more efforts and promote more actively and broadly the environmental standards.

The major part of the companies in the survey is within the range of constant control by the respective public authorities as their type of business operations contributes to the pollution and contamination. Around 10 % of the respondents regard as very hard to follow the existing legal norms for environment protection (valid for the field of operations of the respective company). Approx. 65 % of the enterprises define the current legal requirements as medium in intensity and according to 30 % of the responses they are easy to be fulfilled and they pose no problem for the everyday work of the companies (Fig. 1).

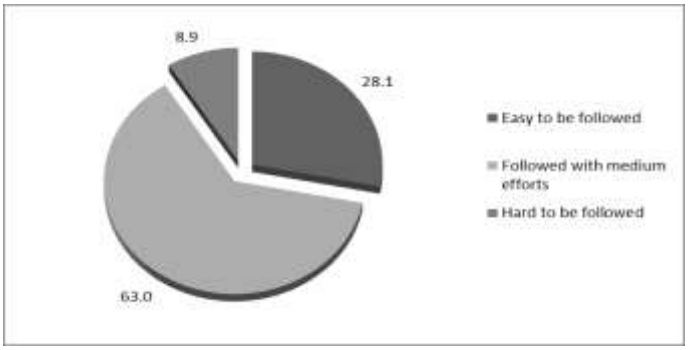

Figure 1. Evaluation of the legal requirements for environment protection that are applied regarding the field of activity of the company (% of companies)

According to the respondents the government influences on the corporate decisions regarding environment protection not that much with its policies, but rather with its mechanisms for coercion, control and monitoring bodies – their role for the ecological decisions and performance of the company is valued even higher than the role of the corporate higher management (Fig. 2).

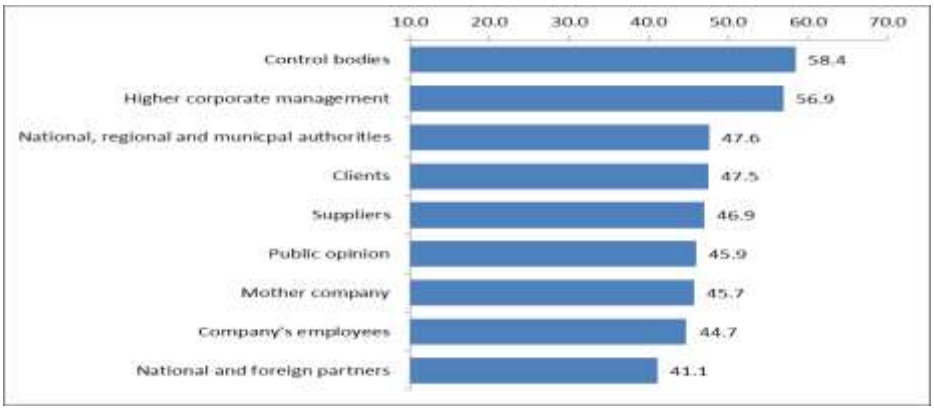

Figure 2. Factors with influence on the company's decisions related to environmental management (% of companies)

According to the companies in the research the public instruments for environmental protection have medium to weak influence on their own ecological decisions and policies. Almost all averages of the estimations for the intensity by which the individual elements of the state policy influence the company's decisions are positioned in the lower segment close to the "Have no influence" corner. The taxes on the resources and energy, emission levels standards and taxes on emissions and waste waters have most significant influence. The influence of the subsidies and tax preferences is graded as weakest. These two instruments are not applied actively by the state in the area of environment protection. Therefore, the companies are not aware of them; they don't recognise them and evaluate them as not influencing the company's environmental policy.

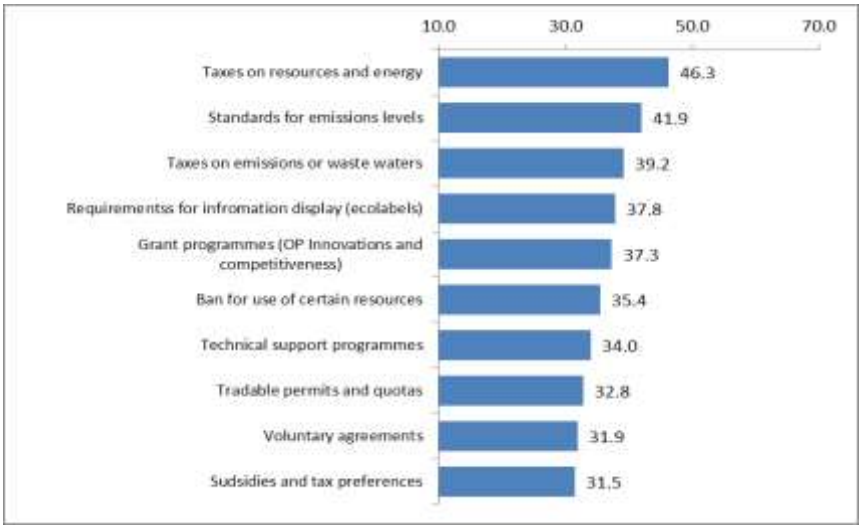

Figure 3. Influence of state ecological policy instruments on companies' ecological policy

Based on the gathered information in Table 1 are presented the relationship between the different public instruments and the indicators used by the companies to monitor their negative impact on the environment – use of natural resources, generation of solid waste, emissions in the atmosphere, waste waters discharged into river basins, local issues (dust, vibrations, noise, smell, outlook), soil contamination, biological diversity, risk of ecological accidents, others. Influence on greatest number of indicators is exercised by the instrument "Grant programmes (OPIC)", followed by "Ban for use of certain resources" and "Tradable permits and quotas".

Table 1.

Cross reference of public instruments and company monitored indicators

	Use of natural resources	Generation of solid waste	Emissions in the atmosphere	Local issues	Waste waters	Soil contami-nation	Risk of ecological accidents	Biological diversity	Others
Ban for use of certain resources			x	x	x	x	x	x	x
Standards for emissions levels			x			x		x	
Taxes on resources and energy			x						x
Taxes on emissions or waste waters			x						
Tradable permits and quotas			x		x	x		x	
Requirements for information display (ecolabels)				x					
Voluntary agreements							x	x	
Subsidies and tax preferences									
Grant programmes (OP Innovations and competitiveness)	x	x			x	x	x	x	x

Conclusion

The results of the research reveal that the existing legal framework regarding environment protection is hard to be followed by the majority of the companies. Despite that the business decisions in this field are based mainly on the requirements of the control authorities. The public instruments have medium influence on the environmental policy of the companies where the taxes on resources and energy, standards for emissions levels and taxes on emissions or waste waters are with most significant impact. The subsidies and requirements for information display have minimal range of influence as far as environmental policy of the business is concerned. In general, these instruments are not used actively by the government to achieve the set environmental goals. This is also one of the reasons why the companies do not recognise them and do not consider them in their strategic planning process. On the other hand, those instruments provide hidden potential that the government can use in the public environmental policy of the country.

Gratitude:

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Stakeholders' Analysis Aimed at Identification of Municipal Actions for Decreasing Landfill Waste Quantities

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Abstract. The paper reviews responsibilities for reaching waste targets which will be facing Bulgarian municipalities, according to the National Plan for Waste Management for the period 2014-2020. The plan has identified certain economic instruments which could be applied in the process towards reaching the waste goals targeted. Economic instruments in the plan are aimed primarily at stimulating municipalities' environmental actions. Municipalities will have to provide the infrastructure needed for implementing the waste management plan and reaching certain environmental indicators. Analysis of the sources of funding has been reviewed. The analysis shows that municipalities have at their disposal funds from waste tax, deductions based on landfill waste quantities, according to the Waste Management Act, subsidies from the Ministry of Environment and Waters (MOEW), as well as grants from the European Structural and Investment Funds through the Operational Programme "Environment 2014-2020". Calculations show that there is a gap in the financial resource needed for the construction of waste treatment infrastructure. Municipalities are recommended to find other sources including private funds to cover the gap. The possibility for public-private partnerships is one of the options municipalities could use. There is already a public-private partnership in a Plant for mechanical and biological waste treatment

established. A stakeholders' analysis is used for the description of interests, capacity and motivation of all parties involved in the process of landfill waste quantities decrease. As a result possible municipal actions for decreasing landfill waste quantities by addressing stakeholders' interests are identified. The actions are identified on the basis of stakeholders' interests.

Keywords*: waste management, municipal waste, economic instruments, Bulgaria*

Introduction

Waste management is a part of the environmental policy of Bulgaria. As a member state of the European Union (EU) Bulgaria is following European policies. European policy for the 2014-2020 period is envisioned in the Europe 2020 strategy for smart, sustainable and inclusive growth. Bulgaria accepted the National Strategic Plan for Waste Management 2014 - 2020 (NPWM).

The present paper aims at identification of possible municipal actions for decreasing landfill waste quantities by addressing stakeholders' interests.

Material and methods

The Stakeholder's analysis method has been applied by using the Stakeholder's matrix instrument. All the parties who would benefit from or lose by the actions of municipalities towards reaching the goals have been identified as stakeholders. The different groups of stakeholders have their own problems, capacity and interests, which have to be well understood and assessed during the process of planning and final choice of municipal actions.

Results and discussion

NPWM consists of nine programs with hierarchically planned measures towards reaching the main strategic goal of „Community and business who do not landfill waste".

Economic instruments, such as product charges and a new household waste tax have been planned for implementation in the National program for waste prevention (NPP). Although the households are not the ones to generate the biggest waste quantities, prevention measures are aimed at those, since they are the main economy agent. These instruments are expected to stimulate consumption, which generates less waste and behaviors aimed at reducing landfilled waste by using separate collection systems, redemption, reuse and recycling. The measures of collecting additional payments for resource use and setting conditions for granting subsidies in the NPP are only aimed at "polluters". All the rest are aimed at stimulating municipalities to take actions for prevention and decrease of waste by reuse, separate collection, recycling etc.

Almost all the rest measures in the nine programs are investment measures. Decentralized installations planned in the chosen scenario for implementation of the NWMP will have to be built by the state and municipalities in case private funds are not attracted. Estimates in the NWMP show that revenues from waste tax cannot practically provide sufficient investment capital to implement the chosen scenario. Since the budget of waste priority axis in OP "Environment 2014-2020" is not enough to cover the investments needed, a need for elaboration of different options for additional funding has been identified by the authors of NWMP, e.g. public-private partnerships.

Municipalities have found a solution by setting appropriate measures to achieve the objectives in their own programs for waste management. They are

encouraged to improve the performance of recycling and recovery of household waste. Those who meet specified targets for recycling household waste are exempt from the 50% of the deductions due for landfilling, thus reducing their costs. On the other hand, if municipalities do not fulfill their obligation to provide infrastructure for the handover of separately collected waste by citizens and companies, 15% increase will be imposed on the charge for landfilling. These deductions can be used by the municipalities for future investments in waste infrastructure. If they manage to decrease waste quantities, the deductions will be less, so less money will be available for future investments, and less will be needed, since landfilling cells will have capacity for longer periods. This source of funding cannot be used for covering separate waste collection infrastructure costs though, since all investment costs are all included in the waste charge, which has to be socially affordable.

One of the options for attracting additional funding set in the NPWM is by establishing a common system of separate collection and sorting of recyclable packaging waste and from other sources by sharing costs between municipalities and the Organizations for recovery of packaging waste (ORP). In addition, municipalities should establish facilities for treatment of residual fraction in household waste. How municipalities would provide funding for the construction of the residual waste treatment facilities is to be decided in subsequent analyses.

Questions concerning identification of appropriate incentives for ORP to participate in the construction of infrastructure for separate collection and tools for attracting business through PPP or other mechanisms are not discussed in the NWMP and remain to be determined by each municipality. Following this, the present paper analyzes the stakeholders in order to identify possible measures for achieving the goal of providing the infrastructure needed by municipalities in order to reduce the waste quantities landfilled.

According to the logic and form the matrix of stakeholders, the paper defines interests, capacity, motivation and possible actions to use the interests of stakeholders towards facilitating the achievement of the main objective. Stakeholders include:

1) Institutions at the central level, which are jointly responsible for implementing the National Plan for Waste Management - MOEW, Regional Inspections of Environment and Waters, Council of Ministers. They have an interest in achieving national targets for waste management and have the necessary information about the objectives and the role of municipalities but are not involved in decision-making at the local level.

2) Municipalities and Regional associations for waste management. They are interested in reducing the amount of landfilled waste and attracting additional funding for infrastructure for separate collection and recycling of waste and are able to conclude contracts for PPP, concessions, grants, subsidies, financial instruments, contracts with ORP, as well as to generate income from recyclable waste trade.

3) Waste sector business agents and industry organizations. They are interested in being assigned part of the waste management activities municipalities are responsible for. The business has available financial resources and economic motivation to use recyclable materials for trade. Not all of them will be able to use recyclable waste as raw material.

4) Population of municipalities. The population is interested in having the amount of waste tax reduced and the environmental quality improved. They have the capacity to change their behavior.

5) Organizations for recovery of packaging waste (ORP). ORP have no interest in further activities under existing contracts with manufacturers to be awarded to them. No motivation to finance additional recovery and separate collection of waste.

6) Producers. They have no interest in having expanded responsibility charges increased. They are interested in improving the resource efficiency of their production. They have the capacity to affect ORP for additional measures in support of effective separate collection vs having their charges increased.

Municipalities have the following options for action:

- Informing the National Committee for the Prevention of waste (NCOP) as an advisory body to the Minister of Environment and Waters for future measures in execution of NPP for the purpose of coordination and initiation of new, specific measures to more industries and / or waste streams.
- Conducting of a study of the attitudes of the business in the waste sector in order to identify the appropriate stimuli for their participation in the improvement of the separate waste collection systems, including providing investments.
- Conducting of a study of the attitudes of the population in order to identify the appropriate stimuli for their active participation in the process of separate disposal and collection of households waste.
- Conducting of a study of the attitudes of the ORP in order to identify the appropriate stimuli for additional actions on their side for the improvement of the separate waste collections systems.
- Conducting of a study of the attitudes of producers and research organizations in order to identify the appropriate stimuli for eco-design and resource efficiency.
- Analysis of the results of all the studies above in order to identify possible economic instruments for stimulating the stakeholders' support in the process of decreasing landfilled waste by separate collection and recycling.

- Comparative analysis of the identified instruments in order to choose the most appropriate and make a conclusion for its effective application.

Conclusion

Relations between stakeholders are a complex system of factors that are considered in separate components to be well understood. The proposed actions have been identified, considering potential conflicts between stakeholders' interests, which may put the achievement of the intended result of reducing landfilled waste at risk. The implementation of proposed actions is the subject of future studies that will help the process of identifying specific economic instruments in support of achieving the waste objectives of Bulgarian municipalities. Comparative analysis of the instruments will contribute to assessing options for attracting private financing.

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The Policies and Measures to Improve Energy Efficiency in Bulgarian Household Sector

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Abstract. Energy efficiency policy of Bulgaria prioritizes the rapid and sustainable economic growth of the country with a stable energy sector, increased efficiency of energy consumption and integration of renewable energy sources. In this report energy efficiency is seen as an opportunity to reduce energy consumption by implementing concrete measures to save energy thus reflecting completely EU legislation in this area and the need to conduct in-depth studies with benefits to society.

Keywords*: energy efficiency, energy policies, household, Bulgaria*

Introduction

Energy efficiency is one of the key factors in achieving the long-term objectives of EU in terms of energy and climate. In European policy it is seen as a cost-effective means of reducing harmful emissions, improving energy security, enhancing competitiveness and creating more affordable conditions for consumption for all.

The national priority target for rapid and sustainable economic growth in Bulgaria is related to the existence of a stable energy sector, utilization of the high

potential of energy conservation and large-scale deployment of renewable energy sources (SEDA, 2005, 2014). The possible impact of policies in this area on consumers is poorly explored and undeveloped area. This report aims to present energy efficiency as a mean of improving the quality of energy services and as an opportunity for reduction of energy consumption through the implementation of concrete policies and measures to save energy.

Methodology

The report applies the descriptive research method for collecting secondary data from various literary sources such as statistical reports at national and European level, reports of government agencies and advisory bodies, European projects, research papers, etc.

Results and Discussions

Potential for Energy Efficiency in Bulgaria

In connection with the barriers to increasing energy efficiency related to the limited affordability of energy saving solutions in Bulgarian households some researchers note that the country has not unlocked the potential for financial measures particularly in the housing sector. They emphasize that the promotion of certain measures related to the change in consumer behaviour can lead to reduced energy consumption without requiring additional costs (MANTCHEVA, KARABOEV & STEFANOV, 2012). This is supported by the data collected in the "Measures Aimed at Consumer Behaviour" group of European databases for energy efficiency ODYSSEE and MURE (ODYSSEE AND MURE, 2015).

The discrepancy between the market potential for increased energy efficiency and the cost-effective potential from individual or social point of view is valid for both the European and national policy. This is related to the identification of obstacles to deployment of the created energy efficiency measures. The

appropriate combination of policies and measures for energy efficiency would help overcome these barriers using the driving forces facilitating the implementation of measures for energy saving.

Energy Efficiency Policies in Bulgaria

Energy efficiency policy can be seen as an integral part of the energy policy of the Republic of Bulgaria which is based on national priorities and is in harmony with the requirements of the European directives and market mechanisms. Legislation in this area is fully consistent with the main objectives of EU energy policy for energy security, competitiveness and sustainable development. The Energy 2020 strategy stipulates that "*energy efficiency is the highest priority in the energy policy of the country*." Ambitious targets for improvement, described in the current National Action Plan for Energy Efficiency 2014 – 2020, are set on this basis.

Harmonization of Bulgarian Legislation with the European Legislation on Energy Efficiency

The activity of harmonization of Bulgarian legislation with the EU legislation in the field of energy efficiency and the use of renewable energy sources began as early as the negotiations for EU accession. In the process, Bulgaria committed to introduce in Bulgarian legislation the legislation in the field of energy already adopted by the EU.

The harmonization of Bulgarian legal framework with the European one is being carried out with the implementation of European acts of acquis communautaire which are part of both the Global and the New Approach.

The need to improve energy efficiency in Bulgaria is one of the main priorities of Bulgarian government. A new Energy Efficiency Act was adopted in

March 2013 (SEDA, 2014) transposing the provisions of *Directive 2006/32/EU* on energy end-use efficiency.

Measures to Improve Energy Efficiency in the "Household" Sector

Energy efficiency continues to play an important role in implementing energy policy at global level. In 2008 the International Energy Agency - IEA developed 25 energy efficiency measures[1] which when applied worldwide would lead to saving one-fifth of global CO_2 emissions associated with energy by 2030. They affect different fields such as buildings, appliances, lighting, transport, industry and development of energy networks (OECD/IEA, 2009).

Despite the achievements in the field of energy efficiency in fact end-use of energy increased by 2.3 % between 1990 and 2013 according to statistical data from Eurostat (EUROSTAT, 2013). IEA found that global emissions continued to grow by 44 % in the period from 2000 to 2011 (IEA, 2013). This trend could change with the adoption of appropriate energy efficiency measures for households which can have a significant impact on mitigating climate change (IEA, 2012, 2013).

European Energy Efficiency Database - ODYSSEE and MURE

Implementation of energy efficiency measures in the member states requires serious effort and resources. The analysis of the collected more than 2,350 energy efficiency measures in MURE database (ODYSSEE AND MURE, 2015) shows that they are focused mainly on the implementation of EU legislation. Since 1994 *legal and regulatory* measures (e.g. minimum standards in housing, standards for CO_2 emissions for cars, etc.) and *legally informative* measures have been prevailing in the "Households" sector whereas measures of cooperative type (such as voluntary

[1] Energy efficiency measure is any action or activity undertaken to improve the ratio between an output of performance, service, goods or energy, and an input of energy (IEA, 2014).

codes and agreements) are less popular. It is noteworthy that the sector *lacks markedly informative, financial and fiscal measures*.

Only 4 measures - mainly providing information and training on energy efficient behaviour while on the move (driving, biking) are pointed for our country in the group of measures related to change in consumer behaviour.

Energy needs and the opportunities for their rationalization depend on a number of circumstances - economic, social, demographic development of urban areas and associated lifestyles, traditions and level of life comfort, saturation of households with appliances, etc.

In individual European countries different measures have been established due to cultural differences and social habits and their effectiveness is a function of the economic environment and development of the country (MELLAR, 2015; ODYSSEE AND MURE, 2015). However, there are some areas of intervention where the uniform EU legislation should be applied with greater attention and consistency.

Conclusion

Energy efficiency policy in Bulgaria is characterized by strongly targeted legal and regulatory measures which complement the relatively limited financial and legal informative measures. The measures implemented by the Bulgarian government organizations and institutions for increasing energy efficiency in the "Households" sector reflect completely the EU law in this area. It is noted that the country has not unlocked its potential of measures related to *change in consumer behaviour* which may lead to reduced energy consumption and increased energy efficiency without requiring additional costs.

The inclusion of households and individual consumers is significant and topical research problem of growing importance for implementing energy efficiency policy in society.

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Energy Efficiency and Energy Poverty in Bulgarian Households

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Abstract. The need to improve energy efficiency is a priority of both the European Union and the Bulgarian government. Households as end users are an important part of this process. Among the biggest challenges of energy efficiency policy are the worries caused by "energy poverty" of households which requires studying their behaviour to prevent its expansion in the future.

***Keywords**: energy efficiency, energy poverty, household's behavior, Bulgaria*

Introduction

Energy efficiency is recognized as a basic strategy in the policies on reduction of energy consumption and climate change. The benefits of efficient use of energy are mainly related to the reduction of greenhouse gas emissions and air pollution.

According to the Sustainable Energy Development Agency (SEDA), the trend for proactive growth of energy prices compared to households incomes and the lack of initiatives to improve the performance of homes and household appliances can lead to deterioration of the energy comfort of Bulgarian household in conditions of already reduced costs to satisfy other needs (SEDA, 2005). This report aims to identify the need to study the behaviour of Bulgarian households in energy efficiency area amid concerns raised by "energy poverty" in Europe and Bulgaria and the danger of its expansion in the future.

Methodology

The report applies the descriptive research method for collecting secondary data from various literary sources such as statistical reports at national and European level, reports of government agencies and advisory bodies, European projects, research papers, etc.

Results and Discussions

Energy Intensity of Bulgarian Economy

Energy intensity reflects the amount of energy per unit of gross domestic product (GDP) and is a key indicator of the efficiency of energy consumption. Since joining the EU in 2007, Bulgaria has been constantly among the top member states in energy intensity rankings (EUROSTAT, 2014 a).

Eurostat data for 2014 show that among the countries in the EU there is not such meteoric growth of energy consumption compared to economic growth as reported in Bulgaria considering the modest growth of GDP (EUROSTAT, 2014 a). As can be seen in Fig. 1 most EU member states achieve economic growth accompanied by an absolute decline in energy consumption as shown by the average score for the EU. Against this background, Bulgaria happens to be the only EU country where GDP growth is accompanied by proactive energy consumption (EUROSTAT, 2014 a).

The difference between the energy intensity of Bulgarian economy and that of the economies of EU countries remains wide and the high values of this indicator for efficiency of energy consumption remains a major challenge for Bulgarian state.

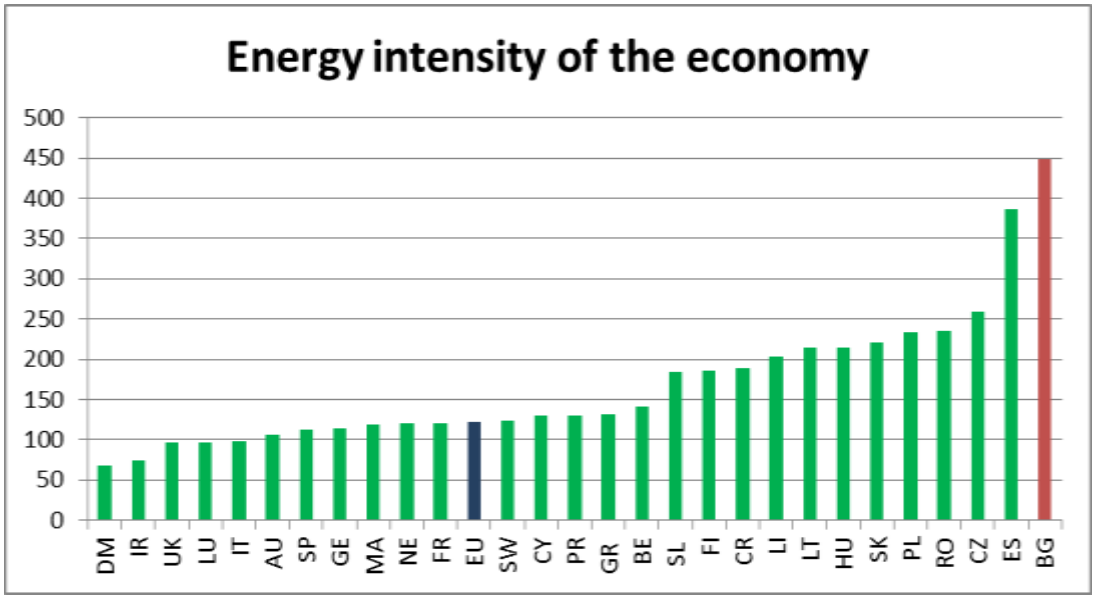

Fig. 1. Energy Intensity of the Economy in 2014 of EU-28, Presented by Gross Inland Consumption of Energy Divided by GDP (kg of oil equivalent per 1 000 EUR) (EUROSTAT, 2014 a)

Energy Efficiency and Households as Energy Consumers

Energy consumption in households reflects the consumption of fuels and energy to meet the household needs of the population and is directly dependent on the lifestyle and economic standard of people. Access to adequate and quality energy is directly linked to the economic well-being of the population and is crucial to the competitiveness of the economy of a country.

Statistical data (EUROSTAT, 2013) show differences in the proportion of the consumed electrical energy in the end use of energy by households on average in the EU and Bulgaria. This share of Bulgarian households is about 40 % which is significantly above the EU average – 24 %. The main reason for this is the low level of gasification of households in Bulgaria and consequently the low rate of natural gas consumption in the total energy needs of households - 2.2 % compared to the EU average of 39% (EUROSTAT, 2013).

According to the National Statistical Institute (NSI) for 2014 expenditure on "Housing, water, electricity and fuels for domestic needs" with a share of 13.4 % of the total consumer spending comes second in the structure of their cash spending after expenses for food and beverages with a share of 32.3 % (NSI, 2014 a).

Energy efficiency measures in households could reduce the burden of energy costs in the total household budget. In the period 2000 - 2013 energy efficiency at EU level improved by 15 % showing a growth of 1.2 % per year. The "Households" sector has achieved the greatest improvement in energy efficiency with a growth of 1.7 % per year (ODYSSEE AND MURE, 2015).

"Energy Poverty" Among Households in Bulgaria

The growing "energy poverty"[1] of households in Europe and Bulgaria is a major challenge to energy efficiency policy. Numerous analyses and assessments emphasize the trend for danger of expansion of that problem in the future (BOUZAROVSKI, 2011; ESC, 2015; GREEN INNOVATION BG, 2015; IEA 2014; KISYOV, 2014; PENEVA, 2014). *Three main factors for energy poverty* can be identified in our country: outdated and energy inefficient housing, low income and continuously rising energy prices.

A current statistical Eurostat survey presents information on the proportion of the population in the EU who is not able to maintain the required thermal comfort in their households (EUROSTAT, 2014 a). In 2013, 46.6 % of the total population of Bulgaria responded that they cannot maintain adequate thermal comfort in their households thereby putting the country first among the member states of the EU-28. In comparison, the EU-28 average for this indicator was 10.8 %. Inadequate heating and unpaid bills prevail mainly among the most vulnerable social groups. The same study shows that 60 % of the population aged over 65 years were not able to heat

[1] The International Energy Agency suggests the following definition: "Energy poverty refers to a situation where a household has technically access to energy but cannot afford adequate energy services to meet basic needs" (IEA, 2014).

sufficiently their homes compared to an average of 12 % in the EU (EUROSTAT, 2014 a).

Against the background of high figures in the groups at risk of poverty and social exclusion households are facing serious problems in terms of unaffordable energy costs (ESC, 2015; GREEN INNOVATION BG, 2015; NSI, 2014 b; PENEVA, 2014). The National Statistics Institute published data that nearly 49 % of the country's population lives in such conditions (NSI, 2014 b).

There is no doubt that energy poverty is becoming a serious problem both in the EU and in our country. It is clear that the driving forces for this are generated by the specific local social, political and environmental conditions. The lack of systematic research does not allow the development of effective measures and policies which can be directed at the problem in Bulgaria which is one of the most affected countries in the EU (ESC, 2015; KISYOV, 2014; PENEVA, 2014). Studying the behaviour of households in terms of energy consumption would support the creation of a coherent national policy combining the principles of social protection and strategies for energy efficiency.

Conclusion

The high energy intensity of Bulgarian economy compared with the economies of EU member states remains a major challenge to Bulgarian state. Bulgaria needs to encourage appropriate measures to increase energy efficiency within its energy policy in the aftermath of the global financial and economic crisis.

Numerous analyses and assessments underscore the trend that energy poverty is a growing problem (incl. in Europe and in Bulgaria) and it threatens to expand in the future. The driving forces for this are generated by the specific local social, political and environmental conditions. Studying the behaviour of households in the state of "energy poverty" in terms of energy consumption would support the creation of a coherent national policy combining the principles of social protection and the strategies for energy efficiency.

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Greenwashing of Products: A Serious Challenge for Commodity Science

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Abstract. More and more companies build their image on environmental and social responsibility. However, such image must be adequately communicated with the consumers, business partners, non-governmental organizations and state institutions. The term greenwashing is used to describe the act of misleading the consumers regarding the environmental practices of a company or the environmental benefits of a product or service. Greenwashing is problematic because it can encourage consumers to do the opposite of what's really good for the environment. This paper presents different forms of greenwashing and discusses why it represents the risk for companies and consumers.

***Keywords**: products, greenwashing, environmental labelling*

Introduction

Products are the key subjects of commodity science and their environmental evaluation is becoming one of the equal important aspects of modern product development (Astrup Jensen and Remmen, 2006). More severe environmental legislation requirements are coupled with the growing market demand for 'greener' products, Interest in greener products is increasing and consumers are becoming

increasingly aware of their social responsibilities and their indirect impact on the environment through their purchasing behaviour (European Commission, 2013; The Nielsen Company, 2014). Such trends are accompained by the clear growth in the number of different environmental labels and schemes (European Commision, 2013). Namely, labelling is an important tool to communicate the characteristics of products to the consumers, including environmental and sustainability issues. During the last 30 years, a growing number of environmental labels have been developed by individual companies, industrial sectors and non-government organizations, national and international governmental organizations (Taufique et al., 2014; Golden, 2010). That is why eco-labelling has gained a lot of attention within commodity science community in the past decade and half.

More and more companies build their image on environmental and social responsibility. Unfortunately, one of the shortcuts within such efforts is the use of false environmental claims, labels and advertising of products and services. According to some recent reports, such negative and misleading practice is on the rise, increasing the potential to confuse even the most careful of shoppers in spite of the fact that are different forms of ecolabels are present for decades (Horiuchi et al., 2009).

The term greenwashing is used to describe the act of misleading the consumers regarding the environmental practices of a company or the environmental benefits of a product or service (Horuichi et al., 2009). It is problematic because it can encourage consumers to do the opposite of what's really good for the environment. The fact is that commodity markets can be seriously negatively affected by greenwashing practices. With greenwashing practices of products a negative publicity can weaken previous efforts in the field of greener products development. In spite of this, it seems that greenwashing is still not recognized as a serious danger for the economy because not much attention is given to it as a topic of concern and discussion. This paper aims to describe and comment the problem of the

greenwashing of products and emphasizes the need for strategies development to fight against this negative trend.

Different forms of greenwashing

Greenwashing is deceptively used to promote the perception that an organization's policies are environmentally friendly. Unfortunately, the lack of common definition of what a 'green product' is makes a problem of greenwashing more evident. The most comprehensive review of greenwashing practices and forms to date was given by TerraChoice Environmental Marketing (2009). They are grouped in seven categories: sin of a hidden trade-off, sin of no proof, sin of vagueness, sin of irrelevance, sin of lesser of two evils, sin of fibbing, and sin of worshiping false labels.

However, greenwashing is not always intentional although the great extent of this phenomena is deliberately launched onto the market. In many cases it is based on not sufficient knowledge or not sufficient awareness of the problem company is faced with. One of the forms of non-intended greenwashing is the use of single-attribute labels, that is, the labels which describe and emphasize a single environmental aspect and ignore the others (Golden, 2010). Such labels do not take into consideration all direct and indirect impacts of a product. The focus is on single environmental indicator only, while others are ignored, leading to so called 'burden shifting' (European Commission, 2013). Examples include carbon footprint labels, ISO Type II labels, compostability labels for bioplastics etc.

The importance of greenwashing for companies and consumers

Many corporate structures use greenwashing as a way to repair public perception of their brand. Product labels or claims carrying statements like "eco-friendly", "environmentally safe", "recyclable", "biodegradable" etc. became very popular and widespread on the market. However, research by TerraChoice

Environmental Marketing in 2007 showed that more than 95 % of over thousand products of broad consumer goods, claiming to be green, commited at least one of greenwashing "sins" (TerraChoice Environmental Marketing, 2009). The rise of greenwashing, paired with ineffective regulation, contributes to consumer scepticism of all green claims, and diminishes the power of the consumer in driving companies toward greener solutions (Dahl, 2010).

That should be a concern to all companies, because greenwashing of the competitors can hurt entire industrial sector. It can slow down sustainability efforts by making more people sceptical of environmental initiatives. It also impedes consumers from understanding the impacts of their purchasing decisions (Horiuchi et al., 2009). Greenwashing based on false claims, labels and statements have already caused some serious public conflicts and lawsuits, where companies like Danone, Coca-Cola, Superfos, Enso Plastics etc. were involved.

Strategies for avoiding greenwashing of products

Question which is permanently facing within industry in last two decades is how to evaluate the environmental impacts of the products as objective and accurate as possible and which are the relevant criteria. There has been rapid development of methodologies, tools, databases and protocols for the assessment of product sustainability over the past twenty years, like life cycle assessment, product environmental footprint, ISO standards for product carbon and water footprint, ISO environmental product declaration, cradle-to-cradle certification, forest stewardship council certification to mention some of them. It has become clear that environmental policies on products are oriented towards life cycle concept. Product life cycle thinking is essential in the path to sustainability by expanding the focus from the production site to the whole product life cycle. It expands the traditional focus on manufacturing processes to incorporate various aspects associated with a product over its entire supply chain including use and waste treatment. The producer

becomes responsible for the products from cradle to grave and is supposed to develop products, which have improved performance in all phases of a life cycle (Astrup Jensen and Remmen, 2006).

Secondly, green marketers need to learn which aspects of the greener products are really important for the consumers. They have to understand also how products impact environment throughout their life cycles and that, consequently, there is no easy way to promote certain product as "environmental friendly" or "green".

Accurate and reliable eco-labels would arguably be helpful to promote greener products. Although consumers' trust in eco-labels, perceptions, understanding and use of product related environmental information is a prerequisite for more sustainable consumption, eco-labels alone are not a sufficient condition for economic success concerning higher sales of greener products (Golden, 2010; Teisl et al., 2008). Eco-labels are not sufficient and the role of government in both legislation setting and goal setting is critical (Horne, 2009). Of course, rising up of consumer awareness should also be one of the most important long-term strategies.

Conclusion

Business and organizations require more and better information about environmental aspects of products in order to be able to make better-informed decisions. The rise of greenwashing, paired with ineffective regulation, can contribute to consumer scepticism of all green claims, and diminishes the power of the consumer in driving companies toward greener solutions. On the other hand, the problem of greenwashing opens up the question how to compare environmental performance of products in general. There is no single strategy to fight against greenwashing of unfair companies. Sometimes they do not even realize they practice greenwashing due to their low environmental awareness and knowledge. To overcome any dilemma, one of the right paths is that before claiming to be

environmentally responsible, let an external third party verify and validate the results based on well-defined standards.

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The Role of Environmental Labeling for Sustainable Production and Sustainable Consumption

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Abstract. One of the main causes of environmental degradation is unsustainable consumption, which is all the greater the higher the level of industrialization. Economic activity (especially production) is based on the use of natural resources. It is therefore important to adjust the type of activity and its scope to existing natural conditions. Natural resources be taken to include a rational way and produce the products whose use is safe for the environment. The European Union has taken action in range sustainable development, directed towards achieving sustainable production and sustainable consumption. This is especially important due the growing number of products, their new functionality and global circulation of the products. EU governments have taken action toward the development of market ecological products. Therefore, emphasis was placed on system of environmental labeling.

Currently is a growing interest among consumers protection of the environment, who realize their relationship activities with other spheres of social and economic life. This is due to the acquisition of the natural goods that is safe for human health and nature. At the manufacture are limited use of natural resources.

The aim of this article is to present the environmental labeling, which is one of the tools of sustainable production and sustainable consumption. Environmental

labeling is a good tool used in the process of communication between the producer and the consumer. Thus enabling easier selection of environmentally safe products.

***Keywords**:* sustainable consumption, sustainable production, environmental labeling, environmental awareness

Introduction

Environmental labeling is a tool used in achieving the objectives of environmental policy and implementation of the principles of sustainable development. Environmental labeling can be considered as one of the tools to shape sustainable production and sustainable consumption. As defined by the Oslo Symposium in 1994, sustainable consumption and production (SCP) is about "the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of further generations" (*Sustainable development…*2015).

Environmental labeling is also used as a tool for environmental marketing. The primary objective of eco-labeling is to provide consumers with accurate and reliable information on the impact of products on the environment, thus facilitating purchase decisions. The increase in sales of environmentally safe products is possible to achieve thanks to the identification by consumers and suppliers of the benefits of buying environmentally friendly products (Adamczyk, 2004).

The European Commission promotes environmental labeling, which is based on the creation of demand for products more desirable in terms of environmental sustainability.

The EU Ecolabel, which was launched in 1992 by the European Commission in light of developing a Europe-wide voluntary environmental labelling scheme that

consumers could trust, now has 36 403 products and services comprised by 1 875 licences. Nowadays the largest number of EU Ecolabel licences was awarded in France (26%), Italy (18%), and Germany (12%) (*Facts and Figures*…2015).

The number of licenses issued does not reflect the number of products bearing the Ecolabel, which we can see by the number of products bearing the Ecolabel by individual EU countries. The clear leader in this ranking are Italy, which significantly distancing other countries.

Material and methods

The empirical part is based on the results of tests obtained from businesses and consumers. In the first part of the study used the opinions and experience of leadership at various levels (in particular those responsible for environmental management).In the second part of the study used the opinions of consumers about environmental labeling in the context of diagnosis of environmental labels.

The study used the questionnaire method.

Results and discussion

(1) Empirical studies of enterprises

Among the companies surveyed environmental labeling is used only 24% of respondents. Enterprises with implemented to environmental labeling, 33.3% use more than one eco-label. The most commonly used sign is the eco-label BIO, meaning that production takes place in an environmentally friendly manner. Further frequently used eco-labels are (Figure 1.): *Blue Angel*, *Ecolabel* and *Polish EKO Mark.*

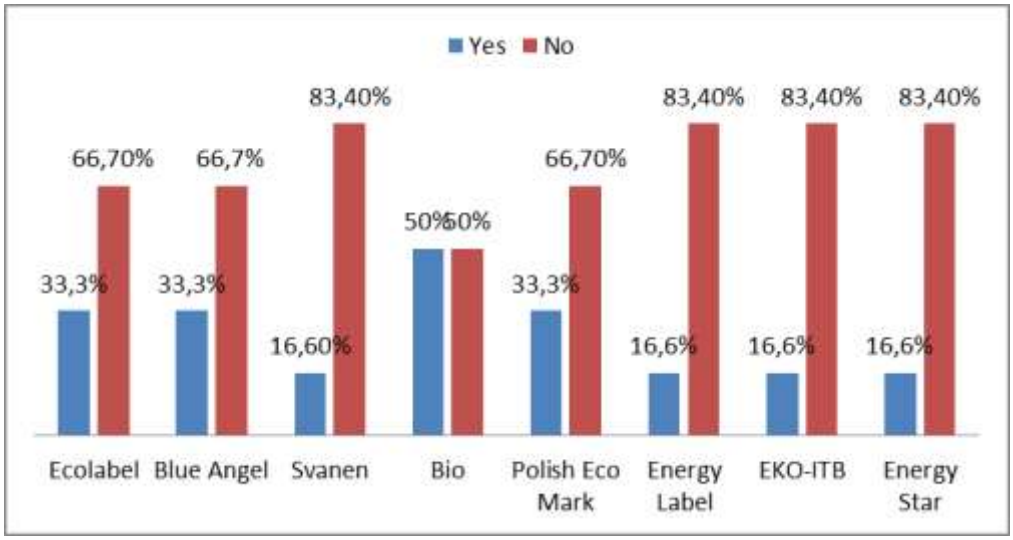
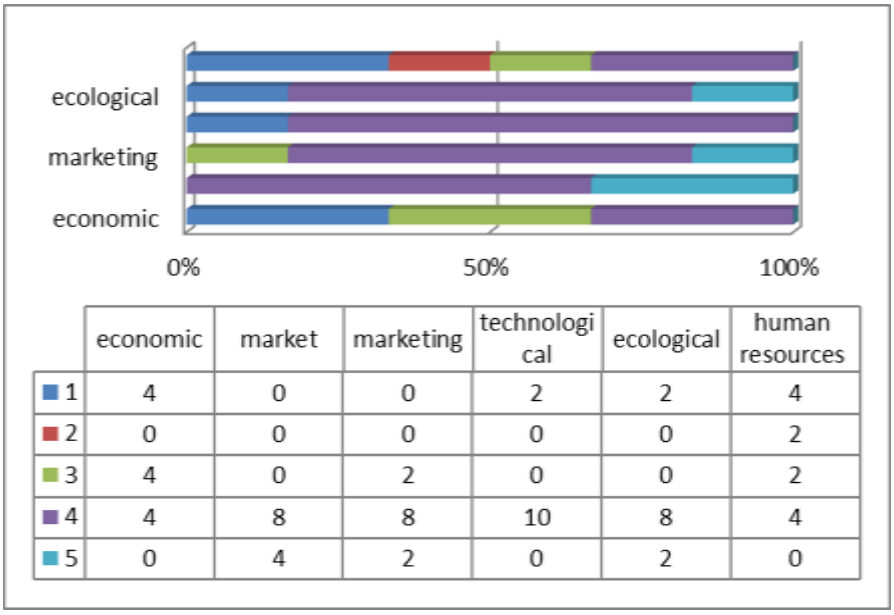


Figure 1. Environmental labeling in enterprises

Source: own research

Companies using environmental labeling were also asked to specify the reasons for the implementation of this tool. The respondents assessed the importance of factors: economic, market, marketing, technological, ecological, human resources on a scale of 1-5 (where 1- is not taken into consideration, 5 is the most important in the decision-making process). Analysis of these correlations showed that the main reason for implementation are primarily market signals (competitiveness, the specifics needs of customers). Also important reasons are: marketing issues, ecological and technological (Figure 2.)



	economic	market	marketing	technological	ecological	human resources
1	4	0	0	2	2	4
2	0	0	0	0	0	2
3	4	0	2	0	0	2
4	4	8	8	10	8	4
5	0	4	2	0	2	0

Figure 2. The reasons for the implementation of environmental labeling in enterprises

Source: own research

(2) Empirical study of consumer

The first question in this group enabled the development of a hierarchy of environmental awareness signs. In most respondents recognize the energy label, 88%. The relatively high level of awareness (61%), characterized by a sign Bio organic food. Other characters Environmental included in the questionnaire are not highly recognizable trademarks. Surprising may be low recognition Ecolabel (18%), as promoted by the EU Commission.

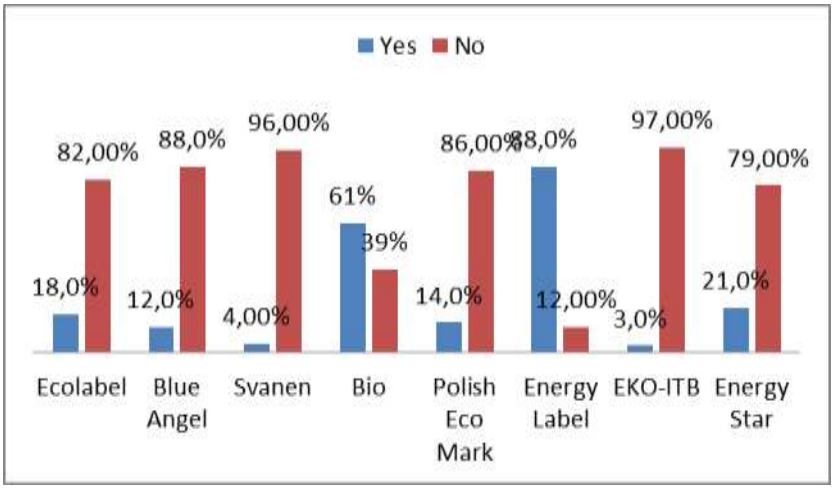


Figure 3. Knowledge of environmental labeling among consumers

Source: own research

Respondents were also asked to answer in terms of distinguishing between environmental labels. 79% of them declare no environmental labels to distinguish among the reasons for pointing out far too much eco-label in the circulation (89%). This may be the fundamental reason for the low level of both recognition and distinguish the various environmental labels.

Conclusion

Environmental labeling is an important tool for sustainable production and consumption. Research indicates, however, the low level of their use in enterprises. The results of a consumer survey are virtually identical to the results of research conducted in enterprises. Both the high level of use by the surveyed companies, as well as recognition among respondents, has a mark BIO (Organic food). But a high degree of recognition of the energy label may stem from the fact that its application is mandatory for household products. This confirms that a mandatory legal requirement to inform consumers about the impact of products on the environment

has a positive effect on the process of communication between these market participants.

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Environmental Impacts: Damage and Economic Risk Assessment. State of Art and Literature Review

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Abstract. The environmental risk assessment is integral part of Corporate Social Responsibility (CSR) Strategy. In a Commodity Science perspective, the CSR represent the industrial point of view of global sustainability implementation. Actually, the mainly indicators taken into consideration now are the Willingness To Pay (WTP) and the Disability Adjusted of Life Year Indicator (DALY). The first one measures the economic value attributed to the "human health" and, the second one expresses the number of years lost because of illness, disability or premature death. With their use, it is possible to calculate the amount of revenues lost due to the illness of workers. Therefore, the Economic Value of Environmental Damage made by the company towards its employees can be expressed as the difference between the economic value of the planned production on all the days of work available and the economic value of production calculated for DALY days. The use of these two authoritative indicators gives credibility and reliability to this method, but they are not generalized and harmonized.

Today, there is no model to quantify the environmental damage on human health universally adopted that allows the comparability of results between different

companies in the same sector. Based on the literature review, the purpose of this research is to analyze the different methods for providing the value of the environmental damage (real or potential) in order to facilitate the implementation of CSR Strategy and managing Risk assessment.

Keywords*: Environmental Damage, Risk Assessment, Environmental damage indicators, WTP, DALY, Impact Pathway*

Introduction

Environmental risk management and risk assessment is the process of identifying, evaluating, selecting, and implementing actions to reduce risk to human health and to ecosystems (USPCC RARM, 1997). In the industries, in order to achieve a competitive advantage and maximize long-term profits, it is crucial to adopt a socially responsible behavior, monitoring and responding to economic, environmental and social expectations of all its stakeholders (McWilliams, 2000). The purpose of this research is to provide an overview of the state of the art and to show the basics of literature useful for creating a baseline scenario. In the definition of a proper risk management strategy, it should be considered the assessment of exposure to environmental risk in all its variables.

Material and methods

The authors conducted a systematic review of the literature analyzing the publications (books, scientific articles and reports) on the environmental damage by querying the databases with the keywords "environmental damage" and "environmental risk assessment" and "economic value of environmental damage". Given that sample, the results were classified according to the following set of dimensions and characteristics. 1. Item as Report (R), Scientific Journal (SJ), Book

(B); 2. Objectives; 3. Methods. In the results section, we present the main results obtained.

Results and discussion

In the analyzed literature, the indicators mainly took into consideration by scholars are the WTP, the DALY and the Impact Pathway Approach. Although these tools were not specifically designed for the evaluation of environmental damage, their application in several project encourages the debate about their validity to be applied in the field.

The Table 1 show a sample of the literature exanimate and it represents an overview of the different methods used.

Table 1.

Literature Selection and Methods Overview. (Source: Our elaboration)

Authors	Title	1. Item	2. Objectives	3. Methodological features
Amann et al, 1998	The revision of the air quality legislation in the European Union related to ground level ozone.	SJ	Incidence rate of benefits on human health in the implementation of environmental policies	WTP
Atkinson et al,2006	Cost benefits analysis and the environment: recent development	B	Incidence rate of benefits on human health	Cost-effectiveness analysis integrating information on economic, technical, physical and biological aspects of ozone pollution and abatement
Bickel et al. 2013	Environmental external costs of transport	B	Impact pathway for estimating marginal environmental cost of transport	WTP, Bottom-up approach
Borruso et al 2001	Metodologia per la stima del costo dell'inquinamento atmosferico e del rumore	B	Demonstration of the reasons why quantifying the effects of pollution in terms of life years lost rather than the number of deaths is better if we consider life expectancy	DALY
Desaigues et al, 2007	Final Report on the monetary valuation of mortality and morbidity risks from air pollution	R	Demonstration of the appropriate metric to assess the impact of atmospheric pollution on human health, life expectancy.	Life expectancy

ExternE, 1995-2005	External cost of Energy http://www.externe.info/externe_d7/?q=node/4	R	Impact Pathway for the assessment of external impacts and associated costs resulting from the supply and use of energy	Impact pathways approach methodology
Hainoun et al., 2010	Estimating the health damage costs of syrian electricity generation system using impact pathway approach	SJ	The impact pathways approach methodology for the economic quantification of damage	Impact pathways approach methodology
Holland and Krewitt, 1996	Benefits of an Acidification strategy for the European Union reductions of SOx,NOx, NH3 in the European Union.	R	The concept of 'total economic value' and evaluation techniques could to be use.	VOLY and VSL
Kahn J. Et al, 2007	As China Roars, Pollution Reaches Deadly Extremes	B	Environmental damage definition for China	No Methods
Krewitt et al, 1998	Application of the impact pathway analysis in the context of LCA	SJ	The impact pathways approach methodology for the economic quantification of damage	Impact pathways approach methodology
Rabl et al., 2003	Interpretation of air mortality: number of deaths or years of life lost?	SJ	Criterion the years of life lost rather than the number of deaths. Explanation and demonstration of this statement.	DALY

In the analysis, the most common methods founded are the WTP present in the Impact Pathway approach methodology and the DALY.

The Impact pathway, approach estimates environmental costs and benefits starting the assessment from the emissions sources, then deriving the physical impacts and finally evaluating the physical impacts in monetary terms. The monetary evaluation is performed according to the welfare theory and so it accounts as the welfare losses for individuals.

The DALY is the reference indicator used by the WHO to give a value of the several diseases overall burden. This method does not provide to the single company its total value of environmental damage incurred, because it was created as a general

method applicable to a production sectors. Thus, if a company adopts this method it must add also other values such as medical expenses incurred by workers, or by the company itself, or the economic value of the potential damage to the image and reputation. Therefore, this method could be used as a starting point for a company to be able to make complete estimates, customizing it with the factors that best correspond to its knowledge needs.

Conclusion

In conclusion, the researches exanimated in this work adheres to the criteria and lends itself to be suitable tools for implement a comprehensive CSR strategy. In the future, a method can be created and implemented starting to the existing methods. In particular, new parts that affect other categories of stakeholders could be developed, in order to achieve a comprehensive approach that addresses the relationship between a company that wants to implement CSR and relations with its stakeholder in a complete way.

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Public Opinion on Sustainable Energy Policy Development: Case of Slovenia

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Abstract. Environmental protection and sustainable development has become an unavoidable trend in many sectors including energy industry. Energy policy and energy industry development are strongly correlated with economics of energy sources, environmental issues and socio-political issues. However energy policy is many times to distant from public and public is not even aware of crucial energy related projects in progress. This paper therefore presents findings on public opinion on energy policy and evaluates sustainability of current Slovenian energy policy as well as public preferences for the future vision of Slovenian energy policy as well as for preferred integration in decision making process. The most important findings are that public should be better integrated in energy policy decision making.

Keywords*: energy policy, sustainable development, renewable energy, Slovenia*

Introduction

Energy policy as a key strategic area is many times to focused only on top politics and decision makers such as government and its agencies as well as strong energy organizations and energy lobbies. Public interests are therefore strongly underweighted and neglected. Nonetheless public opinion can not be easily taken

into account when designing energy policy and energy policy strategies and sometimes its complete integration into energy policy can be disputable or at least not recommended, public opinion must still be monitored, considered and included at least in the form of public interest.

Social perspective is becoming more important therefore identifying and monitoring of social acceptability of energy policy and public opinion on different measures taken within energy policy strategies must be considered. When talking about transition to sustainable energy future increasing public awareness on energy issues and integration of public opinion in energy policy is obligatory.

Krozer (2011) examines socially related energy costs with cost-benefit analysis. He evaluates that these external costs reflect real energy costs paid by society and should be included in the process of energy policy making. Jorgsten (2008) also believes that energy systems must be visualized to achieve more active involvement and to set margins of each stakeholder group competences. Energy poverty reduction is also crucial when designing energy policy since it is becoming a mayor issue also in Slovenia (Vendramin, 2010). Santillan Cabeza (2010) reports that energy poverty must be taken care of since there is more and more scarce and vulnerable groups. Ragwitz (2009) also found out that dispersed renewable energy sources enable creation of more jobs especially in SMEs. He evaluates that app. 5,000 jobs could be created in the sector of renewable energy in Slovenia.

Lund (2010) describes in his book that choice awareness is crucial for achieving 100% renewable energy solutions. He believes that key driver of efficient transition to sustainable energy policy is public awareness on different possibilities and different alternatives for the future energy policy development (choice awareness theory). He proves his theory on energy investments in the last 30 years in Denmark where public was informed and has the possibility to act and influence energy policy decisions. Therefore energy projects are better accepted and therefore more efficient and also more socially appropriate.

Society must be included in energy policy making and the first step towards this is to assess public opinion on inclusion of sustainability perspectives and to check supports to different future energy related investments.

Methodology

Required data on public opinion on appropriateness of Slovenian energy policy from public perspective were gathered on the basis of highly structured web questionnaire launched in 2011. Study includes data on understanding and knowledge on energy policy and existing energy projects, desire of public on energy related information, data on understanding the concept of sustainable development, evaluation on integration of different sustainability perspectives (economic, social and environmental perspective) in energy policy making and last but not least social acceptability and appropriateness of Slovenian energy policy. Due to limitations this manuscript presents only partial results on public interest and opinion on different energy sources and inclusion of sustainability perspectives in current energy policy. Methodology of this survey is partially reproduced on methodology of Mumel et al. (2010) and was proved to be appropriate to assess public opinion on energy related issues in Slovenia.

Population group was Slovenian public aged between 20 and 70 years (1.2 million people). However we focused especially on younger generation good education since they will probably lead future development and will present crucial actors of transition towards more sustainable future. Sample of this survey included 453 respondents, mainly aged up to 40 years. The biggest age group were people aged 20 to 30 years (63,6 %) followed by 30 to 40 years old (16,7 %) people. 42.7 % of respondents were men and 57.3 % of women. Sample size was assessed to enable over 95 % accuracy according to SurveyMonkey (2011).

Gathered data were analyzed with descriptive statistics of qualitative data (shares, average values etc.) and cross compared within different demographic groups.

Results and discussion

Results revealed that Slovenia lay public is poorly aware of Slovenian energy policy and Slovenian energy investments. 63 % of respondents believe that they are very badly informed or not informed at all. Only 22 % of them evaluate that they are well informed about energy issues.

Most of respondents (56 %) also does not know any energy policy strategic document. This was surprising since strong debate on strategic energy issues and related documents were in core of media attention in time of implementation of this survey.

However public opinion is also that environmental and social perspective is underestimated. As presented on Figure 1 public evaluates that Slovenian energy policy is focuses especially on economic and technological perspective. Respondents actually evaluated social perspective as the least integrated in energy policy which is reasonable due to low inclusion of public in energy investments and energy policy planning.

According to average value of responds the highest support was granted to solar and wind energy (Figure 2). Both are assessed to be the most environmentally friendly as well as socially appropriate. Highest economic appropriateness was assessed on nuclear energy which is surprising due to relatively low public support to nuclear energy.

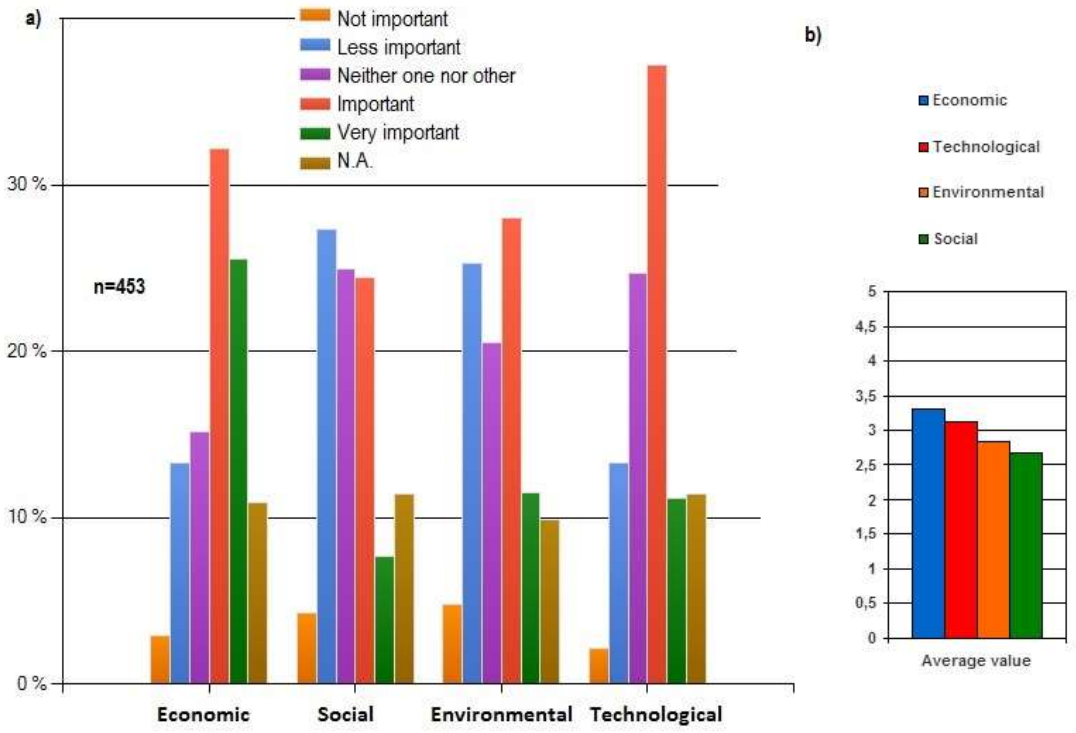

Figure 1. Evaluation of different perspectives in Slovenian energy**:** a) – distribution of results and b) awerage value

When evaluating appropriateness on all three perspectives solar energy is winner again with the highest average support by 362 respondents. Wind energy and other renewables followed. Hydro energy has surprisingly lower environmental appropriateness than wind and solar energy.

The most appropriate conventional energy source was natural gas which is many times assessed as a fuel for softer transition to sustainable energy future. Coal seems to be evaluated as the least appropriate nonetheless it is our local energy source.

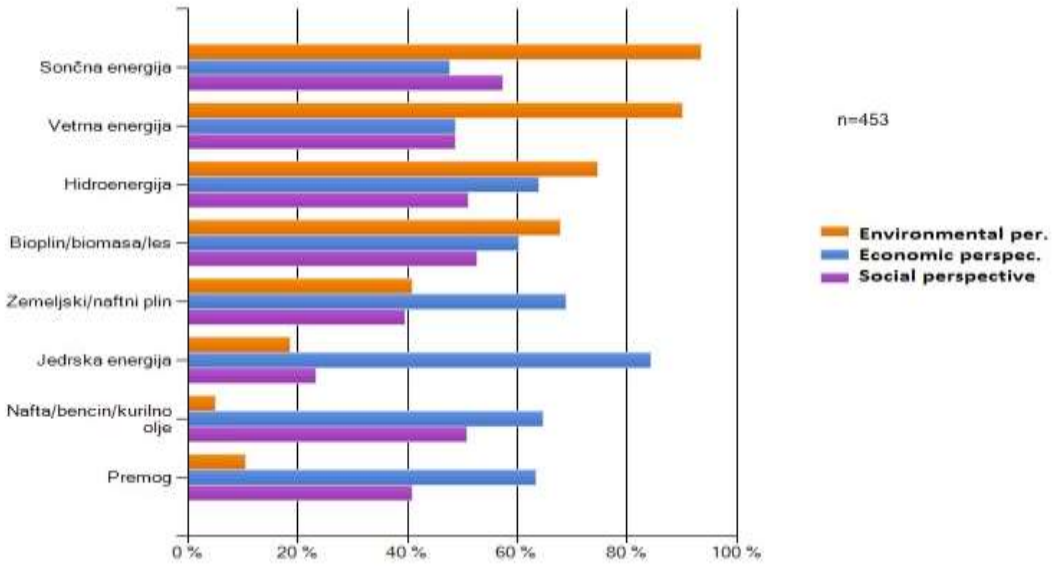

Figure 2. Appropriateness of different energy sources by environmental, economic and social perspective

Conclusion

Results revealed that Slovenia lay public is poorly aware of Slovenian energy policy and its short and long therm objectives. Public also evaluated renewable energy sources as more appropriate from different sustainability perspectives nad coal as the least appropriate energy source. Nonetheless Slovenia has just finished and investment in lignite fired power plant which seems to be contrary to public opinion and causes strong disruptions and differences in local area as well as in whole Slovenia. Lay public also evaluates that Slovenian energy policy is focused especially on economic and technologic perspective and not on environmental and social perspective.

Due to differences in energy policy perspectives and public opinion stronger integration of public opinion is highly recommended to avoid disruptions

and enable more effective implementation of energy investments and energy projects.

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Tourism Towards Sustainability: Challenges And Opportunities For The Accommodation Sector

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Abstract. Tourism contributes directly to over 5% of world GDP. At the same time, it has a significant impact in terms of climate change, generating around 6% of global CO_2 emissions. Forecasts indicate that by 2035, emissions will increase by 160%. Accommodation is responsible for over 20% of these emissions (United Nations World Tourism Organization, 2011).In 2014 the tourism sector generated in Italy 10.1% of GDP (World Travel & Tourism Council, 2015). Given the economic and environmental relevance, it is essential to address strategies to mitigate its impact in terms of contribution to environmental degradation. Tourism is both polluter and concurrently a major victim of climate change. The tourism sub-sector of accommodation has voluntary policy instruments to reduce its environmental impacts: codes of conduct, best environmental practices, environmental performance indicators, environmentalmanagement systems and eco-labels. A critical issue for their diffusion is the capacity to capture and communicate to potential customers, more sensible to sustainability aspects. In addiction, in the last years, the growing number of eco-labels is leading to an increasing confusion among consumers. In this paper, we review the existing literature about firms' and clients perception on tourism eco-labels, in order to figure out weak and beneficial

aspect of their implementation. Considering the Italian context, we focus on the most widespread eco-labels for tourism: the EU-Ecolabel and Legambiente Tourism. The aim is to catch the differences and common points, figuring out their success outcomes. The output of the work will be a valuable tool to develop an empirical investigation on Italian accommodations that aims at increasing the ability to promote a sustainability path in the tourism accommodation sector.

Keywords*:sustainable tourism; tourism management; eco-labels*

Introduction

Sustainability in tourism emerged as a critical issue for a long-term strategy of industry's growth, and both public policies and management tools have been implemented to reduce its environmental impact (Bianchi, 2004; Torres-Delgado and Saarinen, 2014). In 2014 the contribution of travel and tourism to global economy was 9.8% of total economy GDP in 2014. The sector GDP is forecasted to grow by 3.8% per year in the period 2015-2025 (World Travel & Tourism Council, 2015). Given the importance in the global economy, tourism is also an important contributor to environment degradation, and a significant contributor to green house gases emissions (Pang et al., 2013).The most recent figures estimate that tourism emissions from three main sub-sectors represent between 3.9% and 6.0% of global emissions in 2005. Transports account for over 75%, accommodation for 21% and other activities 4%. Forecast for 2035 indicatesthat CO_2 emissions in the global tourism sector may experience a growth of 161% (Gössling and Buckley, 2016; World Tourism Organization and United Nations Environment Program, 2008).Maintaining the global tourism system consequently requires a significant input growth. Tourism on one hand is a mayor contributor to environmental degradation, on the other hand is one of the most vulnerable sector by cause of natural resources decline and, thus, a mayor potential victim (Gossling and Peeters,

2015). Therefore, the tourism's connectionswith global environmental change are evident (Bramwell and Lane, 2008). The accommodation sector is responsible for roughly one quarter of tourism GHG emission, and its impacts are more tangible compared to the transportation sub-sector. In the last years, various forms of environmental certifications and sustainability reporting have been proposed in the lodging sector of tourism. An evaluation of these initiatives is important in order to distinguish the more effective ones, both in terms of contribution to environmental impact reduction and in terms of capacity to engage facilities managers and guests(Buckley, 2012).

Materials and methods

Starting from the main voluntary policy instruments per accommodation, in this paper we review the main studies that investigated certifications schemes in tourism accommodation and the experience of Italy in terms of eco-labels applied to the tourism sector. In particular, we review recent studies which investigated the positive contribution of tourism ecolabels in terms of reduced environmental impact and monetary savings in the accommodation sector.

Certification schemes for tourism accommodations: the case of Italy

Several voluntary policy instruments and tools are available for lodging industry to implement sustainability practices in tourism. During the 90's, the accommodation sector started to promote voluntary instruments to reduce its environmental impact (Tambovceva, 2010).In particular, Eco-labels ensure compliance with specific environmental performance criteria and a better way to communicate this achievement to consumers (Ayuso, 2007). If, on one hand, the growth of tourism eco-labels has the positive effect to increase the sector's sustainability, on the other one it leads to market confusion, in which consumers have difficulties in distinguish credible labels and certifications (Font et al., 2003).Today over 140 labels for

tourism accommodation exists, and there is a lack of comparable standards and criteria (Font et al., 2003). Hence, the mayor obstacle to the certifications success is the lack of credibility, the excessive number of schemes, and the lack of an effective marketing strategy(Synergy, 2000). Considering Italy, the three most popular eco-labelling certifications are the EU-Ecolabel (EC Regulation No. 66/2010), LegambienteTurismo, and Ecoworld Hotel. The EU-Ecolabel is the official eco-label issued by the European Union. Italy is the leading country with 183 tourism facilities awarded (ISPRA, 2015). Ecoworld Hotel is a private label, created by a network of tourism accommodations owners. In 2015, 130 facilities were certified. Finally, Legambiente, the most popular Italian environmental NGO, issues the LegambienteTurismo label. Created in 1997, today includes over 400certified facilities.

Comparison of Italian labels for sustainable tourism accommodations

The three labels listed before have in common the use of several criteria that facilities have to fulfill in order to obtain the certification. These criteria are split into mandatory and optional ones.The Ecoworld Hotel label has 15 mandatory and 104 optional criteria. In relation to the number of optional criteria satisfied, the firm can obtain from one to five stars. The EU-Ecolabel has 29 mandatory and 60 optional criteria. The facility has to reach 20 points from the optional criteria. Finally, LegambienteTurismohas 26 mandatory and 46 optional criteria. The three labelsshare six areas of intervention in which facilities have to put in place actions to improve environmental performances: energy, water, waste, food&beverage, communication and sustainable mobility.

Table1.

Comparison of eco-label mandatory and optional criteria.

	Criteria					
	Mandatory			**Optional**		
Area	A	B	C	A	B	C
Energy	10	4	3	20	20	11
Water	5	2	2	13	13	5
Waste	4	2	6	4	6	6
Food&Bevarage	0	3	4	2	2	12
Communication	1	1	3	1	7	2
Mobility						

Legend: A=EU-Ecolabel; B=Ecoworld Hotel; C=LegambienteTurismo

Concerning energy, the EU-Ecolabel has the most stringent requirements (e.g. 50% of energy from renewable sources), that in the other two label systems are often present as optional criteria (e.g. class A air-conditioning; thermic insulation). About the water section, the common criteria are related to a reduced water flow in bathrooms and linen change. The most demanding labels for waste are EU-Ecolabel and Legambiente. Among the mandatory criteria is the obligation to make the separate collection of waste, with a particular attention on food waste. The separation of hazardous waste and a raising environmental awareness of the guests through communicationare also required.In the section dedicated to the catering service, Legambiente Tourism is definitely the most committed label. On the other hand, EU-Ecolabel does not impose any mandatory criteria.Among the mandatory criteria, all accommodation must inform guests on the applied environmental policy. Ecoworld Hotel is the most demanding in terms of required communication and information to guests.

The analysis of these labels criteria is a preliminary analysis of a broader investigation we are conducting, with the main goal of determining the success factors for the diffusion of these labels. The starting point is to understand what are the main motivations and satisfactory elements for customers of these tourist

accommodation facilities. To do so, we aim at comparing the different criteria set in the listed labels with the importance that customers give to them, in order to focus communication efforts on the criteria that will be identified as determinant for the customer's choice (Esparon et al., 2014).

Conclusion

The analysis has given a brief overview of the main eco-labeling certifications schemes available in Italy. The three instruments have in common a similar structure, based on mandatory and optional criteria. The main difference among them is that while EC-Ecolabel is a voluntary regulation issued by the European Community, the other two are realized by private organizations. This implies that many criteria are stricter in EC-Ecolabel, and that this standard seems to be more reliable because a public body issues its licenses.

Italy counts over 150,000 tourism accommodation facilities (ISTAT, 2011), thus one of the mayor challenges and opportunity is to convey the growing environmental awareness of citizens into the tourism sector. One of the main issues is to communicate positive outcomes of sustainable practices to accommodation managers, such as cost savings. At the same time it is necessary to identify communication drivers to increase customers' demand for sustainable tourism accommodations (Gössling and Buckley, 2016).

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Mapping Water Footprint Of *Durum Wheat* Production In Italy

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Water scarcity in some areas is really a current problem, which affects the balance of entire production areas, in particularly in Southern and Eastern countries, where its demand is expected to increase in the future due to population growth.Agriculture has a strong influence on water consumption; starting from these considerations, this study investigates Grey, Green, Blue and total water used in Italian *durum wheat* cultivation, taking into account production in 2011-2015 years. Results points out an extreme variability of these environmental indicators, as a consequence of climatic and soil heterogeneity; these findingscould offer interesting tools to make reflections for Policy makers, in the direction of water resourcesrationalization.

Keywords: *Water use; Environment policy; sustainability; durum wheat.*

Introduction

Mediterranean area contributes at global production of *durum wheat* for 60% (FAOSTAT, 2013). The production of *durum wheat* within this area is expected to experience increased variability in yield and quality as a consequence of climate change (Toscano et al., 2009). The relationship between the quality and sustainability of wheat is very close. Agriculture is actually the main consumer of freshwater in the world, as point out by Rodriguez et al. (2015). Agricultural

production accounts for about 70% of water withdrawals (Chen &Chen, 2013). Water resources are widely used for food production and, consequently, its demand is expected to increase in the future due to population growth (Bocchiola et al., 2013; Curmi et al., 2013). Rising water scarcity is in fact partially a consequence of the increasing demand food production (Khan &Hanjra, 2009).Ercin and Hoekstra (2014) sustain that freshwater scarcity and pollution will be aggravated in the future and will decrease its quality.Moreover, some authors have estimated that our dependency on water resources will increase significantly in the future (Rosegrant et al., 2009). However, through changing in water management is possible to remain at sustainable levels even with increasing populations (Ercin&Hoekstra, 2014).In order to limit the unsustainable use of global freshwater resources, indicators which make consumption patterns transparent are needed (Ridoutt&Pfister, 2010). Water Footprint (WF) is one of the most common tools used to analyze water management. WF of a product is defined as the volume of freshwater used to produce it and should be measured over the entire life cycle (Mekonnen& Hoekstra, 2011). Hoekstra et al. (2011) define the concept of Blue, Grey and Green Water footprint. In cereal field many studies about the Water footprint of different crops have been published. ISO 14046:2014 contains guidelines related to water footprint assessment of products, processes and organizations, based on life cycle assessment (LCA).

The aim of this paper is to assess Blue, Grey, Greenand total Water used in Italian durum wheat production, identifying both the location and the values of the impacts;this offersan interesting tool for Policy Makers in the direction of water resource rationalization.

Materials and methods

Data of *Durum wheat* production (2011-2015 years) were selected from Italian National Institute of Statistics (ISTAT).Water indicators in relation to hectare of production were calculated as following (Rodriguez et al., 2015):

$WU_{Green\ Region\ i}(m^3\ ha^{-1}) = VWC_{Green Region\ i}\ (m^3\ t^{-1}) \times Y_{pRegion\ i}\ (t\ ha^{-1})$.

$WU_{Grey\ Region\ i}(m^3\ ha^{-1}) = VWC_{Green Region\ i}\ (m^3\ t^{-1}) \times Y_{pRegion\ i}\ (t\ ha^{-1})$.

$WU_{Blue\ Region\ i}(m^3\ ha^{-1}) = VWC_{Green Region\ i}\ (m^3\ t^{-1}) \times Y_{pRegion\ i}\ (t\ ha^{-1})$.

Where:

WU=Water Use.

$Y_{pRegion\ i}$= productivity of *durum wheat* per hectar (t ha^{-1}) of *Region i*.

Total $WU(m^3\ ha^{-1}) = WU_{Green\ Regioni} + WU_{Grey\ Region\ i} + WU_{Blue\ Region\ i}$

Results and discussions

Water use (WU) in different area of Italian *durum wheat* production is shown in Table 1. The higher value of WU_{Grey} was observed in North (892 m^3 ha^{-1}). WU_{Green}in North is 5170 m^3 ha^{-1}. A high standard deviation was observed for WU_{Green}in Centre (st. dev.=1337.8). The WU medium of Italian Regions is 5327 m^3 ha^{-1}, with a ratio between North and South of 1.29.

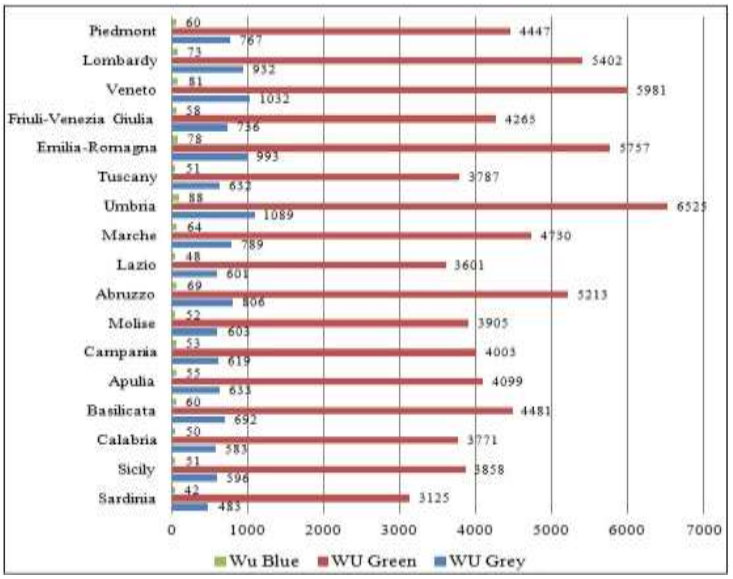
Table 1 .

WU of *durum wheat* production in different areas of Italy (m^3 ha^{-1}).

	WU_{Grey} (m^3 ha^{-1})		**WU_{Green} (m^3 ha^{-1})**		**WU_{Blue} (m^3 ha^{-1})**		**Total WU (m^3 ha^{-1})**	
	Mean	st. dev.	Mean	st. dev.	Mean	st. dev.	Mean	st.dev.
North	892	133.6	5170	774.3	70	10.5	6132	918.4
Centre	777	223.2	4661	1337.8	63	18.0	5501	1578.9
South	627	93.0	4057	601.6	54	8.0	4738	702.6
Italy	740	177.6	4526	942.4	61	12.9	5327	1130.5

Graphic 1 reported WU_{Grey}, WU_{Green} and WU_{Blue} (m^3 ha^{-1}) in Italian *durum wheat* production for each Region. Umbria, located in middle of Italy, has the highest WU_{Grey} (μ=1089 m^3 ha^{-1}), following by North Regions, such as Veneto (μ=1032 m^3 ha^{-1}), Emilia-Romagna (μ=993 m^3 ha^{-1}) and Lombardy (μ=932 m^3 ha^{-1}). The minor value was observed for Sardinia (μ=483 m^3 ha^{-1}), Calabria (μ=583 m^3 ha^{-1}) and Sicily(μ=596 m^3 ha^{-1}), all located in South. Umbria (μ=*6525*=m^3 ha^{-1}) detains

the highest WU_{Green}, while Sardinia(μ=3125 m^3 ha^{-1}), Regions located in South, the smallest ones (ratio of 2.1).WU_{Blue} presents values between 42 m^3 ha^{-1} in Sardinia (South) and 88 m^3 ha^{-1} in Umbria (Centre). Figure 1 allows an easier interpretation of WU of *durum wheat* production in Italy based on *durum wheat* production perhectare in terms of percentile.



Graphic 1. WU of *durum wheat* production in different Italian Regions (m^3 ha^{-1}).

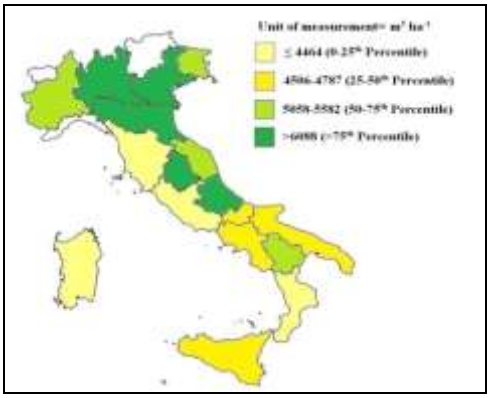


Figure 1. WU of *durum wheat* production in different Italian Regions.

Results in Graphic 1 and Figure 1 showed the existence of three main areas:

-North area with higher WU consumption, in particularly in the middle Regions;

-South area with lower WU consumption;

-Centre area with high heterogeneity in terms of WU consumption.

Mekonnen&Hoekstra (2014) sustain that if grey WF in crop production is reduced, worldwide, to the level of the best 25th percentile of current global production, water pollution is reduced by 54%.Chapagain et al. (2006) point out that majority of costs and impacts of water use and pollution caused in agriculture and industry are not translated in productprices.

Conclusion

The analysis of the results leads us to conclude that the national territory assumes characteristic features, in reference to water footprint for *durum wheat* production. In fact,Southern and Adriatic Regions have mainly a high value of the ratio in WU; this can be attributed both to a high value of WU for the production of *durum wheat* both to a total agricultural area smaller than Northern Italy area. Likewise it can be seen a marked distinction between the North and South (including some Tyrrhenian Regions) for WU related to *durum wheat* production. The drivers that influence the consumption of water for agricultural crops are numerous, but the main ones are: the use of fertilizers, the type of cultivation (at water demand level) and the characteristics of the terrain; they are the key factors for proper management of the total water balance.

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Motivations, Costs and Benefits in the Adoption of the European Ecolabel in the Tourist Sector. A Survey on the Italian Accommodation

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Abstract. In the last 20 years, the tourism industry has witnessed the proliferation of many ecolabels with different scopes and criteria and sometimes a limited area of recognition, which caused confusion among guests. In order to offer a tool useful for consumers and recognised all over Europe, in 2001 the European Union decided to extend its official ecolabel to the hospitality sector. Fifteen years since its introduction, Italy represents the first country in Europe in terms of adhesion to the European Ecolabel while in other countries like Austria, Spain and France, only a limited number of properties are certified. This paper aims at presenting a study of 36 Italian accommodation establishments with the European Ecolabel (out of 194, the 18.6% of the total) and analyses their motivations, difficulties, costs, and benefits deriving from its implementations.

***Keywords**: tourism, Italian accommodation, European Ecolabel*

Introduction

Ecolabels first appeared in the 1980s (e.g. Blue Flag) but they proliferated in the last 20 years (Buckley, 2002; Font, 2002; Plüss et al., 2012). The aim of ecolabels is to certify the environmentally friendly products and/or practices of a company. In doing so ecolabels provide numerous benefits for the tourist companies, tourists and society as a whole. Dabeva (2013) summaries the benefits of ecolabels in the hotel industry as follows: improved image of the company, increased product and company competitiveness, signal for the tourists about the product characteristics, improved product quality. In this way, the ecolabels help to curb some of the negative impacts of tourism (see Sasidharan et al., 2002). Furthermore, Buckley (2002: 185) points out that the ecolabel "becomes one of many characteristics a consumer may weigh, according to individual priorities and preferences, when comparing price and features for alternative tourism products". On the other hand, ecolabels are associated with costs – not only for the certification, but for the compliance with the ecolabel's standards as well. Sasidharan et al. (2002) emphasise the large expenses for environmentally friendly technology that are not within the budgets of small companies; thus, predominantly large companies can afford such certification. That is why the authors are relatively sceptical towards the ecolabels and think that they are "likely to function as nothing more than marketing gimmicks for large-scale enterprises" (p. 172). Furthermore, the increase in the number of the ecolabels for tourist accommodation, with different scopes and criteria and sometimes a limited area of recognition, has historically caused confusion to guests (Duglio and Beltramo, 2014). In order to put this kind of tools into order, in 2001 the European Union decided to extend its official ecolabel to the hospitality sector, proposing a set of criteria divided into two main categories: mandatory (29 criteria) and optional (61 criteria) (EU, 2009). This paper presents the results from a study of 36 out of 194 Italian accommodation establishments with the

European Ecolabel and analyses their motivations, costs and benefits deriving from its implementations.

Material and methods

Data were collected via online questionnaire sent to the managers of all certified accommodation establishments in Italy. The questionnaire, based on previous experiences in other similar researches (Provincia di Torino, 2005), contained 18 questions related to motivations, difficulties, costs and benefits of the adoption of the European Ecolabel. In regard to the motivations, difficulties and benefits, the questionnaire included a set of statements, measuring respondents' level of agreement on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The data analysis was carried out using descriptive statistics: frequency, percentages and means.

Results and discussion

The questionnaire was sent to 194 Italian accommodation. After the first mailing, 19 accommodation responded (9.8%). Therefore, after a reminder, 17 facilities responded (8.8%). In total, the survey involved a sample of 36 accommodation representing 18.6% of the population. The properties involved are divided in two main categories: 22 hotels (61%) and 14 non-hotel accommodation establishments (39%), which include all the other categories as mountain huts, agritourism and bed & breakfasts. On the basis of the category "hotel": 1 property was 2 stars, 11 – 3 stars and 10 establishments were 4 stars. Figure 1 reports the motivations in the adoption of the European Ecolabel:

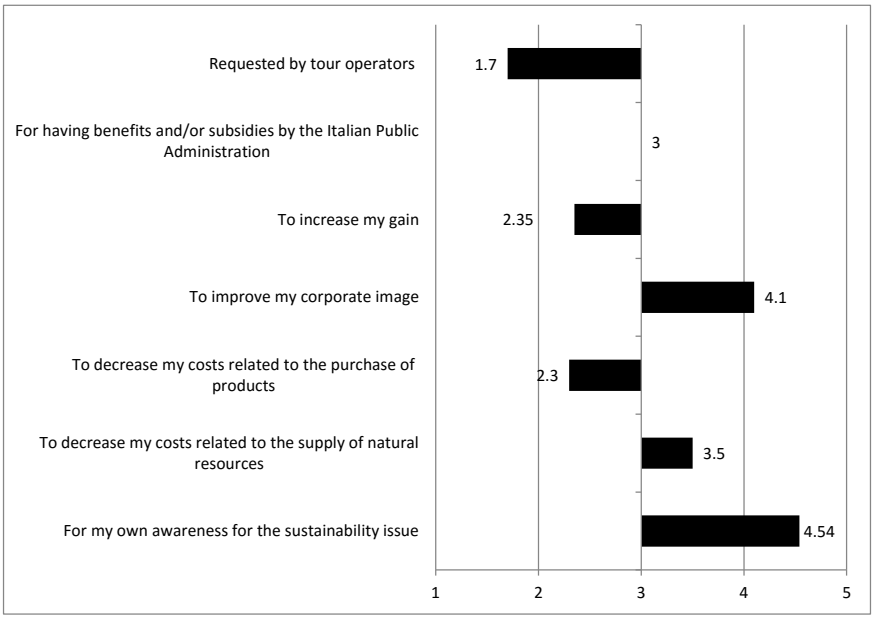

Figure 1. Motivations in the adoption of the European Ecolabel

The main motivations are related to the personal awareness of the sustainability issue (4.54) and for improving the corporate image (4.1). On the other hand, the role of the tour operators (1.7) and the opportunity of buying products at a lower cost (2.3) do not seem to be influential.

Figure 2 and 3 present the costs and benefits of ecolabels. It seems to be clear the division of the properties in the two categories of hotel and non-hotel accommodation establishments: in fact, 45% of the hotels (10 out of 22) incurred expenditures of more than 4,000 € (5 out of them are 4 stars hotels). On the other hand, for the majority of the non-hotel properties (7 out of 14) the declared expenditure is less than 2,000 €. The data suggest a direct correlation between dimension of the accommodation and costs in the adoption of the Ecolabel. Figure 3 reports the managers' perception related to the benefits of the adoption of the European Ecolabel. It is noteworthy that the only perceived benefits is connected with water saving and energy efficiency.

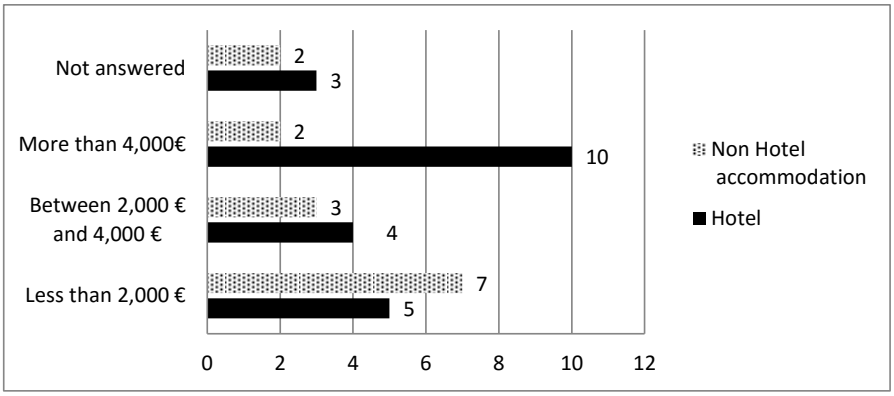

Figure 2. Costs in the adoption of the European Ecolabel

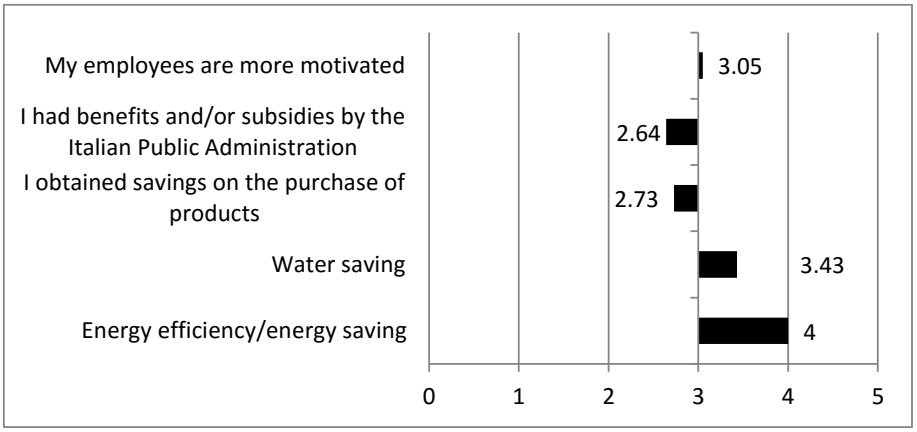

Figure 3. Benefits in the adoption of the European Ecolabel

Specific questions were suggested in order to investigate whether the Ecolabel could be a vector for improved financial results of the accommodation establishment. Firstly, there is a great difficulty in quantifying the benefits of the Ecolabel adhesion: only 3 hotels out of 36 properties (8.3%) affirm to be able to respond to this question. Secondly, even if a tourist seems to know this label, as 50% of hotel of and 35% of the non-hotel accommodation establishments' managers, the certification does not necessarily mean an increase in the number of guests. In fact, only 3 respondents note a major increase in the number of guests after the

certification. All these perceptions drive the managers to affirm how their expectations before obtaining the label have been substantially disproved (73% and 86%, respectively for hotels and other accommodation).

Conclusion

The main results of this work show both strong and critical point in the adoption of the European Ecolabel by the Italian accommodation establishments. On the one hand, the motivations in the adhesion to this tool show an increased awareness by the tourist managers as well as by the guests. Furthermore, the variable "costs" does not seem to create "a barrier". On the other hand, some difficulties in evaluating and, above all, quantifying the benefits persist among the Italian managers. The respondents' opinions reveal a lack of balance between expectations (the improvement of the corporate image) and related benefits (in terms of increase in the number of guests) that drives the managers to affirm how their expectations are not satisfied. In conclusion, even if Italy is the first country in Europe in terms of adhesion at the European Ecolabel (EU, 2016) with 194 accommodation involved, after more than 10 years from its first introduction, they only represent the 0.12% of the 158,000 accommodation establishments in the country (ISTAT, 2016).

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Fruit and Vegetable Wastes as a Source for Production of Biofuels

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Abstract. According to the concept of integrated waste management, significant attention is paid to the waste products emitted from different sectors of the food industry, including production and processing of fruits and vegetables. Waste from fruits and vegetables are specific waste; one of the possibilities for its utilization is its use as a source for obtaining biofuels. The main directions and trends on the possibilities for utilization of fruit and vegetable wastes as a source for obtaining biofuels are presented and analyzed in this paper. The main areas on which work in this field are presented. Descriptive analytical approach used in this paper.

Keywords*: fruit wastes, vegetable wastes, utilization, biofuels*

Introduction

Increased waste generation by residential and industrial sector is causing serious problems for human health and the environment. According to the concept of integrated waste management, significant attention is paid to the waste products emitted from different sectors of the food industry, including production and processing of fruits and vegetables. Biofuel production is one of the possibilities for utilization of waste from fruit and vegetables.

Material and methods

The object of this study is the fruit and vegetable wastes and exploring of possibilities for their use as biofuels. Descriptive analytical method is used in this paper. The information from various scientific publications is studied, analyzed, systematized and summarized.

Results and discussion

One of the main problems today in the world is the management of different types of waste and energy crisis. Waste from vegetable markets contribute to more pollution, which is why there is an urgent need to build and implement an effective system of waste management. Plant waste consisting largely of easily decomposing and rotting organic matter pose a serious risk to health and the environment (Sridevi & Ramanujam, 2012).

Waste from various branches of the food industry contain substances which, because of their corrosive or toxic effect, leading to damage to the sewerage network, adversely affect the operation of the central wastewater treatment plant decreased the purifying capacity of rivers and have an adverse effect on the conditions for life inhabiting these waters organisms. These substances, i.e. bases, acids, chlorides, solids and salts, contained in industrial waste water can be eliminated with physical, biological and chemical methods, or their concentrations can be reduced to an acceptable level (Ammar, 2014).

Huge quantities of agro-industrial waste materials resulting from the processing of agricultural raw materials are generated worldwide. Agro-industrial waste from the processing of sugar cane, oranges, coffee, rice is an appropriate material for bioconversion in chemical products containing citric acid as a result of fermentation processes, while giving more value to it which usually containing waste products. Microorganisms have long played an important role in the

development of food industry (dairy, fish and meat products) and in the production of alcoholic beverages. There is a great interest in the development and use of natural foods and supplements derived from microorganisms, since they are more desirable than synthetic ones produced by chemical processes. Agricultural waste consists mainly of complex polysaccharides that enhance microbial growth to obtain valuable in industrial relation concentrates (Ali, et. al., 2015).

In many processing enterprises of food industry much of the solid waste generated by the enterprise are obtained by separation of the target from the side food components in the initial stages of the transformation process. Adverse side components include soil and foreign, waste plant material, rotten food stocks, clippings, husks, bark, skin flakes, pits, seeds and pulp of fruits and vegetables. In some mills using cleaning with caustic soda to remove the skin of fruits and vegetables with a soft, delicate texture as tomatoes, depending on whether the alkalinity is neutralized. Waste materials with high moisture content can be generated in operations of cleaning and reuse, in which dissolved or suspended solids are concentrated and separated from the waste water stream (Ammar, 2014).

Utilization of waste in agriculture and animal feed are two completely realizable alternatives of management of waste. Neither of the two options is not unique and one of a kind. These capabilities are particularly preferred when waste from food processing industry because of the low content of the basic eligible contaminants. Currently landfilled or undergoing composting solid waste is treated in minor level using screens or strainers to separate the liquid from the solids by filtration or centrifugation. The solid waste is not treated prior to disposal where formed from juice extractors and operations of separation, for the removal of defective, damaged or rotten fruits and vegetables. Minimal processing, such as reducing the size and minor drying experienced and solid waste with low moisture content that are potentially suitable for use as fuel or for incineration (Ammar, 2014).

Organic food waste, including bark, peels, seeds, nuts, grains, hides, skins and bones of raw materials resulting from processing operations. Inorganic waste from the food industry usually include packaging materials such as plastic, glass, metal. The effluent from the processing of fruits and vegetables are high in suspended solids, organic sugar, starch, may contain pesticide residues. Solid fruit and vegetable waste, including organic materials (such as bark, peels, seeds, grains, nuts, skins), are subjected to conventional biological treatment and composting (Ammar, 2014).

Waste from fruit and vegetables represent a specific waste emitted by all fruit and vegetable markets and by many companies in the food industry. Due to their perishability, handling and disposal of such waste are essential for acceptance by society. The most appropriate conversion methods for treating waste from fruits and vegetables are biochemical processes such as anaerobic digestion, due to the high moisture content of the waste. To ensure process stability and better conversion efficiency, it is essential to accurately define the properties of feedstock, especially physical and chemical parameters as total solids, volatile solids content of carbon, nitrogen, a macro- and microelements. Based on these indicators can decide whether waste from fruits and vegetables can be used as a single material or as a co-substrate in the process of anaerobic digestion. Most studies on full characterization of waste fractions are focused on organic part of municipal solid waste on biomass from forestry and agriculture, domestic and industrial sectors, as well as food waste. Much of the research on waste fruit and vegetables are focused on their use as a co-substrate in the process of anaerobic digestion (Asquer, et. al., 2013).

Asquer et. al. considering waste from fruit and vegetables to be used as single, private substrate anaerobic digestion based on the existing scientific literature and based on the results of their analysis. The results obtained from the study of Asquer and coauthors show that waste from fruits and vegetables can be considered as an acceptable possess the necessary qualities, single, self feedstock for anaerobic

digestion. They have an optimum moisture content and volatile solids. In accordance with their chemical composition expected maximum concentration of methane in the biogas obtained is 70%. Table 1 presents the content of some elements in the waste of fruits and vegetables according to Asquer and coauthors (Asquer, et. al., 2013).

Table 1

Content of some elements in the waste of fruits and vegetables

Waste	Content of some elements, mg/kg								
	Fe	**Ca**	**Cu**	**K**	**Mg**	**Mn**	**Mo**	**Na**	**Zn**
Apricot	2,37	3,67	0,04	29,81	1,31	0,31	0,022	0,08	0,08
Aubergine	0,07	2,68	0,42	20,75	1,80	0,02	0,001	0,30	0,49
Banana	0,26	1,79	0,44	51,70	4,35	0,08	0,012	0,08	0,46
Broccoli	0,11	14,03	0,31	27,46	4,36	0,02	0,008	3,28	0,30
Cabbage	0,08	7,96	0,18	21,15	3,02	0,02	0,002	3,43	0,22
Carrot	0,12	6,27	0,15	14,27	2,24	0,03	0,003	8,75	0,10
Cucumber	0,05	3,78	0,05	12,41	1,85	0,01	0,002	1,19	0,06
Lemon	0,10	13,56	0,69	19,71	1,64	0,03	<0,001	0,42	1,14
Lettuce	0,42	6,93	0,31	30,11	1,67	0,08	0,001	1,26	1,13
Melon	0,19	3,70	0,80	37,60	3,60	0,02	<0,001	1,15	0,93
Watermelon	0,81	1,57	0,004	17,13	1,65	0,16	0,007	0,08	0,02
Onion	0,11	9,26	0,51	12,21	1,73	0,02	0,002	0,97	0,80
Orange	0,25	17,61	0,05	11,85	1,63	0,03	0,007	0,11	0,05
Peach	0,24	1,28	1,31	19,06	1,28	0,01	<0,002	0,11	8,40
Pear	0,08	0,94	0,49	7,86	0,68	0,01	<0,002	0,29	1,25
Pepper	0,09	0,61	0,83	15,84	1,10	0,01	<0,001	0,18	0,76
Pineapple	0,07	3,08	1,99	12,90	1,33	0,16	<0,001	0,08	1,53

Source: Asquer, et. al., 2013.

Anaerobic digestion of the organic fraction of municipal solid waste, especially food waste is cost-effective, efficient technology. Methane fermentation is a complex process. The total process of anaerobic digestion includes processes

such as enzymatic hydrolysis, atsidogeneza, acetogenesis, methanogenesis and metabolic every stage is supported by a number of microorganisms (Das & Mondal, 2013).

Anaerobic digestion is a suitable technology waste treatment, especially the organic fraction of solid waste such as fruit and vegetables. The properties waste shows that it is more appropriate they are subjected to anaerobic treatment than other types of treatments such as incineration. Plant waste is a potential source of energy production. Although required further studies to improve the design of the reactor and temperature control, energy released as a result of anaerobic digestion can be seen as a reason many countries start recycling valuable resources for energy recovery, separated in their processing (Sitorus, et. al., 2013).

Das & Mondal have tried to utilize waste from fruits and vegetables to produce bio-methane via anaerobic digestion. These include peel, peel husks, skins and waste pieces of fruit and vegetables. Experiments were carried out with four different concentrations of the starting slurry at three different temperatures. Added five different catalyst to promote the process of anaerobic digestion. It was found that the best results gives the process a 4% concentration of the starting slurry, held at 37ºC. This study provides information on the possibility of being recovered waste of fruits and vegetables through anaerobic digestion to produce biogas. The yield of biogas is increased through the use of a catalyst (oxides of aluminum, iron, tungsten, zinc, copper). (Das & Mondal, 2013).

Biofuels are the energy source of the future global aspect. Worldwide, over 30% of losses in the retail and consumption of agricultural products, including post-harvest and processing levels of wastage representing a major proportion. The process involves extraction of castor seed oil containing about 80% glycerides, followed by the preparation of ethanol from sweet potatoes. The further processing includes trans-esterification, which shows the greatest potential for biofuel production and the need of the hour to refuel the future (Chafle, et. al., 2014).

Biodiesel is a clean, non-toxic, renewable fuel; is obtained from a source of vegetable oils and its subsequent mixing with ethanol. It has a number of advantages from an environmental perspective; significantly reduces greenhouse gas emissions, the main components are carbon dioxide and carbon monoxide. Biodiesel is trying to impose as a potential basis for the development of various bio-industrial products, which could be decisive for the future development of the economy. The challenge lies in identifying these opportunities and to find a suitable spot in the global market (Chafle, et. al., 2014).

Waste of fruits and vegetables separate in agriculture production, processing and storage after harvesting, processing, packaging, distribution and consumption. Most solid waste, including fruit and vegetables, disposed of in landfills and cause serious environmental problems. Because of its nature and composition, these wastes easily deteriorate release an unpleasant odor. Given the high content of moisture and organic matter, more appropriate is this waste to undergo biological treatment anaerobic digestion than to apply other methods such as incineration and composting. Sitorus and coauthors offer recovery of bioenergy in the process. The authors have conducted anaerobic digestion of mixed waste from fruits and vegetables in a bioreactor with a capacity of 200 liters for 14 weeks in order to obtain biogas. The wastes are subjected to anaerobic digestion in a bioreactor at room temperature (Sitorus, et. al., 2013).

Anaerobic digestion is a process in which microorganisms break down biodegradable material in the absence of oxygen. The process is a great application for treatment of sewage sludge, industrial and agricultural waste as it is reduced to 50% mass and volume of the incoming material. It is regarded as a renewable source of energy, as the formed biogas rich in methane, it is suitable for the production of energy and can be considered as an alternative to fossil fuels. As part of the integrated system for waste management, anaerobic digestion reduces the amount of methane that would fall into the atmosphere, where the waste was landfilled. The

advantage of using anaerobic digestion of organic waste in urban areas, in contrast to composting, is the production of biogas with a high methane content, which can be used as fuel, while the composting is predominately carbon dioxide, which can not be used as fuel (Sitorus, et. al., 2013).

Anaerobic digestion is the most ecological and promising technique that will result in biogas production and utilization of wastewater as soil improvers, but requires longer processing time. Degradation and biogas depend on the composition of crop residues and products of fermentation. Sridevi and Ramanujam carried out the anaerobic digestion of waste vegetable reactors with a capacity of 500 ml. Carrots, beans and brinjal are used (Sridevi & Ramanujam, 2012).

Conclusion

Renewable fuels will continue to arouse interest as an alternative to fossil fuels in order to protect human health and the environment. One of the basic guidelines that can be drawn for future research is the search for new sources of renewable fuels to substitute for conventional fuels.

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Proposal of Environmental Aspects Assessment of Products

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Abstract. Commodity science, as an interdisciplinary field, has many references. One, of increasing importance, is to include the environmental aspects. Therefore, more and more technical and scientific work aims to improve the environmental profile of products, especially goods. A special role is played here by the engineers, whose activities have direct and indirect influence on resource conservation, e.g. through the minimizing the use of non-renewable resources while creating technical objects. Now, the challenge is to look for the ways of achieving the technical goals with the least possible impact on the environment. Therefore, it is necessary to create a framework of valuation of products' impact on the environment.

In this paper, a proposal for the assessment of environmental aspects in the design process of selected goods, especially machines and appliances, is presented. The environmental analysis is conducted on the wrapping machine, with the special interest given to its gear transmission. Using ecobalance methods, environmental indices for different constructions of gear wheels are created, and on this basis, an optimal combination of materials for elements of transmission gear - shaft, gear wheels and body - is found. The results of simulation produce many interesting observations, especially important for designers of technical objects. The undertaken

analysis shows that implementation of environmental aspects in the design process, can substantially reduce the environmental impacts of any technical object.

Keywords*: commodity, environmental aspects, products, technical objects*

Introduction

Until recently, an engineer's main task was to find solutions for practical problems including conditions (limitations) of mainly material, technological and economical nature. Ecological aspects need to be included as well in any design algorithm to provide low environmental impact profile of any technical object at the earliest stages of its life cycle (Kłos et al. 2005). Due to legislative pressure, customer requirements or even manufacturers' environmental policy, ecodesign is currently gaining in popularity in all industrial sectors. Although many product environmental impact assessment and Design for Environment (DfE) tools already exist, environmental aspects are unfortunately rarely routinely integrated into the product development process in the industry (Mathieux F. et al. 2007)

Ecodesigning is a process of designing products and product systems in order to minimize environmental impacts over the total product life cycle (ISO 2002). Most environmental impacts are "locked in" at the design stage, which is when key decisions are made on materials, manufacturing methods and how the product will be used and operated. Addressing environmental impacts at the design stage will produce solutions that are likely to be environmentally positive and cost effective (Design Institute of Australia 2004). The syllable "eco" refers to both economy and ecology (Schischke K. et al. 2005). This introduces additional dimension to traditional design. Still, important part is played by such aspects as functionality, safety, ergonomics, endurance, quality and costs. The additional criterion is a project

estimation taking into account its environment influence (Nowosielski R. et al. 2007).

Although it is not the only parameter to be considered in ecodesign, material selection obviously plays an important role in the development of environment-friendly products. Material choices have an impact on costs, manufacturing, recyclability, etc. The main factors upon which the designers rely when considering material choice are: the relationship between materials' specifications and technical, economic and environmental performance of the product, the practice of industrial design embedded in the product and its functionality (Field III F.R. et al. 2001).

Material and methods

In the design process, the designer makes many decisions on the basis of which durability, economic and environmental costs of the designed object are decided. The decision making process is dependent on many different factors, like: designer's knowledge and experience, available construction materials, machining methods (accessible technologies), environmental protection regulations etc. Basic decisions are always made, irrespective of problem type and complexity, others are made when solving unusual problems and happen very rarely. Some actions in the decision making process are one-time, others are recurrent, until a specified result is achieved. To systematize these activities, algorithmic methods have been found useful. They give the designers a possibility to design machines and appliances ergonomically. A design of a given object needs to be characterized first of all with a capability to meet the basic need to produce it in a possibly optimal way with no redundancy. It is not only connected with economic savings, but also with increased environmental friendliness of an object (Kurczewski P. Lewandowska A. 2008).

In the recent years, a preference towards low environmental profile of a machine expressed by its future users can be observed. The industry tries to include this requirement right from the beginning of the conception process, finding and

neutralizing possible areas where the environmental impact could prove to be highest, for example by using:

- appropriate selection of materials needed to manufacture given machine part,
- choice of adequate technological processes, providing lower energy consumption and in effect, minimizing the formation of toxic chemicals etc.

That is why not only the whole concept of the designed object is important, but also the concept of individual parts, mechanisms and nodes. Those, after passing through applicable environmental procedures contribute to the machine as a whole, becoming more environmentally friendly.

The machine considered in this research is a wrapping machine dispensing pasty products into cubes, including butter, lard, cottage cheese, minced meat, ice cream or baker's yeast.

In the presented example, various decisions need to be made concerning different elements of the transmission, some of which are listed below:

1) Transmission type: choice between belt drive, chain transmission and gear transmission. Environmental consequences are connected with vibration levels, noise emission, danger of lubricant spill, energy consumption.
2) Gearwheel type: choice between homogenous and modular wheels. Environmental consequences are connected with energy consumption during the machining processes and noise levels during wheel operation.
3) Gearwheel material: choice between steel, cast steel and polyamide. Although polyamide does not corrode, it is not resistant to high temperatures. As many plastics, it originates from petroleum, and petrochemical processes tend to produce very high environmental impacts.

4) Body type: choice between homogenous or compound. The decision is based on responsibility of designed transmission: if it is crucial to the machine operation, cast steel homogenous body should be used.

5) Body material: choice between cast steel and aluminum alloy. In this case, various factors need to be taken into account by the designer to provide high durability of the construction, low price and environmental impact.

According to the ISO 14040 and 14044 standards, a Life Cycle Assessment is carried out in four distinct phases that are often interdependent in that the results of one phase will inform how other phases are completed (ISO, 2006): goal and scope definition, inventory analysis, impact assessment and interpretation.

Results and discussion

In the presented application of LCA, only the gear transmission with simple gear wheels was analyzed. The reason for choosing this subsystem is its universality and widespread use in food processing machines. As it was presented above, first and basic problem a designer comes across is the gearwheel itself. The decision problem at his stage is the choice of its type and material it is made of. The chosen solution has consequences on the next links of the kinematic chain in the considered transmission. It is not only changes in dimension and mass of elements, but also specific, measurable environmental impacts.

In this phase of analysis, very important from the methodological point of view, gathering of available data concerning transmission is performed. Elements on which the data are gathered include: a pair of gearwheels, two shafts on which the wheels are set and the body in which the shafts are installed. Modifications including 12 different materials used for these elements will be taken into account in the LCA. This way, a large number of possible combinations will be available to choose from in the design process.

In the presented calculation case, each of possible transmission solutions works in the same conditions and bears the same workload. It is assumed that because of the distances between gearwheels, the distances between shafts have to be the same. This limitation causes the diameters of cooperating wheels to be the same, with only possible alterations in the width of the wheels.

To allow a comparison of environmental impacts generated by different versions of the transmission, its elements were created from different construction materials from the same group of stainless and acid-proof steel and cast steel.

The choice of material solutions affects the changes in design of the whole model of transmission. Strength characteristics of selected materials result in different width of gearwheels to carry the same workload. The change in width results in increase of dimensions and mass of elements. All these alterations cause different environmental impacts.

To eliminate a very large number of possible material combinations, sample analyses (in reference to 1 kg of each material) were conducted at the beginning. After verification of environmental impacts of chosen materials, those that are characterized with extreme (high and low) and mean environmental impacts have been chosen for further analysis, as well as those typically used for construction of food processing machines. Achieved results are presented in relation to the environmental point unit (Pt) and its 10^{-3} aliquot (mPt).

Achieved LCA results for the most and least favorable solution of cooperation between shaft, body and gearwheels give the following conclusions:

1) Total environmental impact of transmission using 3H13 steel shaft and body (most favorable solution from the environmental point of view) is 0.06236 Pt.

2) Total environmental impact of transmission using 00H17N14M2 shaft and 1H18N9T body (the least favorable solution in means of environmental impact) is 0.4748 Pt

3) Among the environmental impacts generated by a transmission composed of 3H13 shaft and body (most favorable solution in means of environmental impact), heavy metals creation is the category that burdens the natural environment the most

4) Most of the environmental burdens when using 00H17N14M2 shaft (least favorable solution in terms of environmental impact) are connected with soil acidification due to the emission of sulfur compounds, nitric oxides and ammonia in the life cycle

5) In case of using 1H18N9T body in the transmission (least favorable solution) impact levels are high in soil acidification and winter smog categories, with other categories having only slight importance.

The aggregated LCA results for the chosen variants are presented in Table 2.

Table 2.

Comparison of chosen transmissions models environmental profiles

No	Impact category	Unit	Most favorable solution 1H13/3H13/3H13	Typical solution 2H17N2/2H17N2/1H18N9T	Least favorable solution 00H17N14M2/00H17N14M2/ 1H18N9T
1	Climate change	Pt	0.00761	0.0156	0.0203
2	Ozone layer depletion	Pt	5.553E-05	7.11E-05	5.91E-05
3	Soil acidification	Pt	0.0241	0.23	0.334
4	Eutrophication	Pt	0.00267	0.00392	0.00491
5	Heavy metals	Pt	0.0412	0.0416	0.0423
6	Carcinogens	Pt	0.00887	0.00773	0.00956
7	Winter smog	Pt	0.0108	0.134	0.197
8	Summer smog	Pt	0.00118	0.00143	0.00181
Eco-Indicator		Pt	0.0966	0.434	0.610

Achieved results allow for multi-aspect comparison of three transmission variants being under consideration and in turn, formulation of conclusions:

1) Environmental indicator values for each proposed material solution of a transmission show that using 1H13 steel for gearwheels and 3H13 steel for shafts and body results in the lowest environmental burden (96.6 mPt).
2) Detailed analysis of proposed solutions environmental profiles identifies the destruction of the ecosystem due to emissions of sulfur compounds, nitric oxides and ammonia as the dominant negative aspect of their application in the manufacturing as well as other life cycle phases.

Conclusion

Undertaken analysis shows that implementation of environmental aspects in the design process can substantially reduce the environmental impacts of any technical object. This was presented on a case of a transmission system installed in a food processing machine, but it is also valid for any other element, subsystem or a system of the object.

Identification of environmental impact sources in relation to every element, subsystem and system of a machine should lead to undertaking actions aimed at improvement of the current situation. This relies on the increase of interest of designers, constructors and technologists to include ecobalancing methodology in their work, which in turn would result in:

1) Research and application of eco-friendly materials that guarantee the creation of lightweight, durable elements and systems; this can be done by proper selection of materials
2) Minimization of energy input to technological processes, mainly accompanying the machining of elements,

3) Use of environmentally friendly lubricants that reduce friction resistance in kinematic nodes of a machine and allow easier dismantling of elements.

All these activities should be supported with popularization of the idea of quantitative characterization of environmental impacts caused by technical objects. This should result in easier access to the related data, allowing designers to use them to create environmentally friendly machines and appliances or to improve existing solutions.

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V. QUALITY MANAGEMENT SYSTEMS, STANDARTIZATION AND CERTIFICATION OF PRODUCTS

"Certifications" And Sustainable Tourism In Italian Protected Natural Areas

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Abstract. Environmental sustainability of a territory is increasingly becoming a fundamental element of tourist attraction. Protected natural areas (PNA) could benefit from this trend principally thanks to their own natural resource endowment. Moreover, in recent years, they have taken the "active" role in several aspects related to government of the territory. Some management bodies of PNA have been able to manage and improve their "touristic capital" by adopting several "certification schemes" available, although not in a systematic way. In this paper, we analyzed some "certifications" notoriously considered highly relevant on an international level: "European Charter for Sustainable Tourism in Protected Area" - Part 1, UNESCO's "Man and Biosphere" Programme, ISO 14001:2015 certification, EMAS registration (Regulation EC n. 1221/2009). The analysis is aimed to identify the sharing points to define a theoretical framework that tries to describe the integrated adoption process of the "certifications". The study is focused on the Italian case.

***Keywords**: Protected Natural Area, Environmental Management System, European Charter for Sustainable Tourism in Protected Area, UNESCO's Man and the Biosphere Programme*

Introduction

In the last twenty years, sustainability has gained an increasingly important role within the tourism market, becoming a competitive factor. This trend has spawned the birth of the phenomenon of "sustainable tourism" (ST) (with the adoption of the Charter of Lanzarote on 1995) (1). In this context, the protected natural areas (PNA) have both the natural resources, and governance to play an "active" role in the governance of territory. Furthermore, they can become the main attractors of ST. Some management bodies of the PNA have adopted different types of "certification scheme" in order to improve the environmental sustainability of their policies and, therefore, to benefit from an increase of competitiveness in terms of improving the attractiveness of tourist destination. In this paper we analyzed some "certifications" that are notoriously considered highly relevant to international level: "European Charter for Sustainable Tourism in Protected Area" - Part 1 (ECST) (2), UNESCO's "Man and Biosphere" Programme (MAB) (3), ISO 14001:2015 certification, EMAS registration (Regulation EC n. 1221/2009). The analysis is aimed to identify the sharing points to define a theoretical framework that tries to describe the integrated adoption process of the "certifications". The study is focused on the Italian case.

Material and methods

The word "certifications" has a broader meaning than the one that characterizes the compliance with a standard/regulation (quality certification) or with a process (process certification) (Table 1). Hence, the word "certifications" encompasses the "recognition" granted to a MAB reserve. These "certifications" are analyzed using a comparative approach (4) (5) and classified according to a taxonomy, which links the different types of certification to its object (Table 1). Table 2 shows the main phases of the "certifications" and their "shared points".

Table 3 shows the main key tools/policies and benefits achieved by italians PNA which have at least one of the "certifications".

Table 1.

Taxonomy of "Certifications" of PNA

Type	Certification Body		Certification of Territory	
	YES	NO	YES	NO
Quality Certification	ISO 14001:2015; EMAS	/	/	ISO 14001:2015; EMAS
Process Certification	ECST Part I	MAB	ECST Part I; MAB	

Source: own elaboration

Results and discussion

Table 1 shows as ISO 14001:2015 and EMAS, although "quality certification of the managing body" and characterized by a higher potential of credibility, and legislative and environmental legitimacy (6), don't give to PNA a "certification of territory", unlike ECST (7). Table 2 shows that the main steps are shared by "certifications" and are in line with the approach of Deming cycle (plan, do, check, act). It is noted that the main core activities identified are declined according to the objectives pursued by "certifications". The "shared points" found in comparison of "certifications" are: stakeholder engagement, ecological analysis, socio-economic analysis, policies' analysis related to biodiversity conservation and territory's enhancement, and external audit. It stresses that the "stakeholder engagement" plays a major role within the entire certification process. Finally, you can notice that the "action plans" are shared tools even if available according to specific priorities.

Table 2.

Main phases of the "Certifications" and shared points

Main phases	Main tools/policies	ISO 14001:2015	EMAS	ECST Part I	MAB
Purpose phase	environmental policy	X	X		
	ECST principles			X	
	functions of biosphere reserves				X
Diagnostic phase	stakeholder engagement	X	X	X	X
	initial environmental review	X	X		
	context, stakeholders, risks and opportunities analysis; life cycle perspective (*)	X			
	diagnostic report			X	
	supporting documentation				X
	ecological analysis	X	X	X	X
	socio-economic analysis	X	X	X	X
	environmental criticality assessment	X	X		
	suppliers of environmental quality	X	X		
	tourist pressure analysis			X	
	policies' analysis related to biodiversity conservation and territory's enhancement	X	X	X	X
	sustainable tourism strategies and socio-economic development			X	X
	social activities, information and research				X
Operational and Control phases	stakeholder engagement	X	X	X	X
	environmental improvement programme	X	X		
	planning action (*)	X			
	sustainable tourism action plan			X	
	management plan of candidate management body				X
	external audit (**)	X	X	X	X

(*) Main innovations introduced by the new ISO 14001:2015. (**) It highlights the following periodicity: for ISO 14001/Emas an annual surveillance and three-year renewal, for ECTS a five-year renewal and MAB a ten-year renewal.

Source: own elaboration

In Table 3 it is noted that the "widened" action plan of ISO 14001:2015, allowing a focus on issues about sustainable tourism, it can promote the achievement of ECST. In addition, you can note that the EMAS improves the transparency of the commitment to the reduction of environmental impacts, as confirmed by the Italians PNA management body. Indeed, they consider the improvement benefits of indirect environmental impacts in first place in the ranking

of "external tangible benefits" (8). Finally, it is emphasised that for the Italians PNA recognized MAB reserves implementing long-term strategies (ten-year renewal) determined both aggregation/coordinating of different management bodies (e.g. "Valle del Ticino" and "Parco del Delta del Po") and the expansion of the protected area (e.g. "Miramare e della Costiera Triestina" and "Selve costiere di Toscana"), with the corresponding increase in the number of institutions in governance. The "MAB reserve of Collemeluccio-Montedimezzo" (established since 1977) is an interesting case study. Unesco, in the renewal of 2014, accepted both the expansion of the protected area (the areas administered by the seven municipalities of the area), and the adoption of a governance ("Consorzio AssoMAB altomatese") completely independent of the managing bodies of the two PNA that prior to renewal constituted the reserve MAB.

Table 3.

Key tools/policies and main benefits of "Certifications" in Italians PNA

Type	Key tools/policies	Main benefits
ISO 14001:2015	"widened" action plan (*); periodic internal audit	commitment "wider" to reduce environmental impacts (*)
EMAS	environmental declaration; periodic internal audit	transparency in the commitments to reduce environmental impacts
ECST Part I	sustainable tourism strategies and socio-economic development	bring measureable economic, social and environmental benefits from well-managed sustainable tourism
MAB	zoning: core area, buffer zone, transition area	improving governance of management body and extension of protected area

(*) "Widened" action plan also to the context analysis, to needs of stakeholders, to risks and opportunities, with the life-cycle perspective.

Source: own elaboration

Conclusion

The paper identifies for PNA a theoretical framework for "integrated" adoption of "certifications" in the long term. That framework is embodied in two stages. In the first, you take the new ISO 14001:2015 certification path to facilitate

adherence to ECST. In the second phase, the consolidated process of stakeholder engagement, after obtaining the EMAS, and relative increasing transparency, creates the conditions for existing management bodies (or even new) to prepare appropriate "supporting documentation" to obtain recognition MAB, with a zoning expanded. This integrated progressive certification path allows to optimize the exploitation of potentiality of sustainable tourism that PNA management body can activate.

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Agile Quality Management Systems: Challenges and Implications for Creative Industries

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Abstract. The importance of quality management and agility is growing both in academia and in practice, especially for creative industries. This paper provides a current overview of the existing body of the literature in the field of QMS and agility. The main objective is to provide a conceptual model of agile QMS that is aligned with ISO 9001 and could be easily implemented by companies from creative industries. The conceptual model captures the emerging debates around QMS and agility management. Research questions driving this paper are twofold: 1/ to define the key principles of agile QMS; and 2/ to identify the possibilities to apply agile QMS that is aligned with ISO 9001.

***Keywords**: QMS, agility, ISO 9001, creative industries*

Introduction

The importance of quality management and agility is growing both in academia and in practice, especially for creative industries. The predominant notion in specialised literature is that agility and QMS, particularly those developed according to the requirements of ISO 9001, are not compatible. ISO usually is characterised as being heavy on documentation and rigid on implementation which is the opposite of agility approach. The problems with the implementation of ISO

9001 requirements in the field of services deepens because of the specific characteristics of services.

Service quality: challenges for QMS implementation

Service quality is a concept that has aroused considerable interest and debate in the research literature because of the difficulties in both defining it and measuring it with no overall consensus emerging on either (Wisniewski, 2001). There are a number of different "definitions" in a research literature as to what is meant by service quality. One that is commonly used defines service quality as the extent to which a service meets customers' needs or expectations (Lewis and Mitchell, 1990; Dotchin and Oakland, 1994a; Asubonteng *et al* ., 1996; Wisniewski and Donnelly, 1996). Service quality usually is conceptualised as a multi-level construct.

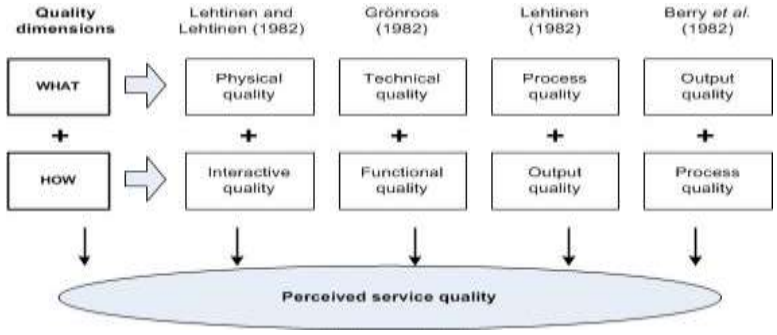

Figure 1. Dimensions of service quality
Source: Kang, G., The hierarchical structure of service quality: integration of technical and functional quality, Managing Service Quality, 16/1, 2006, p. 40

Figure 1 summarises different points of view toward service quality by schematically presenting a categorisation of the dimensions of service quality as suggested by them.

Creative industries in European economy

The analysis of the European Cluster Observatory's first "Emerging Industries" report (2012) identified seven emerging industries[1]. The core cluster categories inside creative industries comprise the following: music, video, communications, performing arts, marketing, printing. According to the ECO report (2014) creative industries is the key sector in future European economy and has been growing faster than any emerging industry in the past two decades. They are are the largest of the emerging industries in terms of employment and by the number of enterprises. Comparative profiles of creative industries in Bulgaria, Romania, Greece and Hungary by key parameters are provided in Figure 2, Figure 3 and Table 1.

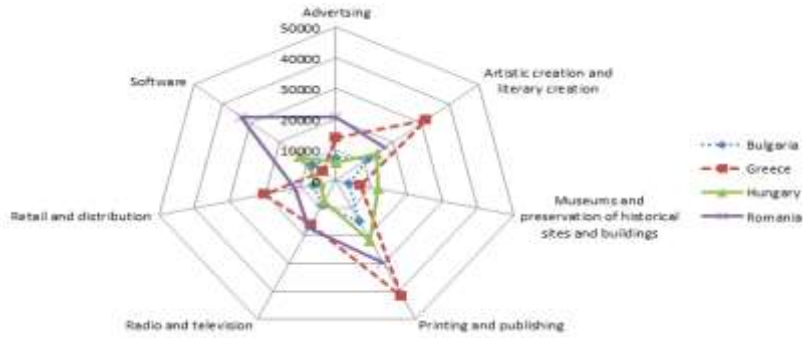

Figure 2. Comparative profiles of creative industries clusters by employees

It is evident that performance of creative industries by number of employees differs substantially both for the core cluster categories and for the countries while the pattern for average wages[2] is the same for the core cluster categories (software at the first place followed by radio and TV). The scale of average wages differs by countries (Hungary at the first place followed by Bulgaria and Romania with almost the same level of average wages).

[1] creative industries, eco industries, experience industries, maritime industries, mobile services industries, mobility industries, and personalised medicine industries

[2] Wages are used as a proxy for productivity

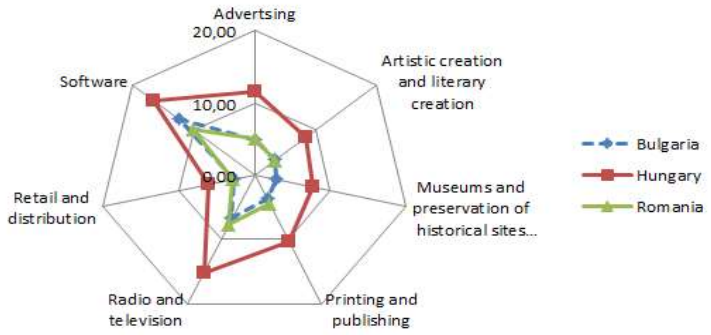

Figure 3. Comparative profiles of creative industries clusters by average wages[1]

Table 1.

Comparison of core cluster categories in creative industries, Bulgaria and Romania

	Bulgaria				Romania			
Core cluster categories	**Employees**	**Enterprises**	**Employees per enterprise**	**Average wage**	**Employees**	**Enterprises**	**Employees per enterprise**	**Average wage**
Advertsing	7532	3059	2,50	4,78	20520	6336	3,20	4,98
Artistic creation and literary creation	11410	4183	2,70	3,34	17105	7543	2,70	3,24
Museums and preservation of historical sites and buildings	3732	213	17,50	2,90	n.a.	185	n.a.	n.a.
Printing and publishing	14523	2089	7,00	3,77	29420	4013	7,30	4,42
Radio and television	8760	825	10,60	6,75	16959	2058	8,30	7,67
Retail and distribution	6331	2352	2,70	2,65	11696	2240	5,20	2,84
Software	8318	1123	7,40	12,35	33214	4954	6,70	10,18

Being a flagship for European policy initiatives and goals to be reached by 2020, creative industries attract a lot of attention. Quality management and improvement of productivity are critical issues for their development.

Integration of QMS with the agility approach: a conceptual model

Scholars and researchers suggest a variety of definitions for the concept of agility and apply it to different disciplines, therefore there is no accurately or agreed definition for the concept of agility across different disciplines of business (Abuzaid, 2015: 89). For the purpose of this paper we assume the definition of agility as "the

[1] Average wage per employee per hour in the region

strategic mix of standardization and flexibility, targeted at those organizational pressure points where they're not only needed today, but will most likely be needed tomorrow" (Browning et al., 2008: p. 5). The difference between traditional and agile perception of the key elements of QMS is presented in Table 2.

Table 2.

Key elements of QMS: traditional vs agile situation

Key elements of QMS	Traditional situation	Agile situation
Quality policy	Quality policies are usually documented and elaborated by the top management or with its contribution.	The agile quality policy is formalised in the team's working agreements. Working agreements are developed in collaboration with the relevant stakeholders based on mutual understanding of the approach and the product vision.
Quality objectives	The purpose of quality objectives is to determine conformity to (customer and regulatory) requirements, and facilitate the effective deployment and improvement of QMS.	In agile situation quality objectives are validated against real customer satisfaction, which is highly subjective and cannot be formalised.
Data management	This element is managed and controlled by adoption of appropriate practices and procedures to fulfill the specific customer needs.	Scrum framework is used to provide smooth, lean, and transparent data flow.
Resources	Efficient use and management of the available resources, e.g. technology, human, material, and information.	Resources are part of the team formation and business case. Solutions are created with the support of use cases and teams' own tacit knowledge. Then they are validated in sprints.
Transparency and independence audit	Existing methods are evaluated according to the required standard procedures during the audit process.	Transparency is embedded in agility principles. Daily monitoring allows the teams to know how they progress toward their goal by knowing what each member is doing.

Source: Adapted by "Agile as a QMS: mapping elements of QMS to agile principles" [https://www.scrumalliance.org/community/articles/2015/december/agile-as-a-quality-management-system]

Based on the comparative analysis of the QMS elements for both situations and 7 in-depth interviews with CEOs from Bulgarian software industry (with implemented QMS ISO 9001-2008) it was suggested that the succesful implementation of agile QMS requires compliance with the following agility principles: 1/ establish leadership which highest priority is to satisfy the customer, 2/ create case for change since agile processes harness change for the customer's competitive advantage, 3/ build partnerships which allow business people and developers to work together daily throughout the project, 4/ contextualise and

prioritise solutions through continuous attention to technical excellence, 5/ mobilise capabilities by building projects around motivated individuals, and 6/ ensure continuity by promoting sustainable development through agile processes.

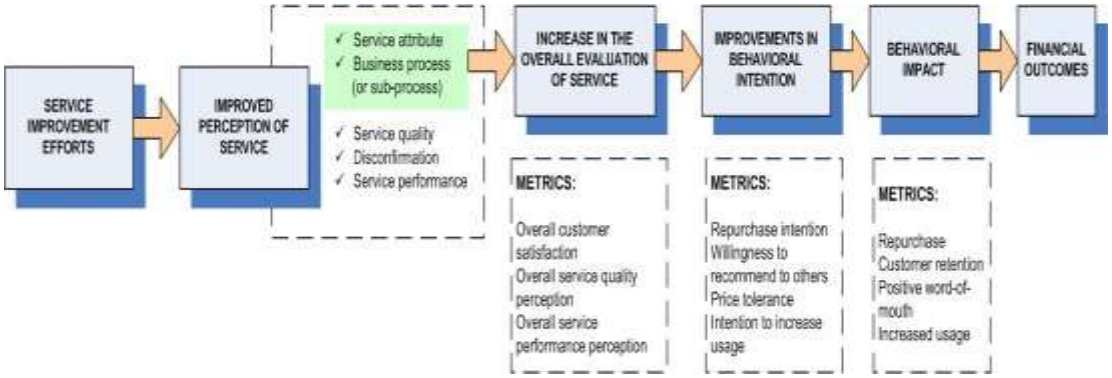

Figure 4. The process of integration of agility approach to QMS implementation in creative industries

Successful integration of agility approach to QMS implementation in creative industries (Figure 4) requires a process-based approach with clearly established goals defined by metrics at each stage. This approach allows progess monitoring at regular intervals, where the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly. Self-organising teams become the main quality driver for creative industries development. This enables delivery of the service frequently with a preference to the shorter timescale.

Conclusion

Successful implementation of agility principles requires QMS to be structured around highly evolved teams, to focus on customer driven requirements, to be implemented within short development cycles, to allow direct communication within the teams. The focus on documentation should be redirected to development of a set of procedures in a workshop format and creation of self-directed teams.

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Exploring Customers' Perceptions about Quality Management Systems: an Empirical Study

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Abstract. A Quality Management System (QMS) includes the organizational structure, activities, programs and actions designed to ensure that a product, process or service conforms to the objectives and the purposes for which it is to be used, starting from the initial identification of the needs and expectations of customers to their satisfaction. The aim of this research is to explore the knowledge and perceptions of customers about companies' QMS related to business process management (ISO 9001), environment (ISO 14001, EMAS III), health and safety at work (OHSAS 18001), social responsibilities-ethics (SA 8000), and food quality (HACCP); moreover it tries to investigate if their presence in a company increases customer satisfaction about the quality of the organization and the product or service that it produces or supplies.

***Keywords**: Quality Management Systems, Standards, Customer Satisfaction, Quality*

Introduction

The conformation and application of standardized quality system models are considered to be one of the most important phenomena in quality management development and globalization (Dale et al., 2001). Companies are increasingly using

QMS as a tool to obtain not only internal benefits but also external ones, such as customer satisfaction and loyalty. These standardized models were designed as a supplier - client - customer relationship regulation mechanism and as the part of an external quality management idea. The main purpose of quality system implementation is to prove to the customer the company's ability to control properly all quality factors, which ensure the conformity of certain quality measures to specified requirements (Ruzevicus, Adomaitiene and Sirvidaite, 2004). Many studies have considered QMS from the company perspective (Martı´nez-Costa &Martı´nez-Lorente, 2003; Sampaio, Saraiva and Rodrigues 2009; Sebhatu&Enquist, 2007;Sánchez-Ollero, García-Pozo and Marchante-Lara, 2011; Taríet al. 2010; Grunert, 2007; McMurrian&Matulich, 2006), without evaluating consumer perceptions. Considering that, the aim of this research is to understand if Italian consumers are aware of QMS and whether the presence in the company of such systems is a distinguishing factor in terms of greater customer trust and satisfaction and if it can lead to obtain benefits in terms of increased sales and more customer satisfaction and loyalty.

Materials and methods

The research was carried out through a questionnaire proposed to an heterogeneous sample of 1040 consumersthatwerebornorliving in Italy. Ithasbeenidentified an heterogeneous sample ofcustomers in termsofage in ordertoobtain a wider vision on costumers' perceptionof QMS, andtounderstandwhetherageis an importantfactorofperceptionandchoice. Data have been collected from 15 September to 15 December 2015. In data processing we have used statistical analysis techniques to measureMean, Standard Deviation (SD) and Pearson's correlation (r).

Results and discussion

The 45% of the sample (468 customers) are male, while the 55% (572 customers) are female. The 37% is composed by consumers with less than 25 years old, the 34,5% from 26 to 35, the 11,4% from 36 to 45 and the 17,1% by consumers with more than 46 years old. The 0,2% has a primary school diploma, the 9% has a middle school diploma, the 33,4% has a technical diploma, the 20,8% has an high school graduation, the 31% has a university degree and finally the 5,6% has a postgraduate course or master or a Ph.D. degree. Table 1 shows that more than half of the sample (except for the youngest segment) knows ISO 9001 and consumers feels safer if a company is certified. Considering environmental standards, the groups between 26 and 45 years old are those that have greater awareness; moreover about the 55% of the total sample declared that thinking may be influenced positively by adopting one of the two models (ISO 14001 and EMAS). Only the 20% of the sample considers environment as an important factor in buying decisions. About the 70% of the total sample said they don't know OHSAS 18001 standard. Despite this, approximately the 80% declared that the presence of this certification could increase his satisfaction. Subsequently considering a Management System of Corporate Social Responsibility, about the 80% of the total sample declared that he had never heard of SA 8000, but approximately the 70% declared that the presence of this certification would increase his satisfaction. Finally the 60% claims to have heard about "Hazard Analysis Critical Control Point (HACCP)". This percentage rises to 70% if we consider the age group between 36 and 45 years, while it decreases (approximately 50%) in the band below 25 years.

Table 1.

Consumer Knowledge and Perception of Quality Management Systems

		Knowledge of the standard *		Total (Mean %) (N)	Greater perceived quality and security of certified organization **			Total (Mean %) (N)
	AGE	**Yes**	**No**		**Yes**	**I don'tk now**	**No**	
UNI EN ISO 9001	**< 25**	45,3%	54,7%		50,0%	42,2%	7,8%	
	26-35	75,4%	24,6%		67,6%	21,8%	10,6%	
	36-45	86,7%	13,3%	72,9% (698)	71,7%	11,7%	16,7%	66,7% (658)
	> 45	84,3%	15,7%		77,5%	6,7%	15,7%	
EMAS III/ISO 14001	**< 25**	23,4%	76,6%		50,0%	42,2%	7,8%	
	26-35	36,9%	63,1%		60,3%	32,4%	7,3%	
	36-45	35,0%	65,0%	31,1% (316)	53,3%	35,0%	11,7%	56,1% (580)
	> 45	29,2%	70,8%		60,7%	28,1%	11,2%	
OHSAS 18001	**< 25**	21,9%	78,1%		82,3%	12,0%	5,7%	
	26-35	36,3%	63,7%		77,1%	14,5%	8,4%	
	36-45	23,3%	76,7%	26,3% (284)	86,7%	10,0%	3,3%	80,3% (830)
	> 45	23,6%	76,4%		75,3%	11,2%	13,5%	
SA 8000	**< 25**	12,5%	87,5%		69,8%	23,4%	6,8%	
	26-35	26,3%	73,7%		69,8%	20,7%	9,5%	
	36-45	11,7%	88,3%	17,1% (188)	70,0%	18,3%	11,7%	70,7% (732)
	> 45	18,0%	82,0%		73,0%	10,1%	16,9%	
HACCP	**< 25**	49,5%	50,5%		-	-	-	-
	26-35	67,0%	33,0%		-	-	-	
	36-45	70,0%	30,0%	62,1% (624)	-	-	-	
	> 45	61,8%	38,2%		-	-	-	

* Knowledge (in %) divided by age group

** Perceived quality (in %) divided by age group

Table 2 shows that all issues subjected to costumers were assessed with high importance in a Likert scale from 1 to 5 with values between 3 and 5; Standard Deviation is in almost all cases good indicating a slight dispersion from the average. Moreover there is no correlation between perception and age, except with regard of the level of quality perceived with the possession of SA8000 standard, indicating that older consumers consider these theme more important. Also between perception and educational degree there is no correlation.

Table 2.

Consumer Perception on Product, Environment and Food Quality, Ethics and Security

	Mean (SD)	r perception/age	r perception/ educational degree	Total respondents% (N)
Importance of a product/ service quality	4,43 (0,64)	0,11	-0,03	100% (520)
Perceived product/ service/organization quality with ISO 9001	3,98 (0,67)	0,06	0,04	63,3% (329)
Importance that a product respects the environment	4,45 (0,76)	0,05	0,00	100% (520)
Perceived quality with ISO 14001 / EMAS III	3,95 (0,69)	0,05	0,05	55,8% (290)
Importance of the issue of health and safety at work	4,82 (0,42)	0,05	-0,03	100% (520)
Perceived security with OHSAS 18001	4,37 (0,67)	0,05	0,09	79,8% (415)
Importance of social responsibility and ethics in a company	4,26 (0,72)	0,10	-0,01	100% (520)
Perceived quality and safety with SA8000	4,29 (0,63)	0,21	0,08	70,4% (366)
Importance of food quality	4,73 (0,49)	0,04	0,00	100% (520)

Conclusion

The research shows that today's consumer is a person attentive to quality rather than quantity. All subjects evaluated (the product and service quality, the respect and protection of the environment, the health and safety of workers, social responsibility and ethics and food quality) are considered by most of the sample of high importance, even if the issues considered most important among these are health and safety of workers and the food quality.The standard ISO 9001 and the HACCP protocol are known to most of the sample while ISO 14001, EMAS III, OHSAS 18001 and SA 8000 are less known and it would be necessary to make the consumers more aware of these issues. Moreover a large part of the sample declared that they received greater safety and satisfaction with the presence of these different standards and QMS in the company. So we suppose that surely these standards could

be used from the company as a good tool in order to increase customer satisfaction of its clients.

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Linking "*Student satisfaction*" with *Quality Function Deployment* (QFD) to manage Higher Education in Italy

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Abstract. From 2005, all European countries had to create their appropriate university Quality Assurance systems. Italy, in this process, has accumulated a significant delay; in fact only starting from 2013, all Italian universities are obliged by law to adopt the Auto-evaluation, periodic Evaluation, Accreditation (AVA) method. The aim of this paper is to consider the interconnections between the AVA method and Quality Function Deployment (QFD) in order to create a model that could facilitate the application of the AVA approach.

Keywords*: Education; Student satisfaction; AVA method; QFD*

Introduction

Nowadays Universities produce Higher Education as a product and have been driven by competition to examine the quality of their services, to redefine their product and to measure customer satisfaction (Cruickshank, 2010). The American system was one of the first to apply quality models to the education sector. In Europe, through the Bologna Declaration of 1999 the Bologna process was born, where the Europeanministers set out to achieve the European Higher Education

Area. All this in 2005 led to the formulation of Standards and Guidelines for Quality Assurance. From that moment, all European countries had to create their appropriate university systems. Italy, in this process, has accumulated a significant delay. Just in 2011, it was born the National Agency for the Evaluation of Universities and Research Institutes (ANVUR), who assumed managerial autonomy in 2012 and adopted AVA mandatory's method for all universities. Starting from 2013, all Italian universities are obliged by law to adopt the AVA method, an evaluation method, in which the university's customer satisfaction is critical. The change introduced by this approach leads us to consider the student as the main customer for university, breaking with outdated schemes in which the student was considered to be the product. Here it lies the great difficulty of Italian academic institutions to make their own this methodology, acquiring new patterns of behavior and approach. The aim of this paper is to consider the interconnections between the AVA method and QFD in order to create a model that could facilitate the AVA application.

Materials and methods

Over the past decades several quality tools have been applied in academic institutions to enhance their effectiveness and efficiency (e.g. Total Quality Management (TQM), Total Quality Control (TQC), QFD). In particular, the role of QFD to improve management education is highlighted in various researches (Ahmed, 2006; Singh,Grover and Kumar, 2008; JamaliAramoon and Mansoori, 2010). The QFD is a technique used to identify the presence of correlated design characteristics and customer requirements and to implement customer requirements; the purpose is to visualize cause-and-effect relationships starting from the customer needs all the way down to the production process. The House of Quality is the matrix that forms the central tool of the method and it is most commonly applied between the 'perceived needs'and 'product specification'in design process (Olewnik& Lewis, 2008). QFD can be used to improve university educational

activities at all levels, from degree program design, to the design of specific courses (Aytac&Deniz, 2005). Thanks to QFD, Hwarng&Teo (2001) identified who would be the customers in Higher Education: students, the faculty itself, employers, the administration, private companies, industries, the local community, general citizens, etc. Among all these stakeholders, the prevailing Anglo-Saxon literature (Burrows,Harvey and Green, 1992; Harvey &Green, 1992) considers the student as the primary customer of the University.Based on of these considerations,we argue that QFD is the ideal tool for identifying customer (student) needs and translating them into instructional strategies that will meet these requirements. But how to connect QFD to the AVA method?

Results and discussion

The application of the AVA method in Italian academic institutions cannot be treated separately from considering the client-student as an absolute priority in every academic activities planning. As a consequence of this vision, we suggest that the correct adoption of the AVA method requires a change that could be based on 'seven keys' (Amidani&Murmura, 2004) which may be closely related to the QFD technique, in which it is fundamental the centrality and satisfaction of customer. Below there is a description of the 'seven keys' and their possible links with QFD.

Table 1.

Connection between "Seven doors" and QFD.

"***Seven doors***"	**Connection with QFD**
The first door: changingattitude	This aspect can be considered asCustomer Requirements, called "WHATs"in QFD phylosophy. This aspect can be linked to the first step of the House of Quality model that is 'identifingcustomersneeds and collect them (WHATs)'. In QFD method, customers tipically identify one hundred to four hundred needs, including basic needs (what they just assume the product will do), articulated needs (what they say they want the product to do), and excitement needs (which, if they were fulfilled they would delight and surprise customers), (Hauser, 1993).

The second door: breaking down barriers	It transforms the needs of the student in training modules, Priorities and Objectives. The wants and needs provided by the customer have to be translated into measurable scale units to be susceptible for market research. Since the statements of the customer are not always clear and comprehensible, they must be interpreted and explained. For that the QFD approach provides a rare opportunity to work on cross-functional teams, employee involvement and participating management by discussing the meaning and importance of the 'WHATs' (Govers, 2001).
The third door: shooting fear	Fear is sometimes the factor that blocks the process of knowledge internalization. When contact between teachers and students is missing, an awful aura develops around the professor who becomes, in students' imaginations, more similar to a terrifying tyrant than to an educator at their service. In QFD it is possible to use the *Relationship Matrix* to analyze this relation. The relationship matrix is the tool used by the team to determine the relationship between customer needs and the company's ability to meet those needs. Relationships can either be weak, moderate, or strong and carry a numeric value of 1, 3 or 9 (Chan &Wu, 2005).
The fourth door: removing the concept of instant gratification	It extends the value of service Customer perception: it illustrates and quantifies customer perceptions. In QFD customer perceptions of how well the company's current product and competitive products fulfill customer needs are useful for guiding product design. By understanding which products fulfill customer needs best, how well those customers needs are fulfilled, and whether there are any gaps between the best product and the company's product, the QFD team can identify goals and opportunities for product design (Hauser,1993).
The fifth door: discovering and understanding the needs in order to satisfy them	It permits to understand the student opinion. In this case we can determine two main types of attributes of the customer: those related to the training of the student and the inputs of the working world. In QFD to manage the customer needs, the team has to structure them into a hierarchy. The primary needs, also known as strategic needs, set the strategic direction for the product. Secondary needs, also known as tactical needs, are elaborations of the primary needs (Hauser, 1993). To each *attribute of the customer* itis assigned an index of importance. It prompts the student (or group of customers) to assign a score based on the priority of training needs.
The sixth door: stimulating curiosity	If we stimulate curiosity in students, they can define their needs in a better way and it is useful to Design targets (HOW MUCH): it determines priorities by assigning important ratings to specific design requirements. In QFD the operationalization of How's are the HOW MUCH's. The How Much's should be measurable as much as possible. If How much are not measurable or non descriptive, then we have not been detailed enough in our definition of the How's (Govers, 1996).

The seventh door: enhancing intelligent	The Enhancement of individual characteristics and inclinations, permits to motivate and stimulate students so that they can cultivate and expand personal abilities in parallel with the acquisition of knowledge. It is important to try to offer 'services' based on personal attitude of customer. The customer, that in our case is the student, has to compile a list of quantifiable product characteristics, that are in line with his personality. This is linkedin QFD to Design requirements (HOW). The design requirements result from the translation of customer wishes into technical specifications. This list must be in balance with the available expertise and the given time and cost frames of the project (Govers, 1996). The Technical Test Measures and Technical Difficulty Ratings represent designer evaluations among the Technical Attributes. Target Value Specifications represent the target levels that each Technical Attributes has to reach.

Conclusion

The adoption of the AVA method requires a change and the application of a model based on student oriented education is the key of the relationship between QFD and AVA.

As Coskun (2014) stated, Universities should always consider that their goal is the satisfaction of students and so, we should understand their needs and expectations. Motivating and stimulating students to expand personal abilities in parallel with the acquisition of knowledge is an important value that link Academic World, Job Market and the development of student skills. Analyzing the need of 'customer' means analyzing 'students' and the use of a technique based on 'seven keys' oriented to student satisfaction along the lines of QFD could improve the adoption of the Italian evaluation model in Higher Education.

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Quality in the Reporting of Sustainable Development of Enterprises

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Abstract. Sustainable development on a macro-economics scale assumes the integral nature of the triad: economy-environment-society. Sustainable development is a concept of long-term economic development, which makes it possible to satisfy the needs of the present generation and does not limit this possibility for future generations. The implementation of sustainable development at enterprise level should mean the integration of economic, environmental and social goals in the management process. Declare the company to operate in accordance with the principles of sustainable development. Sustainable development requires the measurement and evaluation his implementation. For this reporting systems are used. Quality became a challenge for contemporary management. Quality is a factor determining the level of customer satisfaction and decides on enterprise success in the market. At the same time, assuring specified quality level entails some expenditures to be incurred to achieve this goal. In effectiveness analysis behind of cost calculation for objects and processes (measuring the method how these costs are incurred and included into effectiveness) some non-financial measures such as measuring the quality of undertaken activities. The article discusses the guidelines of the Global Initiative (GRI), which are the main systems of sustainable development reporting. Presents analysis report GRI -4, particular indexes were characterized. The key elements of characterized indexes were information about quality management. Particular attention was paid to quality the GRI reporting, and

framework for the content and quality problem in the report. The role of quality in the process of contemporary enterprise management is analyzed. Product quality is a determinant of effectiveness and a factor of enterprise development.

Keywords*: quality, reporting, sustainable development*

Introduction

Informing about sustainable development of enterprises becomes more and more popular although there is no obligation to do so. Many enterprises extend the range of information by voluntary disclosures to give a more complete picture of their activity. Quality issues are connected with sustainable development of an enterprise. The quality category is most often identified with characteristics of products and services which meet customer expectations. Quality refers to the whole process of enterprise management process, including accounting and reporting its results to a wider stakeholder group. The aim of this paper is to identify quality in reporting enterprise sustainable development. The role of quality as a sustainable developing reporting rule according to GRI and including quality assessment into the GRI G4 report.

The role of quality in enterprise sustainable development

Any modern enterprise to achieve and keep its competitive advantage must consider more and more strict environmental regulations. Quality becomes one of the primary factors deciding on an enterprise success. Quality is define as the totality of features and characteristics of a product or service in the product design, manufacturing, service and marketing that bears its ability to satisfy stated or implied needs (Beckford, 1998). Quality should be also identified with coordinated and effective management activities related tom making both running and strategic organisation management decisions, i.e. it is possible to say about quality

management. The quality effects obtained during management processes materialize in actual product manufacturing and service providing.

Under highly changing and unstable environmental conditions the base of safe functioning of an enterprise becomes good relations with interested entities, including a stakeholder group deciding on its existence. The measure how the product quality meets customer expectation is their satisfaction. Product of service quality refer to a number of features and characteristics deciding on customer satisfaction, e.g. reliability (ability to work for a specified time), usability (suitability of product features), conformity to requirements (standards), durability (ability to be used during a specified time), easiness (easy service and repair), appearance, perceived by a customer as being connected with a product brand (Griffin, 2002).

The achieving of desired product quality is tied with responsibility for the product and its users. Continuous development to achieve the desired quality should be ensured by Total Quality Management (TQM), i.e. a management process applied to all enterprise management activities and product manufacturing processes to satisfy customer satisfaction (Lock et al. 2003). Such management process includes not only product improvement, but also enhancement of work quality, i.e. employee qualification, technologies, processes, marketing and planning activities.

These aspects of enterprise management are pointed out by the sustainable development strategy. Monitoring and assessment of sustainable development is carried out more effectively within the framework of the processes and organizational structures existing in the present enterprise quality management system. Linking quality management to sustainable development results from the transition from satisfying the customer needs and expectations to creating values for a wider group of stakeholders. An important element of TQM is putting more attention to quality of enterprise connections with its environment, that is expressed in safety and work conditions as well as environmental protection and fulfilling

other social aims. All these management aspects are within the area of interest in reporting enterprise sustainable development.

Quality of result reporting and revealing according to GRI

Sustainability reporting decides not only on quality of enterprise management, but is related also to quality assurance items. The sustainability reporting guidelines set forth by *Global Reporting Initiative* (GRI) belong to the basic reporting standards. The first GRI guidelines were published in 2000, while its third edition, so called G3, was issued in 2006, and the forth integrated version G4 was completed in 2013.

Global Reporting Initiative contains reporting rules, guidelines and standard information. The importance of GRI is confirmed by adhering to the rules of report quality assurance as well as considering quality management as a part of the report. The reporting rules are targeted at providing transparency in issues and indictors presented in a report (Fig. 1).

The GRI Guidelines are included into the following two groups:

- quality assurance rules and proper information presentation,
- rules for identifying problems and indicators to be revealed in reports.

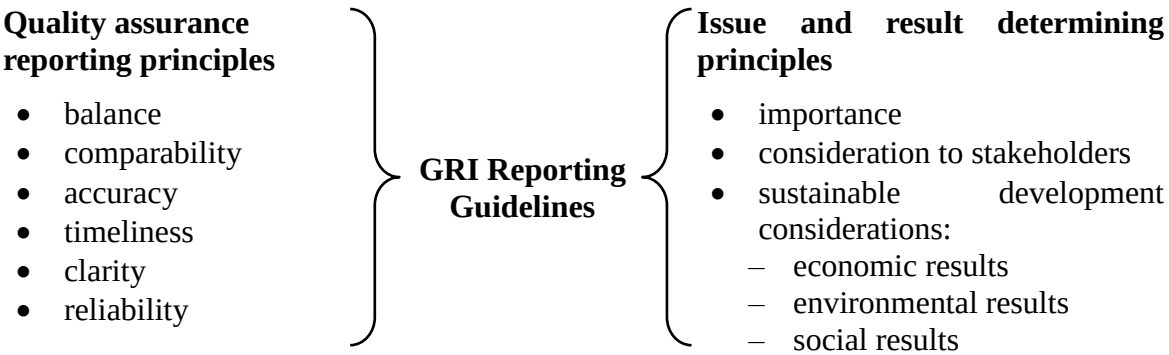

Figure 1. GRI Reporting Guidelines

Source: own research based on: Global Reporting Initiative, Sustainability Reporting Guidelines (2006), www.gri.org

In identification of problems and adequate indicators the following rules are used: importance, consideration to stakeholders and sustainable development context.

To assure report quality the following principles to be adhered to: balance, comparability, accuracy, timeliness, clarity and reliability. According to the balance principle a report should contain information reflecting both positive and negative aspects of activity enabling an enterprise to be assessed as a whole. It is important to observe the comparability principle when preparing a report. Information on economical, social and environmental results should allow a comparison with the assumed objectives, results from previous years and other organizations (benchmarking). To ensure report quality the precision principle is to be obeyed. The presented information should be as much sufficiently precise as possible to present an actual state and be simultaneously understood for the most numerous group of stakeholders. The report should maintain an optimal accuracy level. In accordance with the timeliness principle reports should be prepared regularly and contain current results. The report quality is also emphasized by its clarity. Information contained in the report should be understood and legible. Any report should contain detailed information of specified level and allow retrieve more detailed information through references that enhance report quality. The principle of reliability indicates that information should be gathered, analysed and published to be available to internal and external auditors to check its reliability (DILLING, 2010).

Quality in enterprise sustainability reports

In its general part the GRI presents the profile and location of business and individual customers, and offers to customers, method for measuring customer

satisfaction, practices of customer right observance and percentage of raised and adjusted complaints. Quality assessment is present in the GRI G4 report in the terms of product quality, work performance, responsibility for product (including an effect on customer health and safety, product marking, customer satisfaction, consumer right protection, customer claims), employee training and education, the environment (especially environmental quality of products) (COLDING, PEATTIE, 2005).

In 2015 in Poland the 9th edition of the "Social Report 2015" contest was held. In this contest 37 reports for the year 2014 were submitted, including 10 prepared for the first time. The reports were best prepared by the following companies: CEMEX Polska Sp. z o.o. (main prize), ANG Spółdzielnia Doradców Kredytowych, and for the first time Castorama. In addition, the reports of Bank Zachodni WBK, Grupy LOTOS and Spółki Polskie LNG S.A were awarded (FOB, 2015). The social reports were prepared according to various standards and guidelines related to sustainable development and social responsibility. These conceptions although similar are not identical, that transfers to different reporting areas being difficult to be compared (Adamczyk, 2014). The differences made by financial institutions indicate promotional abilities of this industry. The scope of technical information in sustainability reports depends on industry (Table 1).

Table 1.

Share of subject matter area in enterprise sustainability reports in Poland

Result revealed	Banking	Industry	Trade
Economic effects			
– sales value	●	●	●
– market share	○	●	●
– number of complaints	•	•	•
Environmental results			
– product environmental quality assessment	•	●	○
Social results			
– quality pro training hours	○	●	○
– work performance assessment	●	○	○
Responsibility for product			
– customer health and safety	•	●	○
– programs, standards, codes	●	●	●

– number of nonconformities	•	•	•
– number of claims	•	•	•
– penalties	•	•	•

Legend: ● -significant, ○ - average, • - small

Source: own research based on: Global Reporting Initiative, Sustainability Reporting Guidelines, (2013), www.gri.org

A significant share of information related to economic results, including product sales and market share is assigned indirectly to quality. Information about the number of complaints was released more rarely. The environmental results containing product environmental assessment were disclosed by industrial enterprises, since external stakeholders are sensitive to their activity. Information on the number of training courses and work performance were often disclosed due to the quality management systems implemented previously.

In the field of responsibility for product the reports included good practice programs, standards and codes and the care of customer health and safety was expressed. However, there were less information on numbers of nonconformities, claims and penalties. It follows from report analysis that positive information were presented by enterprises.

Conclusion

The GRI guidelines are used for reporting enterprise sustainable development. The reporting includes economic, environmental and social issues. The quality category is present both in the reporting process and in an assessment of sustainable development.

An analysis of reports in Poland indicates that economical issues are the most commonly revealed as a result of the mandatory obligation of enterprises under investigation. However, information on complaints was disclosed rarely.

In the area of responsibility for product, information related to standards, programs and codes as well as customer health and safety was most often revealed.

This results from the GRI G4 consistency with other standards, related to, e.g.: quality, environmental and safety management. An analysis of reports enables to conclude that the most important issue was the way of presentation, instead of its quality. Discretion in reporting enterprise sustainable development affects the report quality and reliability.

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An Exploratory Study on Improving Physical Strength and Fitness Using the Control Chart

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Abstract. This study analyzes exercise method for effective management of workout with the purpose of improving labor productivity. Control chart will be used as an efficient tool to increase an exercise effect in this study. Increasing the exercise effect has the same meaning of increasing labor productivity. There were some existing studies showing that exercise enables us to soak in more information, work more efficiently and be more productive. One of those studies mentioned that on the days when employees visited the gym, their experience at work changed. They reported that they were managing their time more effectively, being more productive and having smoother interactions with their colleagues.

Keywords*: control chart, labor productivity, fitness*

1. Physical fitness and control charts

Physical fitness is a general state of health and, more specifically, the capability to perform aspects of sports and daily activities. In general, physical fitness is achieved through proper nutrition, physical exercise, and sufficient rest.

Nowadays with automation and changes in lifestyles, physical fitness is considered as a measure of the ability of one's body to function suitably in work and leisure activities,

to resist diseases. Many people know that improving physical fitness is very important, but it is not easy to improve physical fitness effectively. Therefore only a few people can succeed in a good state of health without a proper method.

We think that control charts will be good tools for physical fitness because control charts can effectively handle body fat percentage (BFP), body mass index (BMI), and weight, etc. (Parmar and Vaghela, 2015; Caspersen et al., 1984).

2. Using control chart to improve physical fitness and/or productivity

Using a numerical example, we will explain how to apply control charts to improving physical fitness and/or productivity. Table 1 shows measurements of the BFP (body fat percentage, %) of a fat man who is trying to reduce his body fat by workout. He has measured his BFP (%) once a week for about 5 months to monitor the monthly variation. In numerous cases, the variations of physical fitness can clearly be distinguished after one month of doing exercise. The body fat percentage (BFP) is a measure of fitness level. If one's BFP is greater than 30, he is having excess body fat.

Table 1.

BFP measured values for 5 months

Sample number	x1	x2	x3	x4	x bar	R
1	32.09	32.14	32.06	32.17	32.12	0.11
2	32.13	32.26	32.15	32.13	32.17	0.13
3	32.12	32.17	32.22	32.15	32.17	0.10
4	32.05	32.22	32.15	32.10	32.13	0.17
5	32.26	32.36	32.22	32.30	32.29	0.14

Where X bar stands for the monthly means of BFP, and R means range of fluctuation of BFP during each month.

After looking at the table 1, most people may not find out what problems this man has. That is because glancing at it, BFP measured values are nearly the same. But if you check it through control charts, you can figure out a problem.

$UCL_{X\ bar} = \overline{\overline{X}} + 3\sigma_{X\ bar}$, $LCL_{X\ bar} = \overline{\overline{X}} + 3\sigma_{X\ bar}$

Where $\overline{\overline{X}}$ is the mean of the sample means ($\overline{X}$'s), since $\sigma_{X\ bar}$ is often unknown, $S_{X\ bar}$ serves as an estimator of $\sigma_{X\ bar}$.

In practice, the calculation of control limits is simplified by the use of tables based upon range values rather than standard deviations. For example,

$UCL_{X\ bar} = \overline{\overline{X}} + 3\sigma_{X\ bar} = \overline{\overline{X}} + A_2\overline{R}$

Where A_2 is factor for UCL and LCL in $\overline{X}$– Charts (Monks, 1982).

Table 2.

Control chart factors

Size of Sample (n)	Factor for UCL and LCL for $\overline{X}$-Charts (A_2)	Factor for LCL for R- Charts (D_3)	Factor for UCL for R-Charts (D_4)
2	1.880	0	3.267
3	1.023	0	2.575
4	0.729	0	2.282
5	0.577	0	2.115
6	0.483	0	2.004
7	0.419	0.076	1.924

Source: Evans, J.R. and W.M. Lindsay (2008) p. appendix B (A-3); Grant, Eugene L. and R.S. Leavenworth (1980) p.631.

Table 3.

Control limits for $\overline{X}$-Charts and R-Charts

x bar control chart			R control chart		
CL	UCL	LCL	CL	UCL	LCL
32.17	32.27	32.08	0.13	0.30	0.00
32.17	32.27	32.08	0.13	0.30	0.00
32.17	32.27	32.08	0.13	0.30	0.00
32.17	32.27	32.08	0.13	0.30	0.00
32.17	32.27	32.08	0.13	0.30	0.00

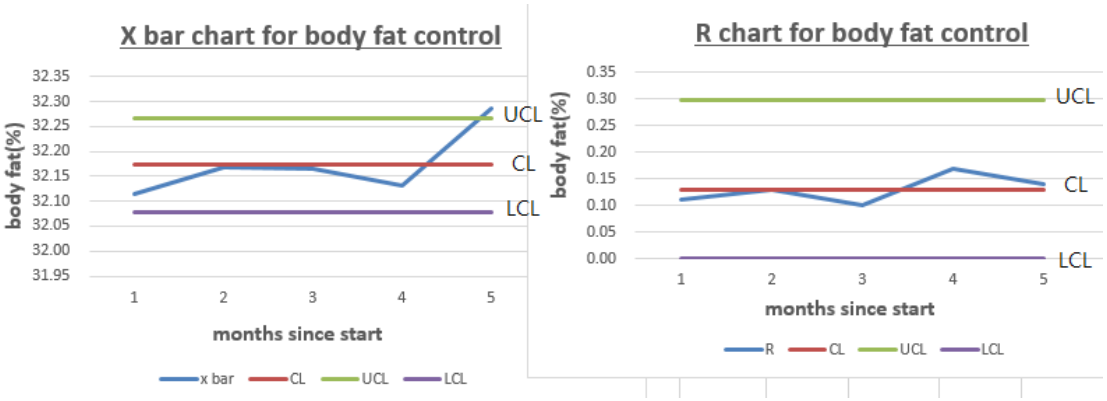

Figure 1. X bar chart and R chart to control body fat

3. Interpreting control charts

There are many things to interpreting a control chart than merely checking to see whether or not the points fall within the limits, UCL and LCL. Any point that falls outside the limits indicates that the situation is out of control.

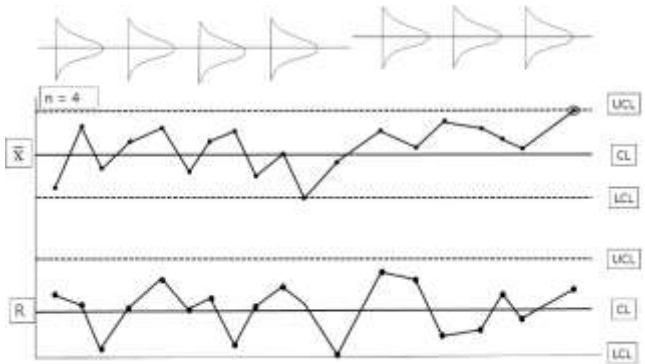

Figure 2. Sampling mean is shifting upward, but range is nearly consistent,

Source: Park, S.H. (1984), Statistical Quality Control, Seoul: Dae-Young Sa, pp, 435-437.

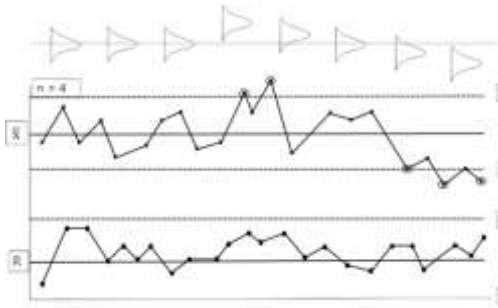

Figure 3. Sampling mean is shifting upward, and then downward, but range is nearly consistent

Source: ibid.

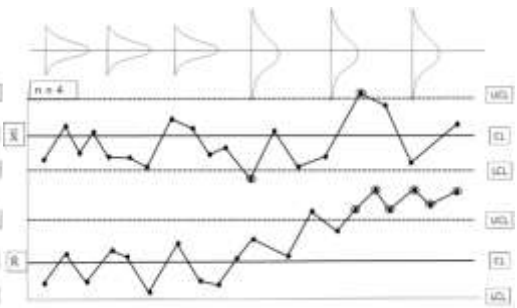

Figure 4. Sampling mean is constant, but dispersion is increasing.

Source: ibid.

4. Continuous improvement

Continuous improvement is very important because it takes a long time to be in a good state of health and to improve labor productivity in work. For continuous improvement, first of all, we'd better seek to reduce the common causes of variation in results. Two techniques for continuous improvement will be briefly explained here: Pareto analysis and cause-and-effect diagram.

It is common to refer to Pareto analysis as "80/20" rule, under the assumption that, in all situations, 20% of causes determine 80% of problems. Using Pareto analysis, it helps to identify the top portion of causes that need to be handled to resolve the majority of problems. Once the predominant causes are identified, then tools like cause-and-effect diagram or Fish-bone diagram can be used to identify the root causes of the problems.

Common uses of the cause-and-effect diagram are quality defect prevention to identify potential factors causing a major problem. Each cause or reason for imperfection is a source of variation. Causes are usually grouped into major categories to identify these sources of variation. It will be able to be illustrated with an apt example like Figure 5.

Figure 5. Cause-and-effect diagram to control body fat

5. Concluding remarks and implication

Lack of control is indicated by points falling outside the control limits on either the $\overline{X}$ or R charts. In numerous cases, it is very difficult for a fat man to identify what is the most serious assignable causes of variation. But if we utilize control charts for variables, Pareto analysis and cause-and-effect diagram, we will be able to find out the assignable causes scientifically and systemically. Nevertheless, through literature review, we could not find any precedent paper which utilizes $\overline{X}$ charts and R charts concurrently to improve physical strength and fitness effectively. We suggest applying control charts in improving physical strength and fitness with cause-and-effect diagram.

There is also evidence suggesting that exercise during regular work hours may boost performance. Take, for example, the results of a Leeds Metropolitan University study, which examined the influence of daytime exercise among office workers with access to a company gym (Friedman, 2014).

Engaging in regular exercise yields a six to ten percent wage increase. The results also show that while even moderate exercise yields a positive earnings effect, frequent exercise generates an even larger impact (Kosteas, 2012).

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Perception Of Extra-Virgin Olive Oil Certifications: A Commodity Market Perspective

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Abstract. Protected Denomination of Origin (PDO) and organic certifications constitute nowadays an effective form of differentiation and can represent an important cues that guide consumer's Quality evaluation. This paper investigates, through K-means cluster analysis, consumer attitude toward these certifications in extra-virgin olive oil Italian market. The results showed three main clusters; the first includes PDO extra-virgin-olive oil (EVOO) consumers(27.2%), the second includes PDO and organic EVOO consumers (32.4%), while the third cluster comprises people indifferent to certifications (40.4%).

Keywords: *extra-virgin olive oil; organic food; PDO; traditional food; certification*

Introduction

Extra-virgin olive oil (EVOO) is an important product in the Mediterranean diet and also major agricultural crop for Southern European countries in terms of both farm income and cultivated area (De Graaff&Eppink, 1999).In recent years, due to growing popularity of the Mediterranean diet among consumers in the US, Canada, Australia and large parts of Asia, EVOO consumption has increased (International Olive Oil Council 2012). The main extrinsic product attribute is

thegeographic origin, which importance in consumer decision-making is highlighted in various studies (Schnettler et al., 2008). Many researchers suggestthat EU geographical indication labels play an important role in signaling olive oil quality (Aprile et al., 2012). Protected Denomination of Origin (PDO) or Protected Geographical Indication (PGI) certifications can offer effective differentiation tools in food markets. Additionally origin is an important attribute for both consumer and industrial product evaluations, due to its role as a quality indicator (Di Vita et al., 2013; Casolani et al., 2015). In recent years the European Union (EU) has recognized the provenance of many EVOO and has certified a total of 43 Italian products in the oils and fats categories as PDOs (Ministry of Agriculture, 2014). Espejel&Fandos (2008) studied the relationship between the perceived quality of an agro-food product with Protected Designation of Origin (PDO) as a criterion for loyalty and buying intention of the Aragonese consumers; a clear distinction was established between quality perceived through intrinsic and extrinsic attributes: results showed that consumers measured quality through the intrinsic attributes.The PDO and the region of origin are significant determinant in food choices; indeed, consumers who are experienced or familiar with a particular region of origin tend to consider it as a key in their product evaluation and choice (Fotopoulos &Krystallis, 2001). Moreover, Cicia et al. (2009) sustain that organic certification has a twofold value for the consumer: it indicates attention toward health and preservation of the natural environment. The main scope of this paper is to highlight the relationships between the evaluation of PDO and organic certification in EVOO consumers, analyzing differences and common points.

Materials and methods

The questionnaire was initially administered to a group of oil consumers (30 people) to find and to fix possible errors of interpretation, superfluous questions and if the answer mode was confused or inappropriate. At this stage respondents were

encouraged to comment on questions and answers, highlighting any criticism. Respondents were screened following these characteristics: they are olive oil consumer; they are Italian citizens and they are over 18 years old. The research was carried out between October 2014 and February 2015 in three different area located in the Southern, Central and Northern Italy. The survey was conducted on 1.200 consumers.

Results and discussions

Socio-demographic composition of the sample is reported in Table 1.

Table 1.

Socio-demographic composition of PDO and OrganicEVOO consumerscompared with the total sample.

		Total sample n=1200		PDO EVOO consumers (43.0%) n=516		Organic EVOO consumers (29.1%)	
		%	n	%	n	%	n
Gender	Male	47.9	575	47.7	246	51.0	253
	Female	52.1	625	52.3	270	49.0	243
Age	Between 18-35 yearsold	23.9	287	22.6	117	21.8	108
	Between 36-45 yearsold	18.8	225	19.3	100	17.1	85
	Between 46-60 yearsold	25.9	311	23.0	119	22.4	111
	Over 60 yearsold	31.4	377	35.1	181	38.7	192
Education	More than high schoolgraduation	22.4	269	24.7	127	19.2	95
	High school or less	77.6	931	75.3	389	80.8	401
Averagehouseholdincome	Lessthan € 15.000	27.9	335	15.9	82	12.9	64
	€ 15.000- € 30.000	44.1	529	33.9	175	29.8	148
	€ 30.001- € 45.000	20.0	240	35.1	181	40.1	199
	Over € 45.000	8.0	96	15.1	78	17.1	85

K-means cluster analysis technique was used to identify market segments (table 2 and 3). The first cluster is the smallest consumer segment accounting for the 27.2% of the sample; it was called “Traditional” EVOO consumers; it’s composed

by the 36.2% of consumers over 60 years, the 18.1% have a more than high school graduation; it is the only cluster in which male (53.1%) are major than female and the percentage of PDO consumers is the highest (82.0%). Consumers within this cluster repute important aspects related to traditions in huge sense; they mostly believe comparing with other clusters that PDO EVOO olive oil is important to preserve historical and cultural traditions, helps to develop Italian typical food system and Italian economy; they also think that PDO EVOO has an appropriate price. The second cluster represents the 32.4% of the sample. It was called "Healthy" EVOO consumers" because it is linked to healthy aspects of certified EVOO in huge sense; in fact, consumers in this cluster believe that PDO and organic EVOO, comparing with conventional one, are safer, healthier, better from a nutritional point of view and their purchase is considered to be useful forenvironmental protection; this cluster is dominated by young people (49.5% of the sample is until 45 years old). The third cluster (called "Indifferent to EVOO certifications ") representsthe 40.4% of the total sample.

Table 2.
Socio-demographicmarket segmentation through K means cluster analysis. Different letters (a–b–c) indicate statistically differentscore.

		Segment 1 "Traditional"EVOO consumers (27.2%)	**Segment 2 "Healthy"EVOO consumers (32.4%)**	**Segment 3 "Indifferent"consumers (40.4%)**
Gender (%)	Male	53.1[a]	45.8[b]	46.0[b]
	Female	46.9[a]	54.2[b]	54.0[b]
Age (%)	Between 18-35	17.0[a]	26.3[b]	26.7[b]
	Between 36-45	17.3[a]	23.2[b]	16.0[a]
	Between 46-60	29.5[a]	23.2[b]	25.8[b]
	Over 60 years	36.2[a]	27.3[b]	31.5[b]
Education (%)	More than high	18.1[a]	28.2[b]	20.7[a]
	High school or	81.9[a]	71.8[b]	79.3[a]
Consumers (%)	Organic EVOO	40.2[a]	58.0[b]	23.2[c]
	PDO EVOO	82.0[a]	62.0[b]	42.6[c]

Table 3.

K means cluster analysis. Different letters (a–b–c) indicate significantly different scores using ANOVA and Duncan post hoc tests.

Statements (Likert scale from 1 to 7, where 1=strongly disagree, 4=neither agree neither disagree, 7=strongly agree).	**Segment 1 "Traditional" EVOO consumers (27.2%)**	**Segment 2 "Healthy" EVOO consumers (32.4%)**	**Segment 3 "Indifferent" consumers (40.4%)**
A1. PDO EVOO is better than conventional from a nutritional point of view.	4.0[a]	4.8[b]	3.3[a]
A2. PDO EVOO is healthier than conventional.	3.2[a]	4.5[b]	3.4[a]
A3. PDO EVOO certification helps to protect the environment.	3.5[a]	4.4[b]	3.5[a]
A4. PDO EVOO has an appropriate price.	3.3[a]	4.3[b]	3.4[a]
A5. PDO EVOO certification helps the Italian economy.	4.3[a]	3.0[b]	3.0[b]
A6. PDO EVOO olive oil is important to preserve historical and cultural traditions.	4.2	4.0	4.1
A7. PDO EVOO olive oil helps to develop Italian typical food system.	5.3[a]	3.8[b]	4.2[b]
A8. Organic EVOO is safer than conventional.	5.4[a]	4.0[b]	4.1[b]
A9. Organic EVOO is better than conventional from a nutritional point of view.	3.2[a]	4.5[b]	3.6[a]
A10. Organic EVOO is healthier than conventional.	3.1[a]	4.4[b]	3.6[a]
A11. Buying Organic EVOO certification helps to protect the environment.	3.2[a]	4.5[b]	3.1[a]
A12. Organic EVOO has an appropriate price.	3.7[a]	4.5[b]	3.6[a]
A13. Organic EVOO taste better than conventional	4.0[a]	4.6[b]	3.8[a]
A14. Organic EVOO helps the Italian economy.	3.2	3.0	3.0

Conclusion

The main product certifications in olive oil field are PDO and organic ones; this study suggests a number of interesting points. Results showed a market classification of EVOO consumers in three main clusters based on attitude toward certifications. Traditional aspects perceived by consumers are prevalent in PDO consumers, while concepts related to health are mainly common to organic ones.

This confirms the main results present in the international literature. A policy advice resulting from this study is that in Italian system it needs to improvetheir communication tools in order to give more information about the value of PDO and organic certifications.

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Conditions and Evaluation of Safety Hazards Packed Chemical Substances and Preparations

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Abstract. The total production of industrial chemicals in the EU-28 increased each year between 2005 and 2007, rising overall by 4.4 % to peak at 371 million tonnes in 2007. During the financial and economic crisis, production fell by 31 million tonnes in 2008 and by a further 43 million tonnes in 2009. The rebound in activity in 2010 more than made up for the losses reported in 2009. In 2011, the production of chemicals in the EU-28 decreased again and then remained relatively stable during the period 2011–2013 (327, 330 and 322 million tonnes), which was still 40–50 million tonnes below the pre-crisis peak in 2007 (*The REACH baseline study. Comprehensive study report…2012).* Polish chemical industry produces about 27% of products in the form of chemical substances and preparations. This group includes inter alia products that are toxic, caustic, flammable, explosive, etc., which, due to their physico-chemical or biological properties can, if improperly handled during transport, storage or handling endanger the health or life of the people and a threat to the environment. Because of the risk of the occurrence of adverse effects on human life and health and the environment, all chemical substances and preparations require the use of packaging which meets the requirements of the regulations (Davidson, 2011), (Emblem, Emblem 2000). The priority of consumer policy - both European and Polish - is to ensure for all market participants high

safety standards. To achieve this purpose it is necessary understanding of the determinants and analysis of safety hazards packaged chemical substances and preparations.

The aim of the study is analysis of conditions and evaluation safety hazards associated with the packaged chemical substances and preparations.

Keywords*: safety hazard, packed chemical substances and preparations, determinants and analysis of safety hazards*

Introduction

Articles characterized by aggressive physicochemical properties, belong to the group of products of which the growth rate of production in Poland from 1995 to 2012 reached nearly 198%. In this group, there are all products with toxic, corrosive, inflammable, explosive, etc. properties, "which due to their physicochemical or biological properties can, in case of improper treatment during transport, storage or transshipment, cause health, life and environmental hazard." The name dangerous substances and chemical preparations was introduced by the Regulation (EC) of the European Parliament and of the Council of 18 December 2006, concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing a European Chemicals Agency. According to the above regulation, chemical substance is defined as "chemical elements or its compounds in the natural state or obtained by any manufacturing process, including any additive, necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition". However, a mixture or solution, composed of two or more substances are defined as chemical preparations. The above differentiation is extremely important on account of the way of classification of substances and preparations, differences in their labelling and procedures of their introduction to turnover (*Regulation (EC) of the European Parliament and of the Council of 18*

December concerning…). The aim of the classification of substances and chemical preparations, on the basis of the analysis of specific results to human health is the distinction of the substances, which are carcinogenic, mutagenic or toxic to reproduction. However, the basic aim of the substances classification and environmental hazard mixtures is to warn the users about the danger to ecosystems.

Because of the danger of negative effects for health and life of the people and environment, all substances and chemical preparations require appropriate labelling, adequate to the requirements in Act of 25 February 2011. According to this Act, packaging of dangerous substances and dangerous mixtures placed on the market should *(Act of 25 February 2011 on the chemical substances and their mixtures …):*

I. have a construction that will prevent any incidental escape of the contents from the packaging. This requirement is not applicable where the specific technical safety devices are required.

II. be made of the materials resistant to damaging impacts of its contents and preventing formation of dangerous substances resulting from impact of the contents on the packaging material.

III. maintain tightness in the conditions of loads and tensions impacting the packaging in the course of its normal handling.

IV. In case of packaging fitted with replaceable fastening devices – they should ensure that their tightness shall be maintained in the course of repeated opening and closing operations in the conditions of normal handling.

V in case of packaging containing dangerous mixtures intended for sale to consumers, it shall

not have:

- a shape or a graphic design likely to attract or arouse the curiosity of children or to mislead consumers,
- a similar presentation or a marking used for foodstuff or animal feeding stuff or medicinal or cosmetic products.

Moreover, according to the Announcement of the Health Minister of 2 March 2015 concerning the labelling of packaging containing dangerous substances, mixtures and some mixtures based on the classification rules GHS (Global Harmonized System) and CLP (Classification, Labelling and Packaging) established by Regulation of the European Parliament and the Council of the European Union of 16 December 2008 concerning classification and labelling of substances and mixtures, each packaging containing substances and preparations must be marked correctly. Information about danger connected to the chemicals are passed through standard warnings and pictograms placed on the labels of packaging.

The priority of European and Polish consumer politics is to ensure all market participants maximally high safety standards. In order to achieve this goal it is necessary to react to already existing danger. Important elements of ensuring safety to the consumers are systems allowing to collect information about the danger caused by dangerous products including substances and chemical preparations such as: European Rapid Alert System of Information Exchange for Dangerous Products - RAPEX, Domestic System of Monitoring accidents caused by consumers (KSMWK) and Domestic System of information about Dangerous Products (KSIPN) are to allow collecting information about dangerous products and monitoring the results of their use.

The aim of the article is to define the assessment of security threat of packed substances and chemical preparations.

Material and method

The selection of efficient, raising customers` awareness instruments about the security threat of handling packed substances and chemical preparations, requires an analysis in the range of awareness concerning security threat of the packed substances and chemical preparations.

The aim of the conducted surveys was the assessment of security threat connected to the packed substances and chemical preparations by the consumers. The scope of the research concerned:

- defining of perceiving dangers connected to substances and chemical preparations,
- defining the influence of appearance of household chemicals products` packaging on purchasing decisions of this group of products,
- defining of warning elements on the packaging, which are important to a consumer,
- defining relevancy of imperfection of household chemical packaging and
- knowing customers opinion about the protection in household chemicals packaging.

The analysis of the questionnaire, as well as the information included in the literature, indicate that nearly 50% of the respondents pay attention to the products` packaging, when they make purchasing decisions. In case of the packaging of preparations and chemical substances, packaging is a crucial factor for about 40 of the respondents. The key factors, which decide about a purchase of so called chemicals are: brand and price of these products.

Results and discussion

In the empirical research connected to the analysis of awareness, concerning security threat of packed substances and chemical preparations, a consumer assessment of the importance of information on the packaging of household chemical articles has been done. The achieved research results have been presented on the fig. 1.

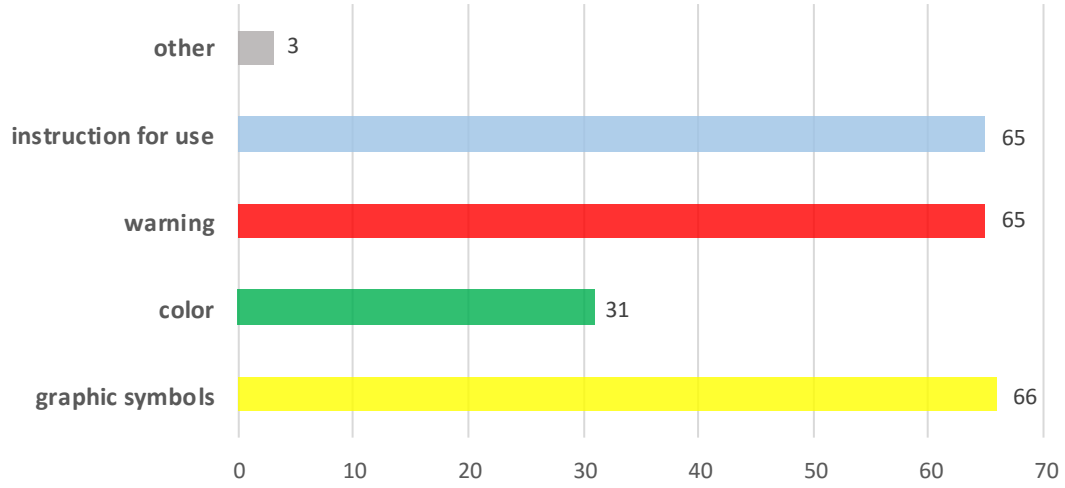

Figure 1. The assessment of importance of information included on the household chemicals packaging

Source: own elaboration.

The vast majority of the respondents (66 indications) claim that the warning elements present on the packaging of the products, which are paid attention to during purchase, are graphic symbols, warnings and instruction manual attached to the product. The colour of packaging has smaller meaning for the users of household chemical products (31 indications).

According to the fact that the household chemicals belong to the group of chemical preparations and substances, which, while being improperly used, can be health, life and environmental hazard, the analysis of the way of perceiving dangers connected to substances and chemical preparations was done. The results have been presented on the fig 2.

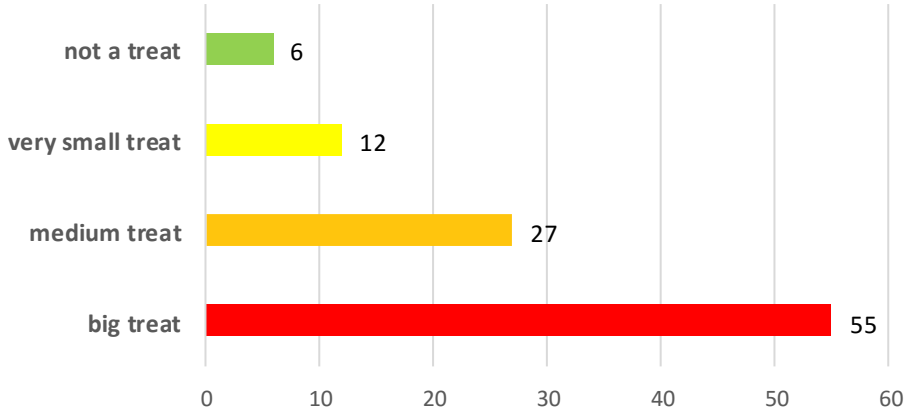

Figure 2. Perceiving dangers connected to substances and chemical preparations
Source: own elaboration.

In the question, which concerns the significance of dangers connected to the use of substances and chemical preparations, more than half of the respondents (55%) showed that the above products pose a big threat. For 27% of the people, who took part in the survey, household chemicals pose an average threat, however, for 4% of the respondents, substances and chemical preparations are not dangerous at all. It is worth to stress the fact that, the participation of the respondents, who claim the dangers connected to the use of substances and chemical preparations are crucial, increased with age. Level of education also differentiated the respondents` opinions in this scope, in the statistically crucial way. However, the assessment of the results of the relevancy of imperfection of household chemical products packaging, which may, in customers` opinion, be safety hazard while handling, have been presented on the fig. 3.

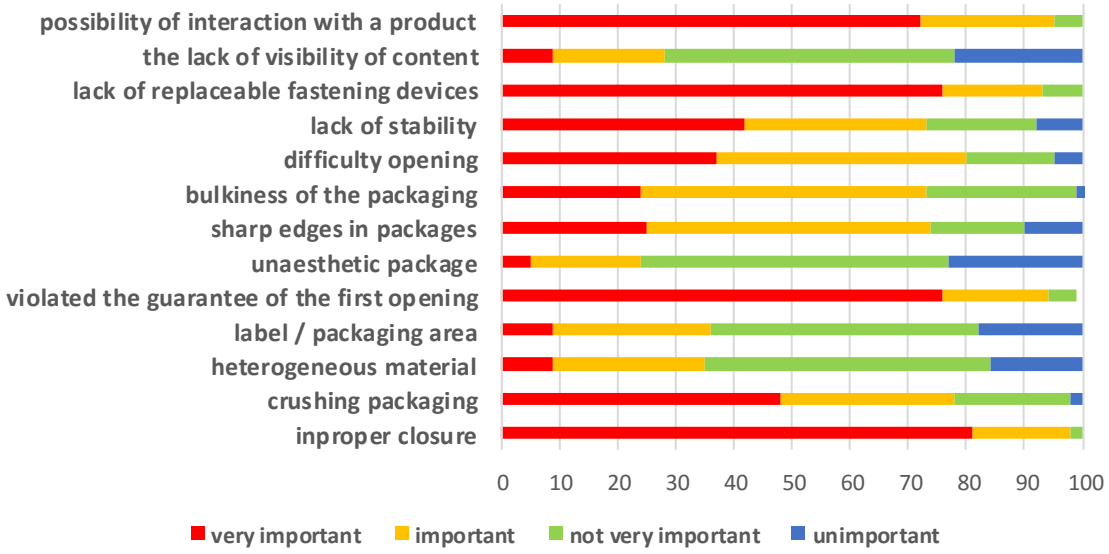

Figure 3. The assessment of the relevancy of imperfection of household chemical products packaging

Source: own elaboration.

The most important imperfections of the household chemical products for the respondents are: improper closure, violated the guarantee of the first opening, lack of replaceable fastening devices and possibility of interaction with a product. The above imperfections received 72-80 indications. In the respondents` opinion, crucial imperfections of household chemicals packaging, for which 40-50 indications have been noted, are sharp edges, opening and handling difficulties. However, as insignificant imperfections, the respondents show: heterogeneous packaging material, dirty label/packaging surface, its unaesthetic made and the content. The above imperfections received from 48 to53 indications.

Conclusion

Products safety is a crucial issue discussed in literature and being the subject of legal regulations. The state of packaging is an important signal for the customers

about possible dangers for safety of the products inside. The use of securities such as guarantee of inviolability of a product and protections against unwanted opening by children as well as consumers` awareness about possibility of serious faults, which have critical meaning for safety, influences the decrease of the risk connected to the security threat of the packed products. The research showed that the consumers are aware of appearance of possible faults in packaging in different groups of products. Presence of faults in packaging is one of the factors discouraging to a product purchase. During the purchase of food products, toiletries and household chemicals, consumers pay particular attention to faults like: guarantee violation of the first opening, improper closure, lack of replaceable fastening devices and negative interactions.

Consumers are aware of dangers resulting from possibility of falsification, pollution of a product (terrorism). That is why they see validity of the use of additional protections, which guarantee inviolability of a packed product. Even though the protections of inviolability of packaging make it difficult to open a product, consumers want to buy the articles, which are equipped in the above protections. On account of the fact that these protections are troublesome in everyday handling, producers should pay particular attention to their functionality. In the research concerning the awareness of security hazard of using packed substances and chemical preparations, it has been proved that consumers are aware of the danger connected to the use of the above products and say they need additional protections in the products to protect them against unwanted opening. Consumers claim that the packaging of household chemicals, medicines sold without a prescription, prescription medicines and cosmetics, should be equipped in such guarantees. Similarly to the case of the use of inviolability guarantee, consumers do not report any particular difficulties connected to the use of protections against unwanted opening, for example by children.

Acknowledgments

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Problems and Perplexities about EMAS Performance Indicators: A Preliminary Analysis of the Italian Thermoelectric Power Stations Case Study

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Abstract. The key indicators, contained into the Annex IV of Regulation (EC) 1221/2009, would allow, quite easily, to assess the environmental impact of an organization, through the quantification of resources and the evaluation of significant environmental aspects allowing, by time, continuous improvement of production performance. Besides, these flows of information are very valuable to all stakeholders, citizens and to anyone else, providing clear benefits, for the same organization, in terms of credibility, transparency and reputation. As well known, these indicators relate to energy efficiency, material efficiency, water, waste, emissions and biodiversity. Apart from these ones, the environmental statement can be carried over other indicators related to specific aspects of a sector. This research has been conducted with the objective to carry out a survey on the correct and adequate use of environmental performance indicators adopted by the Italian EMAS registered organizations active in the production of electricity from fossil energy sources in order to facilitate their continuous audit and improvement, management and benchmarking. This work is a fundamental working paper containing

preliminary results in order to stimulate a desirable discussion among science commodity scholars, receiving from them possible and valuable suggestions.

Keywords*: EMAS, key indicators, thermoelectric power stations, problems*

Introduction

In Italy, and in the rest of world, the use of fossil fuels, for electricity production, covers most of the domestic power generation and energy demand (1). The adoption of an environmental management system (EMS), like the EMAS Regulation, is of fundamental importance for those particularly resource-intensive and with significant environmental implications industrial sectors, such as electric energy generation ones (2).

Despite the deep modernization and upgrading of the national thermoelectric industry, which took place already from several years (3), the severe economic crisis has had serious repercussions on productivity, utilization quotas of the plant and, therefore, on the efficiency of the whole sector.

This work has the aim to investigate about the correct and adequate adoption of EMAS environmental performance indicators adopted by the Italian thermoelectric power plants for motivating their continuous audit and improvement and for facilitating the best management and benchmarking practices.

Material and methods

This analysis began from 2010, that is the year following the entry into force of the newest version of the EMAS Regulation, to 2014, the last year of the most available data. It was decided to restrict the field of investigation to only CCGT (Combined Cycle Gas Turbine) power plants because they represent the most advanced and efficient way to produce electricity. In addition, the focus was on the

analysis of plants equipped with only gas turbine groups, excluding multi-fuel electric generators using other fuels (coal, fuel oil).

The plants have been selected from the EMAS registered organizations databases at the ISPRA (4) and European Commission (5) websites arranged according to the statistical classification of economic activities: NACE Rev. 2 of EC Regulation No. 1893/2006. From this database we proceeded in this way: 1) we have extrapolated those organizations having the NACE code 35.11 (electricity generation); 2) extraction of thermoelectric power plants; 3) adoption of the following sub-criteria: a) gas combined cycle plants; b) plants with installed capacity ≥ 100 MW; c) selection of those plants with, at least, three years of environmental statements.

We examined, therefore, 45 CCGT thermoelectric power plants of the following companies: A2A, E.ON, Edipower, Edison, Enel, EniPower, Iren, Tirreno Power. Considering a time period of five years (from 2010 to 2014), the examined environmental statements are 245 in total. All these plants represent a share exceeding 65% of the installed power generation capacity of the whole national industrial sector.

Results and discussion

We found, first, that all the EMAS key performance indicators (energy efficiency, material efficiency, water consumption, waste generation and atmospheric emissions), as reported in the Annex IV of the Regulation, are referred, quite always, to the gross electricity production, although it would be best to consider the net electrical output, excluding the electrical losses and the energy consumed for starting the auxiliary equipment (pumps, valves, fans, etc.).

All the specific performance indicators are not always reported in the same way; for example, sometimes, the energy efficiency index, about the specific consumption of methane, is expressed in "m^3/GWh", or "MWh/MWh", or even by

in the percentage of "gross electrical energy/energy of methane" or in terms of "kcal/kWh" or "GJ/GWh". Besides the absolute fuel consumptions are not given. Therefore, in order to perform the necessary comparisons and consolidations of data, there will be necessary, then, tediously standardizing the measurement units assuming the appropriate equivalence.

For the production sites that use different fuels (such as natural gas and oil), it is quite impossible, by the environmental summary table and the associated indicators, identifying the energy and environmental contribution of each production unit.

Analysing the various statements, moreover, it is clear that, to date, there is not a unique way to calculate the performance indicators. For example, some organizations, consider as "produced energy" also the waste heat conveyed to the heating systems of residential areas, lowering thereby the efficiency of fuel use quotients.

As regards the thermoelectric cogeneration power plants, it will be necessary, therefore, to recalculate all the different indicators (energy efficiency ratio, use of materials, waste, etc.) referring them exclusively to the net electricity generation by separating, for example, the share of heat recovery and the thermal energy used for district heating; this in order to not distort the comparison with other organizations invalidating the data relating to the electric power production.

For some situations, it is unclear why, from one year to another, vary, significantly, the performance indices of raw materials (hydrochloric acid, sodium hydroxide, etc.) and of waste, especially of hazardous ones. And, in this regard, no explanation is provided. In some cases, they are not calculated the performance indicators relating to the use of materials in relation to produced energy.

Under the voice of "Material efficiency" in the environmental report, rather than individually listing the indicators of the different substances used, sometimes, they are grouped in categories such as "Other consumable materials" or

"Consumable chemicals". Moreover, in some environmental statements there is no indication of produced electricity and this does not allow to derive the plant utilization factor or to calculate certain indicators of use of materials that often are not indicated.

Many times, in the section of the environmental summary, a lot of data and indices are not shown or expressed in the form required by the EMAS Regulation: first of all, those of biodiversity (use of land) and waste production, claiming, as generic explanation, the reasons that are not related to significant environmental aspects of the specific production facility. Furthermore, some statements do not report the summary table of environmental reporting: this does not facilitate the production assessment and benchmarking of the different aspects of environmental performance. Often, the section of the environmental balance does not provide explicit input and output data for previous years, so it is not possible to make immediate comparisons.

For many statements, in "Total emissions of greenhouse gases", only the information data about CO^2 emissions alone are given, omitting the contribution of other greenhouse gases, such as methane (CH_4), nitrous oxide (N_2O), hydro-fluorocarbons (HFCs), hydro-chlorofluorocarbons (HCFCs), sulphur hexafluoride (SF^6), etc. Moreover, it not quite always reported the indicator of CO^2 emissions per GWh produced.

Conclusion

As we seen above, the current correct application of the EMAS environmental statement indices is disregarded by many organizations. Appears to be necessary, therefore, greater expertise and skill of environmental verifiers during the revision process in order to avoid of approving incorrect statements and thus invalidating the important EMAS communication objectives. Also, for a better completeness of information, it would be desirable to have available data about

environmental indicators of individual modules/groups of a specific power plant, rather than those for the whole production site, because this maybe use equipment, thermodynamic cycles, and even different fuels (natural gas, fuel oil or coal).

All the scholars of Commodity Sciences are requested to attend and propose their opinions and suggestions about the contents of this paper in order to contribute, all together, to improve the contents and reliability of the current environmental communication statement of EMAS Regulation.

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Process-Based Approach in the Quality Management Systems Implementation

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Abstract. The Plan-Do-Check-Act cycle (PDCA) is an effective approach in problem solving and change management, which has been set out as a basic principle in standards stipulating the requirements to management systems. Through the PDCA implementation an opportunity is ensured to take planned decisions which, at a later stage, can be evaluated as to their degree of impact on processes and activities. This paper emphasizes on the fact that by applying the process-based approach in quality management, necessary but not sufficient conditions are created to meet the requirements and achieve compliance with the applicable regulatory and standardization requirements to ensure consumer and stakeholder satisfaction. The analysis outlines the possibility to juxtapose the process models in a historical perspective and the dominant quality management model in practice. The achieved results may serve as a basis for introducing the process-based model in quality management systems based on the standard ISO 9001: 2015.

***Keywords**: PDCA, ISO 9001:2015, process-based approach, quality management systems*

Introduction

In September 2015 the International Organization for Standardization published the latest version of the standard ISO 9001: 2015 (ISO, 2015), raising questions about the possibilities for its integration with the process-based approach. The main objective of the study is to undertake a comparative analysis of the requirements laid down in process-based models in a historical aspect and the possibilities for integration with the standard ISO 9001: 2015.

Material and methods

Through a comparative analysis an evaluation has been made and the similarities and differences between the models for the application of the process-based approach in management systems have been identified. The methodology used is based on comparing the requirements, identifying common elements and defining the differences between the requirements, as well as on the assessment of the compatibility and possibilities of the integration of the method in systems for quality management stipulated in the standard ISO 9001:2015 (ISO, 2015). The achieved results of the analysis are shown in *table 1.*

Results and discussion

Dr. Walter A. Shewhart was the first to publish an analysis of the process-based cycle in 1939. In its original version it involves only three steps: specification, production and inspection. These steps correspond to the carrying out of a scientific experiment to test hypotheses, including defining a hypothesis, conducting experiments and testing the hypothesis. A necessary condition for the implementation of the cycle is to follow the steps one after the other, rather than to ensure a continuous process of improvement. Table 1 shows the views of different authors on the implementation of process-based management models as a scientific method of hypothesis testing by years.

Table 1.

Compatibility and differences of process models of quality management

Process-based management models			
The Francis Bacon model (Francis, 1878) Applied for the testing of scientific hypotheses through induction (1620)	The Shewhart method (Shewhart, 1986) Applicable for product manufacturing (1939)	The Deming process-based method (Deming, 1993). Applied for quality management systems (1939)	ISO 9001:2015 (ISO, 2015) Applied for quality management systems in accordance with ISO 9001:2015 (2015) (figure 1)
Hypothesis The first step is defining the problem to be considered. Two hypotheses are formulated: a Zero hypothesis (no need for change) and an Alternative hypothesis (which needs to be proven). After the hypotheses are formulated, it is necessary to determine the method and the appropriate test criteria.	**Specification** The first step is to determine the product specification. Two variants are developed. - Researching the existing product specification; - Necessity of a new product specification. It is necessary to determine the methods and suitable criteria for proving the product compliance.	**(Design - Plan) Product design** The first step is to determine the product specification. Two variants are developed. - Researching the existing product and process specification; - Necessity of a new process specification. It is necessary to determine the methods and suitable criteria for proving the product compliance.	**(Plan) Planning the quality management system** Clause 4 Context – determining the internal and external factors that could impact the strategic goals and the quality management system planning. On the basis of the analysis made the requirements set out in Clause 5 Leadership and Clause 6 Planning should be planned
Holding the experiment The second stage includes the carrying out of a study to test the theory in practice. Holding a number of experiments and analyzing data, collecting empirical material.	**Product manufacturing (Do),** Producing the product in practice. A necessary condition is the collection of sufficient data and its analysis to verify the product specification.	**(Production - Do) Product testing** Producing the product in laboratory and in real conditions. A necessary condition at this stage is the collection of sufficient data and its analysis to verify the process specification.	**(Do) Clause. 7 Support end Clause 8 Operation** Planning, execution and control of processes specified in the context. Undertaking action determined as a result of risk evaluation.

Conclusions The third stage involves decision-making. The information is summarized and axioms are thus formulated. Two possible variants exist: that the theory is wrong and the alternative hypothesis is rejected; that the theory is verified and adopted which would consequently lead to publishing the results so that the new knowledge can be applied in practice.	**(inspection- Check) Product inspection** The third stage involves taking a decision as to whether the product corresponds to the specification, which is determined through statistical control. Two possibilities exist: that the product complies with the specification and is therefore deemed compliant; that the product does not comply with the specification and is therefore deemed non-compliant. In the latter case it is necessary to undertake adequate action to rectify the incompliance.	**(Sales –Check Study) Testing the product on the market** Taking a decision as to whether the product complies with consumers' requirements by holding market research. The sales data should verify the fact that the product complies with the specification required by the customer and meets the customer's expectations.	**(Check) Clause 9 Performance evaluation** Holding internal audits to verify that the system is compliant with the requirements, that it is effectively implemented and maintained. A management review is carried out to confirm that the management system is appropriate, adequate and effective.
		(Research-Action) Should the inspection prove that the plan that was implemented during the previous stage needs improvement, it is necessary to move on to the next step and a new PDCA cycle to improve the initial goals.	**(Act) Clause 10 Improvement** The organization needs to determine the possibilities to improve and implement all necessary activities to meet customers' requirements and to increase customer satisfaction.

Conclusions can be drawn in two directions based on the information in table 1, concerning the similarities and differences in the applied process-based management models.

The main differences between the applied process-based management models in the past and the currently dominant model set out in the standard BS EN ISO 9001: 2015 lie in the fact that former models comprise processes of monitoring of the existing condition of the facility without determining the degree of impact of different external and internal factors that are involved in the planning process. The process approaches applied so far do not require a risk analysis in case of changes in the environment and in the overall business context. It is evident from figure 1 that an approach for the identification of risks related to the external environment is set

out in the standard ISO 9001: 2015, which determines the main difference between them. The new approach in risk management and context determination replaces the preventive action and decreases the necessity to undertake corrective action at a later stage.

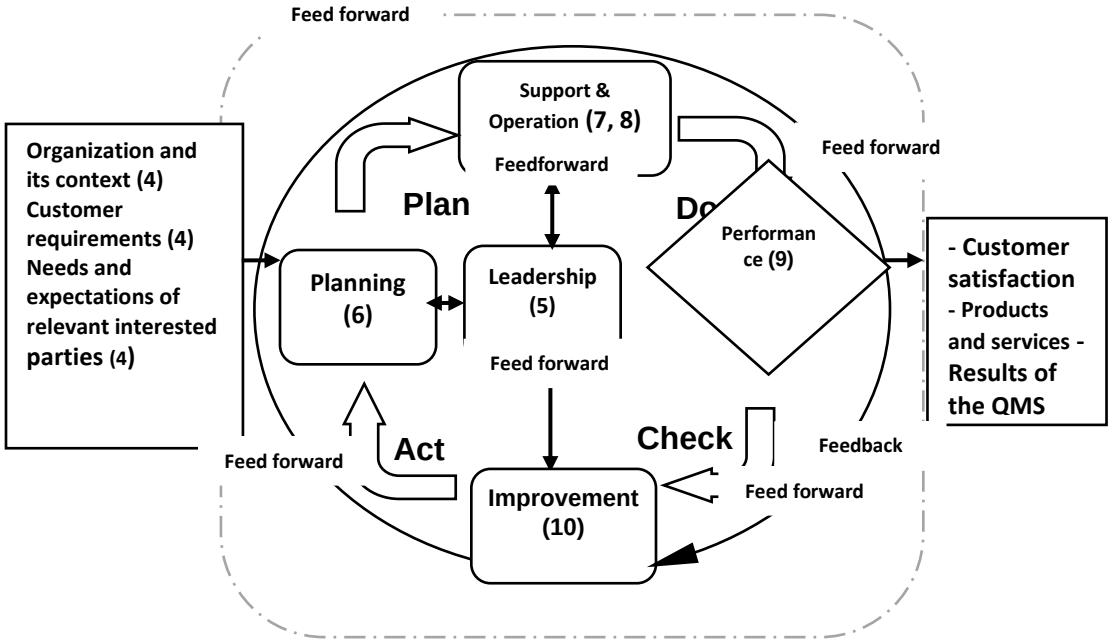

Figure 1. Model of a process-based QMS, showing the links to the clauses (ISO, 2015)

The main similarity in all process-based management models is in the repetition of the PDCA cycle until the hypothesis (goal) is confirmed or rejected. The repetition of the cycle expands knowledge and can result in an improvement of the original goals or hypothesis (Moen & Norman, 2010). Another main similarity is the clear distinction between the different stages of the cycle. The incorrect division of the separate cycles could bring about the undertaking of simultaneous actions (reasons), which in turn could undermine the final result (Deming, 1950). The repetition of the cycles is very appropriate exactly when the key information could

not be announced initially and it is necessary that the PDCA cycle provide feedback. This is required so that assumptions (hypotheses) are confirmed and knowledge is expanded.

The methodology known as "Plan-Do-Check-Act" (PDCA) can be applied to all processes and is an effective tool for business management. The standard ISO 9001: 2015 strongly recommends the use of PDCA in its requirements and confirms the understanding that business operations are managed by assessed processes. The process-based approach is a systematic identification and management of both the processes and the relationships between them. The advantage of the process-based model is in the ongoing control exercised over processes and the connections between them. The successful implementation of the process of continuous quality improvement requires the sequence to be observed at all levels in the management system: from strategic to operational processes with clearly defined responsibilities. The application of the PDCA cycle in all process-based management models ensures that the results obtained are evaluated for compliance to the planned results. The studied process-based management models are compatible with ISO 9001: 2015 and their implementation through an integrated approach could not only protect the interests of consumers by ensuring product quality, but can also help develop a quality management system in the organization effectively implemented in practice. The conclusion is that the activities of any organization represent a dynamic sequence of interrelated processes that are unified and embedded in a process-based approach.

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Impact of Quality Management Systems on the Minimum Durability of Biscuit Products

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Abstract. Quality management systems provide an effective approach to solve problems related to maintaining a sustainable quality of the foods. Biscuit products should be safe, with acceptable quality and stable sensory indicators throughout their period of minimum durability. This paper explores the possibilities for achieving stable sensory indicators in biscuit products by implementing a quality management system. Based on this study it can be assumed that the use of such quality management system has the potential to create the necessary conditions for meeting the compliance requirements and improving customer satisfaction. An analysis was performed of the factors affecting the achievement of stable sensory indicators in biscuits. Water activity analysis and sensory analysis of 30 different types of biscuits were carried out, and the data obtained confirmed that biscuit products can be kept stable throughout the period of minimum durability through a quality management system.

Keywords*: sensory analysis, period of minimum durability, quality management systems, biscuit products*

Introduction

Achieving stable sensory indicators of biscuit products is a priority of every manufacturer in the industry. The difference in sensory attributes between freshly

baked products and products at the end of their period of minimum durability is perceived by consumers with a certain measure of tolerance. Significant deviations in these indicators would worsen consumer satisfaction and reduce sales. As a general rule, every manufacturer strives to minimize the difference in the sensory attributes of a product at the beginning and end of the durability period. Achieving this goal is possible through an appropriate quality management system that governs all production processes, from the supply of raw materials with sustainable quality to the correct storage of the product commercially.

The aim of this study was to compare the sensory characteristics of a freshly produced product (100% durability period) to those of a product stored at 25°C for 6 months (50% durability period) and 12 months (0% - expired durability period) from the date of manufacture.

Material and methods

Thirty different types of biscuit products were used as test material. The test samples used to determine the sensory indicators are representative of the product concerned. The samples were in packaging intended to be used in the distribution. Immediately before and during the test, the test samples were subjected to the typical conditions of storage and distribution (light, temperature and variations in relative humidity). Products with no more than 10% of the period of minimum durability expired were selected as reference samples. The test was conducted in March -April 2016.

The main methods used in the testing were as follows:

- Sensory analysis under ISO 16779:2015 "Sensory analysis – Assessment (determination and verification) (ISO, 2015) of the shelf life of foodstuffs" and ISO 4120:2007 "Sensory analysis – Methodology – Triangle test" (ISO, 2007);

- Determination of water activity (Aw) under ISO 21807 "Microbiology of food and animal feeding stuffs. Determination of water activity" (ISO, 2004)

The criteria for assessing the indicators of the test product were:

- Complete change of the sensory profile of the product;
- Partial change in the sensory profile of the product (change in one of the indicators);
- No change in the sensory profile of the product.

The method chosen for the study was the triangle test applied under laboratory conditions in the science laboratory of University of Economics - Varna. The evaluators were five experts on foodstuffs from the Commodity Science Department. The evaluators have formulated the following hypotheses:

- Null hypothesis: there is no difference in the sensory evaluation of the test samples throughout the period of minimum durability of the product;
- Alternative hypothesis: there is a difference in the sensory evaluation of the test samples.

Restrictive conditions: The test products have a very low moisture content and water activity, which guarantees their microbiological safety. For this reason, the study examines the changes associated with sensory attributes and Aw.

Results and discussion

The changes that occur during storage of biscuit products affect adversely their taste and odour. Although these changes are slow in products with low water activity (Aw) (Clydesdale, 2001), consumers would prefer products with stable sensory characteristics within the period of minimum durability (FSAI, 2014). The following factors (Table. 1) affecting the shelf life of biscuits can be controlled through a management system.

Table 1.

Factors determining the stability of sensory indicators of biscuit products

Stage	Factors
Baking	Coagulation of proteins, caramelization of sugars and Maillard reaction, which results in the browning of the outer surfaces and providing the product with an attractive appearance, aroma, texture and taste (Suzan, 2008)
Production and storage	Aromatic substances are often well soluble in fats and oils (Belitz, et al., 2009). The products must be stored separately from highly aromatic products;
Cooling	As a result of the excessively high moisture content immediately after baking, the biscuits have to be cooled to ambient temperature to prevent condensation in the package (Joseph, 2007);
Packaging	Migration of flavoring and aromatic substances and mixing of tastes and odors when several different types of biscuits are packaged in a single package;
Packaging	Disadvantages due to incorrectly sealed packages; broken packages as a result of sharp edges of the sugar crystals, the edges of the equipment (Dennis, et al., 2009).
Packaging Storage	Improper handling of ready products can worsen the appearance of the products and cause crushing and deformation of the package (Matz, 2009);
Cooling Storage	The migration of fats may cause softening of the chocolate coating of biscuits and even disbonding of the layers in cream sandwiched biscuits (Beckett, 1995);
Cooling Storage	Unpleasant odor may occur as a result of the oxidative changes in fats;
Packaging Storage	Possible migration of odors from the packaging materials, especially in the case of cardboard packaging;
Storage	Loss of crispness due to moisture intake from the environment. The biscuits are highly hygroscopic and must be stored under appropriate conditions;
Storage	Fats have different temperatures of crystallization. The abrupt change of temperature during storage may cause crystallization of fats on the biscuits surface;
Storage	Deterioration of storage conditions may cause changes in physico-chemical properties, which could in turn lead to deteriorated sensory attributes;
Storage	Exposure to very low temperatures may damage the barrier film.

The process-based Quality Management System (QMS) of the biscuit manufacturer includes the management of processes related to the creation, manufacture, packaging and storage of finished products. The effective implementation of the QMS has the potential to create the necessary conditions for the proper management of processes that can aggravate the sustainability of the indicators.

Sustainable quality requires the prescribed shelf life of biscuits to be confirmed by different methods. The sensory analysis is one appropriate method to confirm the period of minimum durability. Failure to apply this method may lead to quality deterioration, highly negative attitudes among consumers and even withdrawal from sale of the products. Economic and marketing factors require that products be evaluated carefully and the period of minimum durability confirmed by sensory analysis in order to prevent the outflow of customers. Table 2 shows the results of the sensory analysis performed on a number of biscuit brands.

Table 2.

Results from the sensory analysis performed on biscuits

Indicator:	**Name and batch**	**Intervals of the estimated shelf life (%) Conforming batches are marked with "x" in columns "S" and the result of Aw is presented in value.**					
		0%		**50%**		**100%**	
		Aw	S	Aw	S	Aw	S
1. Appearance	"Coffee"	0,301	x	0,301	x	0,314	x
1.1. Shape	"Solena"	0,421	x	0,358	x	0,326	x
Diverse shapes, characteristic of each brand. The edges of the biscuits are either smooth or with curly patterns. Allowed: Biscuits with damage on one side resulting from the separation of sandwiched biscuits during baking, but not more than 1 piece per package of up to 0.250 kg. Number of broken biscuits per package of up to 0.250 kg: 1 piece.	"Maslenka"	0,317	x	0,311	x	0,344	x
	"Princess Peanut"	0,382	x	0,326	x	0,315	x
	"Jam-Bi Strawberry"	0,558	x	0,511	x	0,526	-
	"Happy Choice berries"	0,514	x	0,590	x	0,562	x
	"Latino Cocoa"	0,253	x	0,290	x	0,310	x
	"Happy Choice Milk Cream"	0,285	x	0,312	x	0,333	x
1.2. Surface	"Yana with Marmalade"	0,512	x	0,603	x	0,498	-
Diverse surfaces, characteristic of each brand. The edges of the biscuits are either smooth or with curly patterns. Allowed: Biscuits with damage on one side resulting from the separation of sandwiched biscuits during baking, but not more than 1 piece per package of up to 0.250 kg. Number of broken biscuits per package of up to 0.250 kg: 1 piece.	"Grissini"	0,295	x	0,285	x	0,301	-
	"Go-tiny milk glaze"	0,285	x	0,283	x	0,282	x
	"Muesli Integral"	0,378	x	0,300	x	0,345	x
	"Rigo Cocoa"	0,288	x	0,301	x	0,345	x
	"Happy Choice vanilla cream"	0,286	x	0,326	x	0,349	x
	"Cocoa and Milk"	0,297	x	0,368	x	0,298	x
	"Kids Zone"	0,424	x	0,391	x	0,316	x
1.3. Colour of the face side	"Classic Cocoa"	0,300	x	0,288	x	0,312	x
Darker marks allowed on the protruding edges due to overbaking, but not burning. No deviations allowed.	"Coffee Express Cinnamon"	0,196	x	0,265	x	0,298	x
	"Emi Milk Cream"	0,381	x	0,385	x	0,362	x
	"Medenki"	0,544	x	0,518	x	0,576	x
1.4. Colour of the underside.	"Happy Choice	0,295	x	0,388	x	0,328	x

The overall hue of the colouring of biscuits in the same package must be uniform. The colour of the underside may be darker than that of the face side, but not from burning **2. Taste and odour.** Pleasant, corresponding to the input ingredients, with no extraneous taste or odour. No deviation allowed. **3. Surface upon breakage** Pronounced porous structure. No deviation allowed. In sandwiched biscuits the filling should not protrude out of the biscuits. In single packed coated biscuits the deviation allowed is 6 pieces per kilogram.	Cocoa cream"						
	"Olympia"	0,286	x	0,284	x	0,276	x
	"Duo Cream"	0,311	x	0,296	x	0,275	x
	"Choco Milk Cream"	0,280	x	0,296	x	0,288	x
	"Zeffo with Milk frosting"	0,461	x	0,466	x	0,401	x
	"Zeffo with Coconut"	0,566	x	0,510	x	0,544	x
	"Princess caramel"	0,284	x	0,302	x	0,282	-
	"Go-cacao milk glaze"	0,318	x	0,392	x	0,279	x
	"My Story"	0,301	x	0,330	x	0,286	x
	"Homemade Biscuits"	0,375	x	0,379	x	0,337	x

The data in the table above show almost no changes in the sensory attributes of the test products at the beginning, middle and end of the prescribed period of minimum durability. The sensory analyses of 30 different types of biscuit products confirm that the products are stable within the period of minimum durability, and this stability is achieved by the implementation of a quality management system. Deviations from the taste properties were found in four of the test products at the end of the durability period.

Conclusion

The results of the sensory analysis confirm that almost no change occurs in the sensory attributes, and that the biscuit products manifest stable sensory indicators throughout the prescribed period of minimum durability. This ensures unchanged consumer preferences towards the product. The implementation of a quality management system has the potential to create the necessary conditions for fulfillment of the compliance requirements, when such system is used to manage the processes that can affect adversely this stability of the indicators.

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The Compatibility and Differences Between the Requirements of the Standard for Quality Management ISO 9001:2015 and the Standards ISO 22000:2005, BRC Food V.7 and IFS Food V.6.

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Abstract. The competitiveness of the food products depends on their ability to meet users' requirements without creating a safety risk to the customer. The aim of this study is to examine the possibilities of integrating the requirements of the standard for quality management ISO 9001: 2015 with those of the standard for management of food safety ISO 22000: 2005 and standards of the retailers BRC Food v.7 and IFS Food v.6 in a comprehensive integrated management system. Based on this research can be assumed that the use of an integrated system has potential to improve the product quality, to simplify the separate implementation of the requirements, to demonstrate compliance with the regulatory requirements and to improve the customers' satisfaction. The model of implementation of the integrated system should take into account not only the compatibility, but should be primarily based on the fundamental differences between standards ISO 9001:2015, ISO 22000:2005, BRC Food v.7 and IFS Food v.6.

***Keywords**: integration, ISO 9001:2015, ISO 22000:2005, BRC Food v.7 and IFS Food v.6*

Introduction

In September 2015 the latest version of ISO 9001 (ISO, 2015) came but the possibilities for its integration with the standards for food safety have not yet been investigated. The main aim of the study is a comparative analysis between the requirements laid down in the standards of food safety in the recent versions of ISO 22000 (ISO, 2005), BRC Food v.7 (BRC, 2015) (BRC, 2015) and IFS Food v.6 (IFS, 2014) and their comparing with the requirements of the latest edition of September 2015 of ISO 9001.

Material and methods

The main method of the study is a comparative analysis (Nicolas, 2013). The assessment of the compatibility between the four standards are defined in percentages. Full compatibility between the requirements of the all four standards is evaluated by 100%, and the lack of compatibility is evaluated 0%. The following method has been used:

1. Comparing of the requirements

2. Identification of the differences between the requirements

3. Identification of the common clauses in the standards

4. Assessment of the compatibility between the requirements in percentages.

Results and discussion

The results of the analysis are presented in chapters corresponding to the structure of ISO 9001 in Table 1.

Table 1.

The Compatibility and differences between the requirements of the standards

Clauses in the standards for management of the quality and the food safety				
Clauses in ISO 9001:2015	**BRC Food v.7**	**IFS Food**	**ISO 22000**	**%**
4.1 Understanding Organization and it's Context	NA	NA	NA	25%
4.2 Understanding Requirements and Expectations of Interested Parties	NA	NA	NA	25%
4.3 Determining the Scope of the Quality Management System	3.1.	2.1.1.1.	4.1.	50%
4.4 Quality Management System and its Processes	3.	2; 2.1.	4; 5.3.	50%
5.1 Leadership and commitment	1; 1.1.	1; 1.1	5; 8.5.1; 5.1	75%
5.1.2 Customer focus	3.12; 3.6.3.	1.3; 1.3.1; 1.3.2.	5.6.1.	100%
5.2 Policy - must define and implement and communicated	1.1; 1.1.1; 1.1.2.	1.1.1; 1.1.3.	5.2.	100%
5.3 Organizational roles, responsibilities and authorities	1.2.	1.2; 1.2.1; 1.2.2; 1.2.3; 1.2.8.	5.4; 6; 6.1; 6.2.	100%
6.1 Actions to Address Risks and Opportunities	2; 4.2;	6; 6.1 - 6.4.	5.7; 7.	50%
6.2 Quality Objectives and planning to achieve them	1.1.2.	1.1.3; 1.1.4.	5.2.	50%
6.3 Planning of changes	3.6.4.			25%
7.1 Resources;	1.1.5; 1.1.5; 7; 7.3; 4; 4.1; 4.3; 4.4; 4.5; 4.6; 4.7; 4.8; 4.9; 4.10; 4.11; 4.12; 4.13; 4.14; 4.15; 4.16; 6.4;	1.2.7; 3.1; 3.2; 4.6; 4.7; 4.8; 4.9; 4.10; 4.11; 4.13; 4.14; 4.15; 5.4; 1.2.9; 3.3.	6; 6.1; 6.2; 6.3; 6.4; 7.2.3 a); 7.2.3; 8.3.	100%
7.2 Competence	7.1.	1.2.4 KO; 1.2.6.	6.2.2.	100%
7.3 Awareness	7.2; 7.3; 7.4.	1.2.5.	7.2.3 j).	75 %
7.4 Communication	1.1.6.	1.1.5; 1.2.10.	5.6; 5.6.1; 5.6.2;	100%
7.5 Documented Information	3.2; 3.3.	2.1.1; 2.1.2; 2.2.3.8.3; 3.2; 4.2.2; 3.3; 4.2.3.	4.2; 4.2.2; 4.2.3.	75%
8.1 Operational planning and control	6; 6.1.	1.2.9; 4.	7.5.	
8.2 Determination of requirements for products and services	3.6; 3.6.1; 3.10; 3.12; 3.6; 3.6.2; 3.6.3; 3.6.4.	4.2; 4.2.1; 4.1.2; 4.1; 4.2.2; 4.2.2.1; 4.3.	3.3.2; 5.6.1; 7; 7.3.3.1; 7.3.3.2.	100%
8.3 Design and development of products and services	5.1; 5.1.1; 5.1.2; 5.1.3; 5.1.4.	4.3; 4.3.1; 4.3.2; 4.3.3; 4.3.4; 4.3.5; 4.3.6; 4.3.7; 4.3.8;		

		4.3.9; 4.3.10.		
8.4 Control of externally provided products and services.	3.5; 3.5.1; 3.5.2; 3.5.3 3.5.4; 4.13.	4.4; 4.4.1; 4.4.2; 4.4.3; 4.4.4; 4.4.5; 4.4.6.	7.2.3 f).	
8.5 Production and service provision	3.9; 3.9.4; 5.2; 5.3; 5.4; 5.5; 5.6; 5.7.	2.2.3.8.1; 2.2.3.8.3; 4; 4.1; 4.18; 4.18.1; 4.4.1; 4.19; 4.20; 4.20.	7.9; 8.4.2.	
8.6 Release of products and services	6; 6.1; 6.2; 6.3; 6.4.	5.2; 5.6; 5.7; 5.5; 5.3.	8.4.2.	100%
8.7 Control of nonconforming process outputs, products and services	3.8; 3.11.	5.8; 5.9; 5.9.2 KO.	5.7; 7.10.3; 7.10.4.	100%
9.1 Monitoring, measurement, analysis and evaluation		2.2.3; 8.1 KO.	8.3.	75%
9.1.1 General			7.4.4.	75%
9.1.2 Customer satisfaction	3.12.		5.6.1.	75%
9.1.3 Analysis and evaluation		5.	8.4.2.	75%
9.2 Internal audit	3.4.	5.1; 5.1.1 KO; 5.2.	8.4.1.	100%
10.1 Improvement General	2.14.	5.6.8.	7.7; 5.6.2; 8.5.1; 8.5.2. 7.7.	75%
10.2 Nonconformity and corrective action	3.7.	5.10; 5.11.	7.10.1; 7.10.2; 7.10.	100%
10.3 Continual improvement	1.1.		8.5.1.	75%

1. Main Differences

The standards of food safety do not require the determination of context of the organization in taking strategic decisions for the future developments. There are not any published recommendations on methods for determining the impact of these factors, but according to the manner of their enumeration in the standards, it can be assumed, that such one method is the PESTLE analysis (P for Political, E for Economic, S for Social, T for Technological, L for Legal and E for Environmental).

The standards for the food safety require managing risks only in terms of the food safety and do not require analyzing the risks due to changes in the external environment and the overall context of business. This different approach to the identification of the risks is the main difference between the standards. The

innovative introduction of the risk management replaces the current preventative actions and reduce the need for later implementation of corrective actions.

2. Main Compatibilities

- The requirement for a documented system for quality management and food safety regarding to documented procedures, which to be applied in the certified facility.
- The creation of policies for the quality and the food safety
- The availability of organization chart with certain responsibilities
- The maintaining of effective and constantly updated system.
- Providing sufficient resources to ensure efficient and proper implementation of regulatory and customer requirements.
- The definition of the objectives should be measurable, continuously monitored, announced within the organization, aligned with the policy of the management system and updated if necessary.
- The creation of procedures for identification of all batches of taking raw materials and packaging to the final product and the next level of distribution.
- The implementation of an adequate system for control, that creates conditions for a guarantee, that the final product is analyzed for confirmation of its compliance with the critical parameters.
- The collection of information, as result of the activities of measuring.
- The requirement for management review for verification of the system for quality and food safety management.

Conclusion

Although the requirements of all tested standards differ formally, it can be found sufficient similarities in the criterias for assessing the compliance of the

individual clauses between those of ISO 9001 and the rest standards. A common requirement for all standards subject to this study is the necessity of adequately working, regularly assessed for compliance and continuously improved systems for management of the quality and the food safety. Each standard has its own specifics and this serves the same not to lose it's individuality and uniqueness. Sometimes differences are observed in the severity and complexity of the requirements.

The studied standards for food safety are compatible with the latest edition of ISO 9001: 2015 and applying them as an integrated scheme could protect the interests of the consumers by ensuring the quality and safety of the products, as well as to develop a comprehensive system for managing the organization.

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Applicability of Environmental Management in Organizations

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Abstract. One of the ways how to secure the reduction of negative impacts on the environment and to achieve sustainable development is the implementation of environmental management systems. By their implementation the organization accepts a responsible attitude to the identification of the possible risks and points out a considerate and environmental approach to the protection of and the care for the environment. Environmental management systems contribute to the creation of the organization's image, the increase of the market share, to the creation of the better working conditions and to the improvement of the general awareness of the organization, increase competitive advantage. All these presented facts can assist in obtaining new customers whose opinions and demands are constantly changing. The increasing demands of the population lead to the expansion and growth of the production volume and that is why it is necessary to adopt ecological measures.

***Keywords**: environmental management systems, the environment, the protection of the environment, risks, contributions*

Introduction

The importance and contribution of environmental policy contains the identification of the research resources of the organizations negative impacts on the environment, the acceptance of real measures that reduce them and the evaluation of achieved results. Environmental management system also includes protection of product, consumer and employees (Mangra, 2014). Besides laws on environmental protection, the various rules and regulation of national and non-state authorities are also applied and the use of ecologically oriented measures in the in-house sphere is increasing subsequently. The concept of environmental policy is formulated to ensure better environmental performance of the organization. Besides direct regulation instruments there are also market-based environmental policy instruments that are based on a voluntary basis and are related to the active policy of the organization with regard to the environment. The most important measures are: ISO standards 14001 Environmental management systems. Requirements with guidance for use, Environmental Management and Audit Scheme– EMAS and environmental awards. Market-based environmental policy instruments are effective when they influence consumers´ buying decision making (Karkalíková, 2015). Environmental issues are global issues and they require complex integration of economic, social and environmental policies (Mamouney, 2014).

Material and methods

Analysis of presented issues required implementation of the scientific method and analysis that enabled division and more detailed examination of concrete theoretical findings obtained from domestic and foreign sources. The analysis method was also applied while processing data collected by questionnaire as a part of consumer survey. Additional scientific method applied in the survey was polling method as a tool for collecting primary data from deliveries survey. While

contribution processing a synthesis method was used. It enabled summarization and transformation of survey findings into the graphs.

Results and discussion

One of the possible ways how to reduce negative impacts on the environment and to achieve sustainable development is implementation of the environmental management systems according to the *ISO standard 14001:2015* Environmental management systems. Requirements with guidance for use (Ciravegna Martins da Fonseca, 2015). The standard defines increased commitment of senior management, it deals with internal and external issues that have influence on organization including climate instability, it pays attention to environment protection in respect to proactive initiatives, on more effective communication through the communication strategy, it also covers products and services life cycle with emphasis on each production stage (Štibrányiová, 2015). The survey was focused on identification and evaluation of consumers' opinions, attitudes and awareness of selected management systems issues. The number of consumers who are interested in ecological and social issues is increasing. 300 respondents were addressed and 273 respondents have completed a questionnaire. Return rate of questionnaires was 91%.

Figure 1 presents respondents´ answers to question if they are observing the organizations with implemented and certified environmental management system according to the ISO standard 14001:2004, for which environmental protection is importnat.

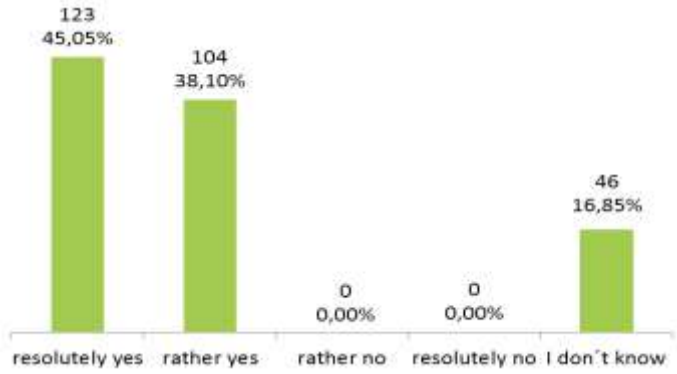

Figure 1. Respondents´ perception of the organizations with implemented environmental management system

The majority of respondents, up to 123 (45,05%), resolutely observes organizations that have implemented and certified environmental management system. Only 46 respondents (16,85%) could not express opinion on the question what may be caused by the fact that they do not know the real meaning of the evaluated term..

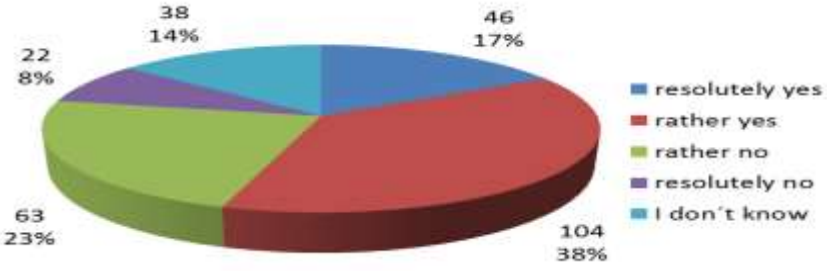

Figure 2. Impact of producer´s violation of environmental protection legislation on customers´ buying decision making

Figure 2 displays the reactions of respondents to the question if the fact that the product producers or service providers violate legislation within the producers or service providers violate legislation within the environmental protection, affects their buying decision making. The majority of respondents, up to 104 **(**38,10%), think that this fact would impact their buying decision making. 46 respondents (16,85%) would be resolutely influenced by this fact, but for 63 respondents

(23,07%) this finding would more likely not have any impact. 38 respondents (13,92%) could not express opinion on this issue.

Figure 3 displays attitude of the respondents if they notice the information on package during product purchase, that the company producing this product has certification according to ISO 14001. The majority of the respondents, up to 251 (91,94 %), do not observe this advice during purchase. Only 22 respondents (8,06%) stated that they pay attention to this information.

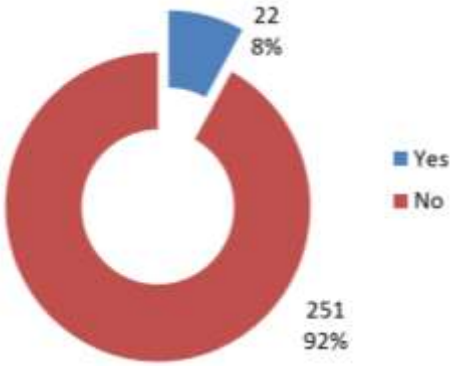

Figure 3. Observation of ISO certification displayed on product package

Nowadays many purchasers and consumers prefer companies that organize and practice their activities in order to decrease negative impacts on environment and contribute to sustainable development. In long term perspective, ecological approach to business can bring to the companies several benefits, increase their competitiveness and sustainability.

Conclusion

Environmental management systems are used for environmental protection and care contributing to ensuring achievement of sustainable development of organization. They strengthen organization's competitiveness, improve image and enable penetration on new markets what can contribute to acquisition of new customers whose mindset and requirements are constantly changing. Many

organizations implement environmental management systems because they want to satisfy consumers´ requirements and ensure ecological and social responsible product distribution process.

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From Documented Procedure To Documented Information: The New Approach Of ISO 9001:2015

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Abstract. ISO standards are normally reviewed and revised every 5-10 years. In September 2015, after extensive review, ISO 9001:2015 standard was published. At the same time also new revision of ISO 14001 standard was published, by harmonizing their layout to the 9001 one.

This paper focuses on the documents necessary for the implementation of a Quality Management System (QMS). The renewed standard defines documented information as relevant data that are required to be controlled and maintained by the organization to support the operation and to be confident that the processes are being carried out as planned. QMS needs to include documented information required by the standard as well as documented information determined by the organization necessary for the effectiveness of the system. According to ISO 9001:2008 it is possible to classified the specifically required documentation in a 3 levels pyramid: top tier included descriptive documentation (e.g. Quality Manual), tier 2 the set of procedures and work instructions (prescriptive documentation), tier 3 consisted of records. In the new standard, a new pyramid model is necessary to classify required documents: top tier concerns high level transversal documents (for the purposes of establishing a QMS), tier 2 contains specific documents (for the purpose of communicating the information necessary for the organization to operate), tier 3

remains of records (for the purpose of providing evidence of results achieved). An organization with an existing QMS should not need to rewrite all of its documented information in order to meet the requirements of the renewed standard, and it may be able to carry out some reduction and/or consolidation of existing documents, in order to simplify its QMS.

Keywords*: standards, quality management, certification, information*

Introduction

ISO standards are periodically reviewed and revised and in September 2015, after extensive review, a new ISO 9001standard was published. At the same time also the new revision of ISO 14001 standard was published, by harmonizing their layout to the 9001 one. Two of the most important goals in the revision of the two main management ISO standards deal with developing a simplified set of requirements that will be applicable to small, as well as medium and large organizations, without disparities, and allowing organizations the flexibility in handling its Quality Management System (QMS). This enables each individual organization to determine the correct amount of documented information needed in order to demonstrate the effective planning, operation and control of its processes and the implementation and continual improvement of the effectiveness of its QMS.

This paper focuses on the documents necessary for the implementation of a QMS. The new standard defines documented information as relevant data that are required to be controlled and maintained by the organization to support the operation of processes and to have confidence that the processes have been carried out as planned (EN ISO 9001:2015, clause 4.4).

Material and methods

Making a comparison between the requirements of ISO 9001 version 2008 and 2015 one, the aim of this paper is to outline the correspondence between required documents in order to demonstrate that an organization with an existing

QMS should not need to rewrite all of its documented information and it may be able to carry out some simplification and/or consolidation of existing documents, simplifying its system.

Results and discussion

The Quality Management System (QMS) needs to include documented information required by the standard as well as necessary documented information determined by the organization for the effectiveness of the system. According the previous version of ISO 9001, the documentation could differ among the organizations, depending on their size, activities, competence of personnel, complexity of processes and their interactions (ISO 9001:2008, clause 4.2.1). The documentation could be in any form or type of medium. The new version of ISO 9001, requires an organization to maintain documented information to the extent necessary to support the operation of processes and retain documented information to the extent necessary to have confidence that the processes have been carried out as planned (ISO 9001:2015, clause 4.4). In 2008 standard is required for an organization to establish, document, implement and maintain a QMS and continually improve its effectiveness, in accordance with the requirements of the standard. In 2015 standard, the term "documented information" replaces the previously used terms "documented procedures" and "records" and, consequently, it is used for all required documents.

According the previous standard (ISO 9001:2008), it is possible to classify the document requirements in a 3 levels pyramid (see figure 1): top tier included descriptive documentation (e.g. Quality Manual), tier 2 the set of procedures and work instructions (prescriptive documentation), tier 3 consisted of records. In the new standard (ISO 9001:2015), a new pyramid model classifies the required documents, as follows: top tier concerns high level transversal documents (for establishing the QMS), tier 2 contains specific documents (for communicating

among the organization the information necessary to operate), tier 3 are records (for providing evidence of the achieved results).

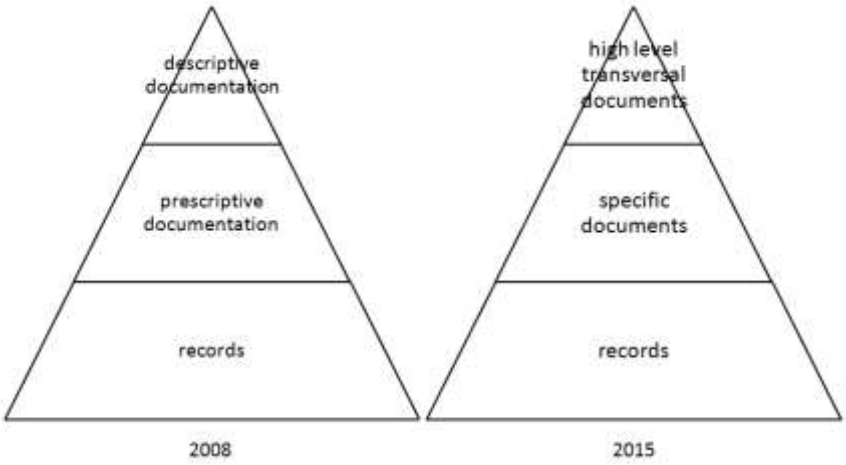

Figure 1. The 3 level pyramids of the document requirements in ISO 9001:2008 and ISO 9001:2015, respectively. *Source: Authors' elaboration*

The documented information (d.i.) to be maintained by the organization, compared with the previously document requirements, includes (see table 1):

Table 1.

Documented information required by ISO 9001:2008 and 2015. *Source: Authors' elaboration*

ISO 9001:2008 **Descriptive documentation**	**ISO 9001:2015** **High level transversal documents**
No document required	4.3 scope of the quality management system
4.2.1.a Documented statements of a quality policy and quality objectives	5.5.2 quality policy
	6.2.1 quality objectives
4.2.1.b Quality manual	*Not required*
4.2.1.c Records required 4.2.1.d Documents and records, determined by the organization to be necessary to ensure the effective planning, operation and control of its processes.	7.5 a d.i. required by the Standard 7.5 b d.i. determined by the organization as being necessary for the effectiveness of the QMS 7.5.2 creating and updating d.i. 7.5.3 control of d.i.

While ISO 9001:2008 expressly required documented procedure, the 2015 version does not specifically requires any of them as d.i. (see table 2). However, among specific documents, are included procedures and any other document maintained by the organization for the purpose of communicating the information necessary to operate. It is a choice of the organization to arrange them in a documented mode for the effectiveness of its processes (ISO 9001:2015, clause 4.4.2).

Table 2.

Documented information required by ISO 9001:2008 and 2015. *Source: Authors' elaboration*

ISO 9001:2008 **Descriptive documentation**	**ISO 9001:2015** **Specific documents**
4.2.3 Procedure of control of documents	*Not expressly required*
4.2.4 Procedure of control of record	*Not expressly required*
8.2.2 Procedure of internal audit	*Not expressly required*
8.3 Procedure of control of nonconforming products	*Not expressly required*
8.5.2 Procedure of corrective actions	*Not expressly required*
8.5.3 Procedure of preventive actions	*Not expressly required*

Records provide evidence of the achieved result (see table 3 for those expressly required by the standards). The organizations are free to develop other records (ISO 9001:2015, clause 7.5) that may be needed to demonstrate conformity of their processes, products and services and QMS.

Table 3.

Documented information required by ISO 9001:2008 and 2015. *Source: Authors' elaboration.*

ISO 9001:2008 Records	**ISO 9001:2015 Records**
4.2.1.c Records required 4.2.1.d Documents and records, determined by the organization to be necessary to ensure the effective planning, operation and control of its processes.	4.4.2 a d.i. to support the operation of its processes 4.4.2 b d.i. to have confidence that the processes are being carried out as planning
5.6.1 Management review - general	*Not required*
6.2.2.e Competence, training and awareness – maintain appropriate records of education, training, skills and experience	7.2 d.i. as evidence of competence
7.1.d Planning of product realization – records needed to provide evidence that the realization processes and resulting product meet requirements	8.2.3.2 a d.i. on the results of the review of requirements related to products and services
7.2.2 Review of requirements related to the product	8.2.3.2 b d.i. on any new requirements for products and services 8.3.2 d.i. needed to demonstrate that design and development requirements have been met
7.3.2 Design and development inputs	8.3.3 design and development inputs
7.3.4 Design and development review	8.3.4 design and development controls
7.3.5 Design and development verification	
7.3.6 Design and development validation	
Not required	8.3.5 design and development outputs
7.3.7 Control of design and development changes	8.3.6 design and development changes
	8.4.1 records of the evaluation, selection, monitoring of performance and re-evaluation of external providers and any and actions arising from these activities
7.4.1 Purchasing process	8.5.1 control of production and service provision
7.5.3 Production and service provision – Identification and traceability	8.5.2 identification and traceability
7.5.4 Production and service provision – Customer property	8.5.3 property belonging to customers or external providers
	8.5.6 results of the review of changes for production or service provision, the persons authorizing the change, and necessary actions taken
	8.6 release of products and services
7.6 Control of monitoring and measuring equipment	9.1 monitoring, measurement, analysis and evaluation
8.2.2 Monitoring and measurement –	9.2.2 evidence of the implementation of

Internal audit	the audit program 9.3.3 management review outputs
8.2.4 Monitoring and measurement – Monitoring and measurement of product	7.1.5.1 d.i. as evidence of fitness for purpose of the monitoring and measurement resources 7.1.5.2 evidence of the basis used for calibration of the monitoring and measurement resources
8.5.2 Corrective actions 8.5.3 Preventive actions	8.7.2 nonconformity, actions taken, concessions obtained, authority deciding the action in respect of the nonconformity
	10.2.2 nonconformity and corrective actions

Conclusion

The ISO 9001:2015 approach for the quality management system emphasizes the needing of a more appropriate use of the documented information. With the update of its certified QMS to the 2015 standard, an organization should not need to rewrite all of its documented information in order to meet the requirements of the new standard. The organization may be able to carry out some simplification and/or consolidation of existing documents in order to simplify its QMS, without compromising the control over their processes and in a logic of effectiveness and continuous improvement

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Technical Regulations of Paints and Coatings According to Association Agreement Between Ukraine and the EU

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Abstract. The comparative analysis of technical regulations in the field of paints and coatings in Ukraine and the EU is held. The main risks of paints and coatings which have been regulated are shown. The ways of harmonization of Ukrainian legislation to European standards in compliance with the Association Agreement between Ukraine and the EU are proposed.

Keywords*: paint and coating materials (PCM), safety, quality,* volatile organic compounds (*VOC), technical regulations.*

Introduction

On September 16, 2014 the Association Agreement Between The European Union and the European Atomic Energy Community and Their Member States, of the One Part, and Ukraine, of the Other Part (The Association Agreement between Ukraine and the EU) has been simultaneously ratified by Verkhovna Rada of Ukraine and the European Parliament. According to Title 4 of the Agreement the Deep and Comprehensive Free Trade Area between Ukraine and the EU partly entered into force since January 01, 2016. According to the Area the EU is partly

removal of customs tariffs and quotas to access of Ukrainian products to the EU market. However, Ukrainian producers must comply with EU standards on safety and quality of products. An important aspect of the Agreement is to approximate sphere of technical regulation and standardization of Ukraine to European standards.

Material and methods

The methodological base of research is the methods of scientific knowledge, a systematic approach and generalization; national, European and international laws and regulations.

Results and discussion

The main paints and coatings risks which needs to be regulated. Paint and coating materials (PCM) are the products of chemical industry, which widely used in building, various industries and household. PCM can contain harmful chemicals that can migrate into the environment and negatively affect to the ecology and human health [1].

Ukraine PCM market is influenced by global trends. Over the last 5 years there have been significant changes in production and consumption of PCM in Ukraine. Share of water dispersion PCM in the total production and consumption increased by 2 times – from over 32% in 2007 to almost 60% in 2015 due to reduced of production of organic solvents based PCM [2].

Regulation of PCM safety is an important aspect of technical regulation. The main factors of PCM risks for the environment and consumer health is the presence of following harmful components:

– volatile organic compounds (VOC);

– heavy metals (lead, chromium, cadmium, zinc etc.) and their compounds that can be the part of pigments, dryers and other components of PCM, the most dangerous of which is a lead.

VOC content in PCM is an important indicator of safety and strictly regulated by legislation in the industrial countries. In the EU there are two directives on the limitation of emissions of VOC: 1999/13/EC (so called solvent Directive) and 2004/42/EC (so called Paints Directive), according to which the content of organic solvents in paints for the EU market since 01.01.2010 must be reduced up to 2-13 times (depending on the type of medium and scope) [3, 4]. Ukraine also undertook to implement Directive 2004/42/EC in the framework of the Association Agreement.

The World Health Organization has recognized the lead as one of toxic elements, which are extremely dangerous [5]. Therefore International Conference on Chemicals Management in Geneva in 2009 approved the establishment of the Global Partnership to promote phase out the use of lead and its compounds in paints. In the framework of UN this partnership named Global Alliance in elimination of lead paints [6].

The main EU legislative document which is directed to manage chemicals and compounds, including heavy metals in PCM is the EU Regulation №1907/2006 "Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)", which came into force since July 2007. According to this Regulation companies must identify and manage risks (hazards) relating to substances that are produced and distributed in the EU market. This also applies to chemicals that may be contained in PCM, in particular heavy metals and their compounds. According to the REACH lead carbonates (CAS № 598-63-0, CAS № 1319-46-6) and lead sulfates (CAS № 7446-14-2, CAS № 15739-80-7) can not be present on the market or used as a substance, as well as in mixtures for use in the PCM [7].

Technical regulations of PCM in Ukraine. In the technical regulations of PCM Ukraine has gone by the way of adoption of national standards identical to relevant international and European standards. Technical Committee of Standardization #168 "Paints and Varnishes" of Ukraine has taken this decision in cooperation with Ukrainian Paint and Coatings Association (UP&CA).

The 6 basic standards which have been translated into Ukrainian and published came into force in Ukraine in 2013-2015. These standards are: DSTU EN 1062-1: 2012; DSTU EN 13300: 2012; DSTU ISO 1514: 2013; DSTU ISO 1513: 2014; DSTU ISO 4618: 2014; DSTU ISO 15528: 2014.

Since January 1, 2016 the 255 national standards of Ukraine (DSTU ISO, DSTU EN) came into force in the original language as identical to the relevant international and European standards according to the order of Ministry of Economic Development and Trade №145 of 11.05.2015 [8]. In addition, over 50 old GOSTs have been abrogated since 01.01.2016, and more than 100 others will be gradually abrogated until 2018 to implement the program of work on national standardization. This is great progress and significant approach of technical regulation in the PCM to modern international standards.

Thus, regulation of PCM quality and safety requirements, methods of it testing will be carry out in Ukraine according in to ISO and EN standards, recognized throughout the civilized world.

However in Ukraine some standards that do not regulate PCM hygiene and safety parameters and do not contain figures on the content of VOC and heavy metals continue to be in force (e.g. GOSTs on enamel PF-115, PF-133 etc.).

The implementation in Ukraine of the relevant technical regulations, which is developing will be the way out of this situation. Thus, the draft Technical regulation "On the limitation of VOC content in certain categories of PCM" has been presented 26 February 2016 at the meeting of the working group at the Ministry of Economic Development and Trade of Ukraine. This document was developed by members of TC 168 "Paints and Varnishes" in enforcing the implementation of Directive 2004/42/EC. It is expected that technical regulation will come to force since 01.01.2017 and will regulate the VOC content in certain categories of PCM. The implementation of the 2nd stage of the technical regulation plans since 01.01.2020,

when the VOC content of PCM, which will have been manufactured supplied into Ukraine should be reduced from 2 times till 13 times [9].

Compliance with such requirement needs further growth of production ecological water-dispersion PCM in Ukraine. Substantial scientific research and experimental work have been carried out in Ukraine to develop new water-dispersion paints for different purpose using mineral extenders of Ukrainian origin. These developments will meet the demand of consumers in the competitive ecologically friendly paints and will promote growth in relevant economic spheres [10].

The main directions of improving technical regulations PCM in Ukraine are:

1. Intensify the implementation of technical regulation "On the limitation of VOC content in certain categories of PCM";

2. The development of technical regulations "On the limitation of lead and other heavy metals content in PCM";

3. Abrogation of the existing GOSTs that do not meet modern requirements of PCM safety and quality;

4. The harmonization of national regulations with relevant EU documents in the sphere of PCM.

Conclusion

The analysis of technical regulations in the sphere of PCM in Ukraine showed the actuality of a substantial revision of national standards on the limitation of VOC and heavy metals and other dangerous chemicals content in PCM according to norms of relevant EU legislation. The impetus for this is the need of harmonization of Ukrainian legislation toward European standards on pursuant of the Association Agreement between Ukraine and the EU.

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VI. SUPPLY CHAIN MANAGEMENT: PACKAGING AND LOGISTICS OF PRODUCTS

Tools for Integrating the Supply Chain

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Abstract. The most important tools for integrating the supply chain include: the electronic data interchange, supply chain management and the automatic data capture. In practice, all of above are used in the complementary mode, because the integration processes are carried out at various levels in various configurations. The use of information technology allows for creation of new business models and change of processes and the relationship between the partners. Implementation of the concept of integrated supply chain management is a convenient solution allowing trading partners to mutually improve traceability of goods along the distribution chain (Bar 2011).

Keywords*: supply chain management, integration, electronic data interchange, automatic data capture*

Introduction

The supply chain management is increasingly complex. The pace of business continues to accelerate resulting in the increased demands for quality and the amount of information made available to the supply chain. Manual processes and

out-dated automation systems cannot keep up with these demands. The new information technologies are the major factor of supporting the functioning of supply chain processes (Lisińska-Kuśnierz, Ucherek 2005). The main feature affecting the level of integration in the supply chain is the use of electronic data interchange technology (EDI), which allows trading partners to build a sustainable competitive advantage, for example by improving the efficiency of logistics processes. The study indicated additional important factors influencing the emergence of integrated supply chain: sharing with business partners' information of stock structure and volume, production plans as well as the use of personalized packaging (Lisińska-Kuśnierz, Ucherek 2004) and labeling (GS1 Standard International Logistic Label...2008).

Material and methods

The research's methodological framework can be defined as an exploratory research and the nature of the paper is practical study with a case applied.

The aim of the conducted surveys was the assessment of role of encoding methods and automatic data collection systems in the development of integrated supply chain. As well as develop a model of the optimal network between business partners, enabling the monitoring of the origin and movement of goods - from the production of raw materials to distribution of packaged goods in the distribution channels.

The scope of the research concerned:

- the evaluation of supply chains in terms of efficiency and effectiveness,
- identification of potential improvements as a result of the implementation of EDI, automatic data capture and best practice in the supply chain,
- costs versus benefits analyze related to implementation of EDI, automatic data capture and best practice in the supply chain.

The case study was conducted with a combined approach where a quantitative survey was complimented with ten quantitative, semi-structured interviews.

Experiential data provided rich accounts of transactional data from ERP system of collaborating partners in the investigated supply chains. 25 563 data records were primarily collected from the thirty four companies. Analysis led to the identification of thirty seven supply chains that functioned continuously in the years 2010-2014.

Results and discussion

Entering into integration should be a strategic decision, where the mutual goal for a company and its business partners is to become more efficient and drive cost out of the supply chain. Conducted surveys and interviews proved that the best practice in the supply chain integration is built on implementing electronic data interchange (EDI) for the business processes. Best performing partners construct their partnership based on mapping key data: business partner lists, article lists, business scenario lists and corresponding price lists. The higher level of integration the more activities in the process are covered by the automate process. Proven way of working in integrated supply chain consists of 5 steps scheme.

Buyer issues a "purchase order" which is sent to the seller. Purchase orders always correspond to the agreed mapping. The buyer expects that the seller can deliver the goods according to the agreed delivery conditions. In the second step the seller confirms the possibility to deliver the demanded goods in the "purchase order" via an "order confirmation". The supplier will also start the actual delivery process.

In the next step "call-off" depending on the agreed Incoterms, logistics will be taken care of by the seller or the buyer. The implementation guidelines for logistics are described in a specific document. In the fourth step based on the picking list a "delivery specification" for each delivery is created. The specification includes the detailed package information. The buyer can create a "goods receipt message" in their ERP-system at the arrival of the packages. Finally, the seller issues an "invoice" that can be accompanied by an "invoice specification". Both documents are sent to the buyer.

Table 1.

Business transactions and tools used between supplier, seller and buyer for integrating the supply chain

Business transactions and tools	**Description**	**Observed Benefits**
Purchase Order	A Purchase Order message is set up between a buyer and a seller. It covers one delivery of goods on one occasion, but can cover a time period with several deliveries. A Purchase Order contains detailed information concerning all aspects of the deal.	Reduced manual work, resulting in fewer entry errors and improved supply chain management (end to end process was shortened by 1,5 day comparing to non EDI transfer of data). Simplified process of dealing with multiple suppliers and customers through use of common business solutions (reduction of business scenarios from nine to four).
Order Confirmation	An Order Confirmation is corresponding to the previously issued Purchase Order and is the answer from the seller to the buyer on the possibilities to deliver.	Accurate data (lack of error due to automate mapping of data). Reduced transactional costs (workload reduction by 20% per order). Consistent information throughout the supply chain.
Call Off & Call Off Confirmation	A Call Off is a business transaction instructing the consignor (seller/supplier) to dispatch goods. A Call Off contains information about how the goods are to be loaded, quantities, marking instructions etc. Call Off Confirmation is the answer from the seller to the buyer on the possibilities to deliver.	Improved traceability, due to automate registration of data. Wide range of data available for control and reporting purpose. Interaction between business partners in an uniform manner.
Delivery Specification	The Delivery Specification describes in detail what is being shipped and how it is packed and marked.	A simplified process for dealing with multiple suppliers and customers through use of common business solutions. Hasten flow of documentation comparing to non EDI transfer of data by 0,25 of day per transaction.
Invoice	An Invoice is sent from a seller to a buyer specifying a request for payment for goods being shipped from a supplier to a “ship to party”.	Reduce manual work and costs comparing to the Invoices received in e-mail or paper format introduce unnecessary complexities (documents must be sorted, scanned, and keyed into an ERP system). Automate matching process allows for linking PO, GR, and Invoice data necessary to perform the proper validations.
Sharing Stock Structure And	Sharing with business partners’ information of stock structure and	Support for change requests due to business needs

Volume	volume	
Sharing Production Plans	Sharing with business partners' information of production plans	The data indicate that in order to obtain certain improvements of productivity, the specified scope and frequency of information sharing are needed.
Personalized Packaging And Labeling	Written, electronic, or graphic communication on the package or on a separate but associated label according to buyer needs.	Everyone can participate in e-business transactions, irrespective of company size or technical expertise.
Barcodes	Barcodes are used to encode information such as product numbers, serial numbers and batch numbers, enabling parties to automatically identify and track products as they move through the supply chain.	Real-time exchange of information and greater electronic information availability
Logistics Labes	A standardized data structure, label design, and label placement standard. It is used to establish best practices of logistical unit labeling around the world.	Simplify the process for dealing with multiple suppliers and customers through use of standardized label design

Source: (Bar 2015).

Although business transactions and tools for integrating the supply chain have been growing in popularity, many potential problems remain to be addressed. This can be only achieved by proper costs versus benefits analyze. In fact the most often appearing problem during implementation projects is cost related and a lack of pre-installation planning (*Improving business performance and competitive advantage*…2011). Note that almost half of the project stated that the business transactions system cost more than expected. In contrast, only about one-quarter of the implementation of the system was actually less expensive than anticipated. This is why the proper financial analysis plays such an important role in project planning and several implementations related costs should be anticipate, like: software (middleware, etc), consultancy fees (IT related and business experts), IT hardware purchase and manpower to control and support the processes.

Conclusion

The business is aware of the potential gains to be made by tools forcing

supply chain integration (Sooksaksun, Sudsertsin 2014). EDI has provided new applications for use in the world economy. The greatest challenge in implementing new approach in the industry seems to be a human resistance to change. However, studied proved that traditional business communication by phone, fax, and mail is replaced step by step by e-commerce applications and this trend is expected to be adopted more and more as time passes (Pfohl, Muller 2015).

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Attitude of the Poultry Meat Industry in Poland to the Implementation of Active and Intelligent Packaging Systems

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Abstract. There is increasing interest in the application of active and intelligent packaging in the food industry. The USA, Canada, Australia and Japan are the leading countries in the production and/or practical application of such innovative technologies. The European food legislation from 2009 initiated interest in such packaging systems. However, in Poland these technologies are still not very well known. The world is also faced with increasing amounts of food waste. The application of active packaging systems enables the extension of shelf-life, ensures the quality and control of food products in the logistic chain will meet consumer expectations and reduces food waste on a global scale. In our previous study from questionnaire research we found that the potential application of active and intelligent packaging in the food industry is of great interest of consumers in Poland and women's interest was higher than men's. The results clearly indicated that the vast majority of consumers were willing to buy food wrapped in active packages, even taking into account the necessity to pay higher prices. Therefore the aim of the present study was to discover if the poultry industry in Poland is eager to apply such innovative packaging in their production. The management staff (managers, technologists, workers of quality and safety departments) of leading companies in the Polish Poultry Industry were asked about the potential application of different kinds of active and intelligent packaging for poultry culinary parts or whole

carcasses. Because it is new packaging technology in Poland the questionnaire had educational function: i.e. questions were blended with short explanations detailing how a particular packaging could influence the packed food. The results support the opinion that some kinds of active packaging (oxygen scavengers, moisture absorbers and antimicrobial substances) and intelligent packaging (indicators of freshness and TTI, should be applied in the poultry industry to meet the requirements of clients, to be competitive on the local and international market and to decrease food waste. However, this will only be practicable if such packaging does not substantially increase the final price of the product.

Keywords*: active and intelligent packaging, innovative packaging, poultry meat industry*

Introduction

There is increasing concern about food waste, and food spoilage, and there are increasing demands from consumers concerning food quality and safety to be met by food producers. Consumers and producers also seek longer shelf lives, enhanced convenience, innovative methods of packaging and environmental protection as well as improvement in technology, food safety systems and flow of information in situations where food can be a source of potential hazard (European Commission, 2012a; Kerry, 2014; Sperber, 2010). The application of active and intelligent packaging systems can guarantee the quality and safety of food in the logistic/food supply chain (Cichoń & Lesiów, 2013; Cierpiszewski 2016; Popowicz & Lesiów, 2014a).

This type of packaging is less known in Poland and most European countries in comparison with the USA, Japan or Australia. However, Polish customers have some knowledge about this innovative technology of packaging. It was noted that

women are more interested in the application of such kinds of packaging than men and all found potential benefits in spite of the slightly higher potential price of buying food in such packaging (Cichoń & Lesiów, 2012; Popowicz & Lesiów, 2014b). There is a lack of information in the available literature if Polish food processors are interested in the potential application of novel packaging technology.

Therefore, the aim of the paper was to present the opinions of employees from poultry meat enterprises in Poland concerning possible application of active and intelligent technology in food production.

Material and methods

The questionnaire was distributed in 2015 to all the most important poultry companies in Poland (50). This was effected both electronically and by post as letters. The management, marketing and technology employees from poultry meat enterprises (44 persons from slaughtering and 21 from processing companies) were asked to complete questionnaires about the possible application of active and intelligent technology in poultry production. The questions referred to producers' expectations with regards to the usefulness of these types of packaging systems and the possibility of the implementation of such technology.

Results and discussion

In answering for first question for the respondents' the most important feature of packaging is the price for which pointed 71,43% and 77,27% workers of poultry processing and poultry slaughtering companies, respectively. In next question only 9% of respondents declared that current packaging solutions available on the market were sufficient. The idea of modifications to the current packaging systems was accepted by over 40% of respondents. More than 50% of poultry meat company employees believed that innovative solutions, such as active and intelligent packaging, should be implemented into poultry meat processing. Then, nearly half of the employees of poultry slaughtering companies and two thirds (66.67%) of poultry processing companies indicated that they know of these packaging solutions

from professional literature. Around 5% of respondents declared an awareness of the fact that active and intelligent packaging has been implemented in practice and over 28% of employees in poultry meat companies in Poland had never heard about these solutions.

The majority of respondents from poultry processing companies believe that their product would still be acceptable if the final price of product increased by up to 1PLN (Fig.1). The same tendency was observed for the final price of processed products wrapped in intelligent packaging materials (Fig.3). On the other hand, over two thirds of poultry slaughtering company employees declared that their product wrapped in the active packaging materials might be accepted in the final price increased by a maximum 0.5PLN or less (Fig.2). However, for raw poultry products wrapped in the intelligent packaging systems more than half of the respondents believed that these products might not be accepted if the final price increased by more than about 0.5PLN (Fig.4).

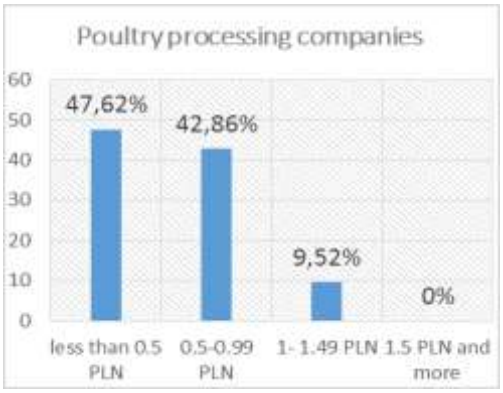

Fig.1 Acceptance of increase in the final price of processed poultry products finale price wrapped in active materials

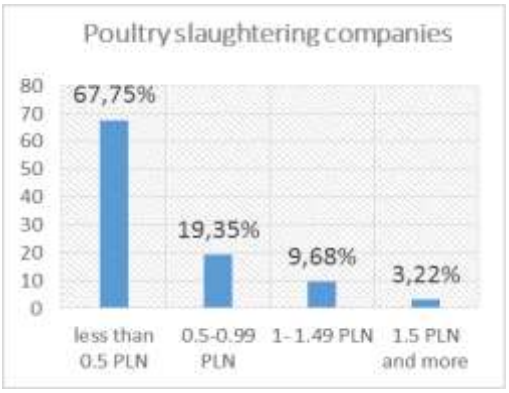

Fig.2 Acceptance of increase in the final price of raw poultry product wrapped in active materials

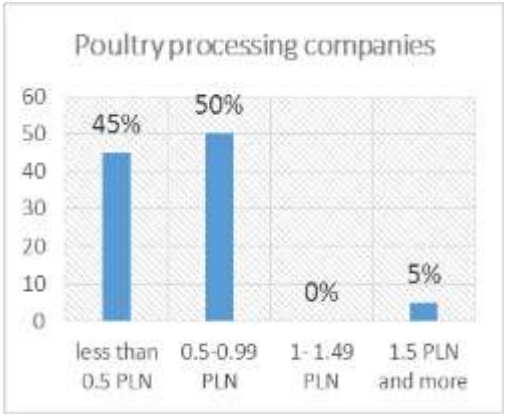

Fig.3 Acceptance of increase in the final price of processed poultry products wrapped in intelligent materials

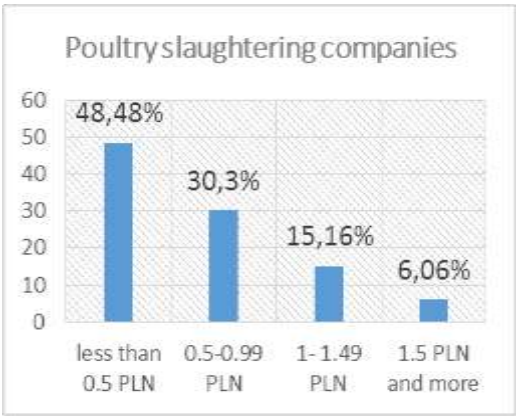

Fig.4 Acceptance of increase in the final price of raw poultry products wrapped in intelligent materials

In poultry processing companies the majority of respondents envisage the possible application of oxygen absorbers (76.19%) and antimicrobial systems (66.67%) in their companies. Also, those in poultry slaughtering companies believe that antimicrobial systems should be implemented. In particular, the concept of flavour compounds being released from the packaging was disliked. A similar tendency for beef meat was described by van Wezemael et al., (2011). Nearly half of respondents indicated smoked products (47.62%) and pates (52.38%) for implementation of innovative packaging systems.

In opinions on the possibility of application of different intelligent packaging technologies the majority of respondents (over 75%) liked the concept of implementation of freshness indicators in industrial practice. On the other hand, the concept of the humidity absorbers was disliked, by both poultry slaughtering and processing company employees.

Conclusion

Active and intelligent packaging systems are potential models of innovation for the Polish packaging and food industry. This study has shown that there is a

willingness to implement these technologies on the part of a majority of Polish poultry enterprises, even if this were to result in a higher final price for food products. Innovative packaging systems such as oxygen scavengers, moisture absorbers, antimicrobial substances, freshness and TTI indicators should, in particular, be implemented in the poultry industry to meet the requirements of Polish clients and help producers to decrease food waste.

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Normative Requirements for Packages from Recycled Fiber Materials

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Abstract. The grade of the recycled paper based packages depends on the quality of the used raw materials. In this regard, the normative documents regulating the requirements for the main parameters determining the recycled fiber mass quality are essential. The necessity of an entry control defines the need for regulation of indicators such as ash content, specifying the unacceptable components in the recovered paper and providing reliable methods to conduct their testing. The category of the paper used and the choice of technological solution should be considered when specifying the values of the individual quality indicators of the finished products. Furthermore, the degree of recycling of the secondary mass determines the type of the final products and their functional purpose. Analyzing the normative-technical documentation based characteristics, a list of the main and most-important user properties of the recycled material made products must be provided together with a proposal for their possible improvement and the degree of compliance with their quality as per the requirements. Due to the usage of packages in contact with food and dangerous goods, should be taken into account all regulatory requirements in the field respectively.

Keywords*: normative requirements, packaging, recycling*

Introduction

The good packaging is the quality packaging. The category "quality" has a comprehensive character, determined by the objective characteristics of the product and its capabilities to satisfy the user requirements, which also become one of the major factors in the design of the various assortments. Considering the trends of environmental protection and in the context of the so-called. "economy of the resources", the development of green packaging depends on the processes of recycling. The production of packaging from recycled fibrous materials is a good example of a successful activity within the Circular economy package. In the amendments of the Circular economy package regarding the Waste Directive of the EU are set high targets "***for recycling and preparing for reuse***" - by the end of 2030 at least 70% of total waste generated from packaging (by weight), including packaging paper and board, as mentioned (Business bulletin, 2016, p.12). In this context ***the quality of the obtained secondary product and its requirements are a major point*** in the evaluation of its life cycle and determines the interest of the authors to the problem.

Material and methods

The object of study are the different normative documents related to packaging from recycled fibre materials. A systematic and interdisciplinary approach is used by applying methods of data analysis and synthesis.

Results and discussion

The requirements to the quality of the used raw materials for recycling and the final products formed from them, including the packaging from paper and board, are regulated by different standardized documents (table 1).

Table 1.

Normative requirements for packages from recycled fiber materials

Normative document	Scope of action
EN 643:2014 *Paper and board. European list of standard grades of recovered paper and board.*	defines the different categories of waste papers, divided into groups and the requirements for their quality: moisture content, undesirable materials, contaminants and unfit for recycling paper and board.
EN 13427:2004 *Packaging. Requirements for the use of European Standards in the field of packaging and packaging waste.*	gives the corresponding evaluation criteria for packaging, as per Directive 94/62/EU (minimization of material, hazardous substances, four heavy metals, recovery of materials, environmental impact) and method for reporting of a compliance.
EN 13430:2004 *Packaging. Requirements for packaging recoverable by material recycling.*	gives a practical guide for evaluating the recyclability of packaging, containing a criteria for recyclability (control the structure / composition and processing of packaging, compatibility with the existing recycling technologies and the emissions caused by them), criteria in the design, production and use of packaging and procedures for evaluating the compliance with the requirements.
EN 13437:2003 *Packaging and material recycling. Criteria for recycling methods. Description of recycling processes and flow chart.*	gives a description of the processes of every type and the criteria for a material recycling: use of secondary (waste) raw materials, scraps from productions, high level of cleanliness of the raw material when is demand.
EN 13440:2003 *Packaging. Rate of recycling. Definition and method of calculation.*	gives the methodology and the principles of the calculation of the rate of recycling for the packaging and the packaging materials. The calculation for material and organic recycling are specified.
CR 13504:2003 *Packaging. Material recovery. Criteria for a minimum content of recycled material.*	Summarizes that it is practically impossible to determine the minimum content of the recycled material for each type of packaging.
CEN/TR 13688:2008 *Packaging. Material recycling. Report on requirements for substances and materials to prevent a sustained impediment to recycling.*	gives some examples of substances and materials that may prevent the recycling process: adhesive tape, RFID tags, metal stitches, plastic laminates, wax and bitumen coatings and others. Specifies that due to differences in the used equipment and the wide range of secondary fiber products,the various recycling operations will have a different acceptance tolerance for non-compatible elements.

ISO 15360-1:2003 *Recycled pulps Estimation of stickies and plastics. Part 1: Visual method.*	gives a method for evaluation of stickies and plastics in different pulps retained on the screen of a given slit size holes (100 μm or 150 μm).
ISO 15360-2:2015 *Recycled pulps Estimation of stickies and plastics Part 2: Image analyses methods.*	replaces the visual examinations and counting technique described in ISO 15360-1 with image analysis. It is used when visual inspection of pulps with a high content of stickies or plastics is very time-consuming to carry out.
EN 25651:1999 *Paper, board and pulp. Specification for units for expressing properties of paper, board and pulps (ISO 5651:1989).*	determines the recommended units used to express the properties of paper, board and pulp: general and special properties, divided into more than 10 groups without considering their category.
Standards ISO 5350 *Pulps. Estimation of dirt and shives.*	gives methods for evaluation of pulp in passing and reflected light by visual method.

Moreover, for the produced recycled packages operate normative acts, regulating the quality of the packaging placed on the market, including: standards representing *the main terms and definitions, rules for acceptance, methods for testing, packing and transportation of the packages, as well as the nomenclature of indicators of quality*.

An important point when considering packaging from recycled fiber material is legislation on their use in contact with food. As summarized Misko (Misko, 2013, p.1), in the U.S., the recycled packaging materials must comply with any applicable regulations and must meet the suitable purity requirements of the Food, Drug and Cosmetic Act (FD&C Act). The European Union (EU) does not have harmonized legislation governing the use of food contact paper and board materials – they must comply with any applicable EU or Member State legislation and must meet the safety requirements outlined in the EU Framework Regulation.

The type, the fiber composition, structure and quality of the used recycled pulp have an impact and are a major factor for the values of the individual quality indicators of the final product. The standards, defining the limits within the separate values of these indicators should exist, do not consider the composition (paper,

board, combination between them) and the rate of recycling (how many times) of the obtained packaging, when it is recycled. Visual inspections of quality control for the used secondary raw material are performed, as the quantitative measurements include only: moisture content, unusable paper components, unusable paper materials (% air dry weight), total weight of the consignment (as wet weight).

Struntz (Strunz, 2006, p.19-21) and other authors (Villanueva & Erder, 2011, p. 35) found that the condition of the entry control of the baling waste paper is not at the required level. Rozalinov (Rozalinov, 2005, p.17) also believes that studying and analyzing the properties of the source materials and their impact on quality indicators of the obtained packages is essential for the design, construction and choice of material for manufacturing of paper packaging.

The finished products made from recycled paper materials should comply with the requirements of the normative documents regulating the indicators of paper, board and pulps as: fiber content, own weight, different strength properties (bursting strength, flat crash resistance, folding endurance, tensile strength, tear strength and others), optical properties, as well as specific properties (degree of sizing, capillary rise, filtration ability, etc.). The basic user properties groups are associated with the ability of effectively usage of the package by purpose, its social significance, practical utility, convenience in use, reliability, harmlessness and esthetic value. Depending on the specifics of the goods that characterize it, the consumer properties are grouped as: functional, reliability, esthetic, environmental and economical (Stoykova & Jeliazkova, 2012, p.20). Based on that, the finished recycled packaging forms its capacity considering the applied technology with predefined parameters. The main task of recycling is to restore the original properties of the product, which has already been in operation and thus has lost a part of its quality characteristics. This makes the reaching of the values, set by the standards for quality indicators of finished products, a difficult task and put into consideration of the products subject to recycling as a separate category.

Conclusion

The normative documents, regulating the requirements for the basic parameters, determining the quality of the secondary fiber-based materials are defining for the grade of the recycled paper based packages. The standards in the research area identify and group the categories of paper and board that can be recycled, represent the basic methods for visual assessment of their quality, by clarifying the characteristics of the substances and materials that influence it. Concerning the recycling process, there are presented schemes and criteria for the technology, there is specified a methodology for calculating the rate of recycling as well, but a general establishment of a minimum content of recycled material is practically impossible. The presented normative documents are interrelated, as their texts are corresponding and are in unison with Directive 94/62 / EU.

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Consumer Taste Evaluation at Russian Wine Market

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Abstract. Russian emerging wine market grows extremely fast and become more and more interesting for foreign companies. This article covers the study of the consumer demands' price descriptors for red dry wines, produced from Merlot grape variety, made in different regions of the world for systematization of the data in formalized model of competitive advantages. The main thesis of this work is to analyze the current tendency of Russian wine market and check if the organoleptic characteristics of wine samples match its price structure or not.

Keywords*: wine market, consumer behavior, demand descriptors*

Introduction

In 2014 offer on Russian wine market constituted 75.1 million USD in volume, lower for 6% against 2013. Decline was observed both in segment of

domestic wine (-5%) and imported wines (-7%). Reduction of offer was driven by growth of retail prices due to increased excise tax; another reason was decline of disposable incomes of consumers. But Russian wine market still can be quite interesting for foreign companies but is it better to import products of integrated chain or use the samples of wines from domestic production. In this conditions the investigation of consumer demands' descriptors in Russia become more valuable especially for foreign companies interested in market enter.

The main thesis of this work is to analyze the current tendency of Russian wine market and check if the organoleptic characteristics of wine samples match its price structure or not. For this task as a first step of organoleptic research the blind consumer hall-tastings were performed using standard method of The international Organization of Vine and Wine. As a second step tastings at points of sale of wines using national 10-points equivalent scale were conducted.

Results of this research shows that consumers of wine at Russian market totally overpay as they buy only a symbolic significance of place of origin not the real value of unique flavor merits. Another result of the exploration is that up-do-date marketing policy for wine producers and sellers at Russian market should include revaluation of the retail price of grape wines sold in retail channels which are not integrated into the international supply chain such as "vineyard shop".

Material and methods

The objects of study at different stages of the study were as follows:

- statistics data of California Wine Institute, San Francisco, CA (USA) on production, imports and exports in the Russian Federation;
- statistics of the Research Center of Federal and Regional Alcohol Markets (Russia) "TSIFRRA";
- retail sales statistics of flavored wines and its samples in the largest supermarkets of Moscow and St. Petersburg.

Statistical data were analyzed by mathematical statistics, correlation and regression analysis.

For experimental studies samples of red and white flavored wines (19 samples), purchased at retail Kemerovo domestic and foreign manufacturers were used.

Sensory analysis was carried out by methods of specialized expertise and consumer research followed by treatment with the results of statistical methods. At the same time all the tests were carried out "blind" method - by experts and specially untrained testers of the consumer panel evaluated the test samples of wine, previously placed in the decanter at a temperature of 150C.

Results and discussion

To analyze consumer's reaction and demand descriptors 18 samples of wines from different countries, including domestic wines were chosen. These samples were subject to two-level research: at first stage consumer at selling points (supermarkets, wine-markets) were surveyed to analyze and choose one of the samples during blind degustation; the next stage were carried by special experts which analyze organoleptic characteristics of presented samples.

In the expert-study organoleptic characteristics of the samples were explored using a quantitative methodology of 100-point descriptive analysis, combined with the analysis of variance results ("Munsell color scale", "wheel of aromas Nobel", "triangle Wedel"), consumers-study were based on national 10-point system of wine evaluation (system of equivalence of Prostoserdov). Research results formed the basis of expert assessment of competitive advantages of wines made on the nomenclature of the performance of their customer value.

Before start of the research the main organoleptic characteristics were tested versus Russian national standard for red wines. Based on it at the sensory wvaluation of quality wines defines the following points: transparency, color, bouquet, taste, typical or "mousse" (for sparkling wines). The transparency of the

wine is determined by transmitted light. The degree of transparency can be different and depends on the age and quality of the wine treatment. For young wines opalescence is accepted, because they can contain in its composition remains of yeast cells and large colloidal particles. In the process of aging as a result of coagulation and precipitation of colloidal unstable fractions wines become more transparent. If you add to this wine the blame extraneous ingredients (water, sugar, glycerin or less stable wine materials) the dynamic equilibrium of the colloid-dispersed composition of wine should disrupt and it changed its degree of transparency. Thus, the transparency of the wine can't be only an indirect evidence of the date of its aging but also shows the purity of composition. Quantitative characteristics of this indicator can be used for identification purposes and to identify certain methods of falsification of wines.

Generally speaking Russian wine experts suppose that if the buyer do not have any preferences, except, perhaps, wine type or place of origin, and he does not feel loyalty to a particular brand, then his choice is determined solely by external appeal of the product: name, label design, bottle design, or PET-package, and as a result consumer give preference for well-differentiated products.

Russian wine market studies show that the decision-making process of buying wine by Russian consumers is as follows:

- vast majority of buyers make a decision to buy a particular bottle of wine directly in the store;
- customer determines the type of wine (red / white, dry / semi-sweet), and country of manufacture.

As a result, the consumer is always looking for something new, try products from different manufacturers. Even if it is acceptable to its value, quality, design, in a short time search is resumed.

Results of research shows there are differencies between the declared parameters of taste wines and actually found in their commercial samples. The

reasons for this, in our opinion, should be sought in the factors that this impact has preserves of the quality of these wines during the processes of transportation and storage.

The second most important parameter of customer value wines is their olfactory characteristics. After olfactory consumers perceive specific odors - the most complex and demonstration feelings, emphasizing the uniqueness or typicality of wines. It is features of wines characterized by their main market and consumer appeal., these critical parameters of customer value wines are not durable and need steady care of all participants in the supply chain to preserve and even to develop them during the process of aging wine in bottles.

Conclusion

Results of this research shows that consumers of wine at Russian market totally overpay as they buy only a symbolic significance of place of origin not the real value of unique flavor merits. Another result of the exploration is that up-do-date marketing policy for wine producers and sellers at Russian market should include revaluation of the retail price of grape wines sold in retail channels which are not integrated into the international supply chain such as "vineyard shop".

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VII. TECHNOLOGY AND INNOVATION PRODUCTS AND PROCESSES

Utility and Safety Assessment of Handwashing Liquid Detergents Containing Blackberry Seed Extract Obtained by Supercritical Carbon Dioxide Extraction

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Abstract. In this paper a common handwashing liquid detergent formulation was enriched with blackberry seed extract in order to achieve the appropriate properties. The extract was obtained by supercritical carbon dioxide extraction. Influence of concentration of the extract on usable properties of laundry detergents: viscosity, foaming and washing ability was tested. In vitro skin irritations testing by zein value determination was also performed. Addition of the extract to the laundry detergents was found to improve safety of use this type of detergents by reducing skin irritations potential while maintaining high levels of efficacy of handwashing liquid detergents.

Keywords*: handwashing liquid detergent, blackberry seed extract, supercritical carbon dioxide extraction, efficacy, skin irritations potential*

Introduction

Handwashing liquid detergents are special purpose products. They are designed for washing sensitive fabrics. Therefore, their formulation should consist

of components that are mild in the interaction with the textile surface. Moreover, handwashing detergents come into direct contact with the skin of the hands during the process of washing. That is why it is vital to ensure that detergents of this type not only demonstrate an appropriate washing performance but also have as little adverse effect on the skin of the hands as possible.

In this paper a common handwashing liquid detergent formulation was enriched with blackberry seed extract in order to improve safety of use of the detergent. The blackberry seed extract was obtained by supercritical carbon dioxide extraction. Advantages of this method of acquiring raw materials include relatively low temperature of extraction and absence of solvent residues in the final product. Conducting the process of extraction at temperature close to 50ºC makes it possible to preserve most active substances in a virtually unchanged form (Roj et. al., 2009). Blackberry seed extract is a reach source of unsaturated fatty acids. These kind of acids are able to complement structures of the skin, moisturize the upper skin layer through reduction of transepidermal water loss and lower skin irritations potential (Krasodomska & Jungnickel, 2015; Van Smeden et. al., 2014; Mojumdar et. al., 2014).

For the purpose of the present study, it was assumed that enriching the composition of a laundry detergent with extracts of this type would reduce the adverse effect of the detergent's ingredients on the skin of the hands. The aim of this work is assessment of the impact of the extract additive on the usable properties and safety of the handwashing liquid detergent

Material and methods

The study examined liquid laundry detergents containing blackberry seed extract. Detergents containing 0.1, 0.3, 0.5 and 0.7 % wt. of the extract were prepared. For the purpose of comparison, an extract-free laundry detergent (Base)

was also tested. The formulation of the liquid laundry detergent tested is specified in Table 1.

Table 1.

Formulation of liquid laundry detergent tested

INCI Name	Composition [% wt.]				
	Base	**D-B0.1**	**D-B0.3**	**D-B0.5**	**D-B0.7**
Potassium Oleate	20				
Sulfated Castor Oil	5				
Glycerin	4				
Tetrapotassium Pyrophosphate	0.5				
Rubus fruticosus (Blackberry) Seed Extract	-	0.1	0.3	0.5	0.7
Potassium Chloride	1				
Potassium Hydroxide	q.s				
Methylchloroisothiazolinone	0.2				
Aqua	up to 100				

Dynamic viscosity measurements were performed with Brookfield DV-III rotational viscometer. Viscosity is measured with a rotating measuring tip called the spindle, which is immersed in the test fluid. Testing was performed at temperature of 20^{o}C, with the spindle rotating at 10 rpm.

The foaming properties were determined using a method set out in the European standard (EN - Surface active agents). Based on measurements, two parameters were determined: foaming ability, *FA* [cm^3] and foam stability, *FS* [%].

The washing properties were determined on the basis of methodology set out in the Polish standard (PN - Washing properties). The method involved washing pieces of soiled test fabric in the test washing agent and in the reference washing agent, under strictly defined conditions. The concentration of the test liquids was 1 % wt. Based on the tests relative washing ability, *RWA* [%], was determined.

Skin irritations potential was determined in zein test. The zein test measures the extent of denaturation of the Zein corn protein by surfactants. The amount of

denaturated protein was determined by Kjejdahl analysis [Bujak, Wasilewski & Niziol-Lukaszewska, 2015; Blagojevic, Blagojevic & Pejic, 2016). The result of the Zein value (ZV) procedure was expressed as mg N per 100 ml of sample.

Results and discussion

The test results are shown in Figures 1 – 3 and in Table 2. Addition of the extract significantly decreases detergent viscosity. No significant effect of the extract addition on the foaming properties was observed. Foaming ability is within the limits of error the same for all samples tested, while foam stability slightly increases with increasing concentration of added extract. Also, there was no influence of the extract on relative washing ability of the detergent tested. The addition of the 0.3% wt. extract reduces zein value by 14 units.

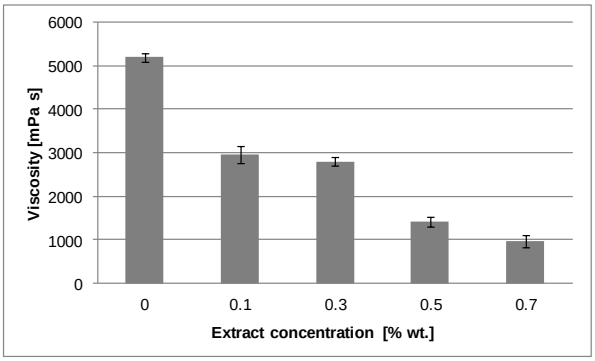

Figure 1. Detergents viscosity vs. concentration of the extract

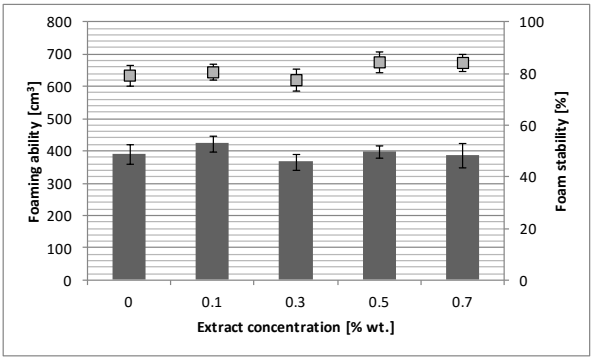

Figure 2. Foaming ability (columns) and foam stability (squares) of the detergents vs. concentration of the extract

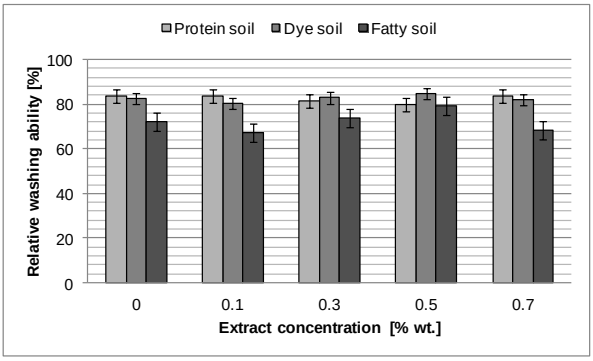

Figure 3. Relative washing ability of the detergents vs. concentration of the extract

Table 2.

Irritants potential of the detergents tested

Extract content [% wt.]	Zein value [mg N/100ml]
0	627±6*
0.3	613±4*

*Assuming the significance level 0.05 it can be stated that these values are statistically different.

Conclusion

The study analyzed the effect of the blackberry seed extract on the usable properties and safety of handwashing liquid detergents. Research has shown that addition of the extract reduces an irritant effect of surfactants on skin and does not deteriorate the efficacy of the detergent tested.

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Circular Economy as a New Model for the Exploitation of the Agroindustrial Biomass

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Abstract. This paper focuses on a new concept of waste and by-products within the agricultural system, based upon the perspective of circular economy, which directs the agrifood chain and the life style towards a "zero waste" model. This new approach can be achieved through efficient small and industrial scale of bioenergy plants, biorefineries and environmentally friendly process for the production of biomolecules to be employed as active principles in agronomy, cosmetics, foods, feeds and pharmaceutical applications. In particular, the case study of this paper concerns the exploitation of Olea, Cynara and Chestnut tissues and by-products as new source for energy and bioactive antioxidant and antimicrobial compounds (polyphenols) (PCT/IT/2009/09425529 *Olea europaea* L.; PCT/IT/2008/000135 *Cynara scolymus* L., MI2014A000177 *Chestnut*), which will also be assessed in different Italian district. The regional level has been chosen for this analysis because the local approach allows to avoid and/or reduce the economic and environmental cost of the waste transport. The polyphenols market is projected to reach 1 billion dollars by 2020 and 4,790 potential source plants are present in

Europe. The recovery of chemicals and the production of energy, should be a continuous process of interaction between high technology and environmental and economic sustainability, making this kind of multifunctional platform highly innovative and consistent with the principles of the circular economy.

Keywords*: Circular Economy, Biorefinery, Agroindustrial Residues, Antioxidant polyphenols*

Introduction

Until now, a linear model of production and consumption has been used so, the new approach of circular economy moving towards a sustainable growth has to be developed. Based upon on this perspective a new concept of waste and by-products within the agricultural system can be suitable implemented. This new approach can be achieved through efficient small and industrial scale of bioenergy plants and biorefineries for the production of biomolecules to be employed as active principles in agronomy, cosmetics, foods, feeds and pharmaceutical applications. In particular, the case study of this paper concerns the exploitation of Olea europea L., Cynara and Chestnut tissues and by-products as new source for energy and bioactive antioxidant and antimicrobial compounds (polyphenols). In this paper a brief assessment of residual biomass from Olea and Cynara has been carried out in the Apulia region. On the basis on the data extraction plant localized in Tuscany and specialized on the generation of bioactive compounds (polyphenols) from the Chestnut tissues and by-products, it hypothesised a multifunctional platform as new source for energy and polyphenols to established in Apulia, a region of the South of Italy, where the two crops considered are the most cultivated in Italy.

Material and methods

In order to quantify the amount of residues per crop (Cynara and Olea) and region, in particular Apulia, a methodology based on a linear correlation among the main output per year and the reproducibility factor of residues has been used (Paiano & Lagioia, 2016). Data and methods concern the extraction of the fractions from Cynara and Olea by products come from the extraction technology used by the unit operating in Tuscany, carrying out the tannin extraction from the Sweet chestnut fractions, based on new sustainable technologies like a water extraction and membrane separation system. This innovative process uses physical technologies (PCT/IT/2009/09425529 *Olea europaea* L.; PCT/IT/2008/000135 *Cynara scolymus* L., MI2014A000177 *Chestnut*), defined as BAT (Best Available Technology) and recognized from Environmental Protection Agency. The process is based on membrane technologies applied to aqueous extracts obtained by heating in a pneumatic extractor and then purified by filtration: microfiltration (MF) treatment, followed by an ultrafiltration (UF) of the previous permeate, finally concentrate with RO (Reverse Osmosis). The obtained fractions have been analyzed and characterized by chromatographic, spectrophotometric and spectrometric (HPLC-DAD-ESI-MS) methods in order to identify and quantify polyphenolic classes (Romani, Campo and Pinelli, 2012). The two commercial products obtained through this process are a liquid fraction concentrated by nanofiltration, and a dry extract by spray-drying from the liquid commercial fraction.

Results and discussion

By the assessment of the residues in Apulia region the following figures have been estimated. About Olea, agricultural residues (leafy and bunch prunings) are approximately 695,000 t/y (dry substance, d.s.) and agro-industrial residues (olive oil by products, like pomace) are 260,000 t/y: both of them are equal to over 37% of

the Italian total. For Cynara, residues are over 52,000 t/y d.s. considered (30% of the Italian total of Cynara residues). It has to be highlighted that material and energy analysis of the entire chain from residual biomass to the energy and biomolecules production will be carried out in the future research. Through the extractive technologies by membrane separation biophenolic fractions from Olea and Cynara have been produced and each sample have been analyzed by HPLC/DAD/MS quali-quantitative methods. The polyphenols from Olea matrices (olive oil by-products, leaves, stems and olive pulps), are known for the highly antioxidant properties and protective biological and biomedical effects (Brunelleschi et al, 2007; Pampaloni et al, 2014). By the extraction, four PHENOLEA fractions with different biophenol concentrations have been produced: PHENOLEA OH-TYR, obtained from olive oil by-products which contains hydroxytyrosol and derivatives more than 90%; PHENOLEA LEAVES-S from dried olive leaves, containing hydroxytyrosol and derivatives more than 50%, secoiridoids as oleuropein 20-35%, hydroxycinnamic derivatives as verbascoside more than 10%, flavonoids, luteolin and apigenin 7-O-glucosides, 2-7%, and trace amounts of lignans; PHENOLEA LEAVES-F from olive green leaves, with hydroxytyrosol and derivatives more than 20%, secoiridoids 60-70%, hydroxycinnamic derivatives as verbascoside more than 3%, flavonoids, luteolin and apigenin 7-O-glucosides, more than 2%, and lignans about 5%. Finally, PHENOLEA RED is an extract obtained from red olive pulps, containing besides the usual Olea polyphenol classes also anthocyanosides, in particular anthocyanosides evaluated as cyanidin 3-O-rutinoside 15-20%, secoiridoids as oleuropein 60-70 %, flavonoids, luteolin and apigenin 7-O-glucosides 10-15%, and hydroxycinnamic derivatives as verbascoside 3-7%. As concern Cynara, the following active fractions with different polyphenol concentration have been produced: CYNARA_SOL is a purified concentrate fraction, obtained from artichoke's dry leaf extract (chlorogenic acid is the main polyphenol, with 50% of the total); CYNARA_CUF is an extract obtained by an ultrafiltration (UF) from

artichoke's dry leaf (di-caffeoylquinic acids have the most quantity, over 40%); CYNARA_SPRAY, a powder obtained spray-drying the dry leaf aqueous extract, with over 75% of flavonols ; CYNARA_OL_TAN COMPLEX is a mix containing 49% Cynara_Sol, 49% concentrate green leaves extract of Olea and 2% grape seeds extract, characterized by the high presence of procyanidins (over 43%). These solutions and powders, enriched in polyphenols, could be employed to stabilize or enhance products, such as: baked foods, cosmetics and supplements for human health. After the extraction of bioactive fractions, residues of Cynara and Olea can be used as animal feed, compost or other agricultural or agro industrial products and/or exploited as energy source. These residues, could be suitable in the energy cogeneration and/or anaerobic digestion. In particular lignocellulosic residues from Olea which have a high LHV (Low Heating Value) of 0.429 Tep/t are suitable for the thermochemical process for heat and/or electricity generation and olive pomace with LHV from 0.369 Tep/t to 0.161 Tep/t, according to its moisture content (from 12.50% to 55%) for biogas production. Cynara residues, characterised by a high moisture content (up to 85%), have a LHV of 0.405 Tep/t) usefully could be used for thermochemical processes, as well as for anaerobic digestion. As regards the sweet chestnut tannin extraction plant, it only uses heat produced by the waste biomass of the process (residue of the first extraction step and the residual virgin wood from chipper). These two kinds of residue provide 0.202 Tep/t which is the energy need for the extraction process that by 77.2 tons of virgin biomass produces the dry extract with a 4.7% yield. The polyphenols market is projected to reach 1 billion dollars by 2020 and 4,790 potential source plants are present in Europe. Extraction potential form brewing, malting, cereals and distillery plants exceeds 15.000 tons (Donnelly et al., 2015). The co-products and waste streams is very attractive for their increased value, for Europe Waste Framework Directive is prioritises the reduction and prevention of waste, reuse and recycling.

Conclusion

The use of residual biomass as a source of bioactive compounds can be also considered as preliminary stage of a closed cycle for the production of energy from waste and exhausted raw material, according to the circular economy concept; indeed these results suggest the possibility of implementing a multifunctional platform, by which the agro industrial chain and the life style towards a "zero waste" model can be suitable developed. Optimizing the productive process, that uses sustainable technologies to obtain standardized and stabilized fractions with higher concentrations of biologically active molecules, will allow to gain new and increasing market shares, because of these biomolecules are suitable for innovative uses in many sectors, like agronomy, textile/dyeing, cosmetics, foods and phytotherapy; besides all of them increasingly demand high value added products, which also are environmentally friendly.

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The Use of Industrial Hemp (*Cannabis sativa* L.) in the Building Sector: an Overview

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Abstract. The increasing demand and exploitation of natural resources and their inevitable exhaustion make urgent and needed the search of sustainable solutions. The building sector, due to the high-energy consumption and the utilisation of products mainly obtained from non-renewable sources and virgin materials, has a significant impact on the environment. For these reasons, for several years the building construction industry has been looking for: innovative solutions to reduce energy consumption; eco-friendly materials derived from plant or animal sources and recycling; and healthier and safer buildings. In the group of natural materials, currently hemp appears the most appreciated and used in the green building and it is easily available in the market. Hemp presents features that well satisfy the energy, technological and environmental requirements. Therefore, the aforementioned intrinsic advantages make hemp a good candidate to become the leading natural building material in the following years. In this context, the aim of this paper is to analyse, albeit briefly, the applications of hemp and its derivatives in the building sector, in particular as insulation and bio-composites.

Keywords*: industrial hemp, building sector, bio-composites, insulation*

Introduction

The building sector is an important economic activity, but responsible for severe environmental impacts. It is estimated that, globally, it uses about 40% of primary energy and releases 40% of greenhouse gas (GHG) emissions (Garcia-Casals, 2006), in addition to a significant depletion of non-metal mineral, water and timber resources. Standards more stringent and a greater general awareness of the strategic importance of the drastic reduction of pollutant emissions and non-renewable resource consumption impose the need to seek new materials and processes. The study and dissemination of these materials, competitive in all respects with the traditional ones but with lower environmental impact, are an important challenge for the construction industry. The revival of hemp and its applications as a valid response to this purpose. This review that highlights it is based on literature review and company data. This plant is actually a herbaceous crop with annual cycle, belonging to the *Cannabinacee* family, and it has a remarkable morphological and physiological variability. There are, indeed, different precocious and tardive, monoecious and dioecious varieties, which are very adaptable in different soil and climatic conditions and so particularly widespread and extremely versatile for various applications. Specifically, hemp cultivation areas in Europe expanded from 8,000 ha in 2011 to almost 18,000 ha in 2014 (France is the main producer), and they will increase to 25,000 ha in 2016, which shows a triple increase in 5 years. The reason is the growing demand for different raw materials obtained from this outstanding multi-purpose crop (EIHA, 2016). Hemp is a fast-growing and plentiful plant, it does not require pesticides and herbicides and it enriches the soil avoiding the growth of weeds. The production process differs significantly in terms of farming technique, transformation and relative unit costs depending on the quality requirements of the final products. The hemp plant has a rough erect stem whose height (1 to 4.5 meters) differs depending on the variety,

soil and weather conditions and seed density. The characteristics of the stem are decisive for possible uses. The stem is formed by an exterior bark of green color formed by two layers of fibers (primary with length of 5-40mm, and the diameter of 13-45μ with weakly lignified wall and secondary of 2mm much smaller and with strongly lignified wall) combined and cemented by pectin. This latter, through the maceration process, will release the bast fiber by an internal part called shives pale white with a chemical composition similar to wood (Ingrao et al., 2015). The bark is made up of 65-70% cellulose, 10-15% hemicellulose, 3-5% of lignin; the shives are constituted by about 35-40% cellulose, 30-35% hemicellulose and 15-20% lignin (Lombardi, 2003). Hemp can be made into any building material including fiberboard, roofing, flooring, wallboard, caulking, etc. All parts of hemp (except inflorescences and leaves) can be used for this end. In particular, the use of fibers and shives is very appreciated in this sector, thanks to their characteristics: low density, elasticity and permeability, but also thermal and mechanical properties. The hemp fibers are used to obtain thermo-acoustic insulating materials for ceilings, walls and floors in the form of rolls or panels. The shives are used for the production of mortars, concrete, plasters and insulating coats for buildings, building blocks consist of hemp and lime. From the seed is extracted an oil (mainly used as food) used as a solvent in paints: hemp oil is ideal for natural wood sealants and paints. As can be noted, there is a wide range of insulation and building materials made from hemp. In this context, the aim of this paper is to analyse, albeit briefly, the applications of hemp and its derivatives in the building sector, in particular as insulation and bio-composites, in order to highlight the several opportunities and advantages offered by the hemp use.

Hemp fiber insulation

The hemp fiber is extremely tear-resistant and moisture. It is hygroscopic, can absorb moisture up to a third of its own weight and release it over time. It is

breathable and allows moisture regulation, so it is suitable for high humidity areas. Its breathable properties also prevent the onset of interstitial condensation, ensuring healthy living environments, free of bacteria, mold and microbes. The fiber has a good ability to accumulate heat better than the other insulating materials made of mineral fibers and this favors the summer cooling of buildings. It has good thermal insulation properties (coefficient = 0.040 W/mK), good resistance to water vapor diffusion (μ is 1), good acoustic and sound-absorbing ability characteristics due to its porosity. Through an impregnating treatment based on soda, ammonium phosphate or boron salts, the same becomes a fuel-resistant material of class 2, according to the UNI CEI EN ISO 13943/2004. The properties of the hemp biomaterials vary depending on the size of the fibers; it is possible to produce panels at low, medium and high density. The formers are designed for the thermal insulation of buildings, while the others are used in building construction and in the furniture industry as excellent substitutes for wood. The fibers and other processing waste materials are used in the production of sound-absorbing panels, insulation and fireproof. They are used in the space between walls of wooden structures, internal thermal insulation coatings, ventilated external thermal insulation, ventilated roofs, interior walls, ceilings, floors and subfloors. These panels can be made entirely from hemp fiber (hemp wool) or part of it (or shives up to 50%) mixed with starches and synthetic fibers, in a variable proportion of 10-15%. These are treated with soda or boron salts to enhance its resistance to fire and heat. With this process are obtained semi-rigid panels and rolls of different density and thickness. On the market, they are present, with different compositions and technical characteristics, products with different trade names. Compared to traditional materials, plastic, glass wool, for example, these products are characterized by a higher impact strength, greater lightness, lower susceptibility to deformation under the effect of heat and humidity and easy to manufacture in three-dimensional parts. Insulating materials made from hemp are suitable for almost all common applications: • insulation panels for

exterior facades; • insulating panels and insulating mats par thermal insulation in uprights walls, exposed wooden beams, roofs and facades; • insulating panels and insulating mats for thermal insulation in uprights walls, exposed wooden beams, roofs and facades; • infill material for filling cavities, hemp rope for joints of windows and doors; • panels soundproofing anti trampling under the floor; • fragments of loose fill insulation hemp as between the padding woods. Finally, but not less important, it is the environmental aspect of these products because, at the end of their life, they can be removed and recycled and composted. However, this is possible only if they are free of synthetic fibers and with a limited amount of flame retardants. When plastered, these products must be disposed of as inert in landfill (Arnaud et al., 2013).

Bio-composites

The bio-composites are the combination of at least two components, the binder or matrix and the reinforcement, which allow to obtain materials with chemical-physical properties different from the individual components. In this context, reinforcing or filler material is represented by the hemp fibers and the shives and the binder is usually lime in its different types (air and hydraulic). The bio-composites, thus obtained, depending on the type of binder and the size of shives and their proportions. They have characteristics and properties suitable for different uses in the building sector, as they present a rigid and lightweight material with excellent insulation characteristics and durability. The shives and fibers, obtained from waste textile processing of hemp, are pressed into particle boards. In particular shives, after the separation from the fiber by scutching, are shredded, chopped into small pieces and then dusted. Depending on usage, the shives are classified into: **fine** with length less than 10mm; **medium size** with a length between 10 and 20mm; **large** with a length between 20 and 30mm. They may be marketed in particle sizes of 5-30mm in length and 2-5mm in width. Already in the past

centuries, the shives and fiber, reduced into pieces, were used as building materials, mixed with clay or lime; while the stems were used to make lightweight structures to create ceilings and partitions after plastering or as a filler in the wood-structure buildings. The compound lime-hemp (Hemp-lime, or Hemcrete) is a building material made by mixing small pieces of shives with a lime based binder. The thermal and acoustic performance of mixtures (lime-hemp) are due to the natural porosity (about 60%) of shives where, in their microscopic cavities, continuous processes of micro-condensation and evaporation are followed. This characteristic gives a power of absorption of liquids about twelve times higher than the straw, three times higher than the amount of wood shavings and pair to five times its weight. The large amount of silica, present in the vegetable particle board, also made good its use as aggregate in hydrated lime-based mixtures, replacing gravel, crushed stone and sand. The mixture is kneaded and applied, after the installation, and the cement of lime and hemp hardens for evaporation of water, carbonation and hydration of lime. The bio-composite lime-shives may be involved in both the construction of massive masonry and as a filler of a wooden structure with beams and pillars. The hemp and lime bio-composites are suitable for a wide range of applications including:

a) Walls infill. The mixture in lime and hemp, for its resistance to compression (about 0.2-0.1 N/mm), is not generally used in an excessive load situation, since it is a highly aerated material that is packaged in this situation. The mixture, with different relationships between lime and hemp, can be pressed and poured inside the containment panels, or sprayed on the inside or outside of the building.

b) Hemp and lime blocks. They are solutions that provide a hemp composition and other binders for applications such as: • insulating walls of new buildings; • external thermal insulation coating of existing buildings coat; • internal insulation of existing buildings; • underfloor insulation; • interior partitions for sound insulation.

c) Insulation for roofs. The bio-composite can be applied directly on the roofs by spraying the mix between a beam and the other with an internal containment panel.

d) Insulating plaster. It is used for buildings made entirely with the bio-composite or of traditional walls for the restoration of works.

e) Screed insulation. It is suitable mainly to new construction, but compatible with the usual technologies for the restoration of existing buildings. They show GHG emission savings of 10 to 50% compared to their functionally equal fossil-based counterparts; when carbon storage is included, GHG savings are consistently higher, at 30–70% (Arnaud, Boyeux and Hustache, 2013; Barth and Carus, 2015).

Results and discussion

The building sector is a market with great potential for hemp fiber applications. The analysed materials have excellent performance when compared with traditional ones. The main positive characteristics are the following: thermo-acoustic insulation; breathability and good moisture absorption; fire resistance and low flammability; reuse and recyclability; resistant to moths, mildew and insects; healthiness of spaces; harmlessness for workers health. Also the use of these materials allows the construction of energy efficient and biocompatible buildings, with low emissions, basically neutral CO_2 (Giglio, 2013). However, the diffusion of hemp fiber is limited by some factors such as: the higher trade costs compared to the traditional products. At early 2013, the price for hemp fibers laid around 75 Eurocent/kg for insulation (2-3% shiv content) (Carus et al., 2013). Consequently, insulation with hemp is 2 to 4 times more expensive compared to glass or mineral wool, although hemp insulation gives additional benefits, such as also the reduction of GHG emissions for their production. Finally, the absence of a reference market and the fact that the most products are manufactured overseas and are imported contribute to restrict the hemp use.

Conclusion

The building sector requires a higher efficiency and environmental sustainability and innovative materials in replacement of the conventional ones. The hemp-based products could be the right response to these needs. The revival of the hemp in fact would be in line with the principles of green-economy because it represents a crop that requires low agricultural inputs (small quantity of water, no pesticides, fertilizers or pesticides). Additionally, it normally provides a natural action of phytoremediation on land. The resulting biomaterials have the same sustainable peculiarities, which are amplified in the building sector, known as a highly energy-consuming activity and with a significant environmental impact.

These products may interest an industry in search of a new identity that must take into account the need to contain the polluting emissions, through the construction of new and sustainable buildings and the improvement of energy efficiency and the reduction of environmental management costs of existing ones. For this reason, it would be desirable a greater spread of hemp products in the context of the green building. The hemp-based products are unfortunately still a niche within the construction industry, these have big difficult to compete because of the general economic crisis, the high cost of biomaterials and the reduced dissemination of the green building techniques among companies in the sector.

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Enhancing the Nutritional Value of Bread Through Fortification with Zinc and Selenium

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Abstract. The mineral elements are of great importance for the normal development and functioning of the human body. Their shortage in nutrition is a problem of a global scale. It has been established that nutrition does not provide the necessary amounts of mineral elements, so there is a deficiency in respect to some essential microelements, such as zinc and selenium.

Zinc is involved in all major bio-chemical processes in the human body. It is a part of the composition of more than 200 enzymes, responsible for the synthesis of proteins and DNA, as well as for the synthesis of hormones and the metabolism of the growth factors. The recommended daily intake of zinc according to the World Health Organization is 11 mg/d.

Selenium is an essential microelement for the human being. It is a part of the composition of a number of enzymes, which facilitate the normal functioning of the metabolic processes. Furthermore, selenium has well-proven antioxidant properties. The recommended daily intake for an adult is 55 μg, where intake up to 400 μg per day is considered innocuous.

The aim of the present paper is to enhance the nutritional value of bread through fortification with the microelements zinc and selenium. For increasing that content water-soluble compounds are used: Zinc sulphate heptahydrate ($ZnSO_4.7H_2O$) and Sodium selenite pentahydrate ($Na_2SeO_3.5H_2O$). Bread is

prepared from wheat flour type 500. The necessary amounts of the microelements for enrichment are calculated according to the recommended intake levels. For determining zinc and selenium content high sensitive ICP - AES method was used. It has been established that as a result of fortification, zinc and selenium levels that are close to the recommended intake are achieved, which provides an opportunity for overcoming their deficiency in human nutrition.

Keywords*: wheat flour, bread fortification, zinc, selenium, ICP – AES method*

Introduction

It has been found that feeding does not provide adequate amounts of mineral elements and there is a deficit in terms of the number of macro- and microelements (including zinc and selenium). Zinc and selenium are essential microelements for the human body. Their main biological role is linked to the fact that they constitute a number of enzymes which help the normal course of metabolic processes. Their deficiency can cause various abnormalities and diseases. According to the Ordinance № 23 / 19.07.2005, the recommended daily intake of zinc is 11 mg/d, while selenium is 55 μg, it is considered that the intake up to 400 μg per day is harmless.

In many countries the enrichment of food is applied as the most appropriate means of improving the mineral status of the population (Saeed, 2011). López de Romaña et al. (2003) enrich wheat flour with zinc oxide and zinc sulphate. The result revealed no significant differences in the absorption of zinc from the both types of samples. This indicates that both forms (zinc sulfate and zinc oxide) are suitable for the enrichment of food products. Iserliyska (2003) is working to enrich bread with zinc too, as they consider that it is most appropriate the zinc to be submitted as zinc chloride.

Increasing the biological value of bread by means of enrichment with selenium can be achieved by insertion into the formulation of the organic and inorganic compounds of selenium. Stabnikova et al. (2008) consider that the most appropriate is the use of baker's yeast cultured in media supplemented with selenium. Thus the bread contains 50 μg/100g selenium as selenomethionine. Novikova (2007) proposes an additive containing sodium selenate and sodium fluoride, intended for use in bakery products. As a result, 300 g of bread contain about 1 mg fluoride and 50 μg selenium.

The aim of this report is to examine the other possibility to enrich bread with zinc and selenium in order to achieve values close to the recommended daily intake and as a result of that - to increase the biological value of bread.

Materials and methods

The following water-soluble compounds are used as additives: Zinc sulphate heptahydrate ($ZnSO_4.7H_2O$) and Sodium selenite pentahydrate ($Na_2SeO_3.5H_2O$).

In the course of investigations the bread dough is made of flour type 500 in two-phase method.

For determining the content of zinc and selenium is used an atomic-emission spectrometer with an excitation source inductive coupled plasma (ICP - AES). The studies were conducted in an accredited laboratory of SGS Bulgaria Ltd. - Varna and in the laboratory of Food research and development institute - Plovdiv.

Results and discussion

In order to enrich bread with zinc and selenium and increasing its biological value there have been made calculations regarding the amount of additives, taking into account the following factors:

- Content of zinc and selenium in flour type 500;
- The average daily consumption of bread in Bulgaria is 250 g (NSI,2015);

- The recommended for Bulgaria values for nutrient intake according to Ordinance № 23/19.07.2005, which are: for zinc - 11 mg/d; for selenium - 55 μg/ d.

The quantities required to enrich the bread are calculated so as to ensure full cover of the daily needs of the human body of zinc and selenium by the consumption of the average daily amount of bread.

Considering the above factors, we found that the optimal amount of enrichment with zinc is 0,0413g $ZnSO_4.7H_2O$, and selenium is 180 μg $Na_2SeO_3.5H_2O$ for 250 g of flour.

Table 1 presents the average values of the analytical tests and the confidence interval according to the statistical treatment of results.

Table 1.

Content of Zn and Se in the analyzed samples (mg/kg), determined using ICP – AES

Sample	Content of zinc, mg/kg	Content of selenium,mg/kg
Wheat flour type 500	6,67 ± 0,55	0,045 ± 0,01
Control sample of bread	5,99 ± 0,49	0,038 ± 0,008
Enriched sample of bread	35,34 ± 2,4	0,216 ± 0,043

From the results presented in the table it is clear that the zinc content in wheat flour type 500 (6,67 ± 0,55 mg/kg) is close to that in the control sample of bread (5,99 ± 0,49 mg/kg). The addition of the specified amount of zinc as $ZnSO_4.7H_2O$ in bread leads to adequately increase in its quantity compared to the control sample bread. In the process of baking it was found some loss of zinc compared to the preliminary estimates - about 5%. The losses are due to the fermentation processes in which the yeast microflora absorbs some of the available mineral substances in the dough. Having that in mind, we consider that it is appropriate to increase the amount of the added $ZnSO_4.7H_2O$ to 0,0434g. This amount will compensate the technological losses and will achieve the reference values mentioned for nutrient intake.

According to Table 1 the selenium content in wheat flour is 0,045 ± 0,01mg/kg, while in the control sample of bread it is 0,038 ± 0,008 mg/kg. On this basis it is calculated the required amount of supplement - 180 μg $Na_2SeO_3.5H_2O$ in order to reach the reference values for nutrient intake. In a study Iliev and Yovkova (2013) also define the content of selenium in bread, as their derived values are similar. According to Davydenko et al. (2011) the loss of selenium during the technological process amounts to 50 ÷ 55% but they apply the enrichment of selenomethionine, and it is known that the organics forms of selenium are much more unstable. On the basis of our research, we can assume that the technological losses of selenium during the production of bread are about 15% when using the inorganic form of enrichment. On the basis of the results obtained it has been recalculated the required amount of $Na_2SeO_3.5H_2O$ to 205,07 μg for 250 g of flour.

The results obtained for zinc content in the analyzed samples are compared with the reference values for nutrient intake, as presented in Figure 1.

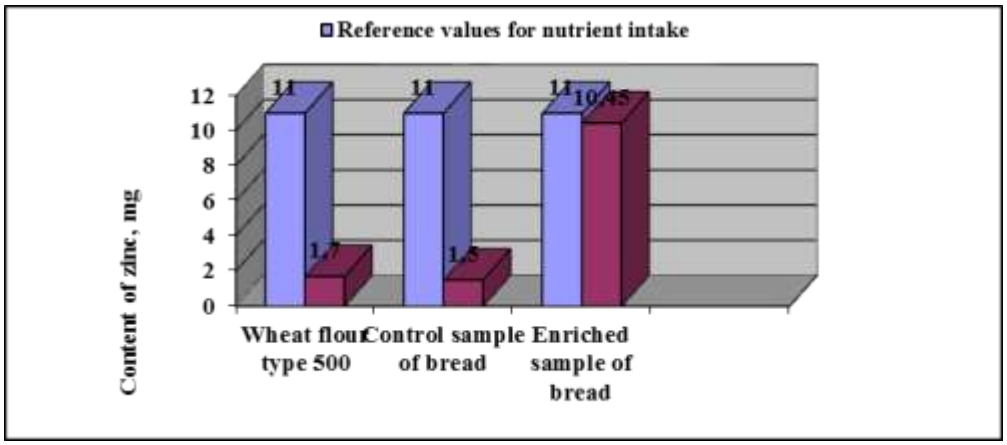

Figure 1. Content of zinc (mg/250g) compared with the reference values for nutrient intake (mg/d)

The results show that the average daily consumption of non enriched bread satisfies approximately 13% of the body's needs of zinc. Addition of $ZnSO_4.7H_2O$ increases the biological value of bread, as the content of zinc in the enriched sample bread rises and reaches 96, 28 % of the recommended average daily intake.

Figure 2 compares the results obtained for the content of selenium in the investigated samples and specified reference amounts for nutrient intake.

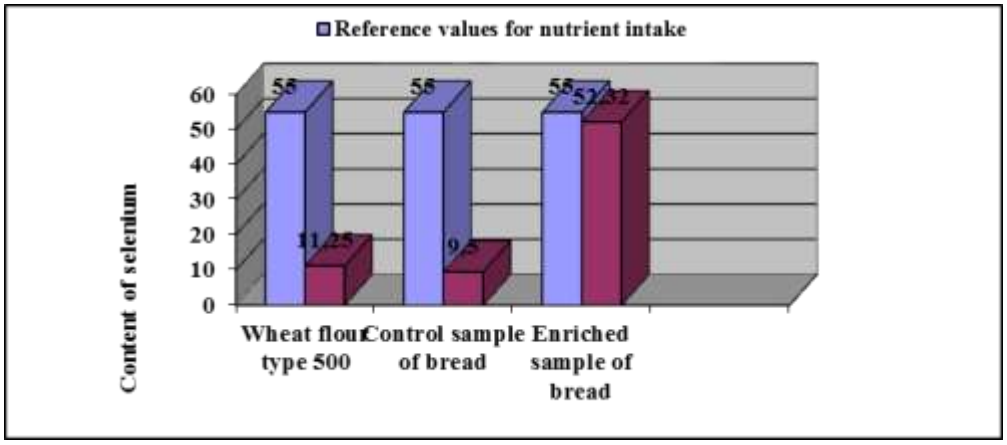

Figure 2. Content of selenium (μg/250g) compared with the reference values for nutrient intake (μg/d)

In the figure it is seen that the addition of the specified amount $Na_2SeO_3.5H_2O$ results in increased biological value of the bread. In the control sample bread the selenium content satisfies marginally (less than 20%) the recommended intake of 55μg/d, while after the enrichment the achieved values are much closer to the recommended. It is found that in 250 g of the enriched bread are achieved approximately 95.13% of the reference values for nutrient intake. This opens the possibility of overcoming the deficit of selenium for the population in Bulgaria.

Conclusion

Of the studies carried out we found that supplements of zinc sulfate heptahydrate ($ZnSO_4.7H_2O$) in the amount of 0,174 g/kg of flour and sodium selenite pentahydrate ($Na_2SeO_3.5H_2O$) in the amount of 820,28 μg/kg of flour successfully can be used for increasing the content of zinc and selenium in the bread and thus to achieve levels similar to the recommended average daily dietary intake values. Moreover these additives are readily available and don't impede the

technological process of bread making. Consumption of bread with increased biological value reveals the possibility of overcoming the deficiency of Zn and Se in human nutrition.

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Heme Iron Content in Chicken Muscle Homogenates Depending on Imidazole Dipeptide Levels

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Imidazole dipeptides such as carnosine and anserine are naturally-occurring in muscle tissue compounds. Carnosine's antioxidant activity is multifunctional, it can act as a metal chelator, free radical scavenger and buffering agent. This and related dipeptides have been shown to prevent lipid peroxidation in pork, turkey and beef. The aim of the study was to determine the influence of imidazole dipeptide preparates on heme iron content in a model system, such as chicken muscle tissue homogenates with or without fat addition. Carnosine or anserine/carnosine preparations (2:1) at concentrations of 25 mM and 50 mM were used as antioxidant factors. Oxidation in these systems was induced via iron ion addition (in an ascorbate/Fe3+ system or Fenton reaction) or thermal treatment. Samples were analyzed immediately after preparation. Heme iron levels were determined according to the *Hornsey* (1954) method after modification by *Ramos et al.* (2009). Concentrations of imidazole dipeptides in chicken tissue were quantified via the reverse phase chromatography technique (RP-HLC) after derivatization with ortho-phthalaldehyde. The significant effect of histidine dipeptides was observed in terms

of the protection of the heme iron in muscle tissue homogenates after thermal treatment and Fenton reaction induction. A similar tendency was observed in samples with added fat. In model systems with an initiated Fenton reaction, the highest level of hem iron content was observed in samples where anserine mixed with carnosine was used.

***Keywords**: imidazole dipeptides, lipid oxidation, poultry*

Introduction

Food additives which present antioxidant activity should not affect product organoleptic quality and should remain effective at low concentrations [McBridge et al., 2006]. Synthetic antioxidants such as BHT or BHA have proved effective as inhibitors of lipid oxidation, although concerns relating to possible associated toxicity have led to the desire for their replacement with antioxidants from natural sources [McBridge et al., 2006]. This has fostered research into the screening of raw materials from plant and animal sources for the identification of new antioxidants [Gupta and Sharma, 2006; Brewer, 2011]. One of example of an animal origin antioxidant could be a hostidine dipeptide such as carnosine which is commonly present in mammalian tissues and in particular in skeletal muscle cells. It is responsible for a variety of activities related to the detoxification of human and animal organisms from free radicals and the by-products of membrane lipid peroxidation such MDA. Carnosine and other related compounds also demonstrate membrane protection activity, formation of complexes with transition metals and proton buffering capacity. In particular, it has recently been demonstrated that carnosine is a selective scavenger of unsaturated aldehydes (by-products of membrane lipid peroxidation) and considerable second messenger of oxidative stress. Also, it inhibits aldehyde-induced protein-protein and DNA-protein cross linking in neurodegenerative disorders. Many studies show the positive effect of

imidazole dipeptides against lipid and protein oxidation [Decker et al,. 1995, Kopeć et al., 2013]. The aim of this work was to determine the influence of imidazole dipeptide preparates on heme iron content in model oxidation systems in chicken muscle tissue homogenates.

Material and methods

Muscle tissue homogenates were prepared from chicken breast muscle (characterized by 23.8% protein and 0.95% fat content) with or without chicken fat (1.1% protein, 79.2% fat), purchased from a local commercial source. Average histidine dipeptide levels in muscle tissue were 23 mM. During the homogenization (15 seconds, Mixer B-400 Büchi, Swicerland), distillated water was added at a ratio of 2:1 (meat : water). Carnosine (**C**) purchased from Pure Bulk, USA or anserine/carnosine (**A+C**) preparations (2:1) obtained from the *Department of Animal Product Technology and Quality Management, Wrocław University of Environmental and Life Sciences* were used as antioxidant factors. Oxidation in this system was induced via thermal treatment or iron ion addition (in an ascorbate/Fe3+ system or Fenton reaction). Samples were analyzed immediately after preparation. Heme iron levels were determined according to the *Hornsey* (1954) method after modification by *Ramos et al.* (2009). For sample preparation, 2.5 g of each meat homogenate were mixed with 10.25 ml of 90% acidified acetone and homogenated in tubes with Miccra D1 (ART Prozess & Labortechnik GmbH & Co, Germany) for 15 seconds. The test tubes were incubated at room temperature in the dark for 1 hour, then the absorbance was measured at 640 nm using a Nicolet Evolution 100 UV-VIS spectrophotometer (Thermo Fisher Scientific, USA).

Results and discussion

Heme iron is reactive in oxidation processes [Pal et al., 2011]. However, its conversion in an ionic form leads to greater acceleration of oxidative stress and leads to changes in the native tissue components [Kumar and Bandyopadhay].

Lombardi-Boccia et al. (2002) reported that heating decreases heme iron content in different types of meat, such as poultry, beef, pork, veal, lamb and rabbit. In this study, the influence of the addition of peptide antioxidants on heme iron content was analyzed in different oxidation model systems.

In control samples (with or without fat addition), addition of histidine dipeptides had no influence on heme iron content in analyzed samples (Fig.1). In homogenates after thermal treatment at 80°C, a lower level of heme iron was observed. However, addition of imidazole dipeptide preparates offered significant protection to the heme iron in homogenates both with or without added chicken fat (Fig.2). Oxidation in the ascorbic acid/iron Fe III system lowered heme iron level more weakly than was observed in other oxidation systems. Moreover, after dipeptide addition the heme iron level was similar to the values from control model systems without induced oxidation (Fig.3). In the Fenton model system, a significantly lowered heme iron level was observed. In homogenates without fat addition both types of preparates had a similar protective effect on heme iron content. On the other hand, in the model system with fat addition, the anserine with carnosine mixture at the concentration of 25 mM showed a greater protective effect against heme iron than pure carnosine (Fig.4).

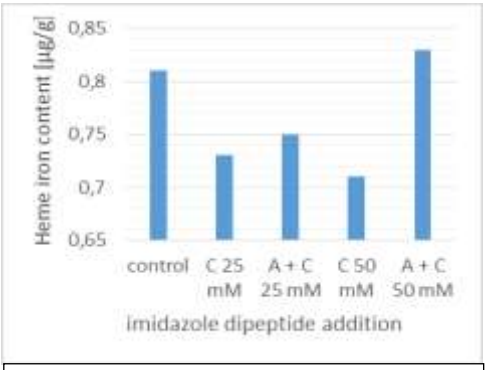

Fig 1. Heme iron level in homogenized muscle tissue (control) in relation to histidine dipeptide addition

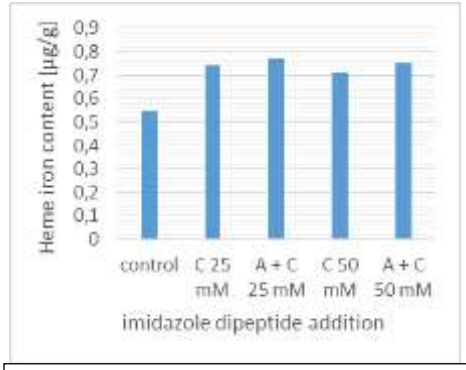

Fig 2. Heme iron level in homogenized muscle tissue after thermal treatment (80°C) in relation to histidine dipeptide addition

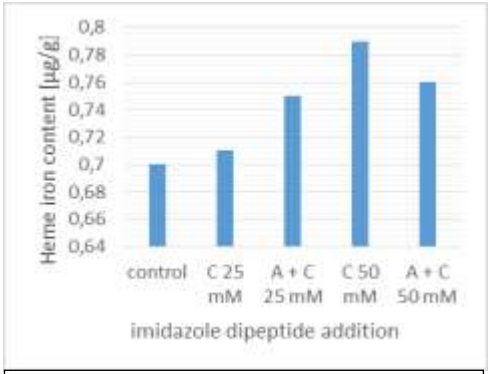

Fig 3. Heme iron level in homogenized muscle tissue in ascorbic/FeIII system in relation to histidine dipeptide addition

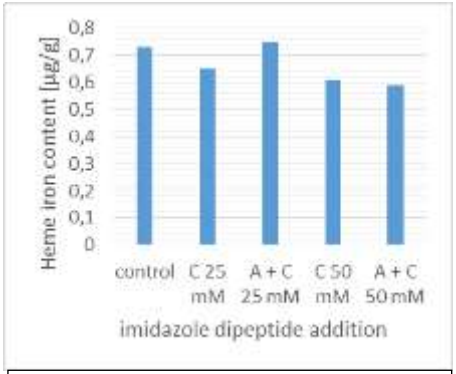

Fig 4. Heme iron level in homogenized muscle tissue in Fenton system in relation to histidine dipeptide addition

Conclusion

This study shows the protective effect of both histidine dipeptide preparates against heme iron losses in chicken muscle tissue homogenates. However, the carnosine with anserine preparate showed higher activity in the analyzed model systems.

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Opening Product Innovation

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Abstract. In order to keep up with technological pace, firms increasingly stop limiting themselves to only use technology developed in house. Open innovation both in- and out bound holds great importance and growing potential in creating radically new products. Organization's ability to learn from experience and analysis plays important role. Emergence of new factors as the increasing availability and mobility of skilled employees, creation of venture capital markets, the novel opportunities to externally exploit unused ideas, the emergence of new technologies that allow collaboration of distant geographic areas and the presence of capable suppliers started to erode the benefits of closed innovation paradigm. This trend is reflected into the rise of open innovation paradigm, whose main logic is that valuable ideas can come from inside or outside the company and innovation outputs can be used internally or externally. We conducted empirical research to identify structural relationships between radical product innovations and company behavior in firms operating in Slovakia with focus to open innovation. The findings reveal that successful innovators in Slovakia open up their borders for exploration and exploitation, build external and internal networks, use highly developed innovation processes including technology and market trends evaluation, link their innovation projects to company strategy and, actively use intellectual property rights. Their

entrepreneurial culture fosters flexibility, quick experimenting, seeking for new opportunities and creating space for radical innovations.

Keywords*: open innovation, product innovation, radical innovation*

Introduction

The development and successful introduction of new products on the market is one of the most challenging tasks of management. If the company wants to survive, it must be able to apply the processes that lead to new business opportunities and new products in changing conditions. Discontinuous change is considered to be a source of the greatest business opportunities. It is often argued that incumbent organizations suffer in the face of radical innovations due to the commitments to their current value networks and new entrants succeed (Benner, 2010; Christensen, 2006; Rothaermel and Hill, 2005). Ansari and Krop (2012) challenge this opinion and create framework for understanding incumbent challenger dynamics. In the paper we try to shed more light to the company behavior leading to radical innovations based on own empirical research in Slovakia.

Material and methods

We conducted quantitative research to identify structural relationships between radical product innovations and company behavior in firms operating in Slovakia. We analyzed new product introductions on the market in the period of five years from 2009 to 2013.

Collected data were processed by the statistical program Statgraphics. Main characteristics were obtained arranging the collected data into frequency tables. To test the hypotheses that we posed in terms of research set, we used data analysis by cross-tabulation. We specified company behavior differentiating radical innovators (innovators with new to the world products) from others analyzing their activities

and processes by means of cross-tabulation and frequency tables. We examined the statistically relevant relationship between variables by the test of fit - chi-square test - applied to the cross-tabulation.

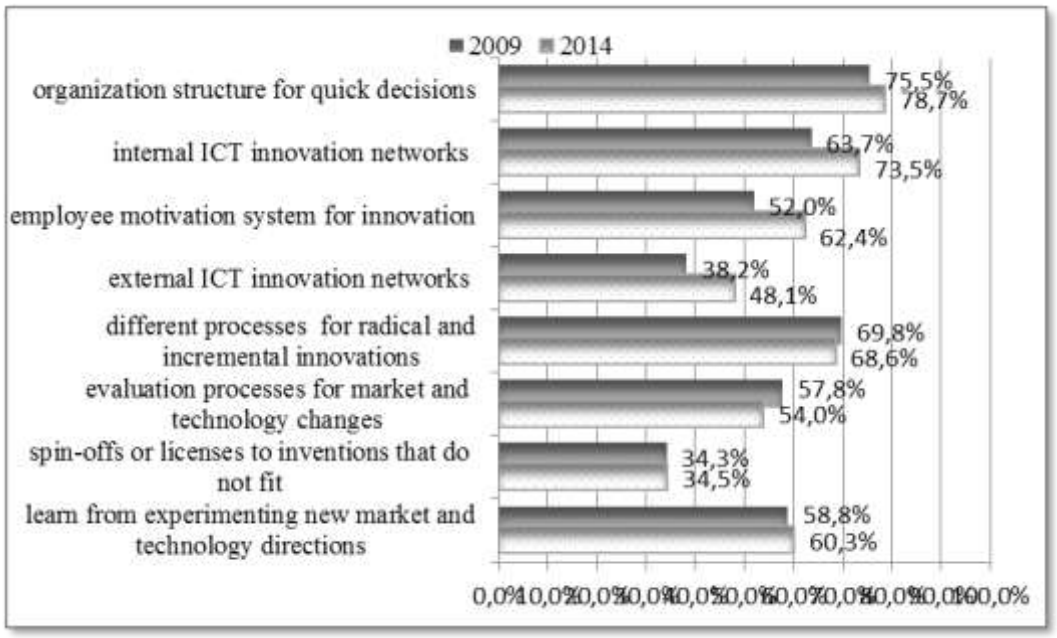
Results and discussion

The research in 2014 involved 287 companies, of which 45.3 % were small enterprises with number of employees 1 to 49, 27.18 % were medium-sized enterprises with number of employees from 50 to 249 and 27.53 % of the total sample consisted of large enterprises with more than 250 employees. Of all enterprises 63.07 % were owned by Slovak capital, 24.74 % by foreign capital and in 12.2 % of cases the ownership was mixed.

42 firms (14.6 %) introduced a new to the world product, 100 (34.8 %) firms introduced a product new to the market and 138 firms (48.1 %) introduced a product new to the firm. New to the world products were introduces by 29.5 % of foreign firms, by 25 % of firms with mixed (foreign and Slovak) ownership and by 6.6 % of Slovak firms.

Supporting organization becomes important for radical innovation (chart 1). In our previous research in 2009 we have not identified any differentiating factors between radical and incremental innovators in supporting organization. In 2014 research stage we found several differentiating factors: internal ICT network for innovation, specific processes for radical innovations that are different from processes for incremental innovations, evaluation processes for technology and market changes, ICT network for innovation with external institutions, creating spin-offs or selling projects that do not fit corporate strategy.

Chart 1 Supporting organization for radical innovation



Source: own research

Bellow (table 1) we summarize the key processes and activities that differentiate radical innovators (with new to the world products) from others with statistical relevance (with P value equal 0.05 or smaller).

Table 1.

Organizational approach to innovations used by radical innovators

Innovation processes
Highly developed and efficient systems for new product development including technology and market trends evaluation
Specific processes for radical innovation that is not in line with common procedures
Corporate strategy factors
Innovation strategy
Link between innovation projects and overall company strategy
Supporting organization for radical innovation
Internal cooperation using ICT network for innovation
Specific processes for radical innovations that are different from processes for incremental innovations
Evaluation processes for technology and market changes

External cooperation using ICT network for innovation
Creating spin-offs or selling projects that do not fit corporate strategy
Internally and externally open innovation with systematic involvement
Internal research and development
Marketing and sales
Production
Customer service
Logistic, procurement and distribution
External research institutions
Consumers and customers
Knowledge management
Active Intellectual property rights protection
Passive use of Intellectual property rights of others
Flexibility for implementing small projects and experiments with quick feedback

Source: own research

Open innovation both in- and out bound holds great importance and growing potential in creating radically new products. In our survey in 2009, involvement of internal research and development was the only differentiating factor for radical innovators. In our survey in 2014, radical innovators involved also marketing and sales, production, customer service, logistics, distribution and procurement functions into internally open exploration in addition to research and development personnel. The nature of external openness has changed too. Firms cooperate with external research institutions and universities very rarely. Only 3.8 % firms in our sample systematically cooperate with universities and research institutions, most probably due to the cost cuts during economic crisis. Cooperation with external institutions was very productive it brought much more new to the world products than just in house innovation.

Conclusion

The study reveals the importance of internal and external openness in innovation processes. The results are useful for the academic sphere as the study reinforces the theory on open innovations (Lichenthaler 2011; Chesbrough, Vanhaverbeke and West, 2006) and for company management willing to establish

innovation culture in the company. Radical innovators tend to be involved in open exploration and open exploitation more than other companies.

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Food Additives versus Clean Label - Consumers Preferences and Expectations from European Perspective

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Abstract. Expectations of contemporary foodstuffs' consumers evolve and change. People are now more concerned with foodstuffs' composition,production process and the ingredients origin. Linked to the health and wellness trend and a more recent emphasis on provenance and sustainability, this change in behaviour has meant that many consumers have become label critics. They are looking for no additives, especially E-numbers, sweetenersand artificial colours in food products.Consumers expect well known, easy to recognise ingredients, short lists of them and finally, natural and minimally processed food. Simple food label called clean label becomes a proof of natural way of food processing and a new way of foodstuffs' labelling. In fact, clean label has become important across Europe, with an average of 27% of all new products launches in packaged food in 2013 being clean label and 18% in Poland in the same time. The main aim of the paper was to present and analysethe European consumers preferences and expectations towards clean label on foodstuffs.MalopolskaDistrictinhabitants' opinions in this area were also analysed and presented as a trial of clean label potential in Poland.

***Keywords**: clean label, food additives, preservatives, food colours, sweeteners, consumers' preferences and behaviour on foodstuffs' market*

Introduction

Food additives, for some consumers considered as unnatural, unhealthy or even a public health risk, are substances of natural or synthetic origin, which are added to food to serve a certain technological or sensory function (Emerton & Choi, 2008). They counter food perishability and bacterial degradation, give or restore colour or important flavour to food, increase food products availability (Bearth, Cousin and Siegrist, 2014). The fact is that despite the passage of time aroundhalfofallconsumers acrosstheEuropeanmarketshave almost no knowledge of the additives in their food butgenerally associate them with some concernand avoid products containing them (Tarnavolgyi, 2003; Dickson-Spillmann, Siegrist and Keller, 2011). Consumers would like to be better informed about the content of additives in food, the consequences of their consumption, especially potential health impact. What is particularly important,conumsers want to have an alternative and a possibility to make an informed choice when buying food. Such alternatives are natural, organic, free form additives/no preservatives food products that are more and more often in demand on the European market (Morley et al, 2013).

Given this perspective it seems that replacing artificial food additives with natural, better-known and acceptable ingredients should be a priority for food manufactures. In all foodstuffs' categories in Western European countries consumers prefer familiar ingredients such as protein, fibre, corn flour instead of E-numbers, however taste, smell and texture of products should remain stable, well known and accepted by consumers (Bearth, Cousin and Siegrist, 2014).

The trend that involves the removal of chemical-sounding ingredients, and E-numbers, and increasingly extends to the creation of healthier labels with the removal or reduction of salt, fat and sugar is called clean label. In fact it is yet to be defined, anyway should cover simultaneously three dimensions: free from additives - remove or replace them, simple ingredients list - choose recognisable ingredients

that do not sound chemical or artificial and finally minimally processed using traditional techniques that are understood by consumers and not perceived as being artificial (Osborn, 2015). For manufacturers using a clean label positioning means using ingredients that are generally accepted by consumers. The shorter and simplerfoods ingredients listthe better.

Material and methods

The main aim of the research was to determine and analyse on the basis of intensive literature research European consumers' behaviour and attitudes towards food additives and clean label on foodstuffs. The practical part of the article presents the results of pilot research concerning Polish consumers opinions on foodstuffs' additives and potential of clean label trend on Polish market. On the bases of results obtained using Internet survey method the answers of 355 consumers (persons mainly or jointly responsible for food and grocery shopping in their household) were analysed. The survey was conducted in May 2015 in Malopolska District usingquantitative online questionnaire. 64% of respondents were female and 36% were men. Age split was as follows: 30% 16-29 years, 42% 30-49 years and 28% 50-65 years. The obtained data were analysed and compared to the results of cross European research conducted in 2013 in France, Germany, Italy, Netherlands, Russia, Spain, Turkey and UK on a sample of 2805 consumers (The Clean Label Guide, 2014).

Results and discussion

European consumers are looking for transparency and clarity in foodstuffs labelling. They want to understand what they are eating and receive confirmation that their choices are doing them good. So, using as few ingredients as possible and ingredients they acceptincreases in their opinion a product's appeal (The Clean Label Guide, 2014). Some countries, as France (where 35% new products launched

are positioned as 'clean label') or UK (more than 33% products) are more advanced in terms of clean label. They see clean label as a qualifier to go to market whereas those countries that are still developing (Turkey, Russia) provide the largest opportunity for differentiation from competition by going clean label. Poland seems to be in the second group. Anyway more than 75% of European consumers mistrust E-numbers, while shorter labels with easily recognizable ingredients motivate consumers to choose a product. Clean label products are perceived to taste better, a natural positioning is clearly associated with improved freshness (Osborne, 2015). In European countries consumers are actively looking for clean label positioning on popular dairy and bakery products when making grocery choices. What is important, consumers do not want to compromise on taste or texture for a clean label alternative, so maintaining eating experience is a priority for clean label recipe reformulation (Cracking the Clean Label Code..., 2014).

Malopolska inhabitants are looking for traditional food (52%), local (43%), natural (42%) and organic food (31%). These food categories are for them the guarantee of foods naturalness, and quasi clean label products. Surveyed Poles are for the idea of foodstuffs clean label in general, although 47% of them have never heard about the name of this trend.The awareness of the questioned consumers of the term “clean label” is presented on Figure 1.

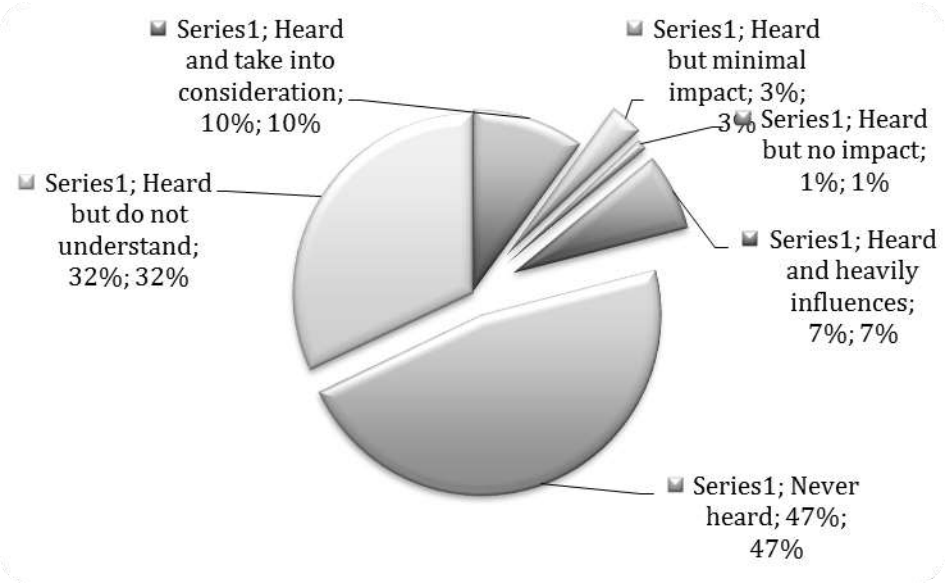

Figure 1. Polish consumer awareness of the term "clean label"

Simple, clear food label only for 12% of Malopolska inhabitants is a proof of natural way of food processing. They do not analyse these two elements together. What they trust is clear information in the form of nutrition claims, i. e. "no additives" – 42%, or "all natural" – 36%. Women (75% of indications) and middle-age consumers (63% of indications) in general are much more interested in health aspect of products ingredients comparing to other respondents.62% of them declare to pay attention to the list of ingredients when buying food or drink product, but only 7% is interested in the length of it. Having a child or young family is often a life-stage where health and nutrition become more of a focus. Consumers rank the ingredient list as the second most important factor considered in purchasing decision, after price.It is the conformation of the European trend in this area (The Clean Label Guide…, 2014). Ingredients that are most recognised are: sugar, glucose, artificial sweeteners, artificial colours, artificial flavours, preservatives, starch, lecithin, soya protein, Ascorbic acid, Monosodium glutamate, maltodextrin.

Surveyed Poles are in general looking for no additives, (they divide them into acceptable, tolerated and not acceptable ones – see Table 1.), as well as for

natural and minimally processed foods. All this information should be placed on a product package – front and back of it should correspond.

Table 1.

Acceptance of food additives

Acceptable	Tolerated	Not Acceptable
Natural flavours	Yeast extract	Guar gum
Natural colours	Ascorbic acid	Maltodextrin
Sugar, glucose	Pectin	Monosodium glutamate (MSG)
Vegetable oils	Lecithin	Xanthan gum
Starch	Fibre	Carrageenan
Gelatine	Artificial colours	Mono- and di-glyceride fatty acids
Soya protein	Artificial flavours	Caseinate
Preservatives	Modified starch	Xydroxypropylmethylocellulose (HPMC)

Source: self study

Not all consumers want the same when it comes to food labels and on-pack food claims. Consumers in different age expect and accept different things in different food categories. The most sensitive to this problem are young women and people above 50 years old (the same tendency in Poland and surveyed European countries).Diary (56%), meat (42%) and bakery products (40%) are the food categories the respondents paid the most attention to considering their content and production process.

Western Europe consumers distinguish between healthy everyday foods such as yoghurts and breads where a clean label is a must, and indulgent categories such as dairy desserts where it can be a key differentiator and help to raise purchase intent and ultimately boost salesOn average, over half of consumers them switchtheirpreferredbrandofbakeryanddairy productsforanotherbrandifitcarriedaclean labelclaimsuchas‘natural‘or‘noadditives’.(Cracking the Clean Label code…, 2014).According to the conducted survey in Malopolska it is 32% of consumsers respectively.

Conclusion

Researchindicatesthatproductswithcleanlabelsarebecomingmoreappealing commercially across Europe. On average, 30% of consumers are now actively seeking products with some form of clean label claim. Moreover, 70% of dairy and bakery products purchasers are aware of clean label claims and say the presence of these claims encourages purchases. The findings also show that awareness varies between different types of clean label claim. For example, 'all natural' claims are the most well-known and influence purchasing decisions significantly. Organic claims, on the other hand, are less popular and have less of an impact on consumers.

Europeans are both aware of clean label positionings and actively look for these types of claims when shopping. Poles in the contrary do not have such an awareness, clean label trend is just being introduced in Poland. While there are some regional differences in Europe, on the whole European perceive clean label products to taste greater and be better for you. What is more, even products that aren't primarily seen as healthy can benefit from improved clean label positioning. It is therefore key for manufacturers to know consumers' preferences and make the right product labelling and ingredient choices.

There isa great opportunity for Polish food brands to exhibit natural ingredients to increase their visibility in the market. There is also a chance to increase the interest for local and regional minimally processed food.

More consumer education in this area for sure is needed, as nowadayscleanlabel claimsarebecomingamust-havefeature,rather thananaddedextra of foods.

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The Quality of Products for Enteral Nutrition

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Abstract. The research of quality of products for enteral nutrition have been conducted. These products purposed for the peoples with certain diseases, injuries, affections and those who has increased need in essential components of food. The research of created products for enteral nutrition in dry form and ready for use liquid form has showed the high quality and the ability to satisfy the target consumer category needs.

Keywords*: products for enteral nutrition, quality indexes, needs, consumer*

Introduction

One of the main concepts of healthy nutrition is creation of products that address of the specific consumer categories needs. Enteral nutrition, which is adapted to the peculiarities of digestion and metabolism of different diseases and injuries types, is used in cases, when the normal food insertion is impossible or

difficult for the purpose of improvement the effectiveness certain categories of patients treatment (Grasdalen, 2011; Belyaiev, 2009). The range of products, designed for enteral nutrition of people with certain diseases, injuries, destruction, have increased the need for essential components of diet are at increased physical and neuro-emotional stress, accompanied by a significant loss of nutrients, is limited (Kondrup et.al, 2003; Macola, 2005). The composition of nutrients in the products for enteral nutrition is specially adapted to the needs of people with hipermetabolizm. They have high content of proteins, amino acids, omega-3 fatty acids, carbohydrates, vitamins, minerals, antioxidants (Akbaylar et.al, 2012; AKE Recommendation, 2000; Barendgret et al, 2008). Depending on the composition, the products with the appropriate direction, depending on the specific needs of certain categories of patients, especially designed for nutrition of people, who are in critical conditions (patients with multiple trauma, burns, sepsis, diseases of the nervous system), complications in pre- and after surgery, wounds); patients suffering from cancer, during chemotherapy and radiation therapy; patients with impaired glucose tolerance; patients with renal insufficiency.

For the standardization of this product group the research of quality indicators was held.

Material and methods. The objects of research are dry soluble products for enteral nutrition of people with certain diseases, injuries, destruction, those, who have increased need for essential components of diet, and those, who have an increased physical and neuro-emotional stress, accompanied by significant losses of nutrients:

Sample 1 – the product for enteral nutrition of people in critical conditions;

Sample 2 – the product for enteral nutrition of people with impaired glucose tolerance;

Sample 3 – the product for enteral nutrition of people with cancer;

Sample 4 – the product for enteral nutrition of people with renal insufficiency.

For being control ones 2 dry soluble products for enteral nutrition were selected: control 1 – product "Resourse Optimum" (produced by company "Nestle' (Switzerland), control 2 – product "Reabilact" (produced in Ukraine).

The quality of products for enteral nutrition was determined by the following indexes: moisture content, ash content, height of foam and its stability, active and total (volumetric) acidity, mass fraction of solids, purity recovery index. The research was conducted using standardized physical-chemical methods.

Results and discussion. Ash content and the presence of mineral extraneous impurities are important indexes of products for enteral nutrition in the form of dry mixes are moisture content (Table 1).

Table 1.

Physical and chemical properties of products for enteral nutrition

Indicator	Products for enteral nutrition					
	Control		Developed samples			
	1	2	1	2	3	4
Moisture,%	6,16±0,04	3,08±0,03	4,07±0,02	5,08±0,03	3,18±0,02	3,06±0,08
Ash content,%	2,692±0,016	2,411±0,014	3,892±0,016	3,454±0,016	2,959±0,008	3,052±0,016
Mineral admixtures	Not found					
Extraneous admixtures	Not found					

After the studies it was found that the moisture content of the investigated products are in the range 3.06–6.16%. The fluctuations in the values of this index can be attributed by the varying moisture content of used constituents.

Investigated ash, which describes the presence of mineral compounds and is primarily due to used mineral additives and other raw materials shows, that developed products can be characterized by their high contents. In particular, the highest content of mineral substances was found in samples 1 and 2 (3.892% and 3.454%, respectively) . Mineral and extraneous admixtures were not found, that gives reason to conclude their high quality.

In order to match the physical and chemical quality characteristics of products for enteral nutrition in a ready to use liquid form according to special metabolic needs of the target groups of consumers and factors that determine the use and convenience of consumption preparation the research of physical and chemical parameters was done (Table 2).

Table 2.

Physico-chemical indexes of products for enteral nutrition quality in a ready for use form

Indicator	Products for enteral nutrition					
	Control		Developed samples			
	1	2	1	2	3	4
Active acidity, units. pH	6,31± 0,01	6,06± 0,01	5,96± 0,01	6,21± 0,01	6,02± 0,01	5,97± 0,01
Total (volumetric) acidity, ° T	22±1	20±1	20±1	20±1	21±1	19±1
Mass fraction of soluble dry substances,%	15,2± 0,5	15,0± 0,5	17,1± 0,5	17,2± 0,5	16,7± 0,5	15,9± 0,5
Clean recovery group	I	I	I	I	I	I
Index solubility cm^3 raw sludge	0,20± 0,05	0,20± 0,05	0,16± 0,05	0,18± 0,05	0,15± 0,05	0,2± 0,05
The relative dissolution rate,% not less than	92	95	93	96	95	91
Density, kg/m^3	997,20 ±0,02	998,17 ±0,02	996,19 ±0,02	998,15± 0,02	997,25 ±0,02	998,17 ±0,02

The analysis of the results shows that the total and active acidity of products are slightly acidic and close to neutral. It shows the ability to maintain normal acid-base balance of the body, positive impact on the activity of proteins and nucleic acids. The developed resuls of the mass fraction of dry soluble substances, purity of

recovery, relative speed of dissolution, solubility index, density indicate high resolution soluble components that were used in the development of dry mixes. This is particularly important for this category of products, due to the possibility of these probe input and the need to minimize the effort required for their oral use. For example, studies suggest rational selection of raw materials and compliance of developed products necessary properties.

Conclusion. So, the research of developed products for enteral nutrition in dry and ready to use liquid forms has showed the high quality that meet the needs of the target consumer category.

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Energy Efficiency: a Critical Analysis of the Role of Public Administration in Italy

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Abstract. The commitment to improve energy and environmental performance in public administration is essential for the success of development models geared towards lasting sustainability.

The Public Administration (PA) has a dual consumer/user role, public heritage and decision maker/planner, in promoting energy efficiency at local level, in the light of specific problems and peculiarities. For several decades, initiatives have been launched at various levels to improve energy and environmental performance in the public administration.

The aim of this study is to outline from a critical perspective, the state of the art of policy makers in Italy concerning energy efficiency measures in public administration and the main issues impeding the achievement of its full potential. We also analyze the driving forces for implementing systems and tools to improve energy efficiency.

The European Union Directive (2012/27/EU) recently adopted in Italy gives the public administration the task of promoting energy efficiency at national level by defining and implementing policies and measures aimed at improving energy performance.

Keywords: *Energy efficiency, Public Administration, energy policy*

Introduction

For several decades, a plethora of initiatives have been undertaken at various levels to improve the energy and environmental performance of the public administration, shifting paradigms from the current socio-economic development perspective, to review them from the "sustainable" development point of view.

Since the United Nations Conference on Environment and Development, held in Rio de Janeiro in 1992, useful operational tools have been introduced and used by local authorities in order to ensure effective and efficient land management, based on the fundamental concept of "accountability". Accountability is concerned not only with reporting non-financial performance, but also a set of promotional and information activities, through transparent decision-making processes (CNDCEC, 2011).

Since the 1990s, the Italian organism public administration, consuming more than 1,000 toe, have been obliged to appoint an Energy Manager (EM) to promote and spread a culture of energy efficiency within the organization.

However, in spite of regulatory constraints, to date the Italian PA has appointed very few Energy Managers and remains distinguished by much inefficiency.

In 2013, 1,531 Energy Managers were appointed, of whom only 144 within the PA. While it is impossible for us to make a more accurate estimate, the Regulation appears to have been widely disregarded, since 8-9 out of 10 public bodies have failed to comply; only 3 Energy Managers are employed by ministries and agencies, only 7 out of 20 regions and 43 out of 110 provinces have appointed an Energy Manager, and local authorities have only 105 instead of one thousand (Fire, 2013).

Therefore, it is a well-known fact that the PA’s commitment to improve energy performance is long overdue even if recent studies have estimated that by

2020 the PA could save electricity and thermal energy equal to 0,8 TWh and 1,5 TWh respectively through intervention capable of generating substantial investments valued at approximately €1,000 billion per year (Politecnico di Milano, 2013).

Constraint and opportunities for improving energy efficiency in the public administration in Italy

The driving forces for implementing systems and tools to improve energy efficiency range from economic and organizational oriented incentives to those related to environmental and social dimensions. The high cost of energy makes it essential to identify rapidly the most appropriate technological and organizational interventions for reducing the energy costs of the PA and its exposure to volatile energy prices.

In order to improve energy performance, the energy management practices of the PA must be in synchrony with the concept of energy efficiency, effective detection systems have to implemented and suitable data and information must be available for evaluating the results obtained in order to identify possible areas of improvement.

There are however many cultural, value-related, financial, technological, institutional and operational issues in the public administration sector that could limit investments in energy efficiency. It is particularly important to note that if on one hand the PA shows a lack of knowledge and unwillingness to adopt practices and systemic tools for monitoring and control, on the other, it appears to be too complicated and costly. In fact, specific skills and high technical and organizational capabilities are required when implementing programs aimed at efficient and sustainable energy management.

There are also other problems such as the persisting limited availability of financial resources, which discourages the PA from making plans and investments that could yield returns in the medium-long term, that call for the realization of effective energy efficiency improvement strategies.

In addition, the lack of awareness of the benefits and opportunities related to the improvement of energy performance does not permit the development of a "culture" of shared energy efficiency.

Culture in this case expressed both in "socio-environmental" terms (e.g. environmental protection, enhancement of energy and renewable resources, etc.) and in "individualistic" terms (e.g., everyday use energy conscious, lifestyle, buying patterns, etc.) depends on the degree of sharing of objectives, strategies and values that the PA can spread internally and among the various external stakeholders. Internally, through the virtuous cycle of strategic sharing and co-responsible design, using communication and training to "contaminate" vertically and across the organization and stimulate feedback flows; externally, through the enhancement in a communicational key, of what has been achieved and the involvement of all stakeholders, whatever their title of relationship with the organization.

From a technical and operational perspective, the complexity of the planning, technical and financial aspects of energy efficiency measures, as well as the lack of commitment, also relational, of the individuals responsible for their implementation, magnify and reinforce the barriers to energy efficiency.

Additionally legislative instability and the long and tortuous bureaucratic procedures required by global operations are factors that induce the PA to opt for simple technologies to implement rapidly but characterized by short-term vision.

One way of overcoming knowledge barriers and reducing technical and economic information asymmetries, may be to enforce the regulations currently in force.

Conclusion

The affirmation of energy paradigms geared towards greater efficiency and sustainability is an interesting challenge and presents new opportunities for the Italian PA, which should play a leading role in the complex economic scenario that we have been experiencing for some years (Borgonovi, 2005).

The current energy efficiency approach of the Italian PA stems from a strategically unstructured vision, governed by legislation and highly fragmented planning that result in occasional activities rather than medium-long term planned initiatives, enacted after a careful measurement and assessment of the results obtained.

Therefore, it appears that the boundaries of the PA require redefining in order to reconsider the relationships between the public and private sectors and the public institutions in terms of cooperation, collaboration and partnership, based on reliable and long-lasting relationships, integration of public funds and private resources and the resultant risk allocation. Moreover, it is essential to exchange experiences and best practices with the aim of guiding the PA and especially local bodies towards lasting sustainability and economic growth through competitiveness, environmental protection and social development.

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Modern Building Materials Based on the Recycling Technology

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Abstract. The results of complex problem solving industrial wastewater of different nature using nanomodified clay - montmorillonite and kaolin, hydromica subsequent disposal of water treatment products.

Keywords: *recyclyng,ceramics,nanotechnology*

Large-scale project of complex processing of industrial and household waste, which are in the form of powder, pastes, slurries in materials, products for the construction industry includes the development of the individual processes, the list of which is determined by the volume of industrial and household waste, which can be recycled.

The basis of the proposed technologies, referred to, is based on recycling technology - for technical building ceramics using as a component of the charge in the production of ceramic construction products industrial and domestic waste of different nature and origin of the principle of matrix and agent.

The scientific concept of the implementation of recycling technologies are based on colloidal chemistry of materials using nanotechnology elements, which makes it possible to specifically deal with complex, over the years did not address environmental for today conducted preliminary research and technological tests of the technology of building material samples using ceramic technology. (Figure 1.).

Technological solutions using recycling are proposed to produce a ceramic material for various applications in the construction (road building, ceramic grave, economy blocks) using an ingredient blend of industrial and domestic waste of various natures which are in the form of powders, pastes, slurries.

As an example, it is a mechanism for the implementation of recycling technologies for disposal of sludge produced after galvanic treatment, assessment of its environmental and economic performance, conducting of tests to evaluate the physical and mechanical properties of the ceramic material (product).

Table 2.

List of recycling technologies in the production of building materials (products, goods)

The list of industrial and household waste, which are subjected to recycle	The production where the household waste product will be recycled
The sludge resulting from the cleaning of fresh water and sea water containing the water-soluble fractions of petroleum products, including emulsified oil and oil	Preparation of organic-nanocomposites. The raw material for a large list of technical building ceramics with improved physical and mechanical characteristics, consumer characteristics.
The sludge after water treatment of galvanic production, containing ions of heavy metals: Fe, Cu, Cd, Zn, Ni	As a batch ingredient in the production of building ceramics: bricks, tiles, sanitary ware
The slurry after neutralization and purification of etchants in the production of steel pipes	As a batch component in production of construction ceramics, composite materials based on binders
The silt of Bortnychi aeration station waste generated after silt processing	Recycling in technical ceramics technology: for industrial buildings, rubble, ceramic, etc.
Rocket fuel: its products	Production of nanocomposites, blend component for the production of ceramic building materials

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its environmental and economic performance, conducting of tests to evaluate the physical and mechanical properties of the ceramic material (product).

Stages of implementation of water treatment technology

Implementation in the production technology requires the passage of a number of steps, namely:

- Evaluation of the chemical composition of pollution and effluents;

- Familiarization with the existing technological scheme for the treatment of industrial waste water facilities:

- Selection of the optimal method of modifying the selected mode sorbent according to the criterion of the minimum selection of its mass by conducting tests:

- Development of new technological industrial wastewater treatment schemes using a new or existing equipment, if necessary, its modernization;

- Development of technological industrial wastewater treatment regulations.

Environmental technology indicators

Use of technology significantly improves working conditions for workers due to the fact that the technology does not require chemical reagents which are necessary when using the method of reagent industrial wastewater.

When using the waste sorbent technology does not require special warehouses for storage.

The spent sorbent is not environmentally harmful material.

Economic indicators of the use of technology

By using the technology of industrial wastewater treatment costs will be significantly lower compared to the reagent purification method, which is now used in industry.

The cost of the modified sorbent, which will be made by the manufacturer does not exceed 0,5-1,00 dollars per 1 kg.

modified sorbent costs in technologies ranging from 0.3 kg to 1.0 kg per 1m3 of industrial effluents.

For example, for the enterprise neutralization plant with a capacity of 20 m3 to 30 m3 of clean industrial wastewater per day, you will need about 20 kg of modified sorbent.

The resulting effluent sorbents nanomodified processing natural aluminosilicates, sludge can be disposed of by introducing it as an additive in the wall charge for producing ceramic - ceramic brick.

This is confirmed by the results of tests batches of samples with additives and sludge according to DSTU BV 2.7-269-5 and DSTU BV 3.7-42-97. Molded specimens were tested for the device on the CD-1 sensitivity of drying. It is also determined by the humidity and air masses of molding shrinkage. After firing, samples were identified overall shrinkage, water absorption, and the average density of the boundary of the compressive strength (Table 2).

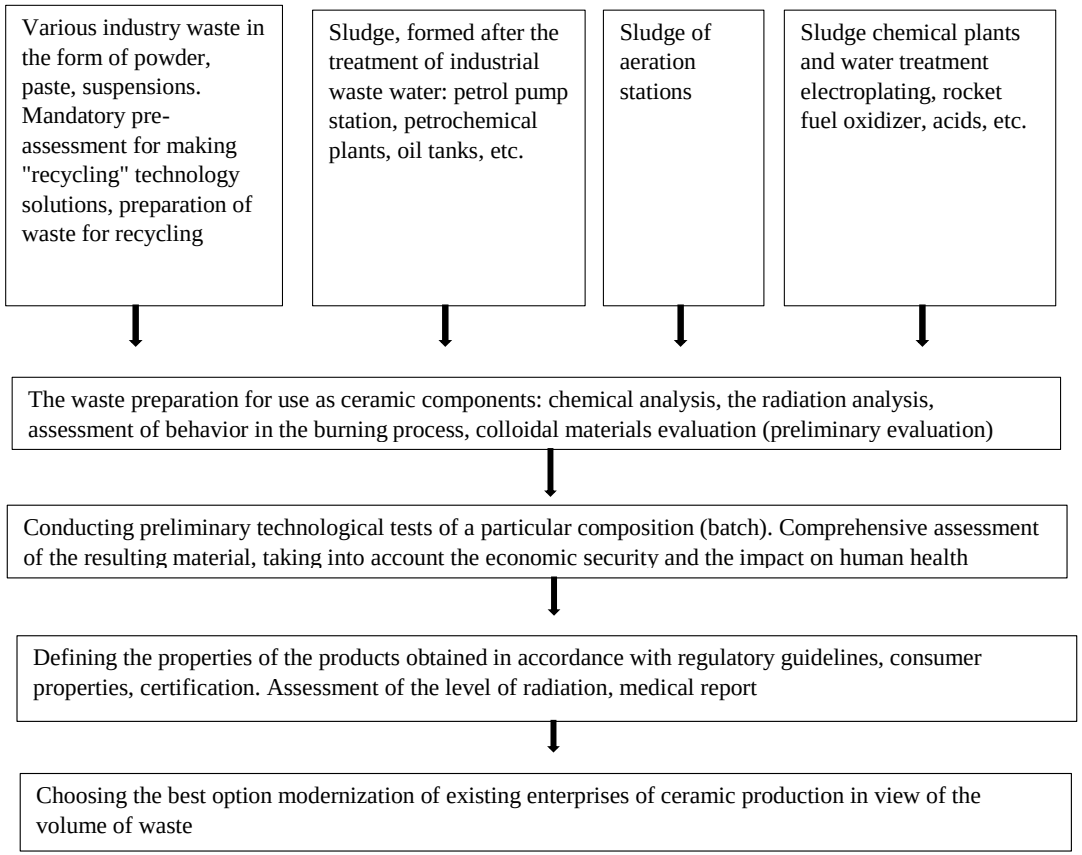

Figure 1. The concept of innovation on recycling technology

Test test batch for ceramic bricks containing waste as sorbents nanomodified samples of montmorillonite (bentonite), showed the effect of increasing the mechanical strength while maintaining within acceptable limits of other important technological parameters. It is believed that when manipulation of the composition of the basic charge and the amount of nano-modified additives, conducting preliminary technological tests will be able to find other useful unpredictable effects that many scientists and technologists are fixed when using nanocarriers. In this sense, it is expedient to provide examples of the effect of increasing the density of nano-modified oxidic compositions that can serve as model systems have been found earlier. When the optimum degree of modification, a predetermined density level on the basis of the molded sample nanomodifiedpresspowder attained at lower compaction pressures, the densities of the sample after baking rises within 0.2-0.3 g / cm3.

Table 2.

The results of test batch processing properties of ceramic bricks containing the additive sludge wastewater treatment effluent

Indicator	Indices batch index component content					
	S0	S1	S2	S3	S4	S5
Forming humidity%	23,35 /20,22	24,63 /19,80	25,19 /20,80	24,49 /19,70	25,24 /19,80	25,80 /20,40>
Sensitivity to drying	> 180	> 180	> 180	> 180	> 180	> 180
Aerial shrinkage %	6,61	6,40	6,24	6,62	6,54	6,70
Total shrinkage,%	6,70	6,54	6,74	6,72	7,04	7,02
The average density, g / cm3	1,55	1,58	1,58	1,54	1,58	1,50
The boundary of the compressive strength, MPa	18,4	19,2	20,0	19,8	20,4	21,8
Water absorption,%	22,28	21,50	21,20	21,44	21,00	20,54

S0 – the batch for the production of ceramic bricks;

S1, S2 - containing samples of batch consisting additional slurry of industrial waste water treatment products of galvanic production 1 and 3% by weight respectively;

S3, S4 - 1.3% by weight. sludge after cleaning contaminated water soluble fractions of petroleum products;

S5 - 3% of the sludge after cleaning ballast water (seawater).

A crucial role is played by the degree of surface modification α. Increased system defect occurring during firing of the molded and dried sample, stimulates generation liquid defects, in turn initiate plastic flow. The result is an increased density of solidification structures during sintering modified samples compared with that of the original sample.

Analysis of the technological properties of the studied sample batches shows that all the classification designations given in DSTU B.V.2.7-26-95 and DSTU B.V.2.7-60 - 97 sludge resulting from the cleaning nanomodified effluent with sorbents can be disposed of by introducing an additive into the blend in the manufacture of ceramic bricks in any existing plant.

Analyzing the above results, we can conclude that the proposed project has an innovative perspective of implementation. The above data allow us to confidently state that nanomodified natural aluminosilicates can broadly be used in addressing the global water treatment problems.

The project provides for the purification of industrial waste of different nature, as such, where product purification dehydrated, stored and achieve the desired volume is sent to the existing manufacturing building ceramic or used as an additive to the batch in a slurry certain solids concentration and then adjusting the humidity of the charge of the ceramic mass immediately at the site of formation of products: brick, tile, ceramic blocks, concrete block, lightweight, etc.

You can express confidence that the combined application nanomodificated natural aluminum silicates as a sorbent in the treatment technology of industrial wastes of different nature from the subsequent disposal of sludge, improves the ecological environment, habitat, modernization of ceramic technology, in terms of regulatory burden plasticity, sintering process and the impact of water treatment products on structure and texture, density, strength of ceramic products, consumer properties.

Conclusions

Based on the scientific principles of colloid chemistry of materials, the possibility of real solutions to global problems of ecology and recycling of different nature, including the sludge produced in the process of applying natural aluminum silicates for purification of galvanic, water, contaminated by petroleum products, including ballast water (seawater).

Application of Absorption and Fluorometric Methods to Measuring Air Pollution through Quantitative Analysis of Chlorophyll Content in Evergreen Plants of *Thuja occidentalis* Species

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Abstract. For urban areas, exhaust fumes from motor vehicles and the burning of coal in coal furnaces cause significant air pollution manifested by smog. A special case is Kraków, which is located in a basin of the Kraków-Częstochowa Upland, where due to poor circulation of air, concentrations of particulate matter pollution frequently exceed the legal limit. High concentrations of pollutants adversely affect human health and physiology of plants in the studied area. The environmental impact upon green plants can be used for determining the degree of pollution in the investigated area.

***Keywords**: exhaust fumes, fuel, smog, chlorophyll, air quality*

Introduction

Poland in the last two decades is characterized by a rapid growth of its economy, which results in increased energy consumption *per capita* (Central Statistical Office of Poland, 2014). Lowering of air quality brings economic losses ranging from tourism decline to the decrease in popularity of the area as a place to live (WHO, 2015). Monitoring is one of the most important elements contributing to the improvement of air quality. Particulate matter PM10 and PM2.5 are the main components of the city smog and are responsible for increased susceptibility to upper respiratory tract diseases of the population living in polluted areas. One factor contributing to the degradation of air quality is the increasing number of motor vehicles. For urban areas in developed

countries such as the USA, air pollution caused by motor vehicles due to the emission of exhaust fumes is in the range of 50% to 90% of the total air pollution in cities (http://auto.howstuffworks.com/percentage-of-air-pollution-due-to-cars.htm, 2015).Air quality can be monitored in several ways. One of them is spot assessment involving the construction of stations and measuring centres in the city. Monitoring of air pollution using plants is a complementary method, supplementing the measurements using electronic sensors. Biomonitoring permits to estimate the impact of harmful chemicals suspended in the atmosphere upon physiological properties of plants.

Material and methods

The aim of this study was an attempt to use green plants, namely the eastern arborvitae species (*Thuja occidentalis*) (Figure 1) as a bioindicator. The authors attempted to measure the level of fluorescence and absorbance, at selected wavelengths, of the preparation obtained from arborvitae. Using publicly available data from urban pollution monitoring stations in the city of Kraków, sampling sites were selected that were located in the vicinity of the measuring stations. Based on literature data (Treshow, Anderson 1989; McLaughlin 1982; Joshi-Abhishek Swami 2007), it was assumed that the exposure to hazardous air pollutants would produce stress in the studied plants, and thus the degradation of chlorophyll. After collecting research material (in the winter months), plant samples have been prepared in accordance with the EPA SERAS 1994 procedure. Measurements were performed using a Perkin Elmer Lambda Bio.

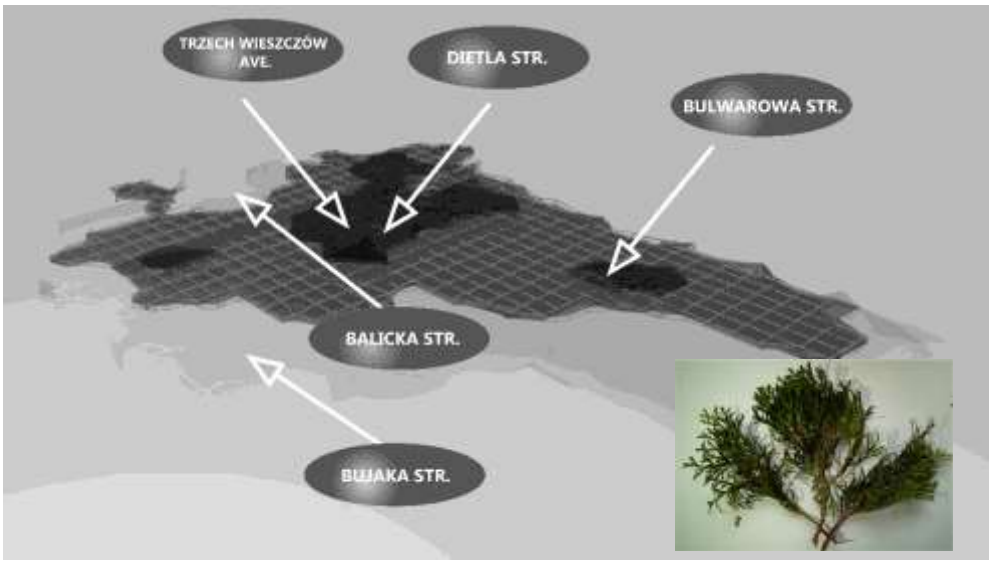

Figure 1. Sampling sites of eastern arborvitae (*Thuja occidentalis*) in the Kraków area
source: own research

Quantitative content of chlorophyll a, b and total chlorophyll was estimated according to the equations (Arnon, 1949):

$$\text{Chlorophyll a } (\mu g/ml) = 12.7\ (A_{663}) - 2.69\ (A_{645}),$$

$$\text{Chlorophyll b } (\mu g/ml) = 22.9\ (A_{645}) - 4.68\ (A_{663}),$$

$$\text{Total chlorophyll } (\mu g/ml) = 20.2\ (A_{645}) + 8.02\ (A_{663}).$$

Results and discussion

Absorptiometric measurements have shown significant changes in the chlorophyll content in the investigated samples of evergreen plants growing in the city of Kraków, which is illustrated in the graph (Figure 2) and the measurement results are summarized in Table 1. The content of chlorophyll in the plants under study decreased compared to reference values obtained from the extract of evergreen plants collected in unpolluted areas (Dobczyce and vicinity). The strongest decline in chlorophyll content was recorded in areas polluted with PM10 and PM2.5 particulate matter. Chlorophyll content in the analyzed plant samples increased along with the distance from pollution sources.

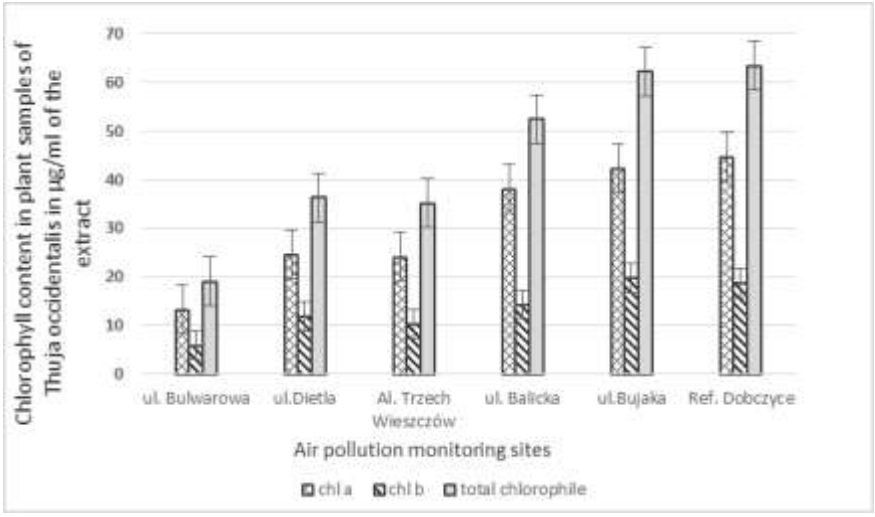

Figure 2**.** Chlorophyll content in samples of *Thuja occidentalis* as a function of the pollution level source: own research

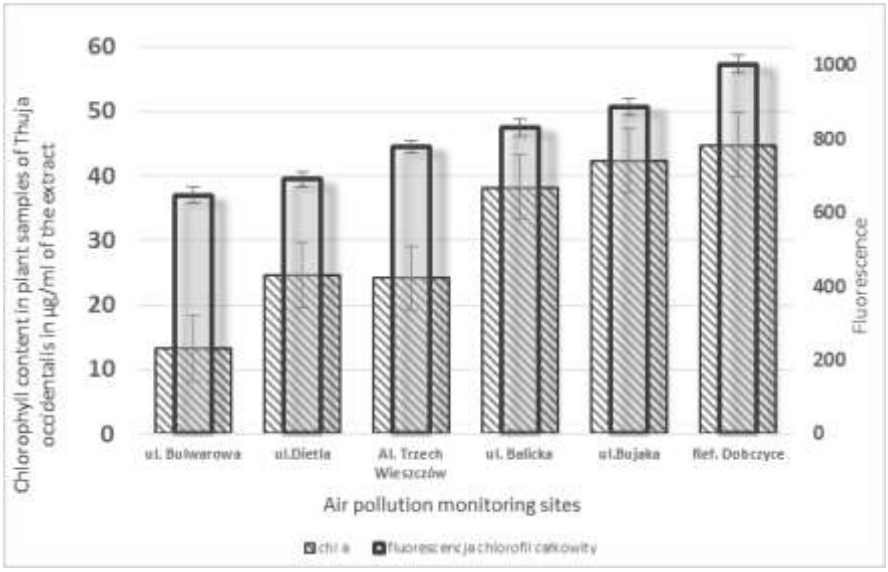

Figure 3. Comparison of fluorecence intensity of the investigated samples in relation to chlorophyll a content source: own research

Table 1.

Summary of results of chlorophyll investigations

Sampling site	**Chl a µg/ml**	**Chl b µg/ml**	**Chl total µg/ml**	**fluorescence a.u.**
Bulwarowa	13.23	5.8	19.04	647
Dietla	24.58	11.75	36.32	690
Aleje Trzech Wieszczów	24.1	10.21	35.1	779
Balicka	38.14	14.27	52.4	831
Bujaka	42.37	19.79	62.14	887
Ref. Dobczyce	44.76	18.66	63.41	7002

Source: own research

The decrease in the chlorophyll a and b content in comparison with the reference samples suggests that the process of photosynthesis was limited in the Photosystem II of the studied plants. The measurements indicate an adverse effect of PM2.5 particles, which could directly contribute to the clogging of stomata in plants. The south-western areas of the city turned out to be the least polluted, which manifested itself in high concentrations of chlorophyll (a + b) in plant samples; chlorophyll a

and b concentrations in the plant extract were 52 μg/ml and 62 μg/ml, respectively. The total chlorophyll content (a + b) of plants collected at the sites Bujaka street and Balicka street, compared to the unpolluted reference samples, remained at the level of 63.41 μg/ml. This allows to conclude that the concentration of PM2.5 air pollutants in the winter months significantly decreases toward the south. The measurements carried out on plants in the city centre (sites: Dietla street and Aleje Trzech Wieszczów avenue) indicated the levels of chlorophylls at 36 μg/ml and 35 μg/ml, respectively. Decrease in photosynthetic efficiency suggests that winter-average concentration of PM10 and PM2.5 particles in air considerably exceeds acceptable air quality standards set at the level of 50 $\mu g/m^3$, posing a threat to human health. The next step consisted in fluorometric analysis performed for the same samples, recording the radiation emitted within the wavelength range of 600-700 nm, corresponding to the luminescence of total chlorophyll, with the absorption of the excitation wave in the range 380-400 nm. Fluorescence measurements confirmed our suspicions about weakening of the photosynthetic apparatus (Photosystem II) in the studied plants. Chlorophyll fluorescence manifests itself at a wavelength of 663 nm (red light), which is mainly due to the excitation of molecules of chlorophyll type a. The absorptiometric method permitted the estimation of chlorophyll a content in the investigated samples, which contributes directly to the red fluorescence. The weakest photoluminescent response of chlorophyll a was obtained for samples of plants collected from the site at Bulwarowa street, for which the concentration level of chlorophyll a was 13 μg/ml. Slightly higher, by 13.5%, photoluminescence intensity was observed for the plant samples collected from the sites at Dietla street and Aleje Trzech Wieszczów - in comparison with the samples from the Bulwarowa site. Similarly, for the plant samples collected from sites located in the south-western parts of Kraków (Bujaka street, Balicka street) we observed a significant increase in the intensity of chlorophyll a fluorescence - again in comparison with that of the plants from the Bulwarowa site. The increase in the fluorescence of chlorophyll a in this case was 35%. The strongest intensity of chlorophyll a fluorescence was recorded for the reference samples, where the absorptiometric method indicated the highest concentration of chlorophyll a among all investigated plants of the *Thuja occidentalis* species (Figure 3).

Conclusions

Eastern arborvitae is a bioindicator which allows to determine the amount of pollution on the basis of chlorophyll degradation measurements. Impurities can be determined both from absorbance and fluorescence. According to the literature, fluorometric studies have higher sensitivity (Guilbault 1999, Sikorska 2008) in comparison with the measurement methods based on the phenomenon of

light absorption. Evergreen plants of the *Thuja occidentalis* family function quite well as a bioindicator, especially in large industrial agglomerations at the time of increased smog severity, which coincides with the autumn-winter and the winter-spring months. Analysis of photosynthesis efficiency based on a plant bioindicator, taking into account the location of sampling sites, gives the opportunity to explore the distribution of impurities and allows to select areas with the lowest concentrations of PM10 and PM2.5 particulate matter in the atmosphere.

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Legal Regulations about Use of Edible Coatings in Food Technologies

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Abstract. This report presents the regulatory requirements for the use of edible coatings in food technologies. The study shows the legislation about the application of edible coatings for food in the US, Europe and Bulgaria. In most cases the edible coatings are treated as food or food additives. There are no regulations which give more specific requirements about the use of edible coatings in the European Union and Bulgaria.

***Keywords**: edible coatings, regulations, food technologies*

Introduction

The compounds of the edible films are substances, which can be used to contact and as a packaging of different food products. For this reason they must meet all legal regulations which concern their components. To preserve the food safety and quality all film-forming components and functional additives must be authorized for use in food products and must not be toxic. Furthermore, all processes in the production of food coatings muse be acceptable for the food industry, keeping GMP[1] (Martín-Belloso O., et.al., 2009).

[1] GMP – good manufacturing practice

The aim of the current study is to present and analyse the legal regulations in United States, Europe and Bulgaria concerning edible coatings used in food technologies.

1. Legal regulations about edible coatings in United States

Due to the legislation in USA the components used in edible coatings must be considered as GRAS[1], after being tested and accepted by FDA[2]. The edible coatings can contain some components which has functional activities. They must be clearly marked in the labeling of the products (Martín-Belloso O., et.al., 2009).

The major responsibility of FDA consist of observing and controlling the safety of food additives before being launched at the markets. Food additives are substances which can slow down some unwanted changes in food products during their storage. They must possess a GRAS status and correspond to GMP of FDA. They must not contain any heavy metals or other pollutants, which exceed the allowed limits, defined by FDA. In USA FDA has made a list of food additives which are authorized for use in food coatings (7. Cheng G., et al., 2012).

In many countries legislation about food products define the antimicrobial components as food additives, if their major purpose is extending the storage life of foods. According to the regulations in USA organic acids (such as acetic, lactic, citric, malic, propionic and tartaric) and their salts, which are approved as GRAS can be used as components of edible coatings. That also equal to some essential oils which possess a GRAS status. (Martín-Belloso O., et.al., 2009).

In USA substances allowed for use as food components must be safe for use according to their purpose as ingredients of edible coatings and in quantity in accordance to GMP. These wholesome components must have an approval by FDA. It is necessary to emphasize that the GRAS status do not guarantee a total safety of products, especially for people who have a food allergies (Pavlath, A., 2009).

[1] GRAS – generally recognized as safe
[2] FDA – Food and Drug Administration

Some edible coatings consist of components (such as milk, wheat, soy proteins and proteins from peanuts and walnuts), which can cause an allergic reactions in some consumers. For that reason edible coatings with compounds which can cause such reactions in consumers must be clearly marked at the labeling of the products it is coated to. [Pashova S., 2013, Martín-Belloso O., et.al., 2009).

2. Legal regulations about edible coatings in Bulgaria and Europe

In Europe many additives are used in the composition of edible coatings. Their name must always be in the marking of food products with their specific functional category (antioxidants, preservatives, colorants, emulsifiers, stabilizers, gelling agents, thickening agents, flavoring agents and sweeteners), name and E-number (Martín-Belloso O., et.al., 2009).

The legislation in the European Union define food additives as "substances, which are not consumed separately as food and do not have a major role as food components in food composition, no matter whether they possess nutritional value. They are used in food products with technological purpose and it is realized in each stage of the production, processing, preparation, treatment, packaging, transport and storage". The Regulation 1333/2008 2008 (Regulation (EU) № 1333/2008) is applied to all food additives, but not for substances used for giving specific aroma or taste.

According to the Food Law in Bulgaria (Food Law) only materials, including active or intelligent ones, produced with accordance to GMP can be used as food packaging. In normal and predictable conditions of use they do not transfer components in quantities, which can endanger human health or deteriorate the quality and sensory properties of the food products. After examination of the Food Law no specific regulations about edible coatings and their ingredients are found.

All materials, which contact food, must be accompanied with declaration of conformity with their requirements. The producers and traders of food materials

must comply with the requirements about their traceability, which are included in Regulation 1925/2004 (Regulation (EU) № 1935/2004) according to the Food Law (Food Law).

Regulation 1925/2004 (Regulation (EU) № 1935/2004) do not apply for materials used for coatings and glazing of cheese, meat products and fruits, which can be consumed together with the food. For that reason the conclusion is that no specific regulations for edible coatings and their components are found in those documents.

Regulation 450/2009 (Regulation (EU) № 459/2009) define specific requirements about the active the intelligent materials, which are supposes to contact food products. The regulation applies for all materials which are authorized for producing and selling in the European Union. No regulations about edible coatings are found here.

The use of additives in food products in the European Union is regulated by t Regulation 1331/2008 (Regulation (EU) № 1331/2008). It is designed by the EFSA[1] to take responsibility of food safety in EU. EFSA evaluate the safety of new food additives, analyse the existing ones (based on new scientific information and current conditions). According to Regulation 1331/2008 (Regulation (EU) № 1331/2008) aroma substances, dyes, preservatives, adjuvants, food enzymes, waxes and all allowed additives can be used as ingredients in edible coatings (Cheng G., Elizabeth A. Baldwin, 2012).

Directive 95/2/EU (ED European Parliament and Council Directive №95/2/EU) and Regulation 1333/2008 2008 (Regulation (EU**) № 1333/2008**) define that "glazing agents" are substances, which give a shining appearance and form a protective coating when applied to food surface. According to that formulation edible coatings and their components must meet all the requirements in these two documents. Edible coatings consist of nutritional components, food

[1] EFSA – European Food Safety Authority

additives, substances in touch with food and food packaging. They are included in the edible part of the food, therefore they must meet all regulations about food components. Film forming substances must not be toxic and all processes about their preparation and food coating must be in accordance with GMP.

All components, which can be used in the composition of edible coatings, are considered as food additives and included in the list of additives of general use. In any case the use of any single component in edible coatings is authorized only if principle "in reasonable quantities" is respected. In Europe all food additives must be clearly marked in the labeling of the food with their functional category, name and E-number (Pashova S., 2013).

Conclusion

As a result of the analyze of the regulations it was found that USA have a well-developed politics in regard to the components used in the composition of edible coatings. FDA has made a list with all additives which possess a GRAS status and are authorized for use in edible coatings.

The regulations about the use of edible coatings and their ingredients are stated in Directive 95/2/EU (ED European Parliament and Council Directive №95/2/EU) and Regulation 1333/2008 2008 (Regulation (EU) № 1333/2008).

As a conclusion it can be summarized that specific legal regulations in the European Union, which give a specific requirements about the use of edible coatings and their ingredients are missing. That is a huge disadvantage and makes the analysis of edible coatings according to legal regulations difficult.

There is no information about edible coatings and the components used in them in the Bulgarian Food Law.

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The rule of by-products to make profitable bioenergy from microalgae: a comprehensive review

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Abstract. The commercial interests for microalgae have increased over the last decades, especially for production of fuels. In this context, several technologies (i.e. open pond and/or photobioreactor) are increasingly being developed to improve microalgae biomass production. However, it should be underscored that, to date, energy (in particular biodiesel) production from these organisms is not economically convenient yet. Hence, to make biodiesel from microalgae feasible in the economic sense, optimised utilisation of all microalgae compounds is needed. Indeed, they are a promising source not only of bioenergy but also of commodities with high added value. The present review was focussed upon the utility of microalgae in the commercial and industrial sector to harness the growing demands of such marine resources. Finally, it seems that the cultivation of microalgae can be more profitable if the future research will be specifically focussed upon the integration of production systems (i.e. biorefinery), thereby making microalgae-based products even more diversified and economically competitive.

Keywords*: microalgae, commodities, bioenergy, biodiesel, by-products*

Introduction

Microalgae are prokaryotic or eukaryotic organisms ranging from a few microns to a few millimetres in size (generally smaller than 30 mμ) that live in a variety of natural aqueous habitats such as freshwater, brackish water, marine and hyper-saline environments, and soil. It is estimated that more than 50,000 species exist in the world, although around 30,000 have been studied and analysed thus far (Van Iersel and Flammini, 2010). Thanks to specific pigments, they are photosynthetic microorganisms characterised by a high capacity of cell division: the population generally double in about 24 hours but, for some species, they can multiply four-fold in the same space of time. Furthermore, photosynthesis allows microalgae to transform solar energy not only into carbohydrates but also in fats, due to specific metabolic pathways characterised by the presence of specific enzymes (Rana and Spada, 2007). The microalgae are increasingly being utilised in both bio-energetic and non-energetic fields both for the bioactive compounds (i.e. carotenoids, phycobiliproteins, etc.) and the high microalgae biomass production rate as well as content of lipids, carbohydrates and proteins (respectively 10-40%; 4-64% and 6-71 % of their dry weight – dw) in the biomass itself (Harun et al., 2010; FAO, 2010). Those compounds and molecules can be used directly without modification or change into different products, either through chemical, enzymatic or microbial conversion. For instance, Spiruline (*Arthrospira maxima* and *Arthrospira platensis*), Chlorella (*Chlorella vulgaris*), and Dunaliella (*Dunaniella salina*) are cultivated in many parts of the world to produce supplements, feeds for fries and food ingredients. Also, the quality of these products is high because microalgae are cultivated without herbicides and pesticides in clean nutrient media without the toxic substances (Rana, 2004). Currently, fossil fuel shortage and environmental impact, as well as the unsustainable bio-fuels production from energy crops have led researchers to experiment cultivation of microalgae in appropriate

facilities to improve their growth to obtain bio-fuels, especially biodiesel. However, although the processing of microalgae to obtain biodiesel is ready for commercialisation, the high cost of production make this technologies uneconomical. So, according to scientists, to make biodiesel production more economically feasible a greater valorisation of the by-products should be considered, in order to obtain commodities with higher added value (Alabi et al. 2009; Beneroso et al. 2013; 2013; Van Iersel and Flammini, 2010; Yen et al., 2013). In this context, the present review focuses upon such commodities performing an in-depth analysis of the production and utilisation pathways in order to highlight technological solutions that can make microalgae based energy economically competitive compared to the other renewable sources.

Technologies for biodiesel production

Nowadays, open ponds and photobioreactors are currently utilised for microalgae cultivation: as largely documented by the specialised scientific literature, these technologies are characterised by different production yields and economic costs associated with their whole life cycles (Harun et al., 2010; Mata et al., 2010). In particular, the open ponds if on one side are constituted by a simple and low-cost equipment, on the other side the covering absence causes high variability of the chemical-physical parameters of the cultivation medium (water) and parasitosis phenomena, so negatively affecting biomass production yield. The latter ranges, indeed, between 10-25 g/m^2 per day during peak photosynthetic activity period, whilst photobioreactors are characterised by a far greater constant production that is generally equal to almost 50 g/m^2 per day (Energy Strategy, 2011). This should be attributed to photobioreactors consisting in closed and transparent structures where the microalgae are not in direct contact with the external environment and receives the solar radiation through the walls of the bioreactor. Those technologies have been designed and are currently under improvement mainly for biodiesel production yield

increase. Indeed, according to US DOE (2010), algal-biomass oil production yield generally ranges from 9 to 60 m^3/ha per year, and so can be even almost ten times higher than that of palm oil. However, the improvements achieved thus far are not yet sufficient to make biodiesel production profitable, as the biodiesel production cost generally ranges between almost 2.5 and 320 €/L, depending upon the microalgae species and technologies utilised (Grima, 2003; Chisti, 2007; Slade and Bauen, 2013). Such values are far greater than the cost of palm oil which is acknowledged as the cheapest oil globally being currently equal to 0.46 €/L (IndexMundi, 2016). Therefore, it would be desirable to decrease the microalgae biodiesel selling price to levels more or less comparable with that of the other biodiesels currently obtained from soybean, sunflower, camelina, jatropha and palm oil that are available in the market. Such can be obtained through either increasing annual algal biomass production yield using Genetically Modified Organisms (GMO) technologies, or by-products valorisation maximisation. Biodiesel is produced from microalgae through a process that provides flocculation and centrifugation of algal biomass, and subsequent extraction and transesterification of bio-oil. During the whole transformation process, the following two by-products are generated: the cake and the glycerol. In particular, based upon its physical-chemical characteristics, the cake can be utilised to produce not only foods and feeds, chemical and pharmaceutical products but also biofuels such as ethanol and methane from the biogas produced (as show in Fig.1). At least, three different solutions may be considered for recovering economic value from the cake, such as: 1) maximum bioenergy recovery from the lipid extracted biomass, with potential use of residuals as soil amendments; 2) recovery of protein from the lipid-extracted biomass for use in food and feed; 3) recovery and utilisation of carbohydrates from lipid-extracted biomass, and the glycerol from the transesterification of lipids to biodiesel (Ferrel and Sarisky-Reed, 2010). However, other sustainable solutions should be considered such as ethanol from carbohydrate, feed from the proteins present in the cake and

biogas from the residual biomass (Fig. 1). Moreover, the CO_2 and digestate coming from the biogas produced can be utilised to feed microalgae. Nevertheless, to maximise the amount of by-products further extraction and separation methods should be developed, because to date the technologies allow to obtain only one specific product, loosing or damaging the most valuable components available in the microalgae. In this regard, Vanthoor-Koopmans et al. (2013) propose the pulsed electric field technique (PEFT) to prevent these problems, as it appears to be more efficient compared to the cell disruption, one of the most applied technology to extract those compounds. Therefore, valorisation resulting from considering the cake not as a biomass residue but as a co-product can aid to the development of bioenergy from microalgae specially through a sustainable/efficient microalgae-based biorefinery process.

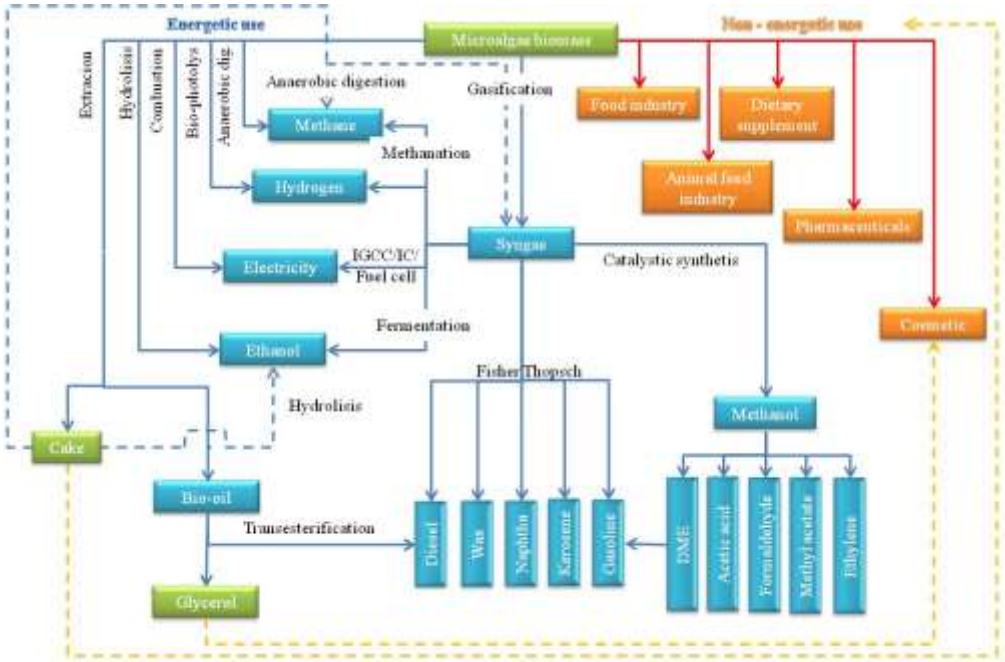

Figure 1. Energy and non-energetic use of microalgae.
(Dashed lines represent the recycling of biomass

Commodities from microalgae cake

As mentioned above, the cake is a residue obtained by removing lipids from the microalgae cells by either pressure or solvents. So, algae cake contains different bio-molecules (proteins, carbohydrates, vitamins, pigments, etc.) which depend on the species cultivated. According to Alabi (2009) and Harum (2010), thanks to the high protein content and quality, the cake can be sold as an animal feedstock for nourish cows, chickens or fishes (Fig. 1). Several nutritional and toxicological studies have stressed on the suitability of the microalgae biomass as a valuable feed supplement or as a substitute of animal feed. For instance, in poultry rations, microalgal biomass up to a level of 5 - 10% (dw) can be safely used as a partial replacement for conventional proteins (Ferrel and Sarisky-Reed, 2010). As shown in the figure 1, the cake can be also utilised to produce biomethane through anaerobic digestion of the biomass. Moreover the residue from the digester (digestate) can be reintroduced into the algae cultivation plant as a source of nutrient, so reducing additional fertiliser requirements: Alabi (2009) has estimated that this operation can help to save by 75% of nitrogen and 50% of phosphorus utilised in a open pond. In addition, thermochemical conversion through gasification (at 850 °C), pyrolysis (at 550 °C) and/or torrefaction (at 300 °C) of cake has been proposed in order to obtain three fractions: solid (bio-char), liquid (bio-oils) and gaseous (bio-gas) (Beneroso et al., 2013). However, those applications do not to allow for a complete economic valorisation of the potentialities offered by the cake: being a microalgae residue, as previously mentioned it is naturally characterised by a high content of lipids (oil), carbohydrates, proteins, pigments and etc. The oil remained in the cake after extraction by pressure (represents 25-30% of cake weight) can be subsequently obtained by means of solvents (Rana, 2012) (Fig. 1). This oil contains important essential fatty acids, such as DocosaHexaenoic Acid – DHA and EicosaPentaenoic Acid – EPA, that are highly demanded by the market of health food supplements.

With regard to those substances, it should be observed that they are naturally contained in fish oils and will be increasingly demanded in the future for several applications, though their production will remain constant. In this context, the authors believe that such a gap could be satisfied using the oil extracted from the microalgae cake. The algal carbohydrates are mainly composed of starch, glucose, cellulose/hemicelluloses, and various kinds of polysaccharides. In particular, bio-ethanol can be obtained by treatment of cellulose or starch with hydrolytic enzymes and subsequent alcoholic fermentation (Fig 1). The CO_2 coming from the latter treatment can be purified and recycled in the algae cultivation plant as a nutrient to grow microalgae. Furthermore, fermenting microalgae biomass with particular microbes, such as *Clostridium sp.,* can produce other important fuels such as butanol and acetone. As is known, these products are valuable organic solvents and in particular butanol has a potential to be used as a renewable transport fuel. According to Hurm et al. (2010) the use of five species of the genus *Dunaliella* as a substrate and *Clostridium pasteurianum* as "fermenter agent" can allow to achieve productions of mixed solvents (n-butanol, 1,3-propanediol, and ethanol) of about 16 g per litre of microalgae culture. Alternatively, a class of high-value compounds can be extracted with many downstream industry applications such as food, cosmetics, textiles, stabilisers, emulsifiers, lubricants, thickening agents and clinical drugs (Arad and Levy-Ontma, 2010) (Fig. 1). In particular, sulfated polysaccharides have shown a wide range of pharmacological activities such as antioxidant, antitumor, anticoagulant, anti-inflammatory, antiviral and immunomodulating (Yen et al., 2013). As already anticipated, thanks to the high nutritional content, cake proteins have been recently utilised as feeds for livestock in zootechnics and for fish in aquaculture (Backer, 2007) (Fig. 1). In addition, they could be utilised for human food products but appearance, digestibility and taste prevent their acceptance by consumers. To solve these problems, a series of experiments have been carried out to modify or combine algal biomass with some food items, by applying various

methods such as heating, baking, mixing. However, the quantity of microalgae which can be added to the pasta or bake is very low because colour and, above all, taste become unpalatable for the costumers (Backer, 2007). For instance, Alabi (2009) suggests to use the cake protein content to prepare a product similar to tofu, a protein based food derived from soy and widespread in the East (retail pricing of this product is in Japan and year 2016 around 4.000 € per t). Therefore, further research should be addressed to overcome these problems and make microalgae proteins pleasing for the consumers. However, Alabi (2009) underlines that the sale of these substances is threatened by the fact that global request of proteins could be saturated by the proteins coming from other bioenergy sources: in this case, profits from microalgae proteins would be very low. Other profitable substances present in the microalgal cake are the pigments, which can be utilised in many no energetic industrial sectors (Fig. 1). These compounds give colourful appearance to algae and allow to absorb visible light and initiate the photosynthesis process: chlorophylls (*a* and *b*), carotenoids (i.e. β-carotene, astaxanthin, lucopene and luteina) and phycobilins are the three major classes of photosynthetic pigments that appear in those vegetable organisms (Milledge, 2012). The potential utilisation of these pigments as natural food grade colorants and cosmetics offers an interesting perspective of the reasonable colour intensity and extensive practical applicability as well as of the relatively high market price of relevant natural dyes for usage in foods. To be able to use extracted water-soluble pigments from algae biomass in food, soft ways of breaking the cell wall and extraction techniques with water would be desirable. Afterwards, the extracted products need to be stabilised for storage by concentrating them, using a carrier material and/or removing proteases and microbial contamination (Van Iersel and Flammini, 2010). Among these compounds, carotenoids are the main commercial products and in particular astaxanthin should have a major success from a commercial perspective, because it is constituted by a molecule with a very high antioxidant activity, 10 times higher than that β-carotene.

Currently astaxanthin is produced through chemical synthesis or from microalgae *Haematococcus pluvialis*. This microorganism, when exposed to various environmental stress conditions, rapidly turns into haematocyst, a "vegetative state" characterised by massive accumulations of astaxanthin (containing 1.5–3% dw) into cytosolic oil globules. The extraction of astaxanthin is simple because the haematocysts are considerably denser than water, so they can be harvested by settling and subsequent centrifugation. Then, the haematocysts are dried and cracked to ensure maximum bioavailability of the astaxanthin (Del Campo et al., 2007). Thanks to its high benefits for health, astaxanthin can be utilised in a wide range of industrial applications such as food (for fortification of foods and beverages), dietary supplements (or nutraceuticals) and cosmetics (for skin care and anti-aging products) (Yen et al., 2013). Furthermore, astaxanthin is widely used in the aquaculture industry for pigmentation of salmon, trout and shrimps. According to Research and Markets (2015), the global market of astaxanthin should almost double in the next five years for both synthetic and natural sources rising from 280 t valued at US$ 447 million in 2014 to 670 t valued at US$ 1.1 billion by 2020. Finally, natural astaxanthin is more valuable than the synthetic one and, in 2015, it was sold at the price of US$ 7000/kg and US$ 2500/kg, respectively. So, the growing trend in the food industry toward using natural ingredients should increase the demand for natural astaxanthin and consequently its value.

Conclusions

Based upon the analysis of the state-of-the-art conducted in the microalgae field, there is evidence that the cake can be used as a valuable source for both material and energy commodities production. Additionally, to make the microalgae production more sustainable biorefinery technologies appropriately combined with solutions and strategies for by-products maximization and valorization should be implemented, thereby enhancing the economic yield of the whole chain.

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Digitalization – a Must in the International Trade for Economic Growth

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Abstract. In recent years, the evolution of international trade shows that digitalization contributes to increasing exchange of products and services, by offering new perspectives on the production and logistic process. The emergence of Big Data allowed digitalization to gain more ground and to generate a remarkable level of collaboration among organizations, which brings a significant improvement in the innovation process. Digital technologies capitalization enables companies to reduce production and delivery costs by managing in a more efficient way the value chain. Increased global connectivity and the Internet of Things make consumers, through their actions and objects used, to generate an increasing amount of data that provides more accurate information on consumers' life, their needs and aspirations. All this information is extremely valuable for companies in adapting their products and services, improving them as fast as possible providing a competitive edge. Thus, digitalization becomes a field of interest for specialists in commodity science who need to support companies to align with this process in order to increase their productivity and innovation capacity.

Keywords*: digitalization, international trade, big data, internet of things, innovation*

Introduction

Innovation and digitalization era is changing game rules and the way things worked until now. This happens in almost all areas of activity, and this is why specialists in commodity science must capitalize as well as possible the advantages of new digital technologies. This article aims to identify how digitalization transformed the way in which trade is conducted worldwide. If until a few decades ago there was a limitation in goods and services transport, nowadays a significant part of goods and services can be delivered within seconds using the internet, that managed to reduce barriers such as distance and cost that once seemed invincible (Lund and James, 2016).

Moreover, digital economy has changed consumers behavior and expectations, especially for young generations who are increasingly willing to be in control of their lives, creating the premises to extend the adoption of digitalization from trade (e-commerce) to many other areas such as e-government, e-health, e-education, etc. (Bumbac & Vasilcovschi, 2016). Further, this trend will be supported by the emergence of new technologies such as the Internet of Things, which makes more and more physical devices to be electronically controlled.

An important concern in the policy of an increasing number of states is also to encourage SMEs to adopt internet technology services such as e-commerce to have access to much larger markets (Finnbogason and Melin, 2014).

Even though there are enough improvement aspects for the development of digitalization real potential, especially in terms of ensuring data security and privacy, progress in this regard can be seen in recent decades. For achieving this objective, there is also a need of good legislation regarding intellectual property protection, enabling innovation and eliminate license infringement practice or other forms of intellectual property theft (BSA, 2015). Also, in the category of things that need to be improved is included the internet access rate, which has a significant

impact on the world economy. A report realized by World Bank specialists emphasized that an increase of 10% in broadband penetration will result in a growth of 1.38% for developing countries and 1.21% for developed countries (Qiang, 2009). Thus, it can be seen that digitalization has a direct influence on economic growth and therefore this process must be treated as a priority in governmental policies and strategies (Bumbac & Vasilcovschi, 2016).

Although is difficult to quantify the effects of digitalization, also because in most cases these are indirect ones, digitalization significantly contributes to increase the competitive level and thereby facilitates progress and innovation. This is possible once with the emergence and development of companies that create a global competition and that quite often revolutionize an entire industry (e.g. amazon, uber, airbnb) and also by the emergence of online platforms that facilitate the exchange of goods, services, ideas, money or workforce (Lund and James, 2016).

Material and methods

The article aims to provide a complementary perspective on the evolution of international trade and digitalization in the last 20 years and especially on how digitalization influenced the evolution of global exports. In realizing this it was necessary to identify data that reflects a global evolution, using secondary data analysis as main method. Therefore, it was used relevant information provided by the World Trade Organization, International Telecommunication Union and World Bank. The main variables analyzed were: world commercial services exports, world merchandise exports and internet users.

Results and discussion

The analysis of exports according to the values provided by the World Trade Organization show that export values have doubled every 10 years, in the last two decades, both for commercial services and for merchandise.

Table 1.

The development of World commercial services and merchandise exports

Year	World export of commercial services (bn US$)	World merchandise exports (bn US$)
1995	1,179	5,168
2005	2,516	10,509
2014	4,872	19,002

Source: World Trade Organization, 2015

A more detailed perspective shows that a significant increase was recorded especially since 2000. Definitely, an important contribution to this growth, in addition to China's Accession and the rise in commodity prices (World Trade Organization, 2015), was brought by digitalization development, a fact that can be seen from the evolution in the number of internet users since 2000. As seen in Figure 1, in the last 15 years, by increasing 8 times the number of internet users from 400 million in 2000 to 3200 million in 2015 "the ICT revolution has driven global development in an unprecedented way", says Brahima Sanou, director of International Telecommunication Union. This revolution was carried out by radical improvement in activities such as significantly facilitating payment methods by introducing digital payments, the emergence of e-commerce platforms, etc. The adoption of digital technologies had a significant contribution to the development and improvement of logistics and supply chains, enabling a much better monitoring of products and goods transport, reducing transport costs and improving operations efficiency (Lund and James, 2016).

Digitalization manages through innovation to generate economies of scale, reducing costs, as it happens in the case of e-commerce platforms, which are highly automated, in this way fees being kept at a low level (World Bank Report, 2016). Moreover, these platforms contribute to an increasing centralization of information on consumer behavior, the so-called Big Data, used as a starting point for future stages in the innovation process.

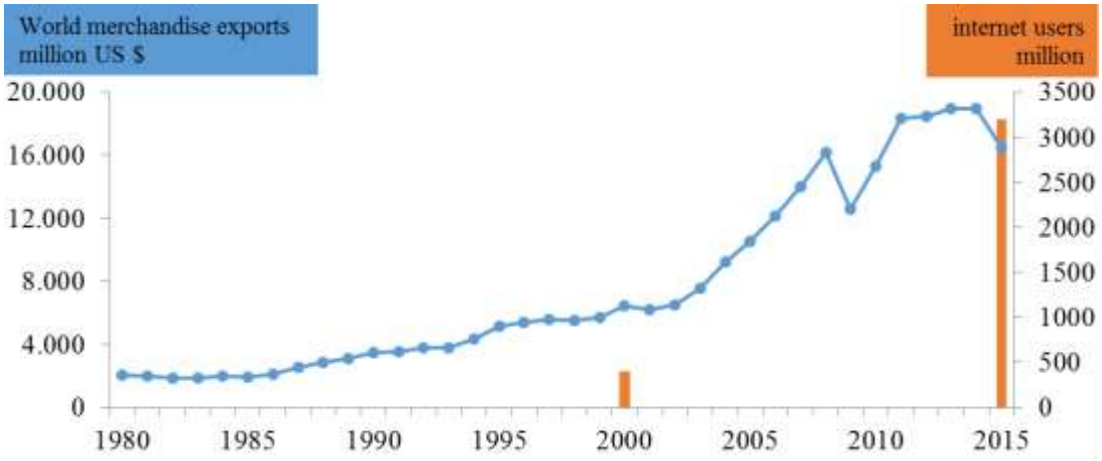

Figure 1. The evolution of world merchandise exports
related to the increase of internet users

Source: Own representation based on World Trade Organization (2016) and International Telecommunication Union (2016)

It is important to note that digitalization has a significant contribution to merchandise exports and does not only increase the volume of IT services (they recorded a 18% increase in the last 20 years, the largest increase in the category of world exports of commercial services, according to data from World Trade Organization).

Conclusion

Digitalization brings some important economic and social benefits, although it has an indirect and hard to measure impact. The internet, through the instruments it offers, creates a radical change in the worldwide trade, offering the possibility for

ever smaller players to have access to ever larger markets and to revolutionize the areas in which they operate. Internet becomes an essential element in a country infrastructure's that succeeds to prove it's increasingly utility in more and more areas. The recorded progress shows that digitalization succeeded in boosting worldwide exports and especially in creating a more competitive and innovative worldwide environment, becoming must more than an option.

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A Study of Synergy Effects of Innovation on Firm Performance

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Abstract. This study investigates the relationship between a firm's strategic orientations, exploration and exploitation, on innovation activity. Also, the synergy effects of four types of innovation: product, process, marketing, and organizational innovation are examined with the consideration of the level of innovativeness and the firm's industrial category

Keywords*: exploration, exploitation, product innovation, process innovation, marketing innovation, organizational innovation, synergy effects*

Introduction

With the fast pace of technological change, the role of innovation on a firm's survival has received increased scholarly attention. However, several gaps in the field's understanding of innovation and firm performance remain with most studies overlooking issues such as the firm's strategic orientation, and its relationship with different types of innovation (product, process, marketing, and organizational), and the integrated effects of these different types of innovation on firm performance. Even though firms are likely to simultaneously develop and introduce more than two types of innovation to take advantage of different opportunities, product innovation

is the key focus in the literatures. Table 1 organizes types of innovation referred to in existing studies

To help fill this knowledge gap and to obtain a comprehensive understanding of innovation activity in a firm, this study investigates the firm's strategic orientations and the synergy effects of the four types of innovation, product, process, organizational and marketing innovation. In this study, the OECD Oslo Manual (2005), which is the international guideline for defining and assessing innovation activities at the firm level, is used as the main source to define four different types of innovation: product, process, marketing and organizational innovation. Also, innovativeness level and industrial differences are divided by the standard of OECD (2011) classification.

Material and methods

This study uses data from 856 firms taken from the KIS 2014, covering the period 2011 to 2013. The KIS data set is the Korean version of the Community Innovation Survey (CIS). First, the overall relationship between firms' strategic approach and their innovation activity using the full sample of 856 firms is estimated. Then, a more detailed analysis of synergy effects of innovation is examined. Potential industry effects are assessed by dividing the sample into high-tech and low-tech industry using the OECD (2011) classification which uses the responding company's R&D intensity (High-tech n = 522; Low-tech n = 323).

Since most of the measures are composed of multiple items, their reliability and the underlying dimensions of each measure are tested by principal component analysis (PCA). Structural equation modeling (SEM) is then used to carry out a simultaneous test the relationships among the constructs. The moderating effects of marketing innovation and organizational innovation are examined through multi group analysis. When the moderating effect occurs, the chi-square of the constrained model should increase by 3.84 to each increase in degree of freedom.

Results and discussion

Results are shown in Table 2. In the full sample results (n=856), an exploration orientation is positively related with both radical and incremental product innovation, supporting H_1; however, it has no significant impact on process innovation, rejecting H_2. On the other hand, an exploitation orientation has a significantly positive effect on process innovation but no effect on product innovation, rejecting H_3 and supporting H_4. H_5, the positive effect of process innovation on product innovation, is only supported when product innovation is radical. Process innovation does not influence incremental product innovation. Product innovation has a direct and positive impact on performance, supporting H_6, however H_7, the positive effect of process innovation on firm performance, is only marginally supported. The results of moderating effects of marketing and organizational innovation are mixed. The moderating effect of marketing innovation between product innovation and a firm's performance is not found, rejecting H_8. However, a moderating effect of organizational innovation between process innovation and a firm's performance is found, supporting H_9.

Industrial differences are also observed. First, results show some industry differences on the effects on product innovation. For example, although an exploration orientation for both industries affects product innovation, the type of product innovation affected varies; radical product innovation in high-tech firms, and incremental product innovation in low-tech. The results also show process innovation affects radical product innovation in both industry groups, however the effect on incremental product innovation is marginal for high-tech and not-significant for low-tech. Moreover, there are major differences between the industries on the influence of product and process innovations on firm performance. In low-tech industry, the positive effect of product innovation on a firm's performance is supported only for radical product innovation. In contrast, in high-

tech industry, the positive performance effects are supported from both radical and incremental product innovation. Likewise, the effect of process innovation on performance varies; low-tech firm performance is positively influenced by process innovation but not for high-tech firms.

Interestingly, once industry effects are taken into account, the significant moderating effects for both marketing and organizational innovation are found. The effect of incremental product innovation on firm performance is increased when it is accompanied with marketing innovation in high-tech industry and the positive relationship between process innovation and firm performance is strengthened with the introduction of organizational innovation in low-tech industry.

Conclusion

The findings provide suggestions for managers who want to maximize the positive effects of innovation. Firstly, it should be noted that there is a fit between a firm's strategic approach and types of innovation. Exploration and exploitation have positive impacts on the implementation of product innovation and process innovation respectively. Secondly, the positive process innovation effect on product innovation is supported only when product innovation is radical. It suggests advantages of process innovation such as cost reduction and efficiency are required to increase the innovativeness level of new products. Lastly, the positive marketing innovation moderation on the incremental product innovation and firm performance relationship in the high-tech industry shows that high-tech firms should focus more on the marketing activities such as advertising and package design to boost their sales if their new product is not totally radical one compared to offerings of competitors. The positive effect of process innovation on firm performance is increased with the introduction of organizational innovation in the full sample and for the low-tech industry.

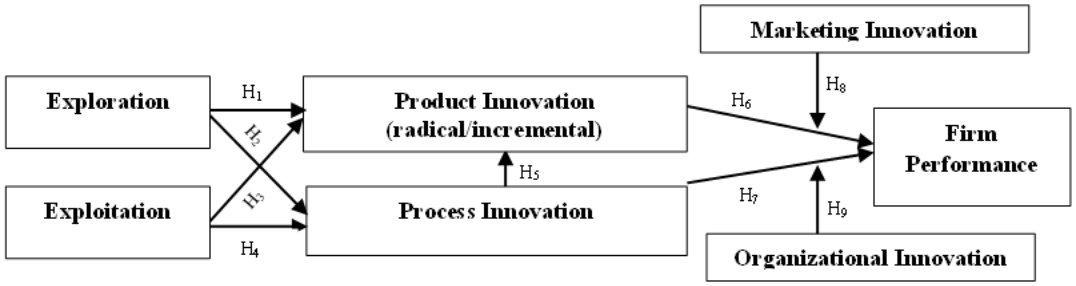

Figure 1. Conceptual Model

Table 1

Researches of Innovation

	Product Innovation	Process Innovation	Marketing Innovation	Organizational Innovation
Un & Asakawa (2015)	○	○		
Kim, Kumar, V.,& Kumar, U.(2012).	○	○		○
Gunday et al (2011)	○	○	○	○
Maine, Lubik, Garnsey (2011)	○	○		
Nasution et el (2011)	○	○		○
Damanpour (2010)	○	○		
Evangelista & Vezzani (2010)	○	○	○	○
Naidoo (2010).			○	
Battisti & Stoneman (2010)	○	○	○	○
He & Wong (2004).	○	○		
Pauwels et al (2004)	○		○	
Weerawardena (2003)				○
Boer & During (2001)	○	○		○
Lukas & Ferrell (2000)	○			

Table 2

Results of Structural Equation Modeling

Path		Standardized Path Estimate			Standardized Path Estimate		
		Radical Product Innovation			Incremental Product Innovation		
		Full	High Tech	Low Tech	Full	High Tech	Low Tech
H_1	exploration→product innovation	.097**	.143**	.026	.106***	.070	.148*
H_2	exploration→process innovation	-.006	.001	-.002	-.006	.001	-.002
H_3	exploitation→product innovation	.097	-.022	.153*	.019	.033	-.017
H_4	exploitation→process innovation	.303***	.292**	.320***	.303***	.292***	.320***
H_5	process innovation→product innovation	.222***	.221***	.231***	.033	.081†	-.081
H_6	product innovation→firm performance	.162***	.152***	.182**	.177***	.197***	.018
H_7	process innovation→firm performance	.065†	.038	.113*	.095***	.054	.163**
H_8	product innovation x marketing innovation→firm performance	*n.s*	*n.s*	*n.s*	*n.s*	*s*	*n.s*
H_9	process innovation x organizational innovation→firm performance	*s*	*n.s*	*s*	*s*	*n.s*	*s*
	χ^2	1.367	.594	1.410	1.475	.465	.465
	d.f	2	2	2	2	2	2
	P-value	.505	.743	.494	.478	.793	.793
	RMSEA	.000	.000	.000	000	000	000
	CFI	1.000	1.000	1.000	1.000	1.000	1.000
	TLI	1.013	1.013	1.021	1.008	1.037	1.037

†< .10 * < .05 ** p < .01 *** p < .001
n.s=not significant, s=significant

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The Effect of Medicinal-Technical Raw Materials on the Physico-chemical Characteristics of Wheat Dough and Semi-Finished Products Cooked With Sponge and Without Sponge Methods

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Abstract. For research it is used the flour baking highest grade and collection of medicinal plants recommended in functional disorders of the cardiovascular liver. Part of the collection is composed of the following medicinal plants: hypericum (grass), valerian (root), thyme (grass), melissa (grass) in the ratio 2:2:1:1. In the process of aging supplement with flour, water and yeast in a semi-finished product formed stable complex compounds which physico-chemical interaction with components of the dough, improving the rheological properties of dough and quality of bread.

Keywords*: phyto- powder, bread*

Introduction

Through targeted research in food industry and medicine are widely used hundreds of species medicinal-technical raw materials. Plants containing biologically active substances that can be used for therapeutic purposes are called drug. Enrichment of recipes food products extracts of medicinal-technical raw materials not only increases their nutritional value, but also gives them preventive properties [3]. The basis of release of competitive innovative functional food must lie fundamental manufacturing highly complex research and testing. At the present

time there is a great interest of the use of medicinal-technical raw materials in the manufacture of functional food. Wild-growing raw materials rich in various biologically active ingredients: vitamins, macro and microelements, dietary fibers, organic acids, phenolic compounds[2]. The current direction of development of technology of wheat bread with improved chemical composition is the use of dry extracts of medicinal herbs. The aim of this work is to study the effect of different dosages of phyto powder obtained from dry extracts of medicinal plants on the properties of flour, rheological properties of dough.

Material and methods

For research it is used the flour baking highest grade and collection of medicinal plants recommended in functional disorders of the cardiovascular liver. Part of the collection is composed of the following medicinal plants: hypericum (grass), valerian (root), thyme (grass), melissa (grass) in the ratio 2:2:1:1.

Plants included in the collection, were mixed, crushed in a laboratory mill, sieved through sieve N 43 and got a fine powder with a solids content of 97-98%:

Experimental samples of wheat bread was prepared with the addition of 2%, 4% and 6% weight of dry matter of flour phyto powder in the dough. As a control sample was used the hearth bread, prepared according to traditional recipes. The study of the properties of gluten was carried out on the device IDC[1].

Results and discussion

The quality of the finished product is determined by the feedstock, so first of all, we have investigated the effect of insertion phyto powder in the quantity and quality gluten of wheat flour.

The study of the properties of gluten was carried out on the device IDC and the results of the study are shown in table 1.

Table 1

Quality indicators of gluten

Dozages phyto powder, %	The amount of wet gluten, g.	The values IDC of the device
Control variant	8,5	74,0
2	8,5	73,5
4	8,5	73,5
6	8,4	73,0

It was found that application of herbal powder almost no effect on the amount of wet gluten of flour, but leads to a slight strengthening. To determine the most promising method of test procedure in the technology of wheat bread with the use of new raw materials, the dough is prepared sponge and straight dough methods.

It is found that breads prepared with the addition of medicinal-technical raw material, possesses the best physical and chemical characteristics.

The results of the influence of the insertion amount of additive and method of restoril online on the physico-chemical characteristics of wheat dough, semi-finished and finished products, the stage of preparing dough, are shown in tables 2 and 3.

Table 2

The effect of medicinal-technical raw materials on the physico-chemical characteristics dough and semi-prepared sponge method

The name of parameters	The quality of semifinished products and the technological process parameters			
	Control variant, %	2%	4%	6%
Humidity dough, %	42,8	42,6	42,5	42,5
The acidity of the dough, grad.	2,5	2,5	2,5	2,5
The duration of the fermentation dough, min.	90	90	100	110
The duration of the proving, min.	120	120	125	125
The duration of baking, min.	40	40	35	35

Table 3

The effect of medicinal-technical raw materials on the physico-chemical characteristics finished products prepared sponge method

The name of parameters	The quality of finished products with the additive			
	Control variant, %	2%	4%	6%
The moisture content of bread, %	41,5	41,7	41,7	42, 7
The acidity of bread, grad.	2	2	2	2
Porosity, %	73,5	74,2	72,8	71,5
Structural and mechanical properties of the crumb, ΔH. com	162,2	151,5	158,5	153,6
Specific volume, cm3	3,20	3,24	3,24	3,21
Put,%	7,8	6,8	6,6	6,1
Shrinkage,%	4,0	3,90	3,6	3,8
Yield,%	143,9	145,2	147,6	148,5

It is found that bread prepared with the addition of medicinal-technical raw material, possesses the best physical and chemical characteristics. In the sample with 2% additive rate "porosity" is higher compared with the control and other samples. The indicator "specific volume" in samples of bread with the addition of drug-technical raw materials is also higher than in the control variant on 1,57 %. The yield of grain with the introduction of a 2% additive increased by 1.20 % compared to control, with the introduction of 4 % additive – 3,70%, making 6 % additive – 5,30%. Shrinkage of bread with the addition is also lower than that of the control, on average, by 0.2-0.4 %. Introducing the additive in quantities of more than 2 % leads to an increase in the duration of fermentation and proofing. Obviously, increasing the dosage of phyto powder suppress the vital activity of yeast, resulting in an increase in the duration of the process. Due to the strong strengthening effect on the gluten specific volume and porosity of bread is reduced, the bread crumb darkens, decreases the total compressibility of the crumb, decrease the plastic deformation, there is the taste and smell of medicinal herbs.

We have investigated the effect of medicinal-technical raw materials to change

quality characteristics of wheat dough, semi-finished and finished products when the straight dough method of preparation are shown in tables 4 and 5.

Table 4.

The effect of medicinal-technical raw materials on the physico-chemical characteristics test and semi-finished products made without sponge method

The name of parameters	The quality of semifinished products and the technological process parameters			
	Control variant, %	2%	4%	6%
Humidity dough, %	43,0	42,6	42,8	43,0
The acidity of the dough, grad.	2,5	2,5	2,5	2,5
The duration of the fermentation dough, min.	95	120	175	195
The duration of the proving, min.	120	120	125	125
The duration of baking, min.	25	25	25	25

Table 5.

The effect of medicinal-technical raw materials on the physico-chemical characteristics finished products made without sponge method

The name of parameters	The quality of finished products with the additive			
	Control variant,%	2%	4%	6%
The moisture content of bread, %	41,6	41,8	41,8	42, 8
The acidity of bread, grad.	1,9	2	2	2
Porosity, %	77,0	80,1	78,8	77,5
Structural and mechanical properties of the crumb, ΔH. com	173,2	176,5	180,0	175,1
Specific volume, cm3	3,38	3,72	3,50	3,45
Put,%	7,5	6,3	6,1	5,9
Shrinkage,%	4,0	3,8	3,6	3,6
Yield,%	146,3	152,4	151,5	150,20

As a result of the conducted research it was found that a dosage of medicinal-technical raw materials in the amount of 2 % is optimal. Bread with the addition of this dosage of medicinal-technical raw materials were characterized by better physico-chemical and organoleptic indicators. Porosity value when adding 2 % additive by weight of flour increased compared to the control is about 4,5 %, making 4% and 6 % is about 2,5 %. In addition, such indicators are increased quality of bread, as dimensional stability, specific volume, porosity, total compressibility of

the crumb, its plastic and elastic deformation. When you make supplements at doses higher than 6 % results in a deterioration of the quality of bread. In connection with strengthening effect on the gluten and decrease in the ability of gluten network frame to stretch under the pressure of carbon dioxide, the volume of bread is reduced, significantly increases its dimensional stability, the bread crumb darkens, decreases the total compressibility of the crumb.

Conclusion

It is established that samples of the cooked dough method, have better indicators of quality than samples prepared sponge method. The introduction of additives in the two-phase method of preparation of the dough due to the intensification of colloidal, biochemical and microbiological processes. In the process of aging supplement with flour, water and yeast in a semi-finished product formed stable complex compounds which physico-chemical interaction with components of the dough, improving the rheological properties of dough and quality of bread.

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Effect of the Type of Hebal Extract Obtained under Supercritical CO_2 Conditions on the Functionality of Hand Dishwashing Liquids

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Abstract. The addition of hydrophobic plant extracts to hand dishwashing liquids contributes to a considerable improvement in their safety of use. The process is related to a decrease in the number of surfactant free monomers in the washing bath, which reduces the skin irritation effect and limits the process of washing protective lipids from the skin of the hands. However, the addition of hydrophobic substances can induce a deterioration in product functionality. The present study analyzes the effect of hydrophobic plant extracts obtained under supercritical CO_2 conditions on the basic functional properties of hand dishwashing liquids.

The product prototypes thus prepared underwent a range of functionality tests. The tests showed the type of extract to have no significant effect on the parameters studied. In all cases, the presence of an extract in the products was found to adversely affect their foaming properties, however the values obtained were still within the range observed for commercially available products. However, there was no significant impact of extract addition on the parameters of liquids associated with their detergent activity (washing ability and the ability to emulsify fatty soils). The results indicate that the herbal extracts under study can be a valuable material for improving the safety of use of liquid agents designed for hand dishwashing, without causing an excessive loss of their functionality.

***Keywords**: hand dishwashing liquids, functionality, supercritical CO_2 extract*

Introduction

The quality of hand dishwashing liquids is linked to their functionality and safety of use (Seweryn, Wasilewski & Bujak, 2016; Wasilewski & Bujak, 2014; Bujak, Wasilewski & Nizioł – Łukaszewska, 2015). One of the ways to reduce the irritating and drying effect of surfactants used in hand dishwashing liquids is the addition of hydrophobic substances such as plant oils or hydrophobic plant extracts (Ananthapadmanabhan, Mukherjee & Chandar, 2013) Among a number of methods of obtaining such raw materials an innovative technique seems to be extraction in supercritical CO_2 conditions (Michorczyk, Vogt & Ogonowski, 2015). The process allows obtaining hydrophobic ingredients from plant materials. The raw materials obtained by this method do not contain any solvent, as the final product of extraction is released from the mixture of carbon dioxide and the hydrophobic substance to be extracted by high-pressure separation. It is an advanced process of extraction which yields plant extracts exhibiting the highest microbiological purity (anaerobic process conditions). It is much more advanced technologically than traditional extraction processes, and since it takes place at a relatively low temperature, the plant-based active ingredients are not degraded and, consequently, their properties are not deteriorated (Michorczyk, Vogt & Ogonowski, 2015).

The study proposed the addition of plant extracts obtained under supercritical CO_2 conditions to hand dishwashing liquids. The tests were performed with a number of plant extracts (see Table 1) which possess strongly hydrophobic properties. Extracts, on the one hand, may enhance the safety of using hand dishwashing liquids, but on the other impair their functionality parameters. The aim of the study was to determine experimentally the effect of innovative plant-based raw materials added to hand dishwashing liquids on the functional parameters. Each of the extracts (at a concentration of 0.3%) was used for the preparation of

prototypes of hand dishwashing liquids which were then subjected to an in-depth analysis with a focus on selected functionality parameters.

Material and methods

Formulations of HDLs. The prototypes of hand dishwashing liquids were then subjected to testing (Table 1). The content of Sodium Chloride was selected in such a way as to achieve the viscosity level of 1000 mPa·s in the products. The liquids containing mint (HDL_M) and sage (HDL_S) extracts exhibited signs of instability manifesting as cloudiness and precipitation of extracts from the solution as early as 24 hrs after preparation. Other prototypes of hand dishwashing liquids, however, were clear and stable for at least six months.

Table 1.

Formulations of hand dishwashing liquid prototypes

Raw material	Concentration [wt. %]					
	HDL_0	**HDL_S**	**HDL_M**	**HDL_C**	**HDL_CH**	**HDL_HL**
Sodium Laureth Sulfate	11					
Cocamidopropyl Betaine	2					
Laureth-7	1					
PEG-40 Hydrogenated Castor Oil	1					
Salvia Officinalis Extract	-	**0.3**				
Mentha Piperita Extract	-		**0.3**			
Calendula Officinalis Flower Extract	-			**0.3**		
Chamomila Recutita Extract	-				**0.3**	
Humulus Lupulus Extract	-					**0.3**
Sodium Chloride	1.4	1.5	1.5	1.6	1.6	1.5
Preservative	0,1					
Aqua	do 100					

Methods

Determination of Washing Ability. The study is based on comparative evaluation of the effects of washing 30 plates (on which standard soil had been applied firstly) with the use of sponge, in model bath and in a solution of a studied liquid. After washing and drying, the plates were immersed in iodine solution, which - in the presence of starch left on plates - forms an intense coloured compound facilitating evaluation of washing efficacy (test according to Polish Standard PN-C-77003).

Evaluation of the Ability To Emulsify Fatty Soils by Studied Liquids. The maximum weight of rapeseed oil colored with Sudan Red capable of being emulsified by 1 dm^3 of a 1% aqueous solution of the studied HDLs was determined (PN-C-77003).

Evaluation of the Foaming Properties. Two parameters: foaming ability and foam stability index were determined for 1% aqueous solutions of analysed hand dishwashing liquids. The method of measurements was in line with PN – EN 12728.

Results and discussion

Determination of Washing Ability. Results of tests investigating the washing ability of formulated hand dishwashing liquids are shown in Fig. 1.

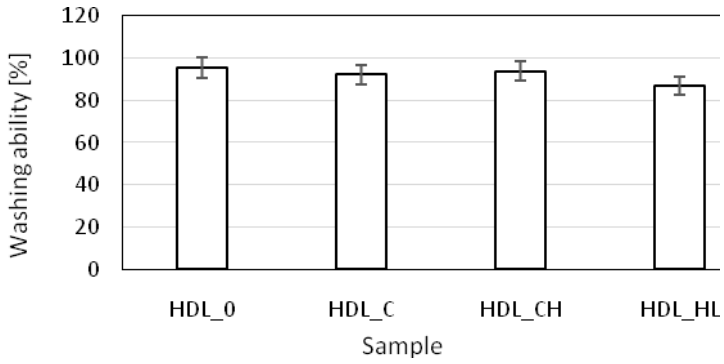

Figure 1. Washing ability of hand dishwashing liquids

The washing ability determined for the studied group of hand dishwashing liquid prototypes was 87-96%. The differences observed in the test are within the margin of error. The type of the extract was not found to affect the parameter under study.

Evaluation of the Ability To Emulsify Fatty Soils by Studied Liquids. The results of the test evaluating the ability to emulsify fatty soils in prototypes of hand dishwashing liquids enriched with extracts are shown in Fig. 2.

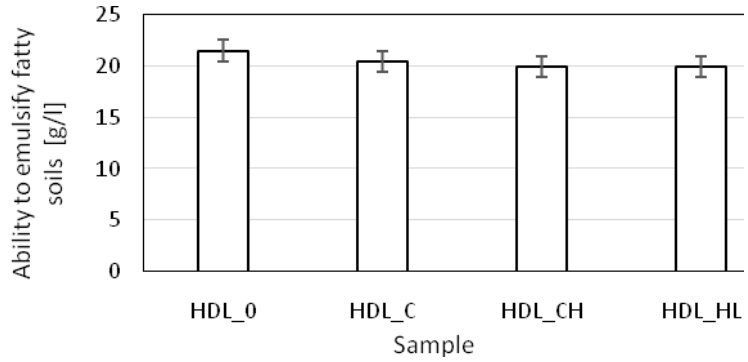

Figure 2. Ability to emulsify fatty soils of hand dishwashing liquids

The ability to emulsify fatty soils determined for hand dishwashing liquids differing in the type of herbal extract is within the range between 20.0 and 21.5 g/l. The addition of an extract to the system results in a slight decrease in emulsification ability compared to the reference liquid (HDL_0), and the arising differences in values are within the margin of error. The slight decrease in emulsification ability may be attributable to the involvement of some of the surfactants in extract solubilization, which reduces their concentration determining the process of emulsification of the additional hydrophobic phase introduced into the system.

Evaluation of the Foaming Properties. The results of the test evaluating the foaming properties and foam stability in the model liquids are shown in Fig. 3.

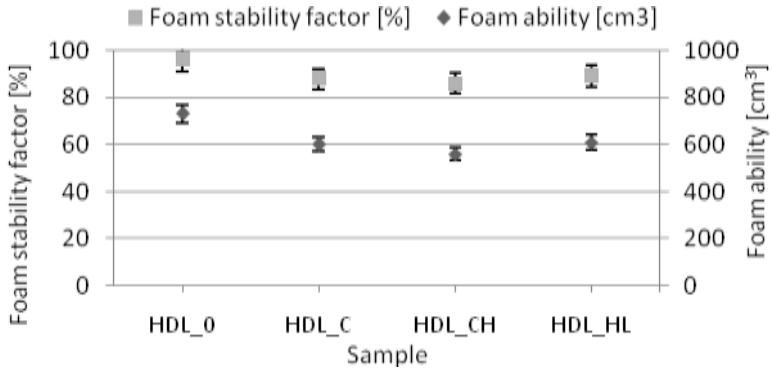

Figure 3. Foaming properties of HDLs

The foaming ability determined in distilled water for the respective products assumes values ranging from ca. 560 to 730 cm^3. For the prototypes of hand dishwashing liquids enriched with herbal extracts the observed decrease in the value of the determined parameter in relation to the base liquid was around 20-23%. There were no significant differences in foaming ability between the liquids containing different extracts. The slight differences in values are within the margin of error.

The stability of foam noted for the liquids under study varied from 86 to 96%. The addition of hydrophobic herbal extracts to the liquid formulations had an effect on reducing foam stability. The determined parameter was found to have decreased by around 10% relative to the base formulation (HDL_0).

Conclusion

The tests showed that the enrichment of hand dishwashing liquids with a hydrophobic extract had no significant impact on the washing ability and the ability to emulsify fatty soils. Moreover, the prototypes of hand dishwashing liquids produced for the study showed relatively high levels of foaming ability and foam stability. The results yielded by the study thus point to the benefit of using hydrophobic plant-based additives: they make it possible to improve the safety of use of the liquids without significantly impairing their functional properties.

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Application of Sage (*Salvia L. Officinalis)* Supercritical CO_2 Extract to Manufacture of All Purpose Cleaners

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Abstract. The study is an attempt to demonstrate via empirical means the possibility of using a hydrophobic sage extract obtained under supercritical carbon dioxide conditions in the production of all-purpose cleaners (APC). A series of prototypes differing in the concentration of the extract was prepared. The products were assessed focusing on their colour and antibacterial properties. The sage extract added to the formulation demonstrated an antibacterial effect against *Staphylococcus aureus* bacteria already at a concentration of 0.1%. Another important factor in favour of adding a sage extract to all-purpose cleaners is the possibility to eliminate synthetic fragrances and colourants from their compositions.

Keywords: *all purpose cleaner, Salvia L. Officinalis CO_2 Extract, functional properties, antibacterial properties*

Introduction

All-purpose cleaners are mild cleaning agents designed for general applications. They are suitable for cleaning slightly soiled areas including kitchen tops, cooker surfaces, painted and ceramic surfaces, floors as well as plastic objects. All-purpose cleaners are expected to remove a range of soils including organic residues (food remains) and contaminants such as ash, dust or mud. All-purpose cleaners should have an array of characteristics – particularly good wetting, penetrating and dispersing properties. They are also expected to have an ability to emulsify soils in cold water.

Commercially available cleaners are mainly based on anionic surface-active agents (e.g. alkylbenzene sulphonates or sulphates of oxyethylenated fatty alcohols) as well as nonionic surface-active agents (e.g. oxyethylenated fatty alcohols). The compositions of all-purpose cleaners also contain substances enhancing the cleaning performance (organic solvents and sequestrants – to reduce water hardness), increasing product attractiveness (hydrotropes to improve solution clarity, colourants and fragrances) as well as preservatives[1-3)].

An additional function of products of this type can be their antibacterial activity on cleaned surfaces. To achieve this property, however, it is necessary to use active substances which are effective and at the same time safe for consumers. An interesting solution seems to be the enrichment of products of this type with a sage extract obtained under supercritical carbon dioxide conditions. In addition to antibacterial characteristics, the ingredient contains considerable quantities of natural colouring and aromatic substances which are alternatives to synthetic colourants and fragrances.

Materials and methods

Materials. The tests were performed with materials used in the household chemicals industry: Laureth-7 (trade name Rokanol L7; PCC ROKITA S.A., Brzeg

Dolny, Poland), Sodium Laureth Sulphate (trade name Texapon NSO; BASF, Ludwigshafen, Germany), Citric acid (Breentag), *Salvia L. Officinalis* CO_2 Extract (New Chemical Syntheses Institute, Puławy, Poland), Methylchloroisothiasolinone and Methylisothiazolinone as preservatives (Euxyl K120; Schulke & Mayr, Fairfield, NJ), distilled water.

Model product formulations

The compositions of all-purpose cleaners with varying contents of the sage extract are listed in Table 1.

Table 1.

Formulations of product prototypes

Component (INCI name)	**Concentration [%]**				
Aqua	90.90	90.89	90.80	90.60	90.40
Laureth-7	8.00				
Sodium Laureth Sulfate	0.80				
Sodium Citrate	0.20				
Salvia L. Officinalis CO_2 Extract	0.00	0.01	0.10	0.30	0.50
Preservative	0.10				

The product was enriched with a sage extract obtained under supercritical CO_2 conditions (*Salvia L. Officinalis* CO_2 Extract) as an antimicrobial ingredient which also provides the product with an appropriate odour and scent. The literature data suggest that the ingredient has antibacterial and virusostatic properties. The coniferous scent which is characteristic of the sage extract is mainly attributable to the content of camphor, α-, β-thujone, α-, β-pinene, 1,8-cineole, borneol, bornyl acetate[4)].

Methods. *Determination of colorimetric parameters.* Parameters relating to the colour of the formulations were determined using a Konica Minolta CR-400 colorimeter. The final result was the arithmetic mean of five independent measurements. *Antimicrobial activity.* The antimicrobial activity of the tested

formulations was determined against gram-positive (*S. aureus* ATCC 25293) bacterial strains. Microbial suspensions of 1.5×10^8 CFU/ml corresponding to 0.5 McFarland density obtained from an overnight culture of bacteria developed on solid media were used. 25 µl of diluted inoculum was transferred onto Petri dishes containing Mueller-Hinton II Agar. After 15 min of incubation, 6 mm paper discs filled with 15 µl of 10% aqueous solution of tested formulations were places onto each Petri discs in triplicate and incubated at 37°C for 16-18 h. The diameter of the inhibition zones was measured using a caliper. The final result was the arithmetic mean of three independent measurements. Error Analysis. The points in the charts represent mean values from a series of three or five independent measurements. The t-distribution was used to calculate confidence limits for the mean values. Confidence intervals, which constitute a measuring error were determined for the confidence level of 0.90

Results and discussion

Determination of colorimetric parameters

The values of colorimetric parameters obtained for the formulations are shown in Table 2.

Table 2.

Mean values of colorimetric parameters in the tested formulations

Parameter	Concentration of sage extract [%]				
	0.0	0.01	0.1	0.3	0.5
*L**	48.41	46.85	40.43	36.75	33.91
*a**	-1.21	-1.33	-1.45	-1,86	-3.08
b*	4.59	7.01	32.64	40.29	47.37

Based on data obtained in the tests it was concluded that an increase in the concentration of the sage extract triggers a change in the colour of the formulations manifesting as a decrease in the parameter describing lightness L*. For example, the difference for the formulation containing 0.5% of the extract and the base

formulation is -14.5. At the same time, there is a slight increase in the proportion of the green colour manifested as a decrease in the parameter a*, and a considerable increase in the parameter b* defining the proportion of the yellow colour. For the formulation containing 0.5% of the extract, for example, changes in the parameters a* and b* relative to the base formulation are -1.87 and 42.78, respectively.

Antimicrobial activity

The antimicrobial effect was investigated on the basis of Gram-positive bacteria *S. aureus. S. aureus*, one of the most pathogenic species among *streptococci*, occurring in the environment, is characterized by a high resistance e.g. to conventional disinfectants and antiseptic agents.

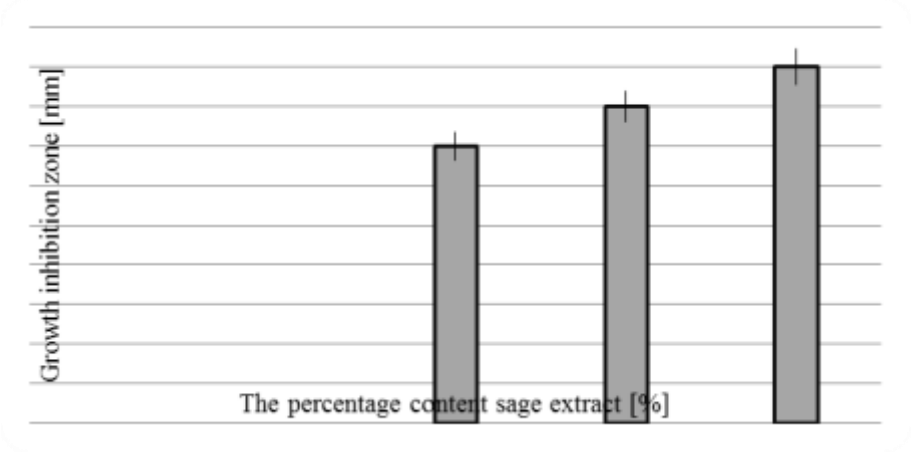

Figure 1. Antimicrobial activity of tested formulations against *Staphylococcus aureus* ATCC 25923.

An antibacterial effect of the formulations against *S. aureus* was already observed at the sage extract concentration of 0.1% (Fig. 1.). The effect is visible as growth inhibition zones (7 mm for the formulation containing 0.1% of the extract) and increases with the increasing percentage content of the extract in the formulation. The antimicrobial activity of the sage extract can be attributed mainly to α-thujone (dominant isomer), β-thujone and other monoterpenes: α-, β-pinene, camphene, limonene, terpinolene[5)].

Conclusions

The findings yielded by the study are the following:

- An addition of sage extract has a favourable effect on the appearance of the formulation (by giving it a pleasant colour).
- Products containing the sage extract offer antimicrobial protection against *Staphylococcus aureus* bacteria.

Acknowledgments

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Status and Trends in Graphene Research

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Abstract. Graphene is not a new material since first studies and research attempts dated back to 1859. The modern era of graphene started few years ago when, in 2004, Professor Sir Andre Geim and Professor Sir Kostya Novoselov of the University of Manchester discovered and isolated a single atomic layer of carbon for the first time. In 2010, they received the Nobel Prize in Physics in recognition of their breakthrough. Graphene is a two-dimensional atomic crystal made up of carbon atoms arranged in a hexagonal lattice. It is the thinnest, the strongest, the lightest and flexible material known. Direct linked to these properties graphene promises significant impact across several industrial sectors such as electronics, medicine, aerospace, automotives, energy storage, water desalination, coatings and paints, solar technologies, oil and communications. Based on these brief considerations, the aim of this paper is to offer a review related to: a) a brief description of graphene properties and productions; b) the review of different graphene applications and related potential and real markets.

Keywords**:** *graphene, graphene production, graphene applications graphene market*

Introduction

Graphene in the last years became very popular thanks to its physics and potential applications. The properties of graphene come from chemical and physical characteristics of its basic elements: *carbon*. The carbon atoms are arranged in hexagonal cells, a configuration that makes the structure stable. Tests showed the graphene layers are stretchy, as strong as steel, excellent both electrical conductor and heat conductor. It is almost completely transparent, yet is so dense that not even allow the channel of helium, the smallest gas atom. Andre Geim and Kostya Novolselov, both of the University of Manchester (UK), discovered Graphene in 2004 during an experiment involving a block of graphite and some scotch tape. Thanks to this discover in 2010 they were awarded by Nobel Prize. Nowadays there are several methods of production of graphene that are gradually consolidating, in parallel to the characterization techniques to determine the innovative structure.

Materials and Methods

Properties. Following recommendations of IUPAC committee, a graphene layer is defined as "a single carbon layer of the graphite structure, describing its nature by analogy to a polycyclic aromatic hydrocarbon of quasi infinite size". This section will focus on main and encouraging graphene properties. However, a deeper and specific discussion on graphene features is beyond the aim of this paper that can be found in the massive and continuous updated literature (Virendra et. al., 2011; Novoselov et. al. 2012; Castro et. al. 2009; Zhu et. al. 2010). Graphene can be surface-functionalizable and dispersible in many polymers and solvents, improving the mechanical properties of the composites and, by means of its high conductivity and charge carrier mobility, it can be used as electrode materials in batteries, supercapacitors and bipolar plates in fuel cells. Graphene can be used as nano-fillers in polymers, reinforcing the elasticity of the polymer composite. A high surface area (2630 m^2 g^{-1}) is an indispensable parameter for porous electrodes in batteries and supercapacitors, catalyst supports for fuel cells and for hydrogen storage. Graphene

also has a high breaking strength of 42 N m^{-1}, perfect to generate electricity in the blades of wind turbines. Concerning thermal properties, the high thermal stability and conductivity (≈5300 W $m^{-1}K^{-1}$) of graphene make it attractive as filler for thermally stable composites and an ideal material to facilitate heat dissipation for highly efficient power management systems. As regards the optical properties of graphene, it nearly has total transparency (optical transparency of 97.7%). Indeed, joint optical and electrical properties of graphene have opened new roads for several applications in photonics and optoelectronics. Graphene highlights properties potentially very promising for bio-applications: as drug delivery, ultrasensitive measurement devices, tissue-engineering applications and regenerative medicine.

Syntheses. Currently, graphene can be prepared by different methods, which naturally influence the properties of the product obtained and consequently the market of graphene. There are probably a dozen methods used and developed to prepare graphene, which led to different dimensions, shapes and quality. In this paragraph, we focused mainly on methods considered scalable. It is also significant to note that the quality of the graphene synthesized necessary affects the possible applications.

For instance, from graphene or reduced graphene oxide flakes for composite materials, to planar graphene for high-performance electronic devices.

Surely, graphene can be prepared by the micromechanical exfoliation of highly ordered pyrolytic graphite. In the exfoliation techniques, often referred to as a scotch tape or drawing method, surfactant or organic solvents are used to exfoliate graphite to produce mono/few layer graphene, whereas acid and oxidant are mixed with graphite to produce graphene oxide. In the experiment of 2004 the researchers obtained graphene by mechanical exfoliation of graphite through scotch tape. In this way they separate graphite crystals into thinner pieces. The tape with attached flakes was immersed in a solvent (acetone) and the flakes including monolayers deposited on a Si wafer. In the last years new technique avoids the phase when graphene

floated in a liquid. These types of processes offer pristine graphene very limited in size, excellent for research activities but not appropriate for massive production. Many attempts have been made also to synthesize graphene in bulk, nevertheless production costs significantly limited this road. There are many other strategies to produce graphene and currently the solution based methods (chemical reduction of graphene oxide, electrochemical exfoliation and liquid phase exfoliation) and CVD (Chemical Vapor Deposition) methods allow a scaled-up graphene production. As already highlighted in "Structure and Properties", the easy functionalization of graphene could be a goal for overcoming limits in production, storage, handling and processing, since the modified graphene composites can have properties resulting from both the graphene and the modifiers. However, the defects formed during these reactions do not represent a limit in case of some transparent conductive coating applications (such as touch screens) but fails to meet the requirements necessary for some other devices, e.g. for high-quality transparent conductors. At this time, CVD growth appears to be the most promising and popular technique for large-scale production of mono- or few-layer graphene films on metal. Unfortunately, the process is expensive due to large energy consumption and the necessity to remove the metal layer. Nevertheless, once the transfer process is optimized this method may indeed be disruptive and cost-effective. Lastly, it is worth to point out that all the information about graphene and graphene oxide related to long term fate, health, and environmental risk assessment is widely lacking (Wang et. al., 2011).

Results and Discussion

Graphene properties make it suitable to replace other materials in a vast range of applications such as: flexible optoelectronic devices (now obtain by indium thin oxide - ITO); conductive inks to print electronic circuits (now conventional based on silicon technologies); new energy solutions for energy production (photovoltaic, fuel cells) and energy storage (super-capacitors, lithium-ion batteries, and hydrogen storage); corrosion-prevention agent (steel corrosion protection is

made by zinc and chromium based coatings), nanomaterials useful in transport, aerospace, biomedical and environmental remediation fields. Probably the right question is not how we can use graphene and graphene based-products rather than how far are their real markets from the labs. Investments committed to graphene research are approximately 2.5 billion dollars, including the European Graphene Flagship Research Programme (≈$1.2 billion) aiming future graphene applications (Peplow, 2015). Over 25,000 patents have been published during the years 2005-2014, mainly presented by China (more than 47% of the total) followed by United States of America (18%) and largely concerned two main sectors graphene synthesis (≈30%) and electronics applications (≈30%) (IPO, 2015). Surprising is also the amount of graphene academic studies and researches whose numbers, starting from 2000 it never stops to grow. Despite the increasing number of R&D funds, patents and researches, until now graphene production and graphene based-products are not yet significant. In 2014, estimated graphene industry production capacity was approximately 800 metric tons and more than 110,000 m^2 and the main producers are United State of America and China (Ren, Chen, 2014). Moreover, global real production does not exceed 120 metric tons reporting $12 million of annual sales. The current graphene cost ranges from $100 to $1000 per gram depending of course on different quality parameters limiting the revenue growth and creating a paradoxical over-capacity in graphene industry (Ciriminna et al., 2015; Peplow, 2015). According to IDTechEx (Ghaffarzadeh, 2016) and Peplow (2015) data, graphene market trend is expected to grow to $220-350 million in 2026. Moreover, forecasts highlight that graphene functional inks and coatings applications will be available on market sooner compare with energy storage and composite one.

Conclusion

High synthesis cost, chipper existing materials and mature technologies to replace, storage and transport problems in graphene supply chain and, certainly not least, health and environmental safety implications they are the main limits to

graphene diffusions in the different fields. Industrial interest in graphene is very high and, if graphene's properties become competitive to justify the cost for radical innovation in the related industrial processes, we will assist to a new chemical revolution in the next few years.

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VIII. QUALITY, SAFETY AND AUTHENTICITY OF PRODUCTS

The Safeguarding of Agricultural Food Production in Harsh Environments and the Optional Quality Term "Mountain Product". The Piedmontese Mountain (North-West Italy) Cheese Makers' Opinions

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Abstract. The importance of food production in rural areas, specifically for the mountain areas, has been confirmed by the European Union with the introduction of the Optional quality term "Mountain Product". However, are stakeholders interested in the use and implementation of this new European tool? *Aim*. This paper aims at investigating into the answers to this question. The data was collected with the scope of knowing what the needs of cheese makers are, so as to further develop their important activities. *Material and Methods*. Firstly, a Piedmontese mountain area was taken into consideration and, secondly, some producers of Piedmontese traditional cheeses were chosen as samples. They were provided with a semi-structured questionnaire to gather information on their opinions about this EU commercial tool and real needs.

Keywords*: Optional Quality Term, Mountain Product, Piedmont, Cheese makers, Traditional cheeses*

Introduction

Over the last twenty years, the European Union has introduced and implemented numerous tools for the enhancement of food products. During this period, various authors verified the opportunities and advantages available according to the Geographical Indication. On the one hand evidencing positive results (Bouamra-Mechemache and Chaaban, 2010; Tiberio and Diniz, 2012; Ismea Qualivita, 2013), whilst on the other, highlighting some negative factors e.g. the evanescent difference between Protected Denomination of Origin (PDO) and Protected Geographical Indication (PGI) in some cases (Lamarque and Lambin, 2015), or the low diffusion of Traditional Speciality Guaranteed (TSG) (DOOR Database; Varese, 2016) disapproved for the weak tie with the territory (Peira, 2014).

Literature Review

With the EU Regulation No. 1151/2012, the European Union introduced a series of new tools for the enhancement of food products in rural areas, under the group name of Optional Quality Term (OQT). The following Commission Delegated EU Regulation No. 665/2014 indicated the conditions of use of the optional quality term 'mountain product' to support the implementation of a mountain value chain (Santini et al., 2013). This new OQT is a tool aimed at promoting local development, maintaining the production activities in mountain areas and redistributing wealth, whilst, at the same time, promoting the territory.

Since the introduction of the "mountain product" term it has been properly defined and officially regulated. Moreover, it brought to light some critical elements including whether the potential stakeholders saw an effective need for this term (Bonadonna and Rosati, 2015). The initial preliminary analysis on this issue underlined that the primary food producers wanted a change in how information as

to the European initiatives is disseminated and that they showed a scarce interest in the implementation of a labelling scheme, in particular for the supply chains with complicated requirements such as breeding (Bonadonna, 2016).

In fact, the EU Delegated Regulation 665/2014, Article 1, stipulates that "*The term 'mountain product' may be applied to products made from animals that are reared for at least the last two thirds of their life in those mountain areas, if the products are processed in such areas*" or, in alternative, "*the term 'mountain product' may be applied to products made from transhumant animals that have been reared for at least one quarter of their life in transhumance grazing on pastures in mountain areas*". Moreover, Article 2 specifies that "*feedstuffs for farm animals shall be deemed to come essentially from mountain areas if the proportion of the annual animal diet that cannot be produced in mountain areas, expressed as a percentage of dry matter, does not exceed 50% and, in the case of ruminants, 40%*".

In this context, the authors decided to analyze the producers' perception related to the "mountain product" term to obtain suggestion from the potential direct users and an elevated value supply chain was identified.

Material and methods

The identified sample for the survey is made up of six cheese factories localized in Piedmontese mountain areas. They produce traditional cheeses of the Piedmontese Alpine Arch, based on the Italian Ministerial Decree (DM 350/99), which is dedicated to Italian Traditional Foodstuffs. In fact, the selected cheese factories produce Toma della Valsesia, Toma Biellese, Maccagno, Toma del Lait Brusc, Nostrale d'Alpe and Toumin del Mel, all of which are indicated in the National List.

A semi-structured telephone survey was implemented so that both the questions and their order could be changed according to the individual interviewed in line with other authors (Pitrone, 1984; Fideli & Marradi, 1996). The questions

covered: the location of milk producers that supply the cheese factories, the satisfaction of regulation requirements, the perception of OQT "mountain product". The interviews were done from September to November 2015.

Results and discussion

The cheese factory sites are located in mountain areas, even though some of the milk suppliers that provide the supply chains to produce cheeses are not always in mountain territories. In fact, there is only one cheese factory that is supplied by exclusively mountain areas. However, the others related that they have a mixed supply, i.e. 60%, 50%, 48%, 10% respectively and one has no mountain suppliers at all.

Before the interview, only 1/6 cheese makers knew the OQT "mountain product". Four producers thought that this tool was useful for most milk suppliers. One producer believed he was able to implement the "mountain product" term easily. In fact, he set-up his own tracking systems that allows for a separation of the milk batches and to trace the internal path. However, it is the supplier's tracking systems that causes the problem here, as the supporting material used by his milk producers rises more than a few doubts! Another producer said that his suppliers do not produce fodder in agreement with the requirements established according to law. Indeed, he is of the opinion that the implementation of the European scheme is more difficult; in any case, he said that he intends to introduce some mountain products in his proposal.

Two producers believed that the "mountain product" term could be used for 100% of their production, whilst another two believed it covered 15% and 10% of their production respectively. The remaining 2 producers were unable to define the quantity but they thought that a part of products could take advantage of the OQT "mountain product" term.

Four cheese makers declared that this OQT was very useful for their production and activities. One producers suggested to survey the milk makers and the consumers' perception before evaluating the European labelling scheme "mountain product".

All of the 6 producers declared that they were willing to pay the internal control system costs and 4/6 were also willing to pay for the external controls necessary to verify the supporting documentation. One of these declared that he would have paid up to 3% of the product value. Moreover, in this context, the Rural Development Programme set-up by the Piedmont Region dedicates funds to cover the cost of implementation of such quality schemes.

Conclusion and limitations

The valorization of mountain foodstuffs is an issue that has involved all mountain operators. Further complexities have been identified at a European and national level. These include the lack of regulation as to the pre-existing symbols and terms dedicated to mountain areas. Another point was the permission for process operations that take place outside the mountain areas, which is allowed provided that the distance from the mountain area in question does not exceed 30 km (EU Delegated Regulation No. 665/2104, Art. 6) (Bonadonna and Rosati, 2015). However, there are some authors who strive to meet the mountain operators' needs e.g. the need to recognize the mountain products through a unique mark (McMorran et al., 2015).

As we are aware that our small study sample may limit the credibility of the results, we believe that this study should be extended to all stakeholders, consumers included, if it is to be successful at a European level. Overall, the interviewed operators had a positive perception of OQT "mountain product" and all of them considered the tool implementation into their entrepreneurial strategies.

Moreover, another limitation is that the sample size does not allow for a wide perception of whether all the European cheese makers will and/or can respect the regulation requirements. Indeed, we are now taking steps to disseminate this study to include all milk producers in our Piedmontese territories.

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Food Quality and Safety in the Context of Increasing their Competitiveness

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Abstract. This paper analyzes the current level of quality and food safety in Slovakia and attitudes of consumers in relation to this issue. Production of quality and safe food has become not only a priority requirement for the food supply chain participants, but also a consumer right. Current food market is characterized by fierce competition and the production of safe food of required quality is a prerequisite for success on domestic and foreign markets. In recent years, the importance of quality and safety of food products has significantly increased in the approach of companies. Gradually, even Slovak businesses are starting to understand that implementation of effective quality management, as well as food safety management, is important from several aspects. Quality and food safety are key factors of stable economic growth of food business influencing even macroeconomic indicators, major sources of savings on materials and energy, as

well as limiting factors for sustainable development. They are an important protection against market losses and very closely related to consumer protection. System approach to quality management and food safety in the enterprise necessitate an understanding of the interrelationship of the processes within the system and its continuous improvement through measurement and evaluation. They manifest themselves with their positive influence on the growth of food companies and their competitiveness.

Keywords*: food quality, food safety, competitiveness, food safety management system*

Introduction

Current globalization economy compels food companies to be more active in regards to improvement of competitiveness, sophisticated production, prosperity, but also creates requirements to promote sustainable development with a focus on the environment, safety, societal and social aspects. The increasing turbulence in the business environment in the output area (market globalization, changing the structure and attributes of demand, competition), as well as in the area of efficient utilization of human, information and financial resources create increasing pressure on food businesses to adapt to changing conditions. The experience from recent decades shows that even a small failure in the system of production and distribution of the food may have far-reaching and serious consequences. In the concept of companies, it leads to increasing importance of food quality and safety (Ellefson & Zach, 2013). Each link in the chain of food production must be secured in order to adequately protect consumers' health. This approach has to be applied regardless of whether the food is produced in the European Union or imported from third countries. An effective quality and food safety policy requires assessment and monitoring of risk related to resources and activities related to the processing of

food products (Mack, 2006). In accordance with the applicable food legislation of the EU, it is required for businesses operating in any stage of the food chain to approach food quality and safety as a management. This means the management of the processes, where each process, whether it is food production, primary production, processing or distribution of food has certain inputs and operations through which these inputs are transformed into outputs (Van Schothorst, 2004). Every process, however, is still affected by many other factors. In order to effectively manage the processes and to prevent risks, it is needed to apply systems of quality and safety management. Activity and functionality of the systems in place to ensure food quality and safety is one of the most important issues related to consumer protection in today's global world (Jarossova, 2014). Due to fierce competition, manufacturers strive to differentiate their production while minimizing costs and maximizing profit by utilizing new technologies and further innovation. The current global economic situation, characterized not only by very competitive environment, but also by the influence of multinational chains, creates a difficult environment for food producers. The food producers, in order to stay on the market, often resort to the deliberate reduction of production quality or other dishonest practices, which in some cases can lead to creation of risks, direct threats to food safety and lowering of quality and as a result may endanger the health of consumers. Consumer protection and improving the quality of life is a strategic priority for the European Union (EurActiv, 2013), which is elaborated in the framework of individual policies at communitarian and national levels in all Member States.

Material and methods

To address the issue, a broad range of scientific methods, which complement each other, was used. Information and data were obtained from literary sources comprised of domestic and foreign book and journal publications. The data was supplemented by current resources in electronic form and the contributions from

scientific conferences and subsequently processed, analyzed and interpreted using the method of analysis and synthesis. In addition to analytical and synthetical methods, other methods were used as well, especially the method of comparison. In realization of the survey, the questioning method has been used, through which one can obtain information about the attitudes and opinions of respondents, the manner of their behavior and motives. Numerical and relational arguments have been evaluated through the use of mathematical and statistical methods. Individual analyzed outcomes were summarized in a clear graphical form.

Results and discussion

Consumer survey was focused on determining the interest of Slovak consumers on issues of food quality and safety, as well as to ascertain their views on the reasons for the appearance of unsafe food on the domestic market. The survey was conducted by standardized interviewing in the form of an electronic questionnaire in the period from October to November 2015. It was attended by 315 respondents, including 186 women and 129 men. Majority of respondents were part of the age group 'aged 25 or younger' (43%), followed by 'aged 26-35' (25%), 'aged 36-50' (17%) and 'aged 51-65' (10%). The least respondents were part of the 'aged 66 years and over' group (5%). Most respondents had higher education (52%) and came from Bratislava region (71%).

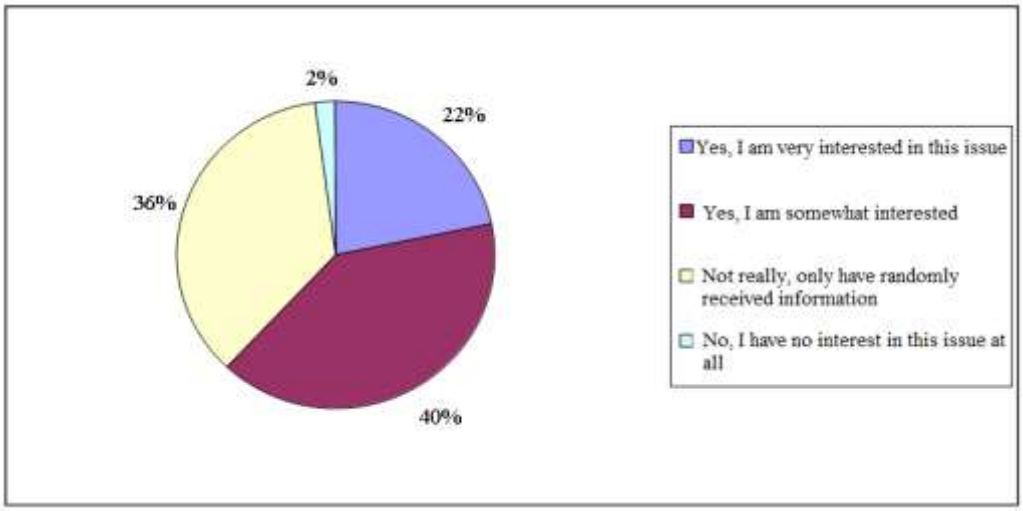

Figure 1. Interest in the issue of food quality and safety

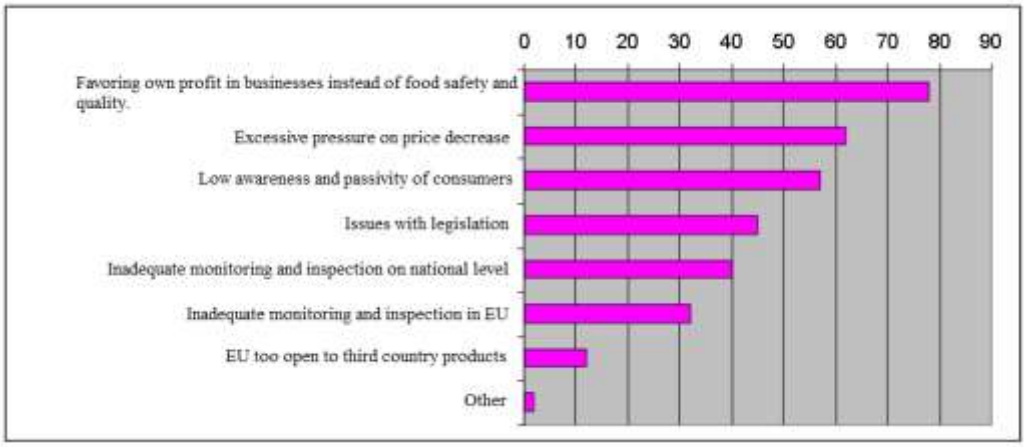

Figure 2. Reasons for appearance of unsafe food products

As shown by the survey results, interest of Slovak consumers in the issue of food quality and safety is relatively high (see Figure 1). It can be assumed that this is due to the current food scandals, which have a negative effect on consumer trust. Based on the results of the survey, it can be stated that in regards to appearance of unsafe products, Slovak consumers blame especially the producers and distributors

who profit at the expense of quality and safety (see Figure 2). Many perceive the weak position of the consumers and criticized their passivity and ignorance and partial criticism is also directed at national and European policies and legislation related to the issue. According to the survey, the monitoring, inspection and control of food products and their quality and safety is also insufficient.

Conclusion

From the results, it can be concluded that the level of consumer interest in food quality and safety is increasing. In recent years, companies are also more perceptive to the fact that if they want to survive in the fierce competitive environment, they have to pay attention to the quality and safety of their food products, as these attributes have become an integral part of the whole society and an important component of everyday life.

The paper is an output of the project VEGA number 1/0670/16 Evaluation of integrated management systems in the context of improvement of business entities competitiveness in the Slovak Republic.

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Prospects for the Use of Natural Antioxidants in the Production of Pastry

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Abstract. Natural supplements (lungwort, knotweed, barberry root, raspberry leaf, and calendula powders) which slow down the process of oxidation and hydrolysis of fats used for pastry have been examined in the article. It has also been determined peroxide, benzidine, acid, and thiobarbituric value of confectionery fat in terms of accelerated kinetic storage method at 50±2°C. Apart from that, the expediency to use natural inhibitors for prolonging fat induction period has been proved. It is planned to conduct further research and devote it to determination of changes occurring during the storage of pastry containing bioantioxidants.

***Keywords**: antioxidant, pastry, peroxide value, benzidine value, acid value, thiobarbituric value*

Introduction

A study of oxidation index and hydrolysis of confectionary fat during storage with addition of antioxidants was carried out. Efficiency of usage of alternative raw materials for extending shelf life of fat-containing confectionery is proved.

Oxidation processes of lipid fraction that occur through the formation of free radicals, affect on the preservation of fat-containing confectionery. In order to prolong storage life of fat, methods of active chemical effect on oxidation processes

that involve the introduction of antioxidants are used. Therefore, efficiency of usage of alternative raw materials for extending shelf life of fat-containing confectionery is proved. As the antioxidants may are used different natural products: vegetables, fruits, bee products, milk products [Bunea, A. et al. (2011)], [Labuza T. P. (2013).].

Material and methods

The object of this project is to study the affect of some alternative natural raw materials to fat preservation that is a part of confectionery product. Natural supplements (lungwort, knotweed, barberry root, raspberry leaf, and calendula powders) which slow down the process of oxidation and hydrolysis of fats used for pastry have been examined in the article.

It has also been determined peroxide, benzidine, acid, and thiobarbituric value of confectionery fat in terms of accelerated kinetic storage method at 50±2°C. Apart from that, the expediency to use natural inhibitors for prolonging fat induction period has been proved. It is planned to conduct further research and devote it to determination of changes occurring during the storage of pastry products containing bioantioxidants. Confectionery fat has been evaluated for odor and flavor according to a 10-point scale [Edwin N.F. (2012)].

Results and discussion

During the experiment, fresh melted confectionary fat was transparent, with typical taste and smell. The check sample was exposed to oxidation what resulted in deterioration of organoleptic characteristics after an eight-day storage period. After 10 days of storage, confectionary fat got darker and its taste became rancid. The organoleptic characteristics of the product were deteriorating more and more intensively as the time of storage was increasing. It should be noted that

organoleptic changes occurred slower during the storage of samples which contained antioxidants. The sample which contained lungwort was more stable as the temperature was kept at 50±2°C.

It can be noted that the more peroxides were contained in the checked fat, the more organoleptic changes occurred (see fig. 1). Moreover, natural antioxidants slowed down oxidation processes during the experiment.

After a ten-day storage, the highest accumulation of peroxide compounds in the check sample was observed. The amount of peroxide compounds was the highest in the sample. It was greater than the quantity of peroxides in the samples containing the following natural supplements: lungwort – by 1,58 times, barberry root – by 1,49, calendula powder – by 1,41, raspberry – by 1,38, and knotweed – by 1,36 times. According to the research results, inactivation of lipids peroxidation in lungwort was the highest during the storage period as it contains enough quantity of ascorbic acid. An antioxidative effect the vitamin C has can be explained with the fact that molecules can both react with and inactivate superoxide anion-radical, hydrogens peroxide, and hydroxyl anion-radical. Moreover, allantoin, flavonoids and terpenoids are some of the chemicals that lungwort consists of [Agadjanian A.A. (2012)].Secondary oxidation products are considered to be more toxic than hydroperoxides. These products include aldehydes and ketones which are especially toxic for the liver [Babenko N. A. at el. (2006)]. This is the reason why determination of these compounds in lipids is very important. It is possible to trace the intensity of oxidative changes in fats on the basis of accumulating carbonyl compounds which react with benzidine. The amount of carbonyl compounds was determined after 15 and 30 days of storage. Figure 2 provides information about the results of this experiment.

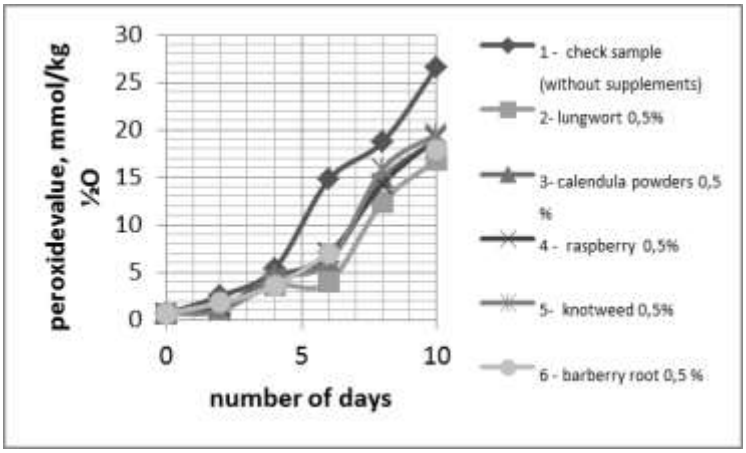

Figure 1. Changes in peroxide number of confectionery fat stored at 50±2ºC

Source: own research.

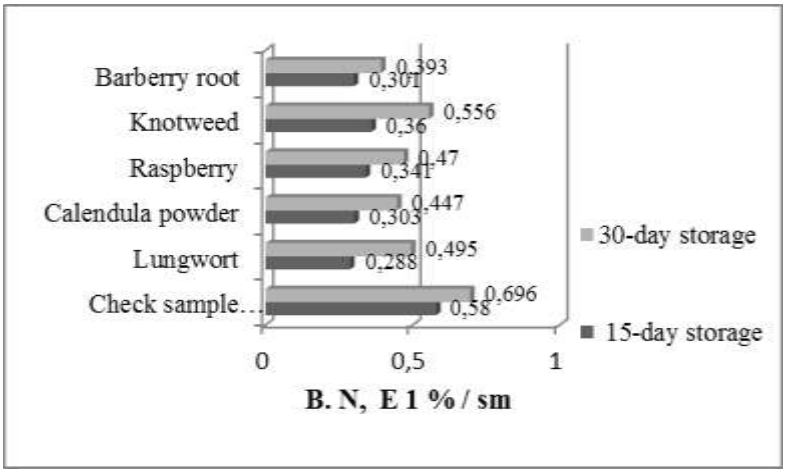

Figure 2. Changes in benzidine number of confectionery fat stored at 50±2ºC

Source: own research

According to the information highlighted above (see fig. 2), it can be seen that the amount of carbonyl compounds was higher in the check sample during the whole storage period. The lowest quantity of these compounds was observed in the sample containing barberry root. After the storage period was over, it turned out that the amount of carbonyl compounds in this sample was 1,77 times lower than in the check sample.

The intensity of lipids peroxide oxidation was determined in accordance with the content of secondary peroxidation products which react with 2- thiobarbituric acid.

According to the data provided below (see fig. 3), it can be concluded that check sample contains the highest amount of monoaldehydes, while the lowest quantity of these compounds was determined in the sample containing barberry root. The amount of monoaldehydes was 1,9 times lower than in the check sample. As for the quantity of dialdehydes, it was 2,17 and 2,12 times lower in the samples containing lungwort and calendula powder than in the check sample. Consequently, as regards Figure 3, the peaks of oxidation at absorption spectrums confirm the stabilizing effect of the studied natural antioxidants.

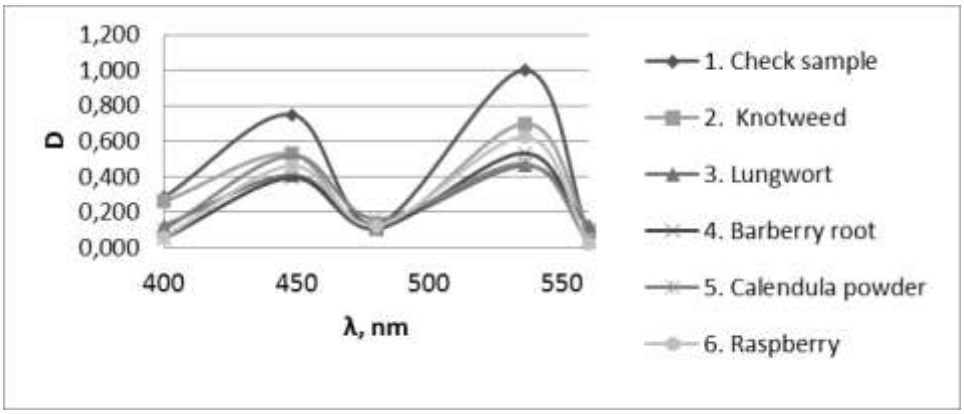

Figure 3. Changes in thiobarbituric number of confectionery fat stored at 50±2ºC

Source: own research

The degree of hydrolytic disintegration in lipids was assessed using an acid number. The examined confectionery fat partially consists of coconut oil which contains triglycerides of low-molecular acids. A change in acid number was accompanied with worsening of taste and smell, because butyric acid and caproic acid were formed as the result of hydrolysis in coconut oil. By the end of the storage period, the amount of accumulated fatty acids in the samples containing natural antioxidants was 1,6-2,1 times lower than in the check sample. It can be explained

with the fact that lungwort, raspberry, and barberry root provided especially strong stabilizing effect.

Conclusion Obtained results show high efficiency of using natural antioxidants towards the oxidation and hydrolysis processes occurring in fats during preservation. As spoilage of lipid fraction in fat-containing confectionery is caused by their quality worsening, a perspective is in using of alternative raw materials in their producing.

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The Issues of Management of Safety of Industrial Commodities – the Case of Cosmetics.

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Abstract. The European Union countries, trying to focus on the consumer, have made every effort to ensure that the products available on the market are safe to use. Cosmetics constitute a special group of products, and they have been discussed in this paper from the angle of the system of safety management enforced in Poland with the implementation of the EU legislation. However, the practice shows that the system has been encumbered with certain shortcomings.

Keywords*: management, legislation, cosmetics*

Introduction

Following its accession to the European Union in 2004, Poland was obliged to implement certain regulations pertaining to, among others, the safety of products. The regulations were gradually brought into practice, even prior to the official inclusion of Poland into the EU framework.

The EU states had drafted the Directive on the General Safety of Products which was later incorporated into the Polish legislation .

The Directive, along another fundamental provision of the EU law i.e. the free flow of goods, services, capital and workers, was poised to guarantee that the commodities traded within the EU markets are safe to use. The law enacted in

Poland regulates numerous issues, both in general and detailed terms, including the responsibility for the whole system of safety within the national borders. That issue will be discussed in more detail further in this paper on the example of cosmetics.

The history of cosmetics and their importance in the contemporary world.

Due to the fact that cosmetics belong to a unique group of commodities that come into direct contact with the human body, they are subject to stringent regulations. Cosmetics, and in particular creams, balms and the so-called color cosmetics are applied to the surface of the skin and consequently they may be infused into the blood circulation. In this way heavy metals or other toxins can find way into the human body. Another threat is posed by microorganisms which may freely develop in certain conditions, e.g. non-sterile manufacturing process.

From the historical perspective, cosmetics are a part of a group of commodities that have been used by humanity for time immemorial, and which have become an important part of life. One of the first pieces of information about the use of cosmetics dates back to 3000 B.C. In times of pharaohs, much attention was brought to the care of the body and physical appearance. In those days, Nefertiti was the benchmark of beauty. The color of skin achieved with the application of cosmetics was the indication of affluence. Women would put golden hue or white lead on their faces, and highlight their eyes with black lead sulfite, painting their lips with natural vermilion paints. Also hair and nails were dyed. The Egyptians, including men, took great care of their bodies. They used clay for washing purposes, and pampered their bodies with balms composed of honey and fragrances and liniment prepared from oils and waxes. They also used facial masks containing diatomaceous earth and milk as well as creams containing, among others, cypress extracts and olive oil. Jews, Greeks and Romans derived their expertise in cosmetics from the Egyptians.

In the ancient Rome, Caesar's beautiful wife Poppea became renowned for the skillful use of cosmetics applied to sustain the youthful appearance. In her days, Rome started to use public baths where goat or donkey milk was used for hygienic purposes, and after the bath bodies were covered with oils and ointments. In addition, Roman ladies powdered their faces and put lipstick on their lips as well as adorned their nails with henna. Ovid wrote in "The Art of Love", "(...) a woman reminds me of a house, it needs to be refurbished from the front and the back when such necessity arises", and then, " let curious maidens look into my booklet on cosmetics to find how that feat can be accomplished".

Cosmetics became more and more common with the availability of more and more effective formulae. Asia, due to its abundant mineral resources, plants and animals, began to play an important role. Also Persia and Arabia of those days became the hubs of the cosmetic market. The cosmetics would reach almost every part of the ancient world via Phoenician trade routes.

Even though cosmetics became an important commodity in the history of mankind, they had their downturn in the Middle Ages. Subsequent to the fall of the Roman Empire, the interest in hygiene and care of body had been declining. Only the women from Eastern territories would sustain the tradition of body care using the facial masks composed of lemon juice and nuts as well as creams containing jasmine and benzoin.

Yet, the time of neglect quickly subsided, and the Renaissance brought about further development of cosmetics beautifying the body. In that time perfume and fragrant waters came into use, and the imperfections of skin were concealed by special powders.

The Baroque, and then the Enlightenment Age made the manufacture of agents enhancing the beauty of the body flourish. It was not just the women, but also men painted their lips, and children's cheeks were powdered.

At the close of the 18th century, cosmetic industry moved to France which became a leader in the production and the use of cosmetics.

Since the onset of the 19th century, cosmetics started to be used not solely for aesthetic purposes, but also for the health reasons, e.g. therapeutic baths. It was then that the first soaps and other cosmetic products came into use. Many of them contained synthetic ingredients as well as invasive substances such as hormones or radioactive agents.

Fortunately, the 20th century brought about the advances of chemistry and medicine into the hygienic cosmetics. It was then that the beauty parlors of Helen Rubinstein (1908) and Elisabeth Arden (1910) were established, and the cosmetics firms such as Coty and Max Factor launched on the market.

As earlier attempts at enhancing the beauty often led to the damage of the skin, in the 20th century care went hand in hand with enhancement. Consequently, personal hygiene was combined with fighting the defects. Cosmetology started making use of cosmetic chemistry, dermatology, oncology, physiology, biochemistry or aesthetic medicine.

Currently, the cosmetic market in Poland is going through a dynamic growth. To give off-hand an example, in 2011, the turnover of the whole cosmetic market amounted to 13.9 billion PLN, and that market noted 14.3 billion PLN in 2012. It should be remembered that, in 2002, the turnover on the whole cosmetic market amounted to 4.69 billion PLN (source: MEMRB)

Presently the natural environment is much more polluted than in the past, which calls for better protective measures. Hence, there are strong challenges for the cosmetic industry. It should be also noted that a large part of the society suffers from allergies which should require the application of modified modern technologies in the manufacture of cosmetics.

Bearing all the foregoing in mind, it would be difficult to imagine a modern person who does not use cosmetics, which not only sustain good health and

appearance over an extensive period, but also increase self-satisfaction. To meet those challenges, a cosmetologist should be effective in his work, yet he must not bring harm to the consumer, which is to say he must be safe to his client.

With hindsight, most raw materials which in the past were used in the manufacture of cosmetics, as discussed earlier in this paper, were efficient for the consumer. Yet, by no means they were safe to use, which cannot be allowed at the present date with the possibilities of modern science and the knowledge about toxic chemical compounds. Well educated and trained for their profession commodity science specialists should safeguard this. They should have the possibility to test products, be aware of the requirements those products have to meet, and finally be provided with legal instruments that guarantee efficacy of their work.

Legislation on cosmetics in Poland and the EU

In Poland, legal regulations on cosmetics have been included in the Law on Cosmetics of 2001. The law was based on the framework of the EU legal system, viz. the Directive of 27th July 1976 advocating coherence of the legislature of the Member States within the area of cosmetics.

The legislation regulates the safety of cosmetics, particularly their formulation, labeling, production conditions and trading, keeping the records and even testing on animals.

A significant stipulation of the Law is the indication of responsibility for the currently traded cosmetics and the appointment of bodies to oversee that.

Sole responsibility for compliance of a cosmetic product with the law and its safety is conferred on the manufacturer, and in distribution on the importer bringing a product to the European Union market.

The regulations prohibit testing cosmetic products on animals and list the chemical compounds which are prohibited from use in cosmetics due to their toxic, hazardous impact on humans. The regulations also specify the substances which are

allowed to be used in the production of cosmetics, however in a limited volume, scope and application – should those requirements be exceeded.

The regulations allow for traces of forbidden substances in cosmetics composition in case where their elimination in the production process is not feasible – and that is the only exception.

The quoted above Laws of 2001 and 2013 require listing specified information on cosmetic packaging, in particular informing about their formulation. The only exception is when the Main Sanitary Inspectorate, on request of the manufacturer, allows keeping the formulation confidential.

It goes without saying that the principles of product safety, in the area not regulated by the Law on Cosmetics, are safeguarded by the quoted earlier Law on Comprehensive Safety of Products. Pursuant to the Law, which follows the stipulations of the EU directive, "a safe product causes no damage to human health when applied under normal or reasonably foreseeable conditions of use, or creates a negligible hazard which is to be accepted in a normal use". The Law protects the market against products which do not comply with the safety requirements and confers on the distributors of those products the obligation to monitor their use, including recording information on the hazards involved in the use of cosmetics as submitted by the customers, to be promptly forwarded to the manufacturer or relevant provincial Inspectorate of Trade.

Should not the general stipulations of product safety be met, the overseeing bodies prohibit trading of such products within the administrative procedure and may impose the prescribed fines.

In addition, at the close of the first decade of the 21st century, the European Commission passed COSMOS Standard (Cosmetics Organic Standard) defining prerequisites for the certification of natural cosmetics. The right for certification has been conferred on the certification bodies which attest the authenticity of a natural cosmetic in terms of its formulation.

Due to the fact that cosmetics belong to the group of products which are in high demand among the consumers, the issue of unfair competition came to play. That is why the Law on Unfair Competition

was enacted. In light of the law, unfair competition is defined as "anytrade practice that is against the law or good practice". Apart from that act, the ruling of the Supreme Court of 2 January 2007 stipulates that "it is contrary to good practice to bring onto the market a product that is identical in kind with another unique product of another manufacturer, when the customer's attention is attracted by the similarity of packaging which evokes a positive association with the image that was planted in the customer's mind by a prior product".

In turn, the Law of 23 August 2007 is poised to protect enterprises against unfair competition, listing the unethical trade practices.

Moreover, a system for the co-operation and exchange of information RAPEX (Rapid Alert System for Non-Food consumer products) was established. This is an early warning network which facilitates forwarding information about hazardous non-food products originating from the EU member states, from the home country, and from the European Economic Area, to the authorities of the remaining states and the appropriate bodies, responsible for recording the information. The main purpose of RAPEX is preventing such products from reaching other consumers.

In conclusion, it should be noted that once such an efficient legal system is in place, a European consumer should feel safe when purchasing cosmetic products. Nonetheless, despite all the steps taken by the EU and Poland, the situation is not fully under control. This is due to the large interest in cosmetics on the part of the community and, on the other hand, inefficient elimination of the unfair competition from the market.

Due to the large demand for cosmetics on part of the consumers, and the limited financial resources of some, the black market has become more and more

aggressive. That market offers rip-offs or fakes, i.e. products which are strikingly similar in appearance to the commodities provided by world renowned purveyors of cosmetics. They are manufactured by the unfair competition and offered at low prices, through such unofficial channels as city markets or via the internet shops.

The above channels are also used for trading products of the unknown origin, mostly imported from abroad. Those goods, due to the unofficial methods of trading, are beyond the reach of the legal controls which were described earlier. Hence, they pose a major hazard to their buyers.

On the final note, it should be stated that in light of the 2007 RAPEX report on hazardous consumer products, cosmetics amounted to 6% of the reported cases. Better yet, according to the most recent RAPEX reports for the past two years, finding hazardous substances in cosmetics which did not comply with the statutory standards led to recalling those products from the market, and in some cases even to their condemnation.

To give a few examples:

- in soaps – microbiological contamination and the carcinogenic substances ;
- in shampoos – microbiological contamination attributable to the use of chemical substances whose application is prohibited in the production of cosmetics;
- in facial masks and balms – substances prohibited in the production of cosmetics;
- in toothpastes – microbiological and chemical contamination;
- in lipsticks – chemical contamination, excessive content of cadmium and lead;
- in creams – microbiological and chemical contamination;
- in fragrances – chemical contamination, excessive content of e.g. arsine;
- in powders –chemical and microbiological contamination, content of e.g. lead.

It took almost 100 pages of text to describe the chemical and microbiological contamination in various cosmetics, in compliance with the RAPEX report for 2001 – 2014.

Conclusions

It may be ascertained that in many cases, even the cosmetics traded through formal distribution networks do not comply with the prescribed legal standards, hence posing hazard to the consumers. Some of those cosmetics, provided they are reported to RAPEX, will be recalled from the market.

By the same token, it should be noted that the cosmetics distributed through the black market pose a grave hazard, yet resolution of that issue requires greater controls on the EU cosmetics market. It should be remembered that the range of hazardous products includes not just cosmetics but also industrial goods and food items.

All in all, the regulations pertaining to the management of products safety are proper. However, the circumstances pervading in some countries make the regulations frequently ineffective. Hence, the system needs continuous monitoring, but most of all streamlining its functioning.

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A Comparative Analysis of Certain Cold Pressed Nut and Seed Oils

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Abstract. Cold-pressed oils, including oils from nuts and seeds, are becoming increasingly popular on the Polish market. Due to their chemical composition they deserve attention. They can be a component of functional foods. They are a rich source of valuable fatty acids. The aim of the study was to compare the qualitative characteristics of selected oils from nuts and seeds. A number of specific oils were detailed. Using gas chromatography, the acid profiles were obtained for nut oil: hazelnuts, walnuts, coconuts, cedars, peanuts, macadamia nuts; and seeds of: pumpkin, almonds, apricots, grapes. The content ratios of acids: n-6/n-3, MUFA/PUFA and UFA/SFA were calculated. Special attention from a nutritional point of view, is given to the calculated value of the ratio C18:3 (n-6)/C18:3 (n-3). Among the tested oils, by far the largest amount of saturated fatty acids (SFA) appeared in coconut oil, approx. 94%. The least quantity of them was contained by cedars oil, at about 7.8%. The oleic acid content C18:1 is the highest in hazelnut oil and macadamia nuts oil at about 81. The ratio of ΣMUFA/ΣPUFA was the highest for macadamia nuts oil (14.23) and hazelnuts oil 8,54. The most preferred ratio of n-6/n-3 are peanuts (4.5:1), macadamia nuts (0.6:1) and walnuts oils (5.4:1).

Keywords*: oils, nuts, the acid profiles*

Introduction

Nuts are an important part of the market for food products in Poland and around the world. They are a complement to many dishes, enriching and diversifying their taste. They are a healthy snack (Li & Hu, 2011). They are the source of many nutrients, macro- and micronutrients, and vitamins (Ros, 2010). They are high energy. The biologically active compounds they include possess antioxidant properties (Miraliakbari & Shahidi, 2008, Wolf, 2015). The modern nut market is stabilized. Commercial offer of Polish nuts market is varies (Biernat *et al.*, 2014). Vegetable oils are rich in various fatty acids, including monounsaturated and polyunsaturated (Ryan *et al.*, 2006). They protect the body against the development of cardiovascular disease (Sabate &Wien, 2010). They owe their properties to the profile of fatty acids, composed mainly of fatty acids with an even number of carbon atoms in the chain and unsaturated bonding (Pereira *et al.*, 2008). Polyene fatty acids of the n-3 and n-6 group are essential for the proper functioning of the human body (Maszewska & Gańko, 2010). They must be supplied with food. The contemporary diet is characterized by a very high consumption of saturated fats and n-6 acids and an insufficient supply of n-3 acids. This causes the immune balance to be upset and an excessive tendency to inflammation develops in the body (Casas-Agustench, Bulló and Salas-Salvadó, 2010). What is important is the ratio of n-6 to n-3 fatty acids. It should be in the range from 4:1 to 1:1 (King *et al.*, 2008). The goal of the study was to compare the acid profile of selected nut and seed oils.

Material and methods

The research subject was selected cold-pressed nut and seed oils. The samples were marked in the work with the symbols: A - peanut oil, B - coconut oil, C - hazelnut oil, D - pistachio oil, E - macadamia nut oil, F- cedar nuts oil, G - walnut oil, H – apricot kernel oil, I- seed red palm oil, K – seed almond oil, L- pumpkin seed oil, M- vineyard grape seed oil. Gas chromatography was used to

obtain acid profiles of the tested nut and seed oils (PN-EN ISO 12966-2:2011, EN ISO 12966-1:2015-01).

Results and discussion

Table 1 shows the characteristic values determined based on PN/ISO: AcV acid value (PN-ISO 660:2010), peroxide value PV(PN-ISO 3960:2010), iodine value IV (PN-ISO 3961:2011), anisidine value AnV and Totox index (PN-ISO 6885:2008).

For all the pressed oils studied, common acids are C16:0 and C18:0. Depending on the type of oil, the quantity of fatty acids is different. The greatest variety of saturated fatty acids (SFA) was found in coconut oil, which contains eight SFAs. Pumpkin seed and almond oil contain six SFAs. The third group includes oils in which there are three or four types of saturated fatty acids. This group of oils includes: macadamia nut, peanut, cedar nut, red palm seed and grape seed. Oils from walnut, hazelnut, pistachio and apricot seed contain only palmitic and stearic acids. The SFA content in the tested oils is varied, from a value of 7.75% for cedar nut oils to a value of 24.6% for red palm seed oil. The exception is the value of 93.54% for coconut oil. The combined amount of saturated fatty acids (SFA) present in the oils studied was summarized in Fig.1.

Table 1.

The characteristic values oils

Oil	AcV mgKOH/g	PV mEq O_2/kg	IV gI_2/100g	AnV	Totox
A	1.01±0.05	2.62±0.05	85±0.5	3.80±0.05	9.04
B	0.25±0.05	1.20±0.2	10±0.6	1.08±0.05	3.48
C	0.56±0.05	1.16±0.2	89±0.5	3.10±0.05	5.42
D	0.18±0.05	12.23±0.01	105±0.6	8.25±0.06	32.71
E	0.33±0.05	7.76±0.06	75±0.5	4.78±0.08	20.3
F	0.60±0.05	20.17±0.4	150±2.2	1.70±0.2	42.04
G	2.23±0.05	1.25±0.1	130±2.2	2.25±0.3	4.75
H	0.42±0.05	18.94±0.06	88±0.5	6.58±0.02	44.46
I	1.13±0.05	5.83±0.5	96±0.6	3.45±0.02	15.17
K	1.34±0.05	4.16±0.02	100±1	2.17±0.03	4.49
L	0.88±0.05	2.92±0.06	116±1	4.10±0.05	9.94
M	1.24±0.05	7.22±0.06	126±0.6	5.12±0.06	19.56

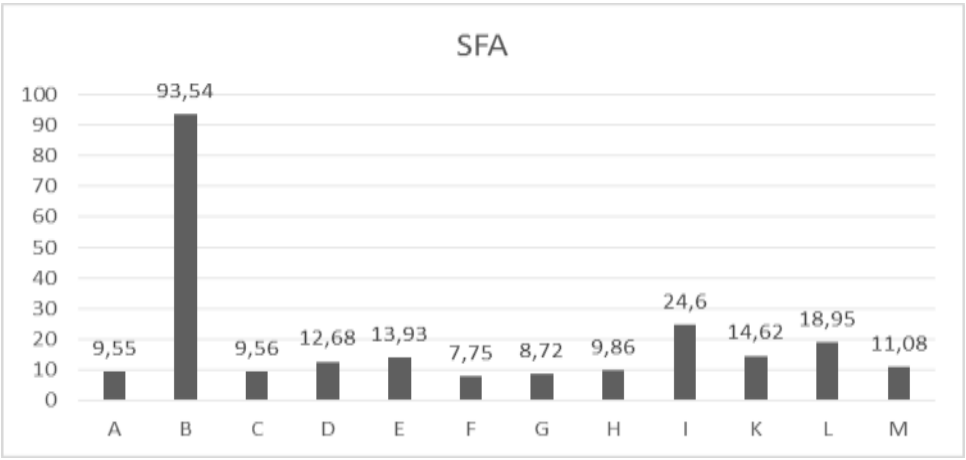

Figure 1. SFA content in the studied oils

For the nutritional value of oil, the levels of unsaturated fatty acids (UFA) are important. The lowest UFA content in the group of pressed oils is coconut oil with a level of 6.46%. For other oils, UFAs represent ca. 75-92%. The highest values are achieved by the oils: from cedar nuts 92.24% and walnuts 91.28%, next to hazelnuts, peanuts, and apricot seed at approx. 90.40%.

The monoene acid content (MUFA) for oils pressed from nuts and seeds are at a variety of levels. In the group of MUFA fatty acids, common for all the oils from nuts and seeds tested is oleic acid. The content of oleic acid C18:1 in the studied oils is shown in Fig.2.

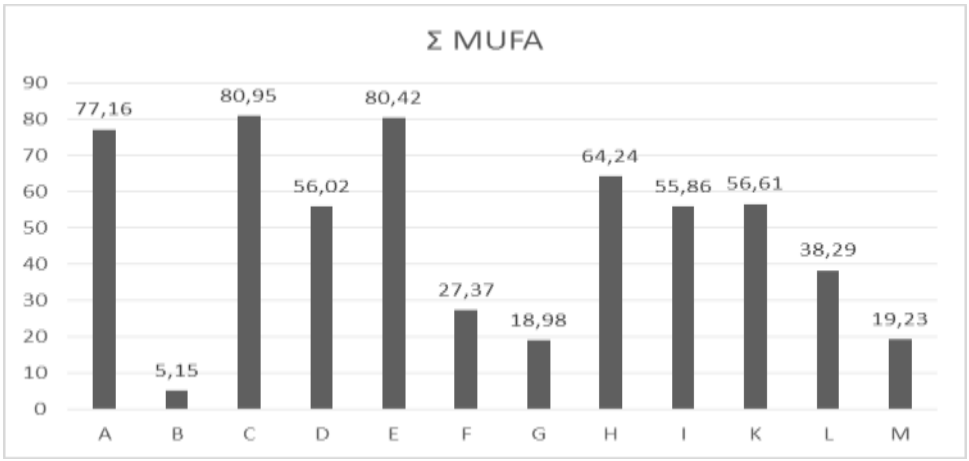

Figure 2. MUFA content in the studied oils

The group of PUFA is very diverse, from 1.31% for coconut oil to a value of approx. 72.30% for walnut oil. In the case of grape seed oil there was a trans form of the acid C 18:1 (trans-9) at an quantity of 0.18%, and cedar nut oil contained a trans form of the acid C 18:2 (trans-9,12) at 0 31%. The content of PUFA acids in the oils studied is shown in Fig.3.

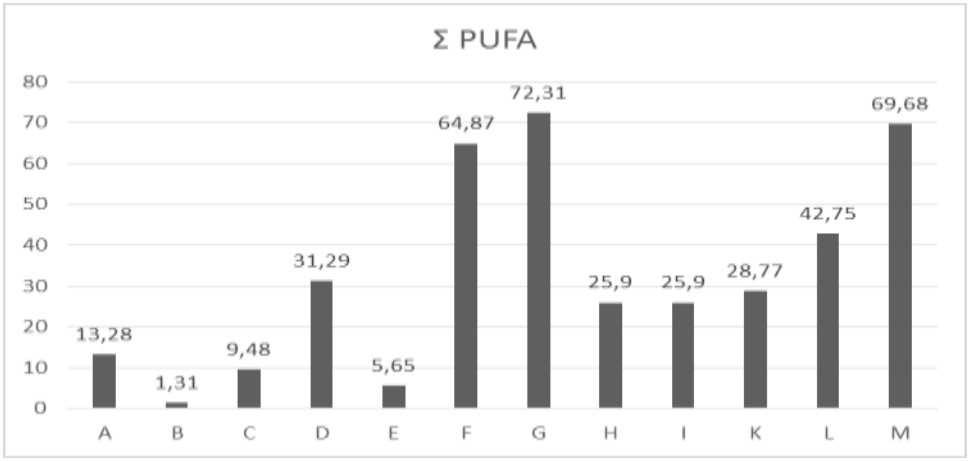

Figure 3. PUFA content in the studied oils

In the case of coconut oil, hazelnut oil and apricot seed oil fatty acids C 18:3 n-3 are not present. However, in pumpkin seed oil the ratio of n-6/n-3 is 161.7:1, while the grapeseed oil ratio is 256.4:1 For the other oils tested the calculated ratios of n-6/n-3 was presented in Fig.4. The ratio ΣPUFA/ΣMUFA oils ranges from less than 1 for cedar nut, walnut, and grape seed oil, to 14.23 for macadamia nut oil. The calculated values of this ratio for the oils tested are shown in Figure 5.

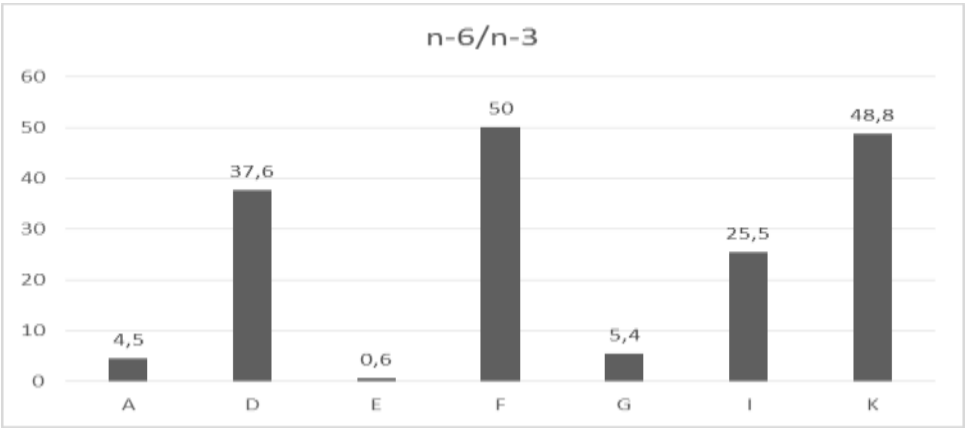

Figure. 4. The ratio n-6/n-3 in the studied oils

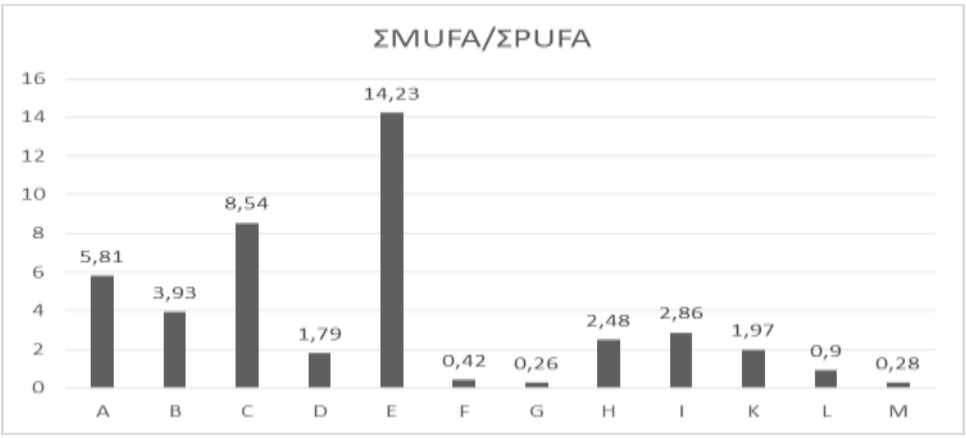

Figure. 5. The ratio ΣPUFA/ΣMUFA in the studied oils

The calculated ratio of UFA/SFA for the test oils are varied. The values of UFA/SFA are in the range from 0.07 to coconut oil to 11.90 for cedar nut oils. A graphical summary of the UFA/SFA ratios is shown in Fig. 6.

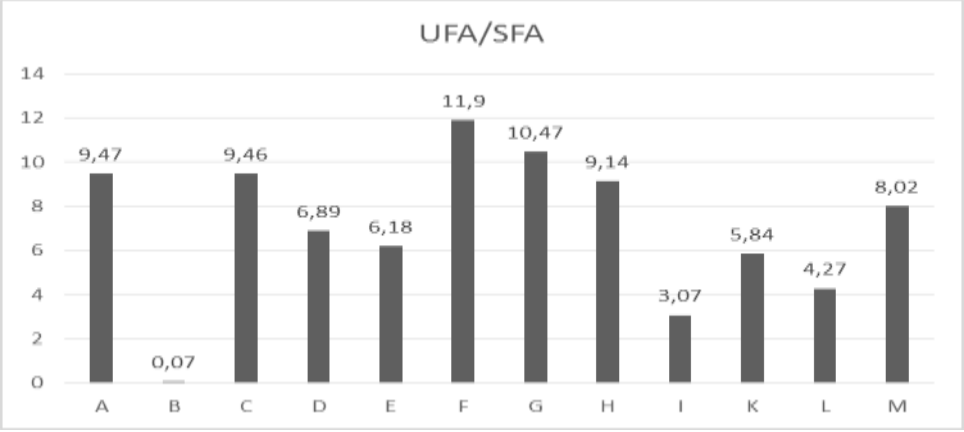

Figure 6. The ratio ΣUFA/SFA in the studied oils

Conclusion

Cold-pressed nut and seed oils are a valuable source of fatty acids valuable to humans. The SFA content in the tested oils varies from a value of 7.75% for cedar nut oils to a value of 14.6%% for the almond oil. An exception is the value of 93.54% for coconut oil. From a nutritional point of view in the oils tested, the preferred ratio of the fatty acids (n-6)/(n-3) is present in oils from the macadamia nuts (0.6:1), peanuts (4.5:1) and walnuts oils (5.4:1). In the oils studied unsaturated acids prevail (75.4-92.25%). The exception is the value of 6,46% for coconut oil. In the case of grape seed oil there was a trans form of the acid C 18:1 (trans-9) at a quantity of 0.18% and cedar nut oil contained a trans form of the acid C 18:2 (trans-9,12) at 0.31%.

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The Measurement of Leather Shrinkage Temperature with Automatic Recording

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Abstract. Hydrothermal shrinkage is one of the most characteristic features of collagen. The shrinkage temperature depends primarily on a type of tanning agent bound to the collagen as well as the tanning process. The standardized measurement method allows only the temperature at which the specimen shrinkage begins without any possibility for analysing the kinetics of the hydrothermal leather shrinkage process. Tests were carried out by using an instrument of our own design with automatic recording of measurement results. The measurements of shrinkage temperature for brain, vegetable and chrome tanned leathers and parchment. The coefficient of variation for obtained data ranged between 0.58% and 0.89 % depending on leather tanning method, thus indicating a high precision of the measurement method. Thus, both data volumes and measurement accuracy were increased enabling an effect of various factors on leather shrinkage temperature to be determined.

Keywords*: leather, tanning, leather shrinkage temperature*

Introduction

The leather shrinkage temperature (T_s) is defined as a water temperature at which a leather specimen starts to shrink. The measurement of this parameter consists in soaking a leather specimen in water and heating it at a specified rate until a significant specimen shrinkage occurs. $T_s$is obtained by reading a thermometer (ASTM D 6076-03, IS 5914 1970, PN-EN ISO 3380:2015-11). Given the most common tanning methods used, the highest values of$T_s$reaching 85-120˚C are recorded for chrome tanned leathers. Lower values of this parameter are obtained for vegetable tanned leathers (T_s=70-85˚C) (Lasek, 1978); and brain tanned leathers (T_s=55-70˚C). However, the shrinkage of parchment, i.e. untanned leather, occurs at a temperature of 55-64˚C (Thomson, 2006).

According to Bieńkiewicz (1986) the shrinkage temperature of tanned leathers depends mainly on the tanning agent bound to the collagen, and tanning conditions. An important parameter is among otherspH of soaking bath and soaking time.Any shrinkage temperature drop or rise informs about changes in the collagen structure (Myjak, 2005). It was found that a collagen modification or cross-linking with amine groups leads to changes enabling high temperature resistant leathers to be obtained at a relatively low concentration chrome used as tanning agent (Chang andHeidemann, 1992). The shrinkage temperature is also a valuable indicator in evaluating the degree of leather deterioration (Vest, 1999). Abdel-Maksoud (2001) found that the shrinkage temperature of parchment manuscripts and historic leather artefacts was significantly lower than those of new specimens or subjected to artificial ageing.

The instrumentation proposed in the applicable standard does not allow a comprehensive analysis of the leather thermal shrinkage process. The device described in the standard (PN-EN ISO 3380:2015-11) does not enable continuous measurement data recording, thus also excluding an analysis of the kinetics of

leather hydrothermal shrinkage.The standardized measurement method allows only a temperature at which the specimen shrinkage begins to be determined that in practice is connected with a temperature reading at one point.

The aim of this paper is to check the proposed new method and device for accuracy and repeatability of test results and present a measuring capacity of the new device for measuring the leather shrinkage temperature.

Material and methods

The test were carried out on two chrome tanned cowhides of 1.71±0.03mm in thickness and a vegetable tanned cowhide of 2.50±0.02mm, brain tanned sheep leather of 0.95±0.02mmin thickness and sheepskin parchment of 0.31±0.03mm in thickness.To measure the shrinkage temperature from each leather 5 specimens of 50x3 ± 2mm were cut perpendicularly to the spine. To improve efficiency of leather watering, before measurements the leathers were deaerated by using a vacuum pump and soaked in water for 24 hours.

The method of shrinkage temperature measurement for selected leathers consisted in placing a leather specimen in device clamps so that it was sufficiently tensioned and preheating it at the rate of 2˚C/min. measurements were made by using a device of our own design equipped with a graphic interface enabling online fast parameter recording, i.e. time and water temperature. In addition, the specimen length before the shrinkage and then until the process was ended.

Results and discussion

The tests allowed the determination of shrinkage temperature for three leathers of various tanning methods and parchment.For the chrome tanned leather the average shrinkage temperature was 96.42^0C,while for the vegetable tanned specimen this figure was 76.70^0C, and 62.10^0C for the brain tanned leather. For parchment the shrinkage occurred at 50.20^0C.The test results are consistent with

those presented in the literature(Chang and Heidmann, 1992;Lasek, 1978; Thomson, 2006).In addition, an analysis of test specimen shrinkage temperature measurements indicates a low variability of the results in individual leather groups, namely the coefficient of variation was 0.61 for chrome tanned leathers, 0.58 for vegetable tanned leathers and 0.88 for brain tanned leathers. For parchment this coefficient was 0.89(see Table1).The tests enabled also the specimen length changes with increasing temperature to be recorded.

Table 1.

Results of shrinkage temperature measurements for chrome, vegetable and brain tanned leathers and parchment

	Chrome tanned leather	**Vegetable tanned leather**	**Brain tanned leather**	**Parchment leather**
N=5				
Mean	96.42	76.70	62.10	50.20
Minimum	96.00	76.00	61.50	49.50
Maximum	97.50	77.00	62.50	50.50
Standard deviation	0.59	0.45	0.55	0.45
Coefficient of variation	0.61	0.58	0.88	0.89

The leather shrinkage measurements for the same tanning method indicate similar changes (Fig. 1A). Quite different changes of specimen length with increasing temperature for parchment and leathers tanned with various methods are shown in Fig. 1B.

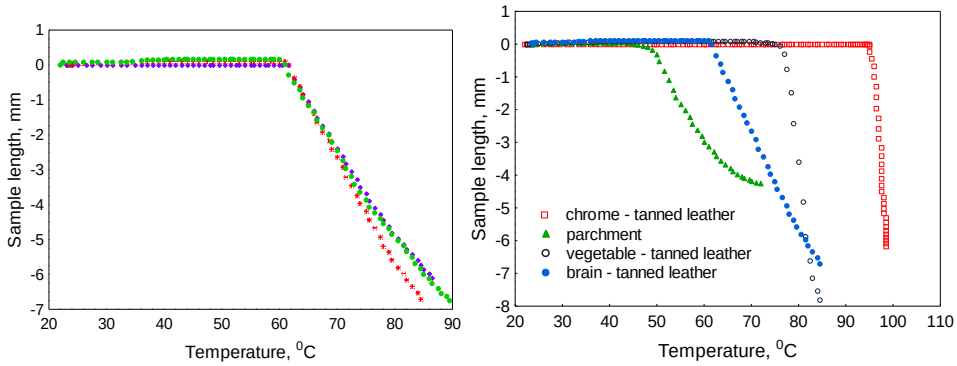

Figure 1.Representative changes of specimen length with increasing temperature. A) leathers tanned with the same method (brain tanned), B) chrome, vegetable and brain tanned, and parchment

Conclusion

The shrinkage temperature for leathers tanned with various methods was measured by using a new measuring device enabling the changes in leather specimen length with increasing water temperature to be recorded. The obtained results allowed the verification of accuracy and precision for measurements made on this device.The hydrothermal shrinkage temperature for the chrome tanned specimen was 96.42^0C, 76.70^0C for vegetable tanned leather, and 62.10^0C for brain tanned specimen, while for parchment the shrinkage occurred at 50.20^0C. The results obtained for leathers tanned with the same method characterized of a low variability, namely the coefficient of variation is 0.61 for chrome tanned leathers, 0.58 for vegetable tanned specimens and 0.88 for brain tanned leathers, and 0.89 for parchment. It was found that the online recording of the kinetics of these processes allows an analysis of leather structure changes depending on tanning agents used, degree of tanning and other factors.

Acknowledgements

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Thermalphysic Characteristics of Bedding Products are a Source of a Person's Sound Sleep

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Abstract. The essential characteristics of blankets are thermal properties, which are estimated by total thermal resistance. Therefore, the work which has been done to research the total thermal resistance of blankets with different bulking fillers, with taking into account the human body thermal balance and thermal losses during sleeping, is considered to be necessary and well-timed.

Keywords*: blanket, filler, comfort, thermal properties*

Introduction

Bedding products – blankets and pillows – are goods of first priority, therefore the demand for them has remained stable.

The manufacturing of the goods in this category and their quality determine the necessity to create conditions for a person's sound sleep. A blanket has to possess properties such as to store heat, soak up and evaporate moisture in order to ensure the human sound sleeping. Moreover, a blanket has to be warm and light, i.e. to be characterized by high indices of heat storage per unit of surface density. A blanket has to possess the capacities to be well- draped, gently cover a human body, not to vent and admit cold air, thereby to ensure comfort during sleeping.

The most important properties of bedding products are thermal, physical characteristics. In fact, nowadays the problem is that the properties of bedding articles enumerated above have not been investigated almost at all.

For the last decade the research of thermalphysic properties of nonwoven textile fabric (just only with them we can compare blankets with bulking fillers) has been done by Boeva-Kashlova, G. (2009), Kolyadenko, N.G. (2010), Sokolovska, T.S. (2008), Bessonova, N.G. (2005), Hushchina, K., Zamyatina, G. and Fedorovskaya, V., Rozbrodin, A.V. (2005).

Every person differs from the rest in age, sex, morphological attributes etc. Moreover it is necessary to take into consideration temperature and humidity of the premises intended for the human sleeping.

The essential characteristics of blankets are thermal properties, which are estimated by total thermal resistance. Therefore, the work which has been done to research the total thermal resistance of blankets with different bulking fillers, with taking into account the human body thermal balance and thermal losses during sleeping, is considered to be necessary and well-timed.

The objective of this work is to research thermalphysic properties of blankets with different bulking fillers.

The objects of research are represented by the sets of blankets with bulking fillers of different fibrous structures. The sets of blankets are manufactured by the limited liability company “Herd Billirbeck HmbX”. The results of experimental data of researching the fillers for bedding articles have been employed during the investigation.

Material and methods

Taking into account the simplicity and availability of standard methods, air permeability (B_p, dm^3/m^2c) of bedding products with different bulking fillers has been investigated in accordance with State Standard (GOST) 12088-77 (1985) with

an equipment, thermal resistance (m^2 ^{0}C/Watt) has been investigated in accordance with State Standard (GOST) 20489-75 (1985) with an equipment.

The research of these properties has been held at the laboratory of the production analytical studies and testing of the scientific and technical centre of confirming the compliance, standardization and probation of the light industry production and means of self-defense of State Enterprise "Ukrmetrtestandart" (Kyiv, Ukraine). This testing laboratory is certified within the system of UKRSEPRO.

Results and discussion

Comfort means the most convenient living conditions, the scope of domestic benefits; advantages, cosiness (Busel, 2004). Undoubtedly, a person can appreciate comfortability, that is the quality of sleep which will influence a person's general state for the following day. Moreover, the opinion persists, that to have a sound sleep the right temperature in a bedroom has to be 12-17^0 C in winter, 17-22^0 C in spring and autumn, 22-25^0 in summer with constant humidity of 40-60% (Kukin and Soloviev, 1967).

The processes of energy reserves accumulation, regeneration, metabolism take place during sleep. The investigation of a sleeping person's biocurrents has shown that our sleep consists of phases periodicity of non-rapid eye movement sleep (NREM sleep) and rapid eye movement (REM sleep) with creation of 90-120 minutes sleep cycles. These cycles recur periodically 4-6 times per night. In general, REM sleep takes 15-25 % of time within night sleep, different stages of NREM sleep - 75-85 % respectively (Ivanchenko, 1988).

A person's sleep cycle scheme is shown in Figure 1.

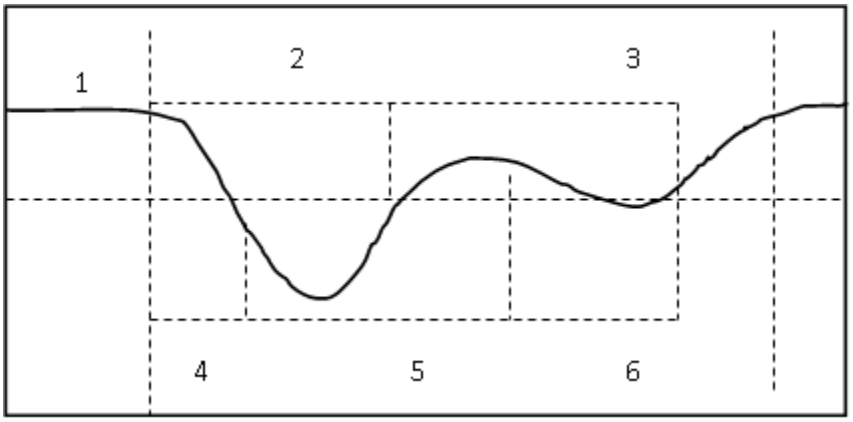

Figure 1. A person's sleep cycle sleep scheme [11]
1 – wakefulness
2 – non-rapid eye movement sleep phase
3 – rapid eye movement sleep phase
4 – falling asleep
5 – sleep length
6 - waking up

Several authors (Rozbrodin, 2005) assert that for a person's sound sleep it is necessary to have:

- health – physical and psychological health;
- comfortable conditions for sleeping – optimal temperature, humidity, lighting, air, ventilation, vibration;
- comfortable bed and bedding articles – they ensure quiet sleep and help choose the right position for sleeping.

Textile materials, which are used to manufacture blankets, represent the system of numerous fibres separated from each other by pores of different forms and sizes, which are filled with air. Heat transmission in such materials is done by thermal conduction through pores in fibres.

The properties of fillers and covers as well as the blankets structure (that is their design) affect thermalphysic characteristics of blankets with bulking fillers.

According to thermal physics, heat is transmitted from more heated object to less heated one relative to the zero law of thermodynamics. Heat transmission will have lasted by the time the thermal equilibrium is established between objects.

The scheme of the system "person – blanket – environment" and the heat exchange process are presented in Figure 2.

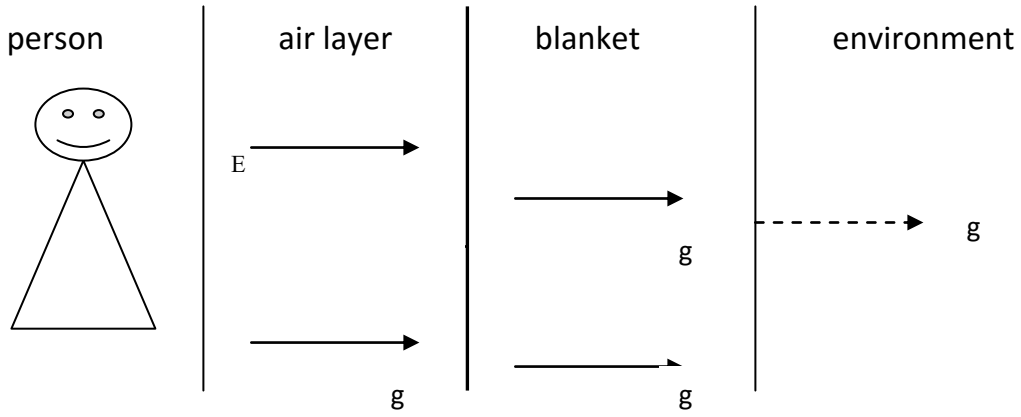

Figure 2. The scheme of the system "person – blanket – environment"

According to Skliannikov, V.P. (1982), *grad T* (temperature gradient), specific thermal flow, thermal emission energy and reradiation are calculated relative to the t^0 of a person's heat distribution. Moreover, one should remember that the heat transmission velocity is influenced by the heat layer humidity, which is a variable quantity that depends on a person's state, their physical load and other factors.

The heat in a human body is formed in the process of biological exchange resulted in heat emission. The lowest quantities of a person's energy expenditure are observed in the state of quiescent during the sound sleep. During sleeping the heat that is produced by a person, is transmitted into the environment by means of bedding articles (blanket, mattress, pillow, blanket cover, pillow slip) and undergarment. Besides that, partially the heat emitted by a person's head and neck is transmitted into the environment.

Thus, a blanket provides a person's organism with the protection against heat losses. The heat-protection properties are investigated according to thermal resistance *R* or total thermal resistance *p*, as well as reverse characteristics - the heat conduction coefficient λ and the heat-transfer coefficient *K*.

However, while assessing the blankets heat-protection properties in the conditions close to the operational ones, researchers judge by considering thermal resistance.

The research results are given in Table 1.

Table 1.

The heat-protection properties of blankets with bulking fillers

№	Name of filler	Surface density, gr/m^2	Thickness, mm	Air permeability, dm^3/m^{2}c	Total thermal resistance, m^2 ^{0}C/Вт
1	Down-feather	539	37,0	15,3	1,32
2	Cotton	511	15,5	25,0	0,61
3	Bamboo	535	20,5	27,0	0,64
4	Liotsell (eucalyptus)	519	21,5	24,6	0,60
5	Wool (sheep)	477	31,5	28,7	0,69
6	Cashmere	527	18,5	27,5	0,64
7	Wool (camel)	540	20,5	28,7	0,67

Conclusion

It is proved scientifically that the warmest blanket with the highest index of total thermal resistance is a blanket with the down-feather filler. Having held experimental research it is determined that the articles with natural protein fillers possess the highest thermal characteristics. Moreover, the heat-protection features of blankets depend on density of the air put into those blankets.

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Traditional Products and Longevity in Sardinia. A Preliminary Study for a Certification Strategy.

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Abstract. Studies carried out by medical researchers and demographers have discovered the existence of the Longevity Blue Zones (LBZ) showing a very high concentration of long-lived people.
The first LBZ identified is located in the Ogliastra region of Sardinia, an area also home to several traditional products that display some characteristics that may be linked to longevity. A study on the possibility of creating quality brands that could enhance the diffusion of the local products of Ogliastra and valorise the positive effects they have on health, must be carried out.
The aim of this paper is, in the framework of this wider strategy, to identify, out of the official group of Sardinian products, which ones can be considered "authentic" products of Ogliastra and, within this latter group, which potential benefits in terms of health are linkable to their consumption.

***Keywords**: Local Products, Authenticity, Certification, Longevity*

Introduction

Longevity Blue Zone (LBZ) is a term coined in the context of age validation of centenarians in Sardinia (Poulain et al. 2004). It was used for the first time to refer to the mountainous areas of Ogliastra and Barbagia (Sardinia), where the proportion of male centenarians born in the last two decades of 19th century reaches one of the highest values in Europe (more than 15 per 10.000 new-borns). To date, four other LBZ have been identified: Okinawa (Japan), Sardinia (Italy), Nicoya (Costa Rica) and Ikaria (Greece). The age validation of Sardinian centenarians (Poulain et al. 2006) resulted in the identification of the Sardinian LBZ, a cluster of 14 villages. The epicentre of the area is the village of Villagrande Strisaili, where men have been found to live as long as women (Poulain et al. 2011).

Figure 1. AKEA Map of Longevity in Sardinia (Poulain et al, 2004)

There are several theories to explain exceptional longevity in the Sardinian LBZ (Poulain et al. 2011; Pes et al. 2013). This population remained isolated for centuries, a fact that contributed to the stabilization of its gene pool (Cavalli-Sforza 2000). However, although genetic association studies have been carried out (Passarino et al. 2001; Pes et al. 2004; Lio et al. 2003), none of these markers have been shown to diverge significantly from that of the general population.

Among the non-genetic factors that might be important to account for these phenomena, the role of physical activity and nutrition has been the subject of recent research (Pes et al. 2013). The same areas are also home to several traditional products that not only are very popular, as they also display some characteristics that may be linked to longevity. In order to successfully market these products, whose diffusion is limited by several factors, and with the aim to preserve the products' quality and authenticity, a study on the possibility of creating quality brands based on authenticity on one side and health-related properties must be carried out.

As per now, the EU and Italian regulations have created two main families of quality and territorial origin- related schemes. The well-known PDO/PGI/TSG brands are EU recognised and are based on an increasingly rigorous control on the origin of the raw materials used to prepare the specialties and of the preparation techniques (Tola 2010). The effects and the success of such certification schemes can be measured in terms of number of certificates issued. The Italian list of PDO/PGI/TSG products (as per March 18th, 2016) accounts for 283 items, 165 of which are PDOs, 116 are PGIs and only 2 are TSGs, showing that the looser scheme is the least successful in terms of adoption. On a regional level, the Sardinian Government has approved and deposited a list of PATs (Agrofood Traditional Products) which accounts for 183 products (3.75% of the Italian PATs). Sardinia also holds five PDOs and one PGI (Tola A. et al 2007).

Methodology

In order to measure the perceived authenticity of the products, between February and May 2015 we carried out an enquiry on pupils of the primary and junior high schools in 3 municipalities of Ogliastra (GC group, 121 individuals 42% F, 58% M) and on their grandparents (GP group, 164 individuals, aged 57-98, 67% F, 33%M). The questionnaire aimed at assessing the persistence of traditional products within the households of Ogliastra, considering two generations of people

(98% of the interviewees from the two groups are related one to the other). The interviewees were asked to enumerate all the traditional/authentic dishes that are usually prepared in the household and other they may know even though not prepared at home. Further questions focused on the origin of the food acquired in the household.

Results and discussion

The lists of the "traditional" products, ordered by frequency, show that 12 out of the first 15 entries are common to the two age groups.

The total number of products deemed "authentic" in the two lists is 39. Moreover, the first three items (culurgiones, gathulis, roasted meat) are in the same position in both lists while the others are in different positions but still very close in frequency. This evidences a strong continuity between past and present food habits.

Regarding the purchasing habits, the two groups show similar profiles with a slight preference for the "grandparents" to purchase food products in small shops or markets and for the "grandchildren" families to produce food instead of buying it. This behaviour is explained partly by different lifestyle and income levels among the groups, although the preference towards homemade/home grown products is prevailing in both (87% GP, 93% GC).

Finally, the majority of declare to check, with variable consistence, the origin of purchased products.

We found 27 products identified by both samples in the official PATs list. The products found in the list created through the enquiry are also consistent with those cited by the literature (Tola A. et al 2014). This makes it possible to create a brand focused on the origin of the products, given their high level of recognisability notwithstanding the generation shift.

Regarding the benefits in terms of health derived from the consumption of traditional foods, some studies are available while others are underway. Homemade

bread, (Pes et al. 2014) has always played a major role in the Sardinian shepherds' diet. The potential pro-inflammatory effect of this high-carbohydrate diet was likely counterweighted by the intense physical activity of the majority of subjects. The use of natural fermentation methods is able to reduce postprandial glucose and insulin blood levels by 25% reducing also the related risks of obesity and diabetes.

Sheep and goat milk products, including lactic acid-fermented varieties such as 'casu axedu' (IPA pron. /a'ʒədu/), are most popular. A diet based on goat's milk can improve lipid metabolism, especially by decreasing triglycerides and it shows a hypocholesterolemic effect. It also has a high level of short and medium-chain saturated fatty acids, which have protective effects on colon carcinogenesis. Its high content of carnitine allows improving the overall cell metabolism. Its higher content in calcium and phosphorus may have preserved the LBZ population from the loss of bone tissue and consequently the risk of fractures. Goat's milk is also rich in zinc and selenium.

Conclusion

The methods used have helped identify a set of 27 authentic products of the Ogliastra BZ. If a strategy has to be drafted to certify as "authentic" and "healthy" the products of the BZ, some additional studies have to be carried out on the effects on health derived from their consumption, since not all the product types are covered. The products with no specific health related properties could be certified as authentic, but in order to preserve their association with idea of "healthy food" some additional information on nutritional values and on the suggested consumption could be added on the label. A two-level certification scheme could be put in practice. An entry level label is aimed at certifying the origin and preparation method of the product. A 2nd stage label will state the product's health related effects, while, as an alternative, other valuable qualities of the product (such as

organoleptic characteristics) are highlighted together with suggested consumption quantities.

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Methods of Analysis Quality and Safety of the Packaged Drinking Water

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Abstract. The paper provides analysis of advanced sensory and instrumental methods of quality and safety of the packaged drinking water. It was offered the algorithm of working out theoretical concept and practical application of profile analysis of complex sensory indicators. Description of analytical equipment of leading foreign firms is given. There has been a characteristic of spectrophotometric method. Analysis of the packaged drinking water on iron content was carried by the spectrophotometric method.

Keywords*: sensory analysis, profile method, spectrophotometric method, quality and safety, packaged drinking water*

Introduction

The problem of quality and safety of drinking water becomes a global scale. The modern world has become even more demanding to consumer features of water in the discovery of chronic diseases and poisoning of people through consumption of poor quality and dangerous drinking water [3]. According to conducted monitoring, there is an acute problem of guaranteeing the safety of drinking water in Ukraine. As

reported by experts, the unsuitable water for consumption consume more than 65% Ukrainian. The main reasons for this phenomenon is the rivers affiliation of Ukraine to 3rd and 4th degree of pollution; the unbalanced layout of the most waterservice companies, imperfect water policy and legislation on safety and quality of drinking water [5].

Water is considered packaged under the condition of using drinking water of underground sources of drinking water or drinking water of centralized drinking water supply, additionally cleaned with the aim to improve its quality, in a hermetic package.

The number of manufacturers of bottled water annually increased by 5 - 10%, but the problem of guaranteeing safety and quality of drinking water is extremely important.

The purpose of this work is the assessment of quality and safety of the packaged drinking water that is implemented in Ukraine.

To achieve this goal it was performed the following tasks:

- the market analytics of packaged drinking water was analyzed;
- the forming factors and preservation of consumer properties of packaged drinking water were researched;
- a comparative assessment of the safety of packaged drinking water was conducted by various manufacturers;
- the ways of improving the quality and ensuring the safety of packaged drinking water were indicated.

Material and methods

The object of the study was bottled drinking water that is implemented in Ukrainian market, packed in consumer packaging PET- bottle of 0.5 liters of the following manufacturers:

- TM «Vittel» (JSC «Vittel N.W.S.», manufactured by France);

- TM «Morshyn» (JSC «Morshyn mineral water plant" Oscar ", manufactured by Ukraine);
- TM "BonAqua" (PI "Coca-Cola Beverages Ukraine Limited", manufactured by Ukraine);
- TM "Truskavets" (OOO "Aqua-Eco" manufactured by Ukraine);
- TM "Bon Boisson" (JSC "Novomoskovsk factory Minvody" manufactured by Ukraine).

The subjects of research were consumer properties of packaged drinking water.

To assess the quality of packaged drinking water, we developed 5 point-scale sensory evaluation of quality indicators.

An objective assessment involves a complex mix of organoleptic and physico-chemical parameters. Physico-chemical methods were determined such indicators of quality and safety of packaged drinking water:

• pH value (pH);

• iron (III).

Results and discussion

The systematic of conducted research indicates that the rate of hydrogen (pH) - is one of the most important indicators of water quality that determines the nature and rate of chemical and biological processes, indicates the degree of acidity or alkalinity of water. At neutral pH (7.0) acid and alkali is present in water in equal amounts (or non-existent). Such environment is the most balanced and best for the passage of biochemical reactions in the body. At the same time, water with low pH has an increased corrosion activity and with increased pH - alkalinity has a characteristic, unpleasant odor, causes irritation of eyes and skin. In nature, the pH is usually situated in the range where it does not directly affect on the quality of consumable water.

Thus, the pH indicator of packaged water samples was characterized by the following values: mineral water TM "Vittel" - 7,09, mineral water TM "Morshyn" - 6.4, mineral water TM "BonAqua" 7,35, mineral water TM "Truskavets" 7 23, TM mineral water "Bon Boisson" 7.68.

In accordance with the requirements of Ukrainian legislation, the pH indicator of packaged carbonated mineral water should be from 6,5 pH to 8,5 pH. The only sample that does not correspond the required standards is mineral water of TM "Morshyn" Ukraine (pH 6,4). From our point of view, this is caused by the fact when the air is in contact with water the carbon dioxide dissolves in water, which forms carbonic acid H2CO3, therefore water pH is reduced to 5.7 - 6. The consequence of this phenomenon is the emergence of a slight sour taste that aggravates the organoleptic qualities of water.

In complex with the assessment of acidity rate, we determined iron content (III) - one of the most widespread natural elements. In surface spring water the iron is usually found in the form of organic compounds, preferably colloidal (insoluble in water). Iron (III) - can create conditions for the bacterial iron development. As a result, water distribution system can completely "overgrown" for several months. The water, which contains iron, can have a rainbow membrane on its surface and create a ferruginous bottom on water distribution tubes. Besides the natural content of iron (II) and iron (III) in water, corrosion of metal surfaces is added. Long-term consumption of water with iron content of more than 0.2 mg / L can lead to various liver disease, to the increased risk of heart attack and so on. At high concentration of iron in water there is a specific metallic taste, which adversely influences on the taste of beverages in a negative way [7].

According to the study, the iron content (III) of carbonated bottled mineral water was characterized by the following values: mineral water TM "Vittel" 0,0000 mg / l, mineral water TM "Morshyn" 0,0021mh / l, mineral water TM "BonAqua" 0 , 0021 mg / l, mineral water TM "Truskavets" 0.0021 mg / l, mineral water TM

"Bon Boisson" 0.0041 mg / l. According to national requirements, the maximum permissible iron content for non-carbonated bottled mineral water is less than 0.2 mg / l.

Accordingly, we concluded that the iron content in the samples packaged carbonated mineral water meets the requirements of the legislation of Ukraine [1].

At the same time it should be noted that the economic situation in Ukraine has affected on the market of packaged natural mineral water. Despite the fact, that almost all companies which are involved in the delivery of water, operate within the country and also produce water in Ukraine, the cost of production and delivery water for the years 2014-2015 significantly increased. Accordingly, the cost of production to the consumer compared to January 2014 also increased (about 25-40% depending on the region and supplier).

Conclusion

The researches of consumer preferences in the market of packaged mineral water found that consumers trust to the popular brand, because almost 50% of the carbonated market, and almost 70% of noncarbonated water belong to 10 major manufacturers. The results of organoleptic and physico-chemical studies of packaged carbonated mineral water samples established:

• the investigated samples of mineral water have a good level of organoleptic properties;

• the investigated samples have lower levels of iron (III), meet the standards and are safe for consumption.

With the aim of ensuring a guaranteed level of quality and safety of packaged drinking water we offer:

1. to harmonize the legislation of Ukraine and the EU countries with regard to requirements for safe drinking water.

2. to implement the ecological and economic methods of water management;

3. to establish the accelerated monitoring of surface and underground water facilities.

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Surface Colour and Acrylamide Content of Market-Purchased Food

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Abstract. The aim of this study was to investigate the relation between colour difference and acrylamide (AA) content of market-purchased food. Test materials were 60 different food products. AA was separated by RP - HPLC - DAD. Surface colour was measured by a portable spectrophotometer MiniScan EZ in units CIE L*a*b*. Our study found that correlation coefficients for AA with L, a and b values were significant ($p<0.05$) for French fries and potato chips, but were not significant ($p>0.05$) for bread, breakfast cereals and biscuits. These results indicate that the browning of market-purchased cereal-based products cannot be an indicator of AA content. Thus, the significance of the correlation between colour difference and AA amount depended on the type of food. Results indicate that it was difficult to estimate the amount of AA based on browning colour of market-purchased food.

Keywords*: acrylamide, surface colour, market-purchased food*

Introduction

One of the latest neurotoxic and carcinogenic substances discovered in food is acrylamide (AA). Acrylamide was primarily found in plant based foods. Heat treated starchy foods such as potato, cereal and bakery products contains high levels

of acrylamide. Estimation of acrylamide occurrence in food commodities is a great concern in many countries. Factors such as difference in food composition, high temperature (more than 120°C), and high carbohydrate, free asparagine, reducing sugars, pH, water content, ammonium bicarbonate and high concentration of competing amino acids can influence on variation in acrylamide level (Claeys, Vleeschouwer and Hendrickxet, 2005, Claus, Carle and Schieber, 2008). The main pathway for AA formation in foods is the Maillard reaction. The Maillard reaction occurs on the food surface and leads to the production of desirable color, flavors and aromas (Lingnert et al., 2002, Matthäus & Haase 2014). Many studies have found a correlation between browning color and AA formation in laboratory-processed food products (Ahrne´ et al., 2007, Mastdagh et al., 2008, Capuano et al., 2009). However, although commercial roasted food products, with their browning colour and roasting flavor, are very popular in Poland, they have not been studied. Therefore, the aim of this study was to investigate the relation between colour difference and AA content of some market-purchased food.

Material and methods

Food samples. Test materials were 60 different food products bought at retail in Poland in 2014. The research materials were divided into six food groups including: French fries ready-to-eat (10), potato chips (10), soft bread (10), crisp bread (10), breakfast cereals (10) and biscuits (10). In all food groups the relation between colour difference and acrylamide content was determined. One sample was represented by at least two packs of the product from the same production batch. Analyses were performed in triplicate and the results were expressed as averages.

Chemicals. The acrylamide standard (99.8%, catalogue No. 23701) and all chemicals of HPLC analytical grade were obtained from Sigma–Aldrich (St. Louis, MO, USA) and Merck (Darmstadt, Germany).

Determination of acrylamide. The AA content in all food products was determined with the method developed by Michalak, Gujska and Kuncewicz (2013).

Measurement of colour. The surface colour of food products was measured by a portable spectrophotometer MiniScan EZ (HunterLab, Germany) in units CIE L*a*b*, where L* represents lightness, positive a* = red, negative a* = green, positive b* = yellow and negative b* = blue. The colour was measured at ten different positions on the product surface.

Statistical analysis of data. The assays were carried out in triplicate and the results are expressed as mean values ± standard deviations (SDs). The data were analysed using the Statistica 12.5 software package (StatSoft, Poland). Significant differences were calculated using Duncan's Multiple range test and were considered statistically significant at the 5% level. Correlations among AA and "L*", "a*" and "b*" components of surface colour were determined by Pearson's correlation analysis at the $p<0.05$ confidence level.

Results and discussion

In the studies conducted worldwide, AA content in food ranged widely from lower than 100 μg/kg in high protein foods, to the highest amounts of 100–4000 μg/kg in high carbohydrate foods (Capuano et al., 2009). Determined acrylamide content in tested products ranged widely from 75 μg/kg for soft wheat bread to 703 μg/kg for breakfast cereals (Table 1). The obtained results show a great variability in acrylamide level between different brands of the same product. The study showed that acrylamide average levels for all groups of products were lower than „indicative value" for acrylamide recommended by UE (2013/647/EU).

Table 1.

Acrylamide content in products (n = 10)

Products (number of products)	**AA[1] (µg kg^{-1})**
French fries sold as ready to eat (10)	377±106^{b}
Potato chips (10)	546±101^{ab}
Soft wheat bread (10)	75±26^{c}
Crisp wheat bread (10)	312±153^{b}
Wheat flakes (10)	703±121^{a}
Biscuits (10)	523±165^{ab}

Note: [1] Mean ± standard deviation; a, b, c, d – Mean values in columns with the same letter are not significantly different ($p < 0.05$); n = The number of the same kind of products obtained from different producers; AA = acrylamide

Information on the relationship between browning and acrylamide formation varies widely. Some researchers have reported that high-temperature, long-time treatment of foods is responsible for a great increase in AA levels in foods, without causing significant changes in the colour or texture parameters (Anese et al., 2009, Taubert et al., 2004). On the other hand, in many studies a good correlation between the acrylamide content of fried, baking and roasting foods and their colour was shown (Ahrne´ et al. 2007, Mastdagh et al., 2008, Capuano et al., 2009).

Our study found that correlation coefficients for AA with L, a and b values were significant ($p<0.05$) for market-purchased potato products, but were not significant ($p>0.05$) for bread, breakfast cereals and biscuits (Table 2). That is, a lot of cereal-based products had darker colour (low lightness and high yellowness) at lower AA contents. Other cereal-based products had brighter colors at higher AA contents. Differently than with the potato products. These results clearly show that the degree of surface browning could be used as an indicator of acrylamide content in market-purchased potato products. But the browning of market-purchased cereal-based products cannot be an indicator of AA content probably because of a strong influence of different raw materials and manufacturing conditions on AA content.

Table 2.

Correlation matrix between AA and "L*", "a*" and "b*" components of surface colour in products (n = 10)

Products (number of products)	Colour parameters	AA
French fries sold as ready to eat (10)	"L*" "a*" "b*"	-0.835* 0.825* 0.386*
Potato chips (10)	"L*" "a*" "b*"	-0.384* 0.225* 0.786*
Soft wheat bread (10)	"L*" "a*" "b*"	-0.185 0.159 0.123
Crisp wheat bread (10)	"L*" "a*" "b*"	-0.086 0.069 0.048
Wheat flakes (10)	"L*" "a*" "b*"	-0.135 0.125 0.066
Biscuits (10)	"L*" "a*" "b*"	-0.148* 0.075* 0.106*

Note:*Correlation coefficients statistically significant at $p < 0.05$; n = The number of the same kind of products obtained from different producers; AA = acrylamide

Conclusion

The significance of the correlation between colour difference and AA amount depended on the type of food. As shown by the other studies, under the controlled system, the correlation between colour difference and the amount of AA in heating food was highly significant. However, market-purchased cereal-based foods did not show a significant correlation between colour and AA amount. Thus, the results indicate that it was difficult to estimate the amount of AA from the browning colour of market-purchased cereal-based products without considering the recipe, processing conditions and raw materials.

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The Effect of Different Sugars on the Alcohol Content

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Abstract. Alcohol has now become indispensable in many industries. The key role in alcoholic fermentation plays yeast, which transform sugar into cellular energy and produce ethanol and carbon dioxide. From the technological point of view the most significant impact on the quality of the final product and on the amount of alcohol has a purity of both yeast culture and medium.

The main aim of this work is to determine the type of carbohydrates that is the best for the yeast *Saccharomyces sp*., and thus lead to the highest alcohol content in the ferment. This yeast can use mono and polysaccharides. In the first stage of fermentation sugars are reduced to glucose and fructose. In this way, substances difficult to assimilate are converted into simple substances, what faster the growth of yeasts. Therefore it can be assumed that the type of sugars will have an impact on the rate of metabolism of microorganisms, and in the end on the concentration of ethanol. The results however did not allow unambiguously verify the hypothesis because accompanying substances were important in the fermentation process.

Keywords*: carbohydrates, fermentation, alcohol*

Introduction

Products of alcoholic fermentation are known almost from the very beginning of humanity‘s existence. The first record dates back to 10,000 years before Christ. Beer was discovered as first, probably by chance. Depending on the civilizations alcoholic beverages performed different functions (Hanson 2013). Nowadays alcohol has become indispensable in many industries. It plays an increasingly important role in medicine but primarily in the fuel industry.

Alcoholic fermentation is a complex process that consists of several stages and includes different chemical reactions. And although this process was discovered many centuries ago, its nature was known relatively recently. The process is carried out by yeast, which using a range of enzyms transform sugar into cellular energy and produce ethanol and carbon dioxide as a side-effect. At the beginning of the fermentation process the yeast break down different forms of polisaccharides to monosaccharides, glucose and fructose 1,6-diphosphate. For this reaction the yeast use different enzymes, both inside and outside the cell. For example the enzyme invertase catalyzes the hydrolysis of the sucrose into glucose and fructose by breaking the O-C (fructose) bond (Flee 1997, Yan Lin et. al. 2012). In this way, substances difficult to assimilate are converted into simple substances, which provides less complicated system of food intake and faster the growth of the yeasts. It is probable that the type of sugars will have an impact on the rate of metabolism of yeast, and in the end on the concentration of pure ethanol.

The main goal of this study was to determine what type of carbohydrates is the best medium for the yeast *Saccharomyces sp*., and thus allows to obtain the highest concentration of alcohol in the ferment. Due to its simple structure monosaccharides are predisposed. They should be easily „digestible“ for yeast and rapidly transformed into ethyl alcohol. However, it may turn out that the difference between the efficiency of the fermentation process will be slightly higher, if at all.

The hypothesis, which will be verified in the present study is: monosaccharides are more easily assimilated by the yeast than the polysaccharides and for this reason the resulting concentration of the alcohol in the ferment will be higher in the case of simple sugars.

Material and methods

The research material consisted alcohol solutions obtained by the fermentation of mediums (broths) prepared with the use of following sugars: glucose, fructose, saccharose (refined beet sugar), potato starch and sugar cane. In the experiment, the yeast *Saccharomyces cerevisiae* produced by "BioWIN" company, symbol DRVIN and trade name Fermivin were used. The yeast *Saccharomyces cerevisiae* is the most commonly used in the industry, known and used since ancient times in baking, brewing and distilling. As a top-fermenting yeast they have low requirements and the ability for fast and dynamic alcoholic fermentation. Moreover, they are resistant to 10-12% alcohol concentration and high osmotic pressure arising from the presence of sugar and inorganic substances. These yeasts have a high tolerance for temperature, but ferment most efficiently at 30-33°C and at relatively low pH . They are resistant to non-volatile organic acids but volatile acids are toxic to the yeast (Lipińska 2006, Yan Lin et. al. 2012).

The fermentation broths were prepared from 500g of distilled water, 125g of appropriate sugar and 0.4g of yeast. First, from a weighed amount of distilled water approximately 10 ml was casted into a beaker and combined with yeast to prepare the yeast starter so-called yeast slurry. The remaining part of the water was mixed with an appropriate sugar. In order to complete dissolution of the sugar the solutions were heated to 80°C and after they were cooled to a temperature of about 30°C and combined with a prepared yeast starter. Thus prepared broths were poured into the bottles and closed tightly with the use of fermentation tube.

The alcohol content was determined according to the methodology described in the Regulation of the Minister of Agriculture and Rural Development on the detailed method of making fermented wine beverages and methods of analysis of these drinks for the official control of commercial quality (Journal of Laws, 2013 no. 0 item 624). Test sample was subjected to distillation and then the relative density of the distillate was measured by pycnometer method. Based on the density of the sample the corresponding alcohol content was read off from the table.

Results and discussion

The duration of the fermentation of individual medium was varied, as shown in Table 1. As a first began to ferment broth including sugar cane, fermentation began after about 32 hours and was the longest. The yeast in the starch medium were activated at the latest. The activity lasted about 10 days and was low. In this broth a thick layer of sediment of undissolved saccharide was visible on the bottom from the very beginning. After start of the fermentation bubbles of carbon dioxide released sporadically. More often they were visible in the sediment causing its porosity.

Table 1.

The duration of the fermentation process

Type of medium (carbohydrates)	Beginning of the fermentation [day]	Length of the fermentation [days]
Fructose	2,5	15,5
Glucose	2	19
Saccharose	2	23
Starch	4	10
Sugar cane	1,5	25,5

In other broths after the beginning of the fermentation a foam appeared on the surface of the solution, followed by turbidity. In the next phase of the process the solutions became clear and on the bottom the sediment of the dead yeast appeared.

The fermentation process was considered terminated when the absence of evolution of carbon dioxide. After the end of fermentation process the broths of glucose and fructose were colorless, clear with a small amount of sediment. Saccharose medium was characterized by a delicate yellow color, while the one of cane sugar was slightly brown, with little turbidity and a large amount of sediment. Starch medium remained turbid with a thick layer of the saccharide on the bottom.

The highest alcohol content was obtained in the ferment from the sugar cane (Table 2). It was 2.5 times higher with respect to the second ferment from saccharose. In the case of starch medium there was no production of alcohol or its amount was too low to be determined with the method used.

Table 2.

The average density of destillates and corresponding alcohol content

Type of medium (carbohydrates)	**Density of the destillate**	**Alcohol content in the ferment [%]**
Fructose	0,99874	0,88
Glucose	0.99835	1,15
Saccharose	0,99706	2,03
Starch	1,00000	0,00
Sugar cane	0,99198	4,94

The results are much lower than expected. The probable reason is the use of the pure, refined sugars for the preparation of set points - sugar cane was the exception. All living organisms, including yeast, for proper functioning require various nutrients, including the micro- and macronutrients. Lack of these components caused premature death of yeast. As mentioned before, the exception was sugar cane, and probably it is why in this case the fermentation process was the longest and the highest alcohol content was obtained.

Conclusion

Ever wider use of alcohol has become a motive to undertake research aimed at increasing the efficiency of the fermentation process. Efforts were made to determine what type of carbohydrates is the best medium for yeast, and will lead to the highest alcohol content in ferment. The results, however, did not allow unambiguously answer to this question. It turned out that an important role in the fermentation process played a trace nutrients. Therefore the hypothesis can not be veryfied.

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Application and review of an integrated check-list to promote legal compliance and socially responsible behaviors among ethnic enterprises

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Abstract. The promotion of upgrading and compliance with legal requirements by ethnic firms needs increasing knowledge of the mandatory legislation on various topics (e.g. contracts, environmental management, hygiene and safety). In addition, it requires the adoption of tailored and innovative methods in order to enable widespread dialogue between foreign and indigenous entrepreneurs in the local economy, taking into consideration specific cultural traits of ethnic entrepreneurs. This paper discusses the review of an integrated and flexible check-list (firstly developed by our research group in 2013-2014) after having been applied to a sample of Chinese firms in the textile/clothing sector within Prato industrial district. These firms have voluntarily undergone the assessment despite the sensitivity of the issues taken into consideration. Starting from the obtained results, our check-list has been revised in some parts with the dual purpose of i) increasing the level of investigation on the compliance of the production processes with mandatory requirements, and ii) becoming also a preliminary tool for companies that want to implement further volunteers management procedures. Together with public administrations, trade associations and professionals in the territory of Prato, one of the main future objective of our work will be to promote further actions to facilitate socially responsible behaviors, such as the design of a

specific standard based to both legal and voluntary requirements, in order to obtain a certification. A certifiable standard would have the potential to contribute in promoting the sharing of ethical and productive rules within the industrial district, as a crucial factor for local development and the sustainability of productive chains.

Keywords*: check-list, assessment, ethnic entrepreneurship, ethics*

Introduction

The harmonious and sustainable development of a territory does not happen by chance, but rather it is – or it should be – pursued by actors and stakeholders of the territory itself (Biggeri et al., 2015a).

Nowadays, the support to the upgrading of firms' production processes in industrial areas with high incidence of ethnic entrepreneurship is a crucial policy area to promote socio-economic integration between foreign and indigenous entrepreneurs, as increasing multiculturalism characterizes local economies due to globalization and migration processes.

This is particularly the case in the industrial context of Prato, where the strong presence of ethnic entrepreneurship is characterized both by a high dynamism (Irpet, 2015) and by widespread use of illegal work and non-compliant with safety and taxation (Dei Ottati, 2014). In this context, our action-research has been focusing on the development, the application and the first review of a newly method designed to start a dialogue with company owners and identify needs and compliance of production processes with mandatory requirements, in order to start regularization processes and improvement.

Material and methods

Since 2013, we have been experimenting and promoting, together with local authorities and entrepreneurs' associations, an innovative model in the industrial district of Prato. The "ASCI" model includes: 1) the application of a newly designed check-list tool to detect firms' non-compliances with mandatory legislation; 2) the provision of tailored technical assistance to entrepreneurs by "technical mediators" of different nationalities, who have been purposively trained to support the management systems of productive processes by ethnic enterprises, also eliminating language and cultural barriers, in order to suggest actions to improve compliance and upgrading. All in all, the "ASCI" model allows to fully assess the compliance with mandatory requirements and define upgrading processes in ethnics companies, also establishing relationship based on transparency and trust (Borsacchi et al., 2016).

Nowadays the "ASCI" check-list - Revision 01 (Biggeri et al., 2015a) is widely used by the local Chamber of Commerce and by entrepreneurs' associations. In addition, our research group had the chance to apply it in more than 140 companies of different size and sector of activity.

Results and discussion

In this paper we outline the results of the application of the "ASCI" model on a sample of 86 sole trader companies owned by Chinese entrepreneurs and located within Prato industrial district (76% in the Municipality of Prato). The legal form as sole trader is highly popular among Chinese entrepreneurs in Prato (Irpet, 2015). The sample includes 49% of companies that have started their activity after 2012. Regarding the sector of activities, the sample is composed as follows: garment industries 54%, wholesalers 8%, knitwear 4%, weaving 3%, ironing 3%, textile printing 1%. Regarding the total number of members, employees and co-workers,

89% of enterprises counts less than 15 persons. The results on compliance with mandatory legislation are outlined below for each business management area.

Workplace safety: First, the situation concerning the basic document for the Safety Risk Assessment is mainly positive (52%), while 12% of the companies had officially started the practice to obtain it. Second, results regarding the identification of persons with key responsibilities for safety management – i.e. the Supervisor of Workplace Safety and the Workers' Representative for Safety – allow to highlight the high correlation with the presence of the Safety Risk Assessment, in particular as regards the Supervisor of Workplace Safety, appointed in 42% of cases. However, the Workers' Representative for Safety is appointed in 20% of companies, while 6% rely on an external representative and more than half of the companies in the sample are not conform. Third, the conformity of electrical system was detected in 32% of the companies, despite the work of entrepreneurs' associations in supporting the installation, adjustment and maintenance of the electrical system through qualified installers, as well as information campaigns implemented in the territory to discourage use of non-compliant practices and unqualified personnel (Biggeri et al., 2015b). Widespread compliance has emerged instead related to the absence of gas cylinders not intended for the production (75%), considered as one of the most likely causes of fire. However the process of fire risk assessment is carried out only by 15% of the companies.

Environmental management: Entrepreneurs show a widespread lack of knowledge and awareness on mandatory requirements and procedures in this area. For instance, the requirements for waste management in the company – including classification, accounting, and final disposal – are not conform in 60% of businesses composing our sample.

Contracts and workers' rights: There is a lack of knowledge and awareness by entrepreneurs on all issues related to the contracts, the opening of insurance positions and mandatory communications, payment of benefits and payroll

management, with a total reference to external consultants. For example, in about 34% of cases entrepreneurs are not aware if their company opened the Insurance Position.

Taxation: In this area results show even greater problems than the contracts area in terms of compliance and knowledge by the entrepreneurs, with high difficulties to obtain basic information due to a total reference to external figures, such as the business consultant. For instance, as regards shipping documents and invoices of company's trades, 36% of companies do not know or provide such information.

Training and information: First, the situation regarding the training of Head of Prevention and Protection is not conform in 25% of the sample. Hygiene and Safety training for workers is even worse, being limited to only 9% companies. The scenario is considerably better for workers first aid (41% of compliance) and fire (42%) training.

Starting from the feedbacks collected during its application, our check-list (Rev01) has been revised in some parts and some mandatory requirements. The revised version (Rev02) keeps the same 4 parts structure of the previous one:

- Part 1 – "General information about the firm";
- Part 2 – "Areas of business management" (i.e. mandatory requirements). This part is the technical core of the check-list. It consists of a total of 157 questions (see Table 1) referred to 47 mandatory requirements in 6 management areas (i.e. Sections) (see Table 2);
- Part 3 – "Direct observation";
- Part 4 – "Problems and opportunities".

Table 1.

Comparison between Rev01 and Rev02 regarding the n. of questions composing the integrated check-list "ASCI"

Sections	**N. of questions**	
	Rev01	*Rev02*
Workplace Safety	42	46
Food Hygiene (for food companies)	25	25
Environmental Management	19	18
Contracts and Workers' Rights	27	24
Taxation	29	32
Training and Information	13	12
Total	155	157

Source: Authors' elaboration

Table 2.

Sections and mandatory requirements of "ASCI" check-list (Rev02)

Workplace Safety	**Environmental Management**	**Contracts and Workers' Rights**
- Safety risk assessment - Supervisor of workplace safety - Workers' representative for safety - Medical doctor for workplace safety - Conformity of electrical system - Conformity of grounding system - Safety of the equipment and machinery - Individual protection devices - Data sheets for chemicals - Fire risk - Risk of interference - Premises - Promiscuity between living and working environments - Canteen	- Environmental authorisations - Air emissions - Industrial water pollution - Waste management - Waste register - Waste accounting	- Number and features of associates, employees and collaborators - Number and features of employees of foreign nationality - Hiring of employees belonging to vulnerable groups - Contract categories - Hiring official communications - Work organisation - Wages/salaries management - Territorial insurance position - Workplace accidents management
Taxation	**Training and Information**	**Food Hygiene**
- Balance sheet - Certificate of incorporation	- Compulsory training • Supervisor of	- HACCP manual - Hygiene authorization

- VAT - Taxes paid in the last financial cycle - Special requirements in case of commercial activities for private consumers - Special requirements in case of commercial activities for other firms - Special requirements in case of commercial activities for foreign markets - Taxes model declaration	workplace safety • Workers' representative for safety • Hygiene and Safety training for workers • Workers first aid training • Workers fire training • Forklift operator • Boiler operator • HACCP manager • Food worker - Job training - Information	- Suppliers' qualification - Raw materials arrival - Check of raw materials' labels - Cleaning and sanitising - Pest control - Analytical plan

Source: Authors' elaboration

Our check-list has been revised with the dual purpose of i) increasing the level of investigation on the compliance with mandatory requirements, and ii) becoming also a preliminary tool for companies that want to implement further volunteers management procedures (i.e. for the risk assessment and/or preliminary to the implementation of certifiable standards).

Conclusion

This study collects the needs and compliance with mandatory business management requirements in 86 Chinese-owned companies in Prato district. The results have shown, albeit with varying intensity, various issues and non-compliances in respect to the mandatory requirements.

After revision, our “ASCI” check-list will better help to investigate about the compliance with mandatory requirements and it would be also used as preliminary tool in companies that want to implement further volunteers management procedures.

Indeed, together with public administrations, entrepreneurs’ associations and professional in the territory of Prato the main future objective of our work will be the design of a specific standard based to both legal and voluntary requirements, in

order to obtain a certifiable label. The aim of the future standard will be the promotion of ethical and productive rules within the industrial district, as a crucial factor for local development and the sustainability of productive chains.

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The Influence of Microwave Heating on Oxidative Change in Olive Oil

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Abstract. The purpose of the study was to analyse oxidation changes in olive oil induced by microwave heating at powers of 200, 400, 600, and 800 W. *The heating time for the samples was 3-30 minutes.* The presence of secondary products of argan oil oxidation was determined on the basis of changes in the anisidine value and Totox index. Secondary oxidation products were formed in samples that were microwave heated at powers of 400-800 W. *After 30 minutes of heating* the anisidine values were: *12.9 (200 W), 41.3 (400 W), 57.5-58.2 (600-800 W).* The Totox values increased with time, similarly to the anisidine value.

Keywords*: olive oil, microwave heating, oxidative changes.*

Introduction

Oil in contact with atmospheric oxygen and high temperatures undergo qualitative changes. These changes in oils used as heating medium when using microwaves is the object of research of many authors. The results obtained show that the type and number of the product formed depends, in particular, on the type of fat, microwave power applied and duration of the process (Gharachorloo et al. 2010, El-Moneim et al., 2009; Lukešová et al., 2009).

In comparative analyses of qualitative changes in olive oil induced by conventional and microwave heating, higher degree of degradation was observed in the case of microwave heating (Poiana, 2012). In these conditions higher concentration of primary and secondary oxidation products as well as polar compounds was observed. The differences observed are the consequence of the way the energy in transferred in the methods of heating used (Buczek & Ostasz, 2011). The likelihood of formation of radicals during microwave heating is larger than in the case of traditional heating (Caponio, Pasqualone and Gomes, 2002).

To determine the products of oxidation and fat degradation formed, chemical analyses methods may be used, based on parameters such as peroxide value, anisidine value, Totox index, contents of free fatty acids, of dienes and trienes, and of polar bondings (Cerretani et al., 2009; Dostalova et al. 2005).

Material and methods

The aim of the study was to analyse the oxidative changes occurring in olive oil during microwave heating with a capacity of 200, 400, 600, and 800 W. The subject of the study was the olive oil *Goccia d'oro*. This is the most recognizable brand of olive oil in Poland. It is the oil obtained from the first cold pressing of hand-picked olives of the types "coratina" and "oliarola". It is a product which is not subjected to any chemical treatment, but only passes through a delicate process of filtration. The fatty acid content in 100 g of the product on the basis of information provided by the manufacturer on the label of the product is:14.0 g SFA, 70.0 g MUFA, and 10.0 g PUFA.

Samples of oil of 50 g were heated in a microwave reactor RM 800. The microwave power was 200, 400, 600, and 800 W. The heating time of the individual oil samples was as follows: 3, 6, 12, 15, 18, 21, 24, 30 minutes.

To evaluate the oxidative changes taking place in the heated oils, the following parameters were used determined on the basis of PN/ISO standards:

peroxide value (PN-ISO 3960:2010), anisidine value and Totox index (PN-EN-ISO 6885:2001).

Results and discussion

During heating of the oil samples with the microwave at time *t* the oil temperature was measured. The maximum temperatures depended on the microwave power. The higher the microwave power the higher the observed temperatures. In the samples of oil heated by microwaves the highest temperatures were:140-145^{o}C (200 W), 172-174^{o}C (400 W) and 205-207^{o}C (600 W), 220-230^{o}C (800W).

The peroxide value is a parameter allowing the initial stage of the oxidation changes to be determined, i.e. the presence of primary oxidation products of oils, especially hydroperoxides. The peroxide values as a result of microwave heating rose over time. In samples heated by a microwave power of 200 W this parameter grew gradually between 4.47-12.29 mEq O2/kg. Under the influence of microwave power of 800 W heating longer than 6 min., there was no significant increase in peroxide value (6.43-7.49 mEq O2/kg). This is the result of decomposition of hydroperoxides in these conditions to secondary products.

Table 1 shows the changes in the anisidine value in the tested samples. This is a parameter indicating the presence of aldehydes, which are secondary oxidation products of oils. The values of this parameter rose over time in all the oil samples analysed.

Table 1.

Changes of anisidine value in olive oil microwave heated at various powers

t, min.	200 W	400 W	600 W	800 W
0	6.68	6.68	6.68	6.68
3	7.51	7.67	8.80	9.96
6	7.85	8.83	11.22	17.98
9	7.78	9.64	20.51	24.17
12	8.16	15.70	26.69	30.17
15	8.38	20.98	33.65	35.92
18	8.84	25.56	39.46	40.85
21	8.81	27.52	41.21	45.00
24	9.96	35.40	48.20	54.94
30	12.91	41.30	57.47	58.16

In oil heated by a microwave power of 200W the changes in this value were the smallest. After 30 min. of heating value the observed anisidine value was 12.91. Much larger changes in this parameter were found in the samples heated by microwave powers of 400-800 W. A significant increase in the anisidine value was found after 15 min. of microwave heating at 400W (15.7-41.3). The samples heated under microwaves at higher values of this parameter were: 20.51-57.47 after 9 min. (600 W) and 17.98 -58.16 after 6 min. (800 W).

Figure1 is a graph of changes in Totox index as a function of time. This ratio determines the overall degree of oxidation of the oil on the basis of changes in the peroxide and anisidine numbers. The Totox indicator is calculated using the formula: $Totox = 2 \cdot PV + AnV$.

The highest Totox indexes was found in oil heated by a microwave power of 800 W, where they amounted to 72.6 mEq O_2/kg after 30 min.. Slightly lower values of this parameter were observed in samples of oil heated by microwaves with a capacity of 400 and 600W. After 30 minutes' heating they amounted to: 71.05 mEq O_2/kg (400 W), 67.62 mEq O_2/kg (600 W). In oil heated by a microwave power of 200 W the oxidative changes were the smallest and gradually rose over time to a value of 37.49 mEq O_2/kg after 30 mins. heating.

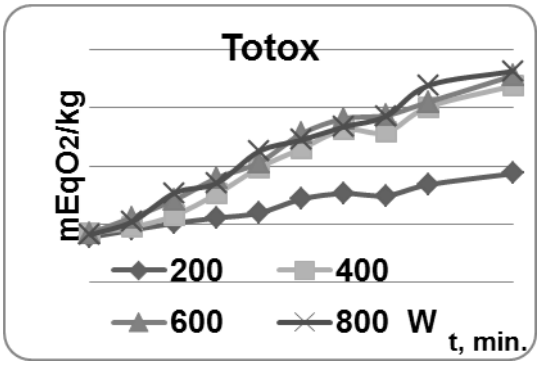

Figure 1. Changes of Totox index in argan oil microwave heated at various powers

Changes in Totox value with time in the oil microwave heated are described by means of the following 2nd degree polynomial: $y = ax^2 + b\,x + c$. The polynomial parameters *a*, *b*, *c* and the coefficient of determination R^2 are presented in Table 2.

Table 2.

2th degree polynomial representing changes in Totox value

Power, W	$y = a\,x^2 + b\,x + c$	R^2
200	$y = -0{,}003x^2 + 0{,}833x + 15{,}54$	0,982
400	$y = -0{,}012x^2 + 2{,}192x + 13{,}92$	0,981
600	$y = -0{,}023x^2 + 2{,}545x + 15{,}60$	0,991
800	$y = -0{,}019x^2 + 2{,}506x + 15{,}40$	0,989

Conclusion

Heating oil samples with microwaves causes the temperature of the oil to rise. The maximum temperatures depended on the microwave power.

The peroxide values as a result of microwave heating rose over time. The longer the heating of the samples, the higher the number of new hydroperoxides in samples heated by a microwave power of 200 W. Longer microwave heating with a higher power of 800 W, for over 6 min., resulted in no significant increase in peroxide value. This is the result of decomposition of hydroperoxides in these conditions to secondary products.

The quantity of secondary oxidation products was dependent on the microwave power. The higher the microwave power, the shorter the heating time required for secondary oxidation products to form in a shorter heating time, and their number increased in proportion to the power of the microwaves applied. The maximum anisidine value, at 57.5-58.2 were found in samples of oil heated at microwave powers of 600-800 W. Totox index values grew in time analogously to the anisidine value.

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Development of a Methodology for Identifying Juice Products From Pomegranate

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Abstract. In this article shown the results which confirm that the fractional composition of anthocyanins of pomegranate juice is important, but cannot be identifying feature of authenticity. These results obtained by using high-performance liquid chromatography. It is necessary to study of the chromatographic profile of carboxylic acids of pomegranate juice and identification of marker compounds. It can help us to identify markers of counterfeiting pomegranate juices in combination with studying the chromatographic profile of anthocyanins.

Keywords*: pomegranate, pomegranate juice, anthocyanins, carboxylic acids, markers of authenticity, identification, falsification*

Introduction

The most important components of pomegranate are phenolic compounds among which predominate anthocyanins (45-80% of the total quantity of phenolic compounds), which are mainly concentrated in cell sap, and controls the color of pomegranate seeds. Pomegranate juice contains the following anthocyanidins: delphinidin-3,5-diglucoside, cyanidin-3,5-diglucoside, delphinidin-3-glucoside, cyanidin-3-glucoside, pelargonidin-3-glucoside, pelargonidin-3,5-diglucoside.

Anthocyanins are responsible for the external and interior color of the pomegranate and the red color is considered by consumers to be one of the main quality parameters. There is current medical interesting on the anthocyanins , for example , crude extracts of several types of fruits appears to have replaced rutin and its derivatives in the treatment of illnesses involving tissue inflammation or capillary fragility.

Phenolic compounds are synthesized in plants partly as a response to ecological and physiological pressures such as pathogen and insect attack, UV radiation and wounding. The basic structural feature of phenolic compounds is an aromatic ring bearing one or more hydroxyl groups. Plant phenolic compounds are classified as simple phenols or polyphenols based on the number of phenol units in the molecule. Thus, plant phenolics comprise simple phenols, coumarins, lignins, lignans, condensed and hydrolysable tannins, phenolic acids and flavonoids.

Flavonoids are powerful antioxidants, and their activity is related to their chemical structure. Plant flavonoids can act as potent inhibitors of low-density lipoprotein (LDL) oxidation or of macrophage oxidation. Dietary consumption of flavonoids was shown to be inversely related to morbidity and mortality from coronary heart disease (CHD).

Due to their strong antioxidant properties, anthocyanins are of considerable interest to the scientific community and consumer market. The naturally electron deficient chemical structure of anthocyanins makes them highly reactive toward free radicals and, consequently, makes them powerful natural antioxidants. Increased understanding of their health benefits has led to a growing interest in determining anthocyanins in foods, nutraceuticals, and natural products.

The high cost of products after processing of pomegranate has led to the emergence of the food market of counterfeit products. There is a growing trend of

producing products with the use of complicated ways of counterfeiting on the market (using of banned units – flavoring matter, sugar-containing ingredients, acidifiers, natural food grade dyes, extracts, etc.), detection of which required enhanced identification with the use of modern analytical methods and expert knowledge. Authenticity is the object of regulation in the global production and circulation of juices and juice products. Regulatory requirements for authenticity of juices are in CODEX STAN 247-2005 (sec. 3.2—3.4).

The purpose of our research is the finding of the identification features which can show us the authenticity of pomegranate juice by using high-performance liquid chromatography of complex phenolic substances and anthocyanins of the juice. The proposed identification method is based on the comparison principle of "finger prints". Chromatographic profiles of anthocyanins are compared with the standard chromatogram of a control sample of original pomegranate juice. Comparison of the chromatographic profiles allows to identify peaks which are noncharacteristic of the composition of phenolic compounds of authentic juice and to make a conclusion about falsification.

Material and methods

Materials

Fresh juices of pomegranate from Azerbaijan and Uzbekistan and two samples of the reconstituted juices were obtained in this research. We choose these countries because most of our pomegranate products are made by Azerbaijan's and Uzbekistan's pomegranates. More than 100 samples of pomegranate juice were identified like authentic and counterfeit juices as a result of earlier screening tests for 3 years. This research presents results of two typical representatives of authentic and counterfeited juices, confirming the effectiveness of the proposed method of

identification. Conventional names will be found hereinafter aimed to exclude the advertising of manufacturers: 1 - authentic juice 2 – counterfeited juice.

Methods

The method described here is a sensitive, fast, and accurate way to determine anthocyanins in commercially available fruit juices using a simple dilution.

HPLC is the preferred technique for both separation and quantification of phenolic compounds. Various factors affect HPLC analysis of phenolics, including sample purification, mobile phase, column types and detectors. In general, purified phenolics are applied to an HPLC instrument utilizing a reversed phase C18 column, photo diode array detector (PDA) and polar acidified organic solvents. Several reviews are available on the application of HPLC and thequantification of phenolics. Normally, HPLC sensitivity and detection is based on purification of phenolics and pre-concentration from complex matrices of crude plant extracts.

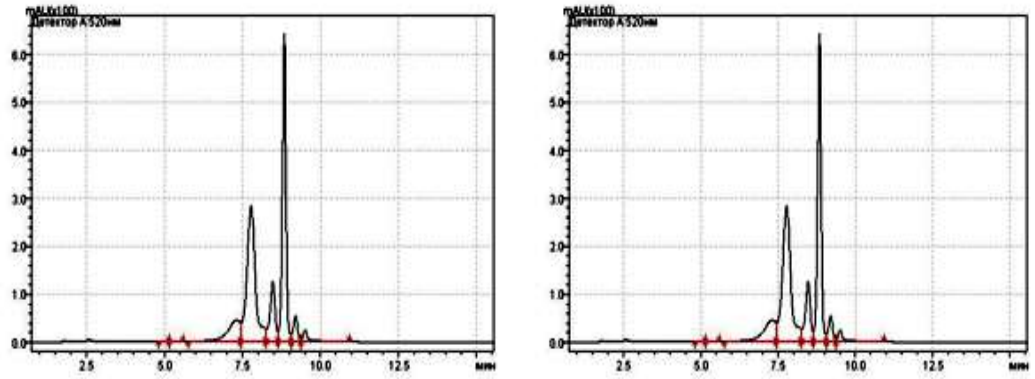
Anthocyanin and phenolic composition of pomegranate juice and juice products was determined on the chromatograph "LC-20 Prominence" of the company “Shimadzu” with spectrophotometric detector. Column 150 mm x 4.6 mm sorbent Nucleosil 100 Angstrom, C18, pre-column with the same sorbent. Spectrophotometric detection was conducted by ultraviolet absorption at wavelength: 520 nm for anthocyanins and 254 nm for phenolic compounds.

Results and discussion

Efficient method of establishing the authenticity of juices, proposed by the International Union, is the study of the composition of anthocyanins. [3] The qualitative composition of anthocyanins is specific and stable for pomegranates. Changes can be observed in total amount of anthocyanins and the ratio between the individual compounds because of different varieties or growing conditions. Our

research has shown that in pomegranates which were grown in different geographical regions, retained phenolic compounds of pomegranate, fractional composition of anthocyanins, which allows to judge the authenticity of pomegranate juice regardless of region of growth.

Figure 1 shows chromatographic profiles of anthocyanins freshly-pressed pomegranate juices, confirming their identity.



(a) (b)

Figure 1. Chromatographic profile of anthocyanins of freshly-pressed pomegranate juices (a – the juice obtained from pomegranates grown in Uzbekistan; b - in Azerbaijan)

Similar results were obtained through studies of chromatographic profiles of phenolic compounds. We have found that there is a decrease in the mass fraction of certain types of anthocyanins in the process of juice production, heat treatment and during long-term storage. Figure 2 shows the results characterizing the decrease of the mass fraction of individual fractions of anthocyanins during storage of directly expressed juice.

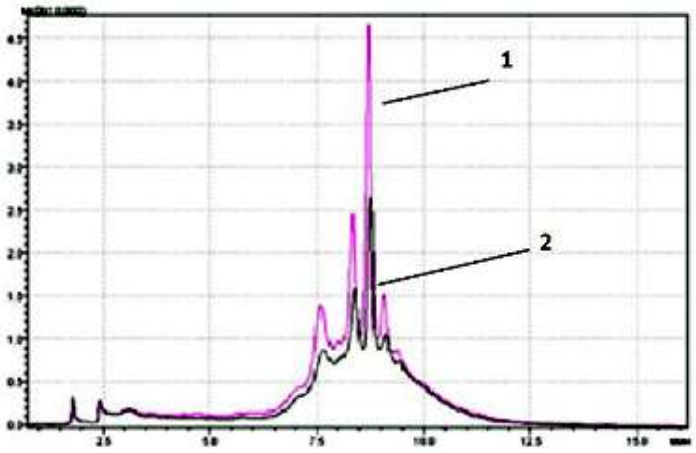
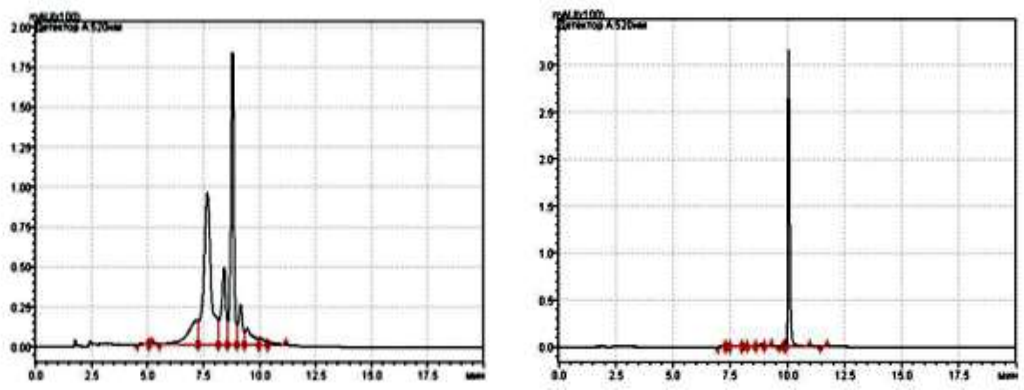


Figure 2. Decrease of the mass fraction of individual anthocyanins during storage of directly expressed pomegranate juice: 1-freshly prepared; 2 - after 3 weeks of storage

Figure 3 shows the chromatographic profiles of anthocyanins of reconstituted juices 1 and 2.



(a) (b)

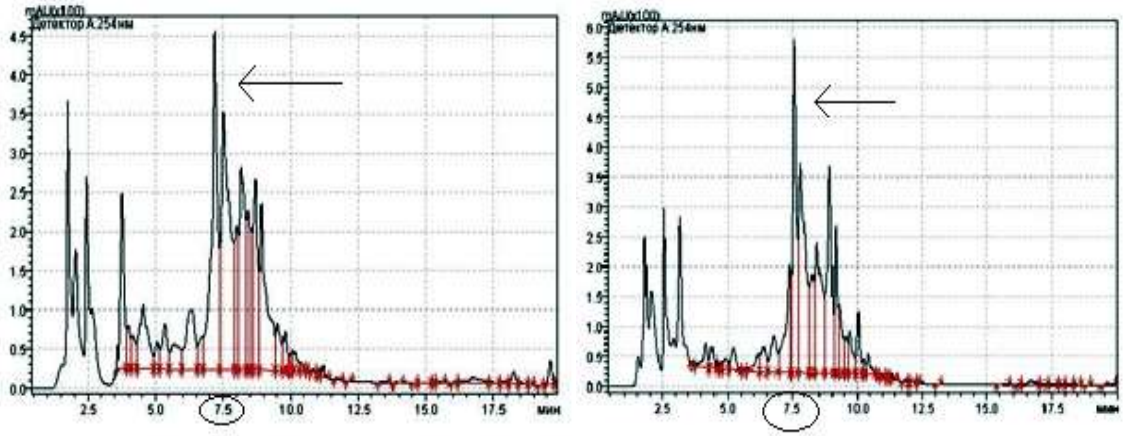
Figure 3. Chromatographic profiles of anthocyanins of reconstituted pomegranate juices (a – authentic reconstituted pomegranate juice; b - counterfeit juice)

Anthocyanins of pomegranate juice is important identifying feature, but we can't rely only on him, since anthocyanins tend to collapse under the influence of

temperature, oxygen, metal ions, and other factors. This fact causes complications in the evaluation of authenticity of juices. In view of this, we have complemented the study of anthocyanins of pomegranate juice by analysis of chromatographic profiles of complex phenolic compounds. More than 50 different samples of pomegranate juices from different manufacturers were installed stable identification features characterizing the authenticity of goods.

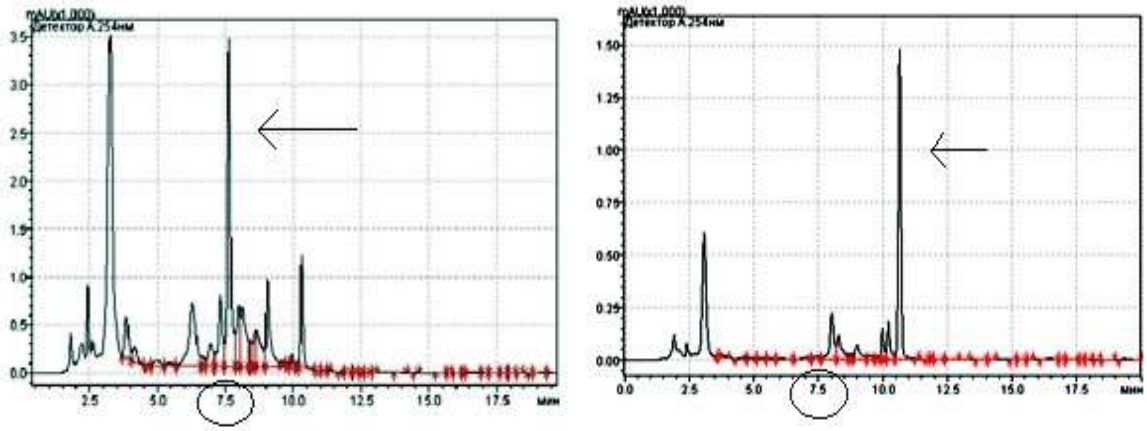
Compounds that can be used as markers in the analysis of authenticity of pomegranate juices were found by analyzing industrial samples of juice, the authenticity of which hadn't doubt. It was found that all pomegranates have phenolic compounds emerging for 7.5 minutes of elution regardless of habitat. It is necessary to pay attention to the group of compounds emerging for 7-10 minutes. This group of flavonoids will also be identifying.

Figure 4 shows the chromatographic profiles of phenolic compounds of freshly-pressed pomegranate juices, confirming their identity. Figure 5 shows the results of determination of phenolic compounds in the reconstituted pomegranate juices 1 and 2.



(a) (b)

Figure 4. Chromatographic profiles of phenolic compounds of freshly-pressed pomegranate juices (a – the juice obtained from pomegranates grown in Uzbekistan; b - in Azerbaijan)



(a) (b)

Figure 5. Chromatographic profiles of phenolic compounds of reconstituted pomegranate juices (a– authentic juice; b - counterfeit)

The juice 2 has unusual intense peak emerging for 11th minute and almost absent or found in very low concentrations above the marker peaks, which are characteristic of authentic pomegranate juice. Represented data are typical for exit-juice product that has features of counterfeit and demonstrate the results of the study

of a wide range of juice products from pomegranates, presented in the consumer market.

Conclusion

Our investigations showed that the fractional composition of anthocyanins and phenolic marker compounds emerging for 7-10 minutes can be identifying features in determining the type of juice and detection of fraud.

We can speak about counterfeiting products according to uncharacteristic of the profile of anthocyanins of pomegranate juice peaks and the absence of marker peaks that are stable components of phenolic compounds in pomegranate juice.

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The Study of Oxidation of Walnuts Fat during Storage

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Abstract. The aim of this paper was to explore chemical and sensory stability of walnuts during their storage.We determined fatty acids composition, as well as chemical indicators of lipid oxidative stability (peroxide and thiobarbituric values and conjugated dienes) during accelerated storage of walnuts. Besides this, a thorough descriptive analysis was performed. The accelerated storage of walnuts was shown to cause the significant changes in sensory characteristics of walnuts, as well as the significant increase of peroxide and thiobarbituric values and contents of conjugated dienes.

Keywords*: nuts; storage; walnuts; lipid oxidation; peroxide value; thiobarbituric value; conjugated dienes; fatty acid composition; volatile compounds*

1. Introduction

Walnut is one of the most popular nut species in the world. It is characterized by high nutritional value and very positive influence on the human organism. Walnuts are used not only as an individual foodstuff, but also as the part of different food products.

Walnuts are the unique natural source bothof basic nutrients and a complex of minor biologically active compounds. They contain high quantity of complete proteins and fats, that causes their high energetic value. Walnuts contain vitamines A, E and B group, as well as unique complex of micro- and macroelements.

Walnuts contain up to 60 % of fat rich in mono- and poly-unsaturated fatty acids that causes their rapid rancidity. The products of lipid oxidation have a carcinogenic and mutagenic effect on people, that's why oxidative processes in fats attract so great attention in assessing the quality of nuts.

The aim of this study was to explore oxidative processes that occurin fats during storage of walnuts.

2. Materialsandmethods

For investigation walnuts harvested in 2015 were purchased at Moscow retail markets. To study the oxidative damage of these walnuts they were stored in thermostate at 30 °C in the package from the manufacturer. The measurement of main parameters of oxidation were performed every week for 5 weeks.

To estimate the degree of oxidation of walnuts fats the walnut oil was produced by cold pressing. For this purposewe measured peroxide value that shows the content of primary oxidation products (peroxides and hydroperoxides), thiobarbituric value that shows the content of secondary oxidation products, i. e. malondialdehyde, the content of conjugated dienes, volatile aromatic substances and fatty acid composition.

Peroxide value (PV) was evaluated following the GOST R 51487-99 «Plant oils and animal fats. Method of estimation of peroxide value». It consisted in the reaction in darkness of a mixture of oil and chloroform-acetic acid 2:3 (v/v) with saturated potassium iodide solution. The iodine formed was titrated with 0.1 N sodium thiosulphate until the yellow colour almost disappeared. Then after adding

starch indicator titration was continued until the blue colour just disappeared. Peroxide value (meq kg^{-1}) was calculated according to the formula: PV = volume of sodium thiosulphate × 0.1 N × 1000 / mass of oil.

Thiobarbituric value (TV) was evaluated according following methods: 5 ml oil was added to 5 ml of thoibarbituric acid solution and heated in a water bath for 40 min for pink color development. Then the tube with mixture was first cooled for 1 hour. The absorbance was measured at 532 nm using spectrophotometer. Thiobarbituric value were calculated from a standard curve of malondialdehyde and expressed as mg of malondialdehyde per kg sample.

Conjugated dienes (CD). Weighed oil samples were dissolved in 6 ml of n-hexane. The conjugated diene absorbance was measured at 232 nm in a spectrophotometer. The results were reported as the sample extinction coefficient E (1 %, 1 cm).

Fatty acid composition were evaluated following the GOST 30418-96 «Plant oils. Method of estimation of fatty acid composition». The fatty acid methyl esters of total lipids were analyzed on gas-liquid chromatograph (Kristalljuks 4000 M) equipped with a flame ionization detector. An HP FFAP capillary column (50 m × 0.2 mm × 0.3 nm) was used. Column temperature was programmed from 200 to 230 °C. The carrier was nitrogen. The separated fatty acid methyl esters were identified by comparing their retention times with those of authentic samples.

Volatile compounds were determined by extraction of chopped walnuts with diethyl ether. The extract obtained was chomatographed in ChromatographShimadzu GC 2010 with mass detector GCMS-QP 2010 on column MDN-1 (hard-connected methyl silicone 30 m × 0.25 mm) in temperature gradient regime at following operating parameters: injector temperature 2000°C, interface temperature 2100°C, detector temperature 2000 °C. The carrier gas was helium.

Sensory analysis was performed by group of tested tasters. All the parameters were determined in threefold repetition. The results of investigation were statistically processed.

3. Results and discussion

Assessment of walnuts smell was performed by profile method. We used such descriptors of smell: “oily”, “fruity”, “nutty”, “sweet”, “woody” and “rancid”. The intensity of the smell was assessed according to the 10-points scale. Results obtained are presented at figure 1.

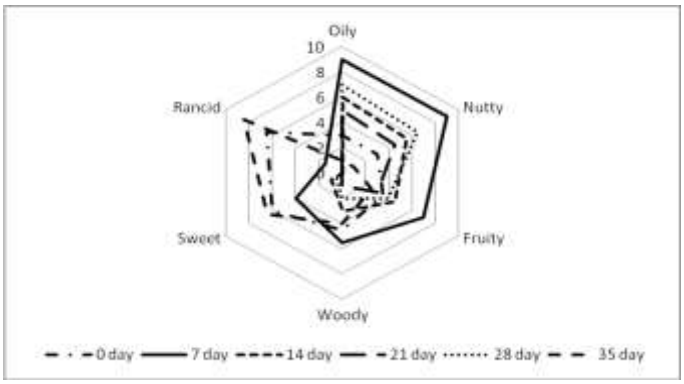
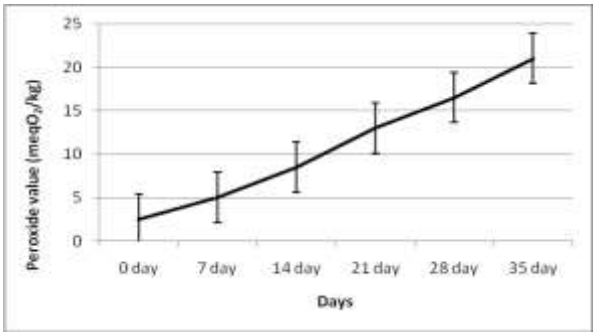


Figure 1.Dynamics of walnuts smell intensity during accelerated storage.

During accelerated storageof walnuts the intensity of “oily” and “rancid” smells increased significantly while the intensity of “fruity” and “nutty” smells decreased.

The dynamics of peroxide value, thiobarbituric value and conjugated dienes contents during accelerated storage of walnuts is presented at figure 2. It is clear that all the values increased during storage.

(a)



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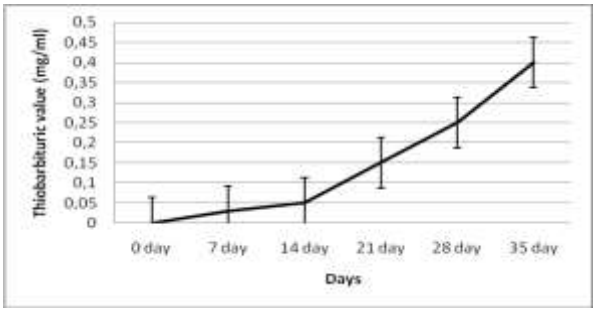

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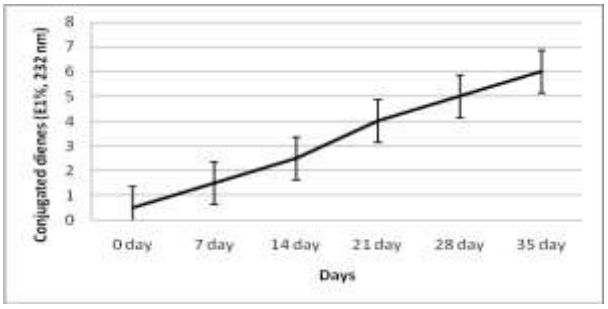


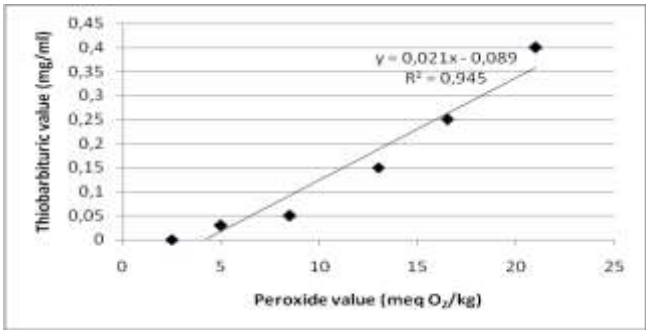
Figure 2. (a) Peroxide value, (b) thiobarbituric value and (c) conjugated dienes contents in walnutsduring storage

The PVs of walnut samples were from 2.5 (day 0) to 21.0 (day 35). The TV of walnut samples during storage varied from 0.01 (day 0) to 0.4 (day 35). The CD values of walnut samples during storage varied from 0.5 (day 0) to 6.0 (day 35). Sharp increase in all the values was observed after 14 days of storage, that was connected with intensification of oxidative processes.

The correlation among peroxide value, thiobarbituric value and conjugated dienes content was calculated (Figure 3). In general, it could be stated, that there

was good positive correlation among all three parameters with coefficient more than 0.9. Maximal value of this coefficient was observed among peroxide value and conjugated dienes content.

(a)



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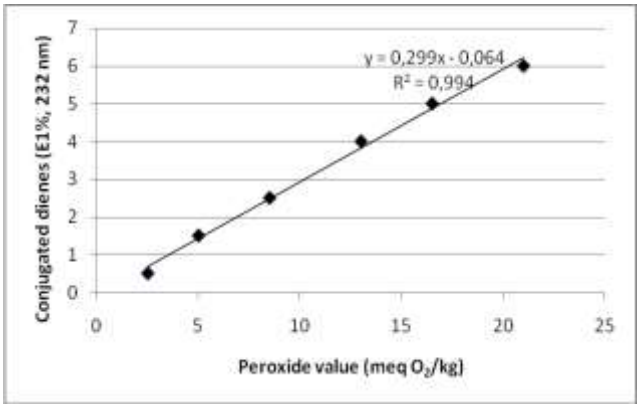

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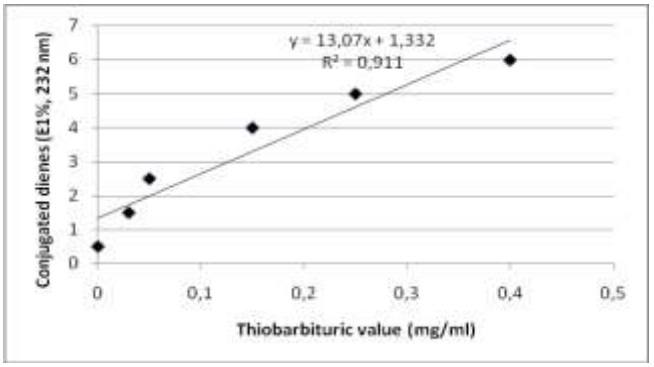

Figure 3. Relationships among (a) peroxide value and thiobarbituric value, (b) peroxide value and conjugated dienes, (c) thiobarbituric value and conjugated dienes

Results of determination of volatile substances are presented in table 1.

Substance	Content, %	
	0 day	35 day
Butyl-s-triazole	4.68	4.03
Isobutyl-oxyethyl-butyrate	4.12	3.55
Nonanal	2.11	1.82
Decane	12.04	10.36
Benzene	1.04	0.90
Dodecane	6.58	5.66
Undecane	1.14	0.98
Tridecane	3.47	2.99
Glycerol triacetate	2.86	2.46
Propanoic acid	3.04	2.61
Tetradecane	5.65	4.86
Irone alpha	2.66	2.29
Beta-bisabolene	2.06	1.78
Pentadecane	3.40	2.93
Hexadecane	3.47	2.98
Heptadecane	5.28	6.95
Phthalic acid	12.99	12.58
Bulyloctylphtalate	13.26	17.79
n-Hexadecanoic acid	5.71	8.67
Di-n-octylphtalate	3.04	2.61

Substance	Content, %	
	0 day	35 day
1-Hexanol	0.60	14.85
Ethinamate	1.23	12.26
2-Heptenal	0.05	6.98
Furan	1.87	32.78
Hexanoie acid	0.53	4.36
2-Noneon-1-ol	2.47	5.41
2-Nonenal	3.45	0.85
Octanoic acid	0.14	1.07
2,4-Nonadienal	0.36	1.05
Cyclohexanone	4.85	0.26
2-Dodecenal	6.54	0.80
Cyclohexen	0.08	0.95
Dodecadienal isomer	0.03	0.69
Decadienal	1.13	1.54
2-Octenalbutyl	0.07	0.23
Bicyclo	0.02	0.16
Dodecatrien	0.59	1.38
Octadecadienoic acid	3.84	0.08
Heptanoic acid	0.75	1.78
2-Undecane-9-methyl	6.24	11.28
2-Buten-1-amine	0.25	0.94

Table 1. The content of volatile substances in walnut samples

The data obtained show that the smell of fresh walnuts is causedby the following main substances: butyl-s-triazole, isobutyl-oxyethyl-butyrate, decane, dodecane, tridecane, propanoic acid, tetradecan, phthalic acid, n-hexadecanoic acid and di-n-octyl phtalate. Oxidative damage of walnuts was accompanied by increase in 1-hexanol, ethinamate, 2-heptenal, furan, hexanoicacid, 2-noneon-1-ol, 2-undecane-9-methyl, which determine the unpleasant smell of rancidity.

The chromatogram of volatile substances of walnuts after 35 days of storage is presented at figure 4.

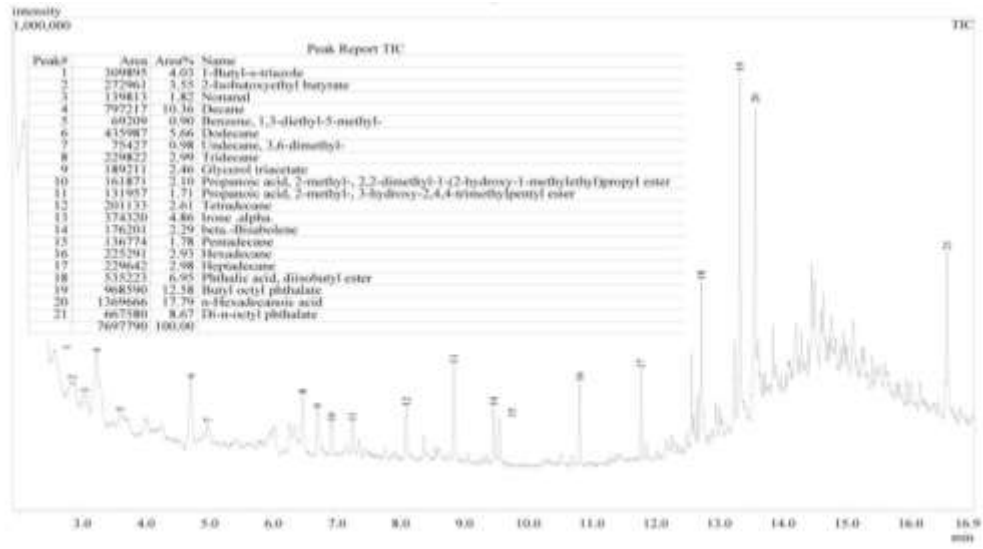

Figure 4. The chromatogram of volatile substancesof walnuts after 35 days of storage

Fatty acid composition of walnutsamples is presented in table 2. Data obtained correspond with results of all other studies.

Fatty acid	Content, g/100 g	
	0 day	35 day
Total saturated fatty acid	**10.97**	**15.71**
6:0	0.16	0.24
10:0	0.06	0.12
11:0	0.26	0.42
14:0	0.02	0.05
16:0	8.31	10.62

17:0	0.03	0.07
18:0	2.05	4.03
20:0	0.08	0.16
Total monounsaturated fatty acid	**16.00**	**17.83**
16:1	0.08	0.24
18:1	15.42	17.59
Total polyunsaturated fatty acid	**73.03**	**66.46**
18:2	60.28	54.98
18:3	12.75	11.48

Table 2. Fatty acid composition of walnut

Data of the table 2 show that walnut oil contains mainlypolyunsaturatedandmonounsaturated fatty acids. Predominant fattyacid is linoleic, the second one is linolenic. During storage the content of polyunsaturated acids decreases while the content of saturated fatty acids significantly increases.

The fatty acid composition of walnuts is important from several perspectives including nutritional quality, possible health benefits offered by monounsaturated and polyunsaturated fatty acid, especially in relation to blood serum lipid profile, flavor-desirable flavors often attributed to several fatty acid, contribution to texture, and importance in keeping quality.

4. Conclusions

Our investigations showed that the chemical indicators of walnut oil oxidation change during accelerated storage. Significant changes were observed in walnut smell characteristics – during storage oily and rancid smells intensified while the intensity of nutty and fruity smells decreased.

During storage all the indicators of oxidative damage of walnuts (peroxide value, thiobarbituric value and conjugated dienes content) significantly increased. Positive correlation among all these values was observed. Fatty acid composition significantly changed during accelerated storage of walnuts - the content of polyunsaturated acids decreased while the content of saturated fatty acids significantly increased. The composition of volatile aromatic substances also

changed considerably: storage is accompanied byaccumulation of substances with unpleasant smell of rancidity.

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Conditions and Evaluation of Safety Hazards Packed Chemical Substances and Preparations

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Abstract. The total production of industrial chemicals in the EU-28 increased each year between 2005 and 2007, rising overall by 4.4 % to peak at 371 million tonnes in 2007. During the financial and economic crisis, production fell by 31 million tonnes in 2008 and by a further 43 million tonnes in 2009. The rebound in activity in 2010 more than made up for the losses reported in 2009. In 2011, the production of chemicals in the EU-28 decreased again and then remained relatively stable during the period 2011–2013 (327, 330 and 322 million tonnes), which was still 40–50 million tonnes below the pre-crisis peak in 2007 (*The REACH baseline study. Comprehensive study report…2012).* Polish chemical industry produces about 27% of products in the form of chemical substances and preparations. This group includes inter alia products that are toxic, caustic, flammable, explosive, etc., which, due to their physico-chemical or biological properties can, if improperly handled during transport, storage or handling endanger the health or life of the people and a threat to the environment. Because of the risk of the occurrence of adverse effects on human life and health and the environment, all chemical substances and preparations require the use of packaging which meets the requirements of the regulations (Davidson, 2011), (Emblem, Emblem 2000). The priority of consumer policy - both European and Polish - is to ensure for all market participants high

safety standards. To achieve this purpose it is necessary understanding of the determinants and analysis of safety hazards packaged chemical substances and preparations.

The aim of the study is analysis of conditions and evaluation safety hazards associated with the packaged chemical substances and preparations.

Keywords*: safety hazard, packed chemical substances and preparations, determinants and analysis of safety hazards*

Introduction

Articles characterized by aggressive physicochemical properties, belong to the group of products of which the growth rate of production in Poland from 1995 to 2012 reached nearly 198%. In this group, there are all products with toxic, corrosive, inflammable, explosive, etc. properties, "which due to their physicochemical or biological properties can, in case of improper treatment during transport, storage or transshipment, cause health, life and environmental hazard." The name dangerous substances and chemical preparations was introduced by the Regulation (EC) of the European Parliament and of the Council of 18 December 2006, concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing a European Chemicals Agency. According to the above regulation, chemical substance is defined as "chemical elements or its compounds in the natural state or obtained by any manufacturing process, including any additive, necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition". However, a mixture or solution, composed of two or more substances are defined as chemical preparations. The above differentiation is extremely important on account of the way of classification of substances and preparations, differences in their labelling and procedures of their introduction to

turnover (*Regulation (EC) of the European Parliament and of the Council of 18 December concerning…*). The aim of the classification of substances and chemical preparations, on the basis of the analysis of specific results to human health is the distinction of the substances, which are carcinogenic, mutagenic or toxic to reproduction. However, the basic aim of the substances classification and environmental hazard mixtures is to warn the users about the danger to ecosystems.

Because of the danger of negative effects for health and life of the people and environment, all substances and chemical preparations require appropriate labelling, adequate to the requirements in Act of 25 February 2011. According to this Act, packaging of dangerous substances and dangerous mixtures placed on the market should *(Act of 25 February 2011 on the chemical substances and their mixtures …):*

I. have a construction that will prevent any incidental escape of the contents from the packaging. This requirement is not applicable where the specific technical safety devices are required.

II. be made of the materials resistant to damaging impacts of its contents and preventing formation of dangerous substances resulting from impact of the contents on the packaging material.

III. maintain tightness in the conditions of loads and tensions impacting the packaging in the course of its normal handling.

IV. In case of packaging fitted with replaceable fastening devices – they should ensure that their tightness shall be maintained in the course of repeated opening and closing operations in the conditions of normal handling.

V in case of packaging containing dangerous mixtures intended for sale to consumers, it shall

not have:

- a shape or a graphic design likely to attract or arouse the curiosity of children or to mislead consumers,

- a similar presentation or a marking used for foodstuff or animal feeding stuff or medicinal or cosmetic products.

Moreover, according to the Announcement of the Health Minister of 2 March 2015 concerning the labelling of packaging containing dangerous substances, mixtures and some mixtures based on the classification rules GHS (Global Harmonized System) and CLP (Classification, Labelling and Packaging) established by Regulation of the European Parliament and the Council of the European Union of 16 December 2008 concerning classification and labelling of substances and mixtures, each packaging containing substances and preparations must be marked correctly. Information about danger connected to the chemicals are passed through standard warnings and pictograms placed on the labels of packaging.

The priority of European and Polish consumer politics is to ensure all market participants maximally high safety standards. In order to achieve this goal it is necessary to react to already existing danger. Important elements of ensuring safety to the consumers are systems allowing to collect information about the danger caused by dangerous products including substances and chemical preparations such as: European Rapid Alert System of Information Exchange for Dangerous Products - RAPEX, Domestic System of Monitoring accidents caused by consumers (KSMWK) and Domestic System of information about Dangerous Products (KSIPN) are to allow collecting information about dangerous products and monitoring the results of their use.

The aim of the article is to define the assessment of security threat of packed substances and chemical preparations.

Material and method

The selection of efficient, raising customers` awareness instruments about the security threat of handling packed substances and chemical preparations, requires an analysis in the range of awareness concerning security threat of the packed substances and chemical preparations.

The aim of the conducted surveys was the assessment of security threat connected to the packed substances and chemical preparations by the consumers. The scope of the research concerned:

- defining of perceiving dangers connected to substances and chemical preparations,
- defining the influence of appearance of household chemicals products` packaging on purchasing decisions of this group of products,
- defining of warning elements on the packaging, which are important to a consumer,
- defining relevancy of imperfection of household chemical packaging and
- knowing customers opinion about the protection in household chemicals packaging.

The analysis of the questionnaire, as well as the information included in the literature, indicate that nearly 50% of the respondents pay attention to the products` packaging, when they make purchasing decisions. In case of the packaging of preparations and chemical substances, packaging is a crucial factor for about 40 of the respondents. The key factors, which decide about a purchase of so called chemicals are: brand and price of these products.

Results and discussion

In the empirical research connected to the analysis of awareness, concerning security threat of packed substances and chemical preparations, a consumer assessment of the importance of information on the packaging of household chemical articles has been done. The achieved research results have been presented on the fig. 1.

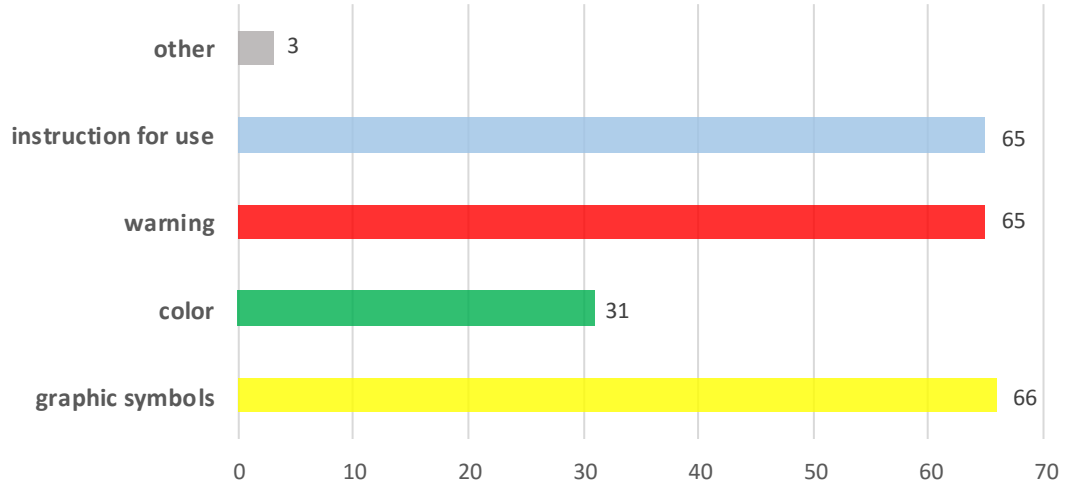

Figure 1. The assessment of importance of information included on the household chemicals packaging

Source: own elaboration.

The vast majority of the respondents (66 indications) claim that the warning elements present on the packaging of the products, which are paid attention to during purchase, are graphic symbols, warnings and instruction manual attached to the product. The colour of packaging has smaller meaning for the users of household chemical products (31 indications).

According to the fact that the household chemicals belong to the group of chemical preparations and substances, which, while being improperly used, can be health, life and environmental hazard, the analysis of the way of perceiving dangers connected to substances and chemical preparations was done. The results have been presented on the fig 2.

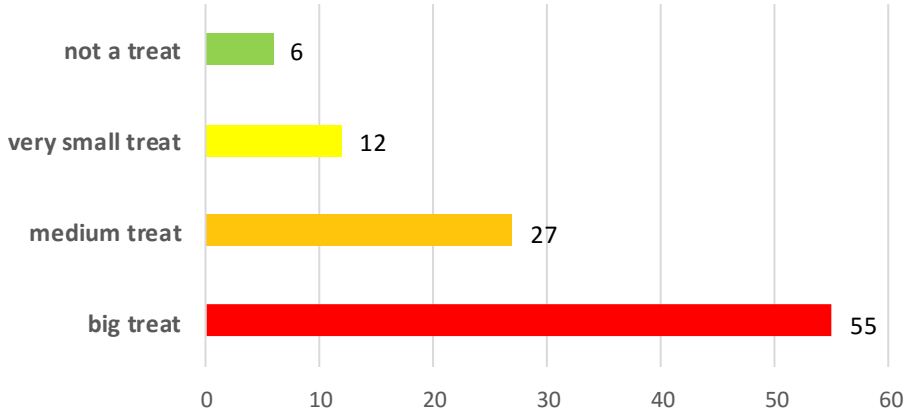

Figure 2. Perceiving dangers connected to substances and chemical preparations
Source: own elaboration.

In the question, which concerns the significance of dangers connected to the use of substances and chemical preparations, more than half of the respondents (55%) showed that the above products pose a big threat. For 27% of the people, who took part in the survey, household chemicals pose an average threat, however, for 4% of the respondents, substances and chemical preparations are not dangerous at all. It is worth to stress the fact that, the participation of the respondents, who claim the dangers connected to the use of substances and chemical preparations are crucial, increased with age. Level of education also differentiated the respondents` opinions in this scope, in the statistically crucial way. However, the assessment of the results of the relevancy of imperfection of household chemical products packaging, which may, in customers` opinion, be safety hazard while handling, have been presented on the fig. 3.

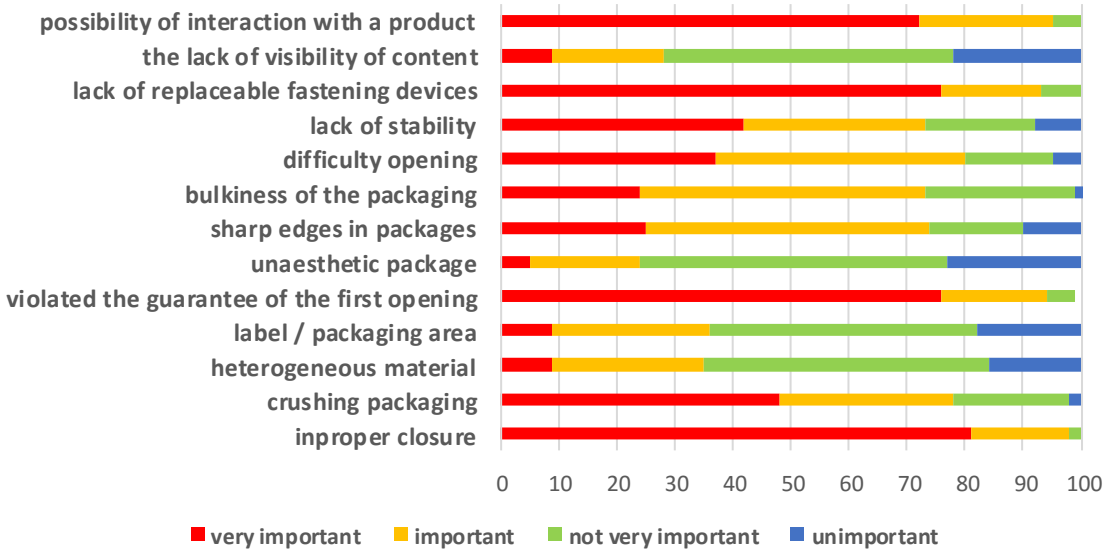

Figure 3. The assessment of the relevancy of imperfection of household chemical products packaging

Source: own elaboration.

The most important imperfections of the household chemical products for the respondents are: improper closure, violated the guarantee of the first opening, lack of replaceable fastening devices and possibility of interaction with a product. The above imperfections received 72-80 indications. In the respondents` opinion, crucial imperfections of household chemicals packaging, for which 40-50 indications have been noted, are sharp edges, opening and handling difficulties. However, as insignificant imperfections, the respondents show: heterogeneous packaging material, dirty label/packaging surface, its unaesthetic made and the content. The above imperfections received from 48 to53 indications.

Conclusion

Products safety is a crucial issue discussed in literature and being the subject of legal regulations. The state of packaging is an important signal for the customers

about possible dangers for safety of the products inside. The use of securities such as guarantee of inviolability of a product and protections against unwanted opening by children as well as consumers` awareness about possibility of serious faults, which have critical meaning for safety, influences the decrease of the risk connected to the security threat of the packed products. The research showed that the consumers are aware of appearance of possible faults in packaging in different groups of products. Presence of faults in packaging is one of the factors discouraging to a product purchase. During the purchase of food products, toiletries and household chemicals, consumers pay particular attention to faults like: guarantee violation of the first opening, improper closure, lack of replaceable fastening devices and negative interactions.

Consumers are aware of dangers resulting from possibility of falsification, pollution of a product (terrorism). That is why they see validity of the use of additional protections, which guarantee inviolability of a packed product. Even though the protections of inviolability of packaging make it difficult to open a product, consumers want to buy the articles, which are equipped in the above protections. On account of the fact that these protections are troublesome in everyday handling, producers should pay particular attention to their functionality. In the research concerning the awareness of security hazard of using packed substances and chemical preparations, it has been proved that consumers are aware of the danger connected to the use of the above products and say they need additional protections in the products to protect them against unwanted opening. Consumers claim that the packaging of household chemicals, medicines sold without a prescription, prescription medicines and cosmetics, should be equipped in such guarantees. Similarly to the case of the use of inviolability guarantee, consumers do not report any particular difficulties connected to the use of protections against unwanted opening, for example by children.

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8. Regulation (EC) No 21/2015 the European Parliament and of the Council of 19 January 2015 concerning the Classification, Labelling and Packaging of Chemicals.

Application of Multielement Stable Isotope Ratio Analysis for Traceability of Cheese Produced in Sardinia (Italy)

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Abstract. The growing interest of consumers in regional products, whose quality is closely related to a specific geographical area and traditional production methods, means there is a requirement to protect the producers of these highly esteemed foodstuffs from cheaper imitations or counterfeit products. Such frauds are also critical in cheese manufacturing, especially for those products with protected designation of origin (PDO), due to their higher economic value. To protect the reputation of regional foods, European Union law has defined the geographical indications PDO and PGI. Various typical cheeses are subjected to this regulation. The safeguarding of typical products implies traceability, which is derived from information on the origin of the raw materials, and on places and production methods. It is therefore necessary to find objective parameters that can correlate these foodstuffs with their place of production. Several studies have shown that the isotope ratios of some bioelements (particularly $^{13}C/^{12}C$, $^{15}N/^{14}N$ and $^{18}O/^{16}O$), measured by isotope ratio mass spectrometry (IRMS), are linked with the geographical origin of foodstuffs and can be used for traceability. These variables are also related to animal feed, and can thus be used for diet control. The aim of this study is to evaluate, by comparing data reported in the literature, the validity of isotope ratios in defining the traceability of typical cheeses produced in Sardinia. This comparative study should be valuable for milk producers to strengthen the bond

of their products with the territory. In addition, this knowledge could provide them with elements that could be inserted in production protocols to define better the typical characteristics of the cheese.

***Key words**: cheese, isotope ratio, traceability*

Introduction

The increase in the consumer's attention to genuine food products with fragrances and flavours that call up ancient traditions has led to the success of typical products on the national and foreign markets. The tendency to meet market demand with imitation products has entailed a drop in competitiveness in some regions, with effects on the rural economy. Geographical origin undoubtedly has commercial appeal and this is also clear from the flourishing PDO and PGI designations of geographical origin established by the European Community by Regulation No 510/2006. With the birth of these new forms of safeguarding, Sardinia managed to obtain the protection of three characteristic sheep's cheeses of its cheese production industry: "Pecorino Sardo", "Fiore Sardo" and "Pecorino Romano", the latter together with Lazio Region and Grosseto Province. The quest for objective parameters able to bind these products to their region or place of provenance is important to give the consumer guarantees on the true origin of typical products and provide producers with instruments to protect their produce. For this purpose the European Community has funded various study projects, including some born of the collaboration between the Istituto Agrario San Michele all'Adige and the Department of Commodity Sciences at the Faculty of Economics, University of Sassari, among which we recall the project CE SMT4 CT98 2236 entitled 'Development and Validation of Methods to Determine the Geographical Origin of Milk, Butter and Cheese', which also involved international partners (German, French, Austrian, English and Spanish). The aim of the project was to give an important contribution to the characterisation of the geographical origin of the cheeses. In this project the research group at the Department of Commodity Sciences, University of Sassari (Italy), focused their attention on dairy products of Sardinian origin and in particular on "Pecorino Sardo" and "Peretta", the latter made from cow's milk, using the isotope ratio of some bioelements for typing and traceability of these cheeses, in particular C, O and N,

determined by isotope ratio mass spectrometry (IRMS) (Manca et al, 2001), which various studies have suggested are among the most valid for controlling geographical origin (Manca et al, 2001; Chiacchierini et al., 2002; Chiacchierini et al., 2003; Manca et al. 2006; Bontempo et al. 2011; Bontempo et al. 2012).

Material and methods

The exploitation of isotopes in the traceability of Sardinian cheese was assessed by evaluating the data reported in the literature.

Results and discussion

The isotope ratios mostly investigated in cheese are $^{13}C/^{12}C$ and $^{15}N/^{14}N$, determined in the casein fraction, and $^{18}O/^{16}O$, measured in the glycerol fraction.

The $\delta^{13}C$ values of milk and cheese protein are similar. This parameter is correlated with the diet provided for animals, and is greater in the case of diets with plants using the C_4 photosynthetic cycle with a tropical origin, such as corn. Our studies have shown that the $\delta^{13}C$ value of corn is around –12‰, regardless of the place of production, while natural forages present values in the range between –25 and –30‰. The carbon isotope ratio is particularly useful for discovering the presence of any C_4 photosynthetic cycle plant supplements, such as corn, which have higher $\delta^{13}C$ content than C_3 cycle plants. In the ewes' milk cheese, Pecorino Sardo, the $\delta^{13}C$ values were all in the range between –26.5 to –24.5‰ (Manca et al. 2001; Chiacchierini et al. 2002), which can be attributed to a diet of grass and forage (C_3 cycle plants). In this type of cheese the highest values of $\delta^{13}C$, which can even reach the value of –21‰, were found in the casein of samples produced in winter, as a result of a larger amount of C_4 plants in the diet (Chiacchierini et al. 2002) when grass is scarce. The $\delta_{13}C$ values in the casein fraction of Pecorino Sardo are more similar to those found in Pecorino Romano, another typical ewes' milk cheese produced in Sardinia but also in Latium and Tuscany. Cheeses of this type produced in the three different regions have shown $\delta^{13}C$ values varying from –26.6 to –24.9‰, which is indicative of milk produced by free-grazing or pasture-grazing sheep. It is interesting to note that Sardinian cheeses

produced in different years (1998, 1999, 2001 and 2002) retained, over time, constant carbon isotope ratio values.

By comparison, in the $\delta^{13}C$ values found in ewes' milk sheep cheeses produced in other regions we note considerable differences between the Sardinian samples and those produced in the Abruzzo region, whose average values are equal to –23.4. No differences were found between the Sardinian samples and those from the central and southern regions of Italy (Latium, Apulia and Sicily).

Considering the carbon isotope ratio in Peretta, the best known typical cow's milk cheese produced in Sardinia, the values of this parameter in cheeses produced in local dairies are different from those found in factory products (Manca et al. 2006). In the first, $\delta^{13}C$ values are between –26.7 and –24.3 and are indicative of a natural forage diet, while in the latter they are between –22.3 and –19.5, revealing the presence of corn in the dairy cows' feed composition (Manca et al. 2006). The $\delta^{13}C$ values of factory products are similar to those produced in Northern Italy from raw materials at intensive production dairy farms. In fact, samples from the Abruzzo region, Friuli and the Parma region have mean values respectively of –22.1, –18.9 and –21.5 (Chiacchierini et al. 2002; Camin et al, 2012).

The nitrogen isotope ratio can provide information about the state of fertilization of pasture and its type. It also indicates the geoclimatic conditions of the area where the animals graze. Manca (2001) has found a mean value of $\delta^{15}N$, equal to 6.29 ± 0.72, in the ewes' milk cheese Pecorino Sardo, very similar to those found by Chiacchierini (2002) in other sheep's milk cheeses (6.97 ± 0.05). The Sardinian samples have mean values of $\delta^{15}N$ higher than those from other regions like Sicily (4.54 ± 0.59), Apulia (5.97 ± 0.72), Abruzzo (3.74 ± 0.05) and Latium (4.35 ± 0.28). The mean values found in Pecorino Sardo are similar to those found in Pecorino Romano (Manca et al, 2001; Chiacchierini et al. 2002). The enrichment of ^{15}N in Sardinian produce seems to be attributable to the particular geoclimatic conditions of the island (proximity to the sea and warm, dry climate). As in Pecorino Romano, the mean value of $\delta^{15}N$ was around 5.48‰ also in Peretta cows' milk cheese and varies with different years of production. As concerns the oxygen isotope ratio, the mean values found in Pecorino Romano and Peretta from local dairies (21.82 ± 1.72‰ and 22.70 ± 2.00‰ respectively) are higher than those found in cows' and ewes' milk cheeses from other regions.

Conclusions

These results have shown that the isotope ratio of the bioelements considered can be useful for traceability. Since these parameters are linked to the place of origin of products, their measurement and values can be introduced into the production protocol to control the real geographical origin of the cheeses. Guaranteeing the quality of a foodstuff that is an expression of the specificity of a particular territory is of fundamental importance for the enhancement and protection of the product on the market. Research aimed at demonstrating that some parameters may really be linked with the geographical origin of the produce must be encouraged and pursued and should not be seen by companies and institutions as an additional cost but, if anything, an investment, able to show their serious approach to meeting the consumer's requirements. Moreover, on our island the designation of origin may also have a supporting function for the diversification of the rural area economy, targeting reciprocal enhancement of the typical product and other economic activities present in the rural area that are linked, or could be linked, with the product, such as catering and tourist accommodation, and the production and marketing of other local products.

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The Quality of Snacks Available on the Polish Market on the Example of Salted Potato Chips

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Abstract. Potato chips are a commonly known snack, which is selected by people of all ages. This food product, however, because of high fat and salt content, as well as contents of acrylamide and trans fatty acids, resulting from high temperature frying, is considered to be unhealthy. Nevertheless, due to their desirable taste, oftentimes improved by the addition of monosodium glutamate, potato chips are frequently consumed snacks.

On the Polish market there are many companies that produce potato chips. It is, therefore, an important foodstuff on the snacks market. The products, however, differ significantly regarding the price and the claimed nutritional value. The aim of the study was to assess the quality of salted potato chips available on the Polish market. For this purpose, 8 products offered by 7 different producers were chosen. Samples were collected from four production batches. The analysis included verification of nutritional value as well as acid and peroxide values. In addition, the sensory quality, the amount of chips with defects and damaged, as well as the integrity of the packaging were evaluated. Analyses of acid and peroxide values were also conducted.

The results show that salted potato chips available on the Polish market significantly differ concerning their nutritional value and sensory quality.

Keywords*: snacks, potato chips, salted chips, quality*

Introduction

Potato chips are commonly a known and popular snack, which is selected by people of all ages (Salvador et al., 2009; Pedreschi et al., 2005). This food product, however, due to the high fat and salt content, as well as contents of acrylamide (Granda, Moreira &Tichy, 2004;Zhang et al., 2005), aldehydes, ketones and trans fatty acids (Moros et al., 2009), resulting from high temperature frying, is considered to be unhealthy (Yi et al., 2015). Acrylamide is associated with cancer risk, neurotoxic effects as well as reproductive toxicity, genotoxicity, and mutagenicity (Medeiros-Vinci et al., 2011; Exon, 2006).

Nevertheless, due to their desirable taste, oftentimes improved by the addition of monosodium glutamate, potato chips are frequently consumed snacks.

There are many companies that produce potato chips on the market (Salvador et al., 2009). The products, however, differ significantly regarding the price and the claimed nutritional value. Nevertheless, nowadays, consumers are more aware of the relationship food-nutrition-health. They are more informed about the quality of products they consume (Arias-Mendez et al., 2013; Shiroma & Rodriguez-Saona, 2009). That is why the aim of the study was to assess the quality of salted potato chips available on the Polish market.

Material and methods

The research was conducted on 8 varieties of salted potato chips available on the Polish market and produced by 7 different manufacturers. The samples were bought in supermarkets in Cracow. All the analyzed samples had original and tight packaging. The material comprised of four production batches and was collected in 2015. The samples were coded with letters A-H.

The research program was prepared on the basis of Polish Standard PN-A-74780:1996 “Potato products. Fried potato snacks” and was divided into two stages.

The first stage of the study included determination of peroxide value (PV), acid value (AV) as well as content of: water, fat,sodium chloride, protein and total ash. Carbohydrates' contents were calculated and with a use of Atwater's coefficients energetic values of the products in kcal units were estimated. The amounts of chips with defects and damaged by weight were also determined.

In the second phase of the research sensory analyses were performed by a team of 10 selected assessors. The panelists assessed shape and size, color, odour, taste as well as texture using 5-point scale according to Polish Standard PN-A-74780:1996.

The data thus obtained went through statistical analysis. Empirical distributions of continuous variables were summarized using means and standard deviations. A one-way ANOVA followed by post hoc Tukey's HSD test was used to compare means. A p-value of 0.05 was required for statistical significance. All data processing and statistical calculations were performed using R 3.2.3. software.

Results and discussion

The results of physicochemical analyses are presented in Table 1.

Table 1.

The results of physicochemical analyses

Parameter	Product								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**p***
Water, [%]	1,92 (0,17)	1,63 (0,37)	1,65 (0,08)	1,65 (0,16)	1,79 (0,06)	2,06 (0,17)	1,82 (0,07)	2,5 (0,49)	<0,001
Total ash, [%]	3,78 (0,16)	4,13 (0,65)	3,46 (0,3)	4,41 (0,3)	5,27 (2,56)	2,98 (0,05)	3,76 (0,22)	3,17 (1,09)	0,07
Insoluble ash, [%]	0,2 (0,22)	0,53 (0,43)	0,63 (0,71)	0,34 (0,28)	0,53 (0,18)	0,33 (0,4)	0,32 (0,18)	0,08 (0,08)	0,552
Sodium chloride, [%]	2,31 (0,55)	1,69 (0,14)	2,52 (0,21)	2,33 (0,47)	1,49 (0,22)	2,17 (0,16)	1,69 (0,23)	2,44 (0,7)	0,002
Protein, [%]	5,92 (1,26)	6,4 (0,53)	5,71 (0,62)	5,64 (0,54)	7,05 (1,25)	5,52 (0,1)	6,23 (0,91)	6,25 (0,66)	0,237

Fat, [%]	38,22 (2,45)	34,38 (6,12)	34,35 (1,84)	31,27 (2,52)	31,8 (0,75)	10,02 (0,46)	35,26 (1,91)	36,85 (4,35)	<0,001
Carbohydrates, [%]	49,8 (2,29)	54,85 (4,43)	53,41 (3,77)	57,89 (2,65)	54,24 (2,24)	78,06 (2,65)	52,94 (2,59)	52,09 (3,56)	<0,001
Energetic value, [kcal/100g]	568,32 (13,05)	552,06 (36,05)	544,83 (16,83)	532,14 (13,14)	531,33 (7,01)	430,46 (2,35)	553,99 (9,03)	564,25 (28,98)	<0,001
Acid value, [mg KOH/1g]	0,57 (0,36)	0,91 (0,36)	0,63 (0,12)	0,5 (0,25)	0,58 (0,09)	0,99 (0,42)	0,57 (0,4)	0,35 (0,31)	0,245
Peroxide value, [mequiv/kg]	0,7 (0,46)	1,49 (1,23)	1,19 (0,64)	0,55 (0,41)	1,28 (0,81)	2,24 (1,86)	1,4 (1,13)	1,04 (0,56)	0,396
Broken parts, [%]	46,58 (9,21)	43,18 (5,43)	54,83 (8,42)	40,11 (7,63)	42,38 (14,97)	33,55 (10,57)	41,18 (11,04)	47,03 (11,33)	0,259
Defects, [%]	18,26 (6,28)	26,99 (10,77)	16,66 (6,11)	19,42 (11,41)	14,5 (8,76)	1,97 (2,5)	26,29 (5,72)	17,68 (5,62)	0,005

Source: own research

Peroxide value

According to Polish StandardPN-A-74780 peroxide value (PV) in potato chips must not exceed 6 mequiv/kg. All analyzed potato chips samples met this requirement. Although some differences between the analyzed samples were found, they were statistically insignificant. The lowest mean of PV was noted in case of product D (0,55 mequiv/kg) and the highest for product F (2,24 mequiv/kg).

Acid value

Acid value (AV) in potato chips must not exceed 1 mg KOH/1g(PN-A-74780). All product samples analyzed were in accordance with this requirement. The lowest value was determined for product H (0,35 mg KOH/1g) and the highest for product F (0,99 mg KOH/1g). The differences were, however, insignificant.

Fat

The lowest fat content (10,02%) was determined in the chips that were produced using potato flour and baked (sample F). Other product contained form 31,27% (sample D) to 38,22% (sample A) of fat. The statistically significant difference concerned only these two marginal products (A and D). None of the products tested exceeded limit of 45% set byPN-A-74780 standard.

Moisture

Moisture content above 3% disqualifies potato chips as they are unacceptable for consumers (Matz, 1984). According to Polish StandardPN-A-74780 water content in potato chips must not exceed 4%. In this research statistically significantly highest water content was detected in product H (2,5%). Other samples contained from 1,63% (product B) to 2,06% (product F) of water.

Sodium chloride

Currently, the advised maximum intake of salt accounts for 6g a day (Referencyjnewartości… nd).According to Polish StandardPN-A-74780 salt content in potato chips must not exceed 3,5%. The highest sodium content was determined in product H (2,44%) and in product C (2,52%), the lowest in product E (1,49%). Differences between the two samples of the highest sodium chloride concentration and the product of the lowest sodium chloride content were statistically significant. The determined content of sodium chloride in all analyzed samples indicated that eating potato chips adds a significant amount of this compound to the daily diet.

Proteins

The samples analyzed contained from 5,52% (sample F) to 7,05% (sample E). However, the differences were insignificant.

Carbohydrates

In this research the statistically significantly highest content of carbohydrates was noted in product F, containing also the smallest amount of fat - 78,06%. Concentrations of carbohydrates in other products ranged from 49,8% (sample A) to 57,89% (sample D). The differences between samples A and D were statistically significant.

Minerals

Total ash content enables estimation of minerals concentration in a food product. Total ash concentrationin analyzed products varied from 2,98% (sample F) to 5,27% (sample E). The differences were statistically insignificant.

The insoluble ash is an indicator of products contamination, mainly with quartz components. In case of potato chips it may point to inaccurate process of raw material washing.

The amount of insoluble ash determined ranged from 0,08% (sample H) to 0,63% (sample C). As in case of total ash, the differences were statistically insignificant.

Chips with defects and damaged

According to Polish StandardPN-A-74780 the number of broken potato chips must not exceed 8% and chips with defects cannot exceed 0,8% per package. In this research all damaged potato chips were counted, even with small missing pieces. This resulted in the number of broken chips ranging from 33,55% (sample F) to 54,83% (sample C). The lowest number of chips with defects was determined in sample F (1,97%). Nevertheless, this product was produced with the use of potato flour. The number of chips with defects in other products ranged from 14,5% (sample E) to 26,99% (sample B).

Sensory characteristics

Thanks to frying, a unique appearance, flavors and texture of potato chips are created resulting in high palatability. Appreciated color and mechanical characteristics of a fried product is developed (Yu et al., 2016; Arabhosseini et al., 2009).Consumers are the final judges of any product. Sensory characteristic of the food product plays a crucial role when making purchase decisions (Gatchalian, 1999).

The results of sensory analysis are presented in Table 2.

Table 2.

The results of sensory analysis

Parameter	Product								p *
	A	B	C	D	E	F	G	H	
Shape and size	2,75 (0,5)	2 (0,82)	2,38 (0,48)	3 (1)	4,67 (0,58)	4,67 (0,58)	3,2 (0,84)	2 (0)	<0,001

Color	3,62 (0,48)	2,8 (0,84)	3,62 (1,25)	3,5 (1)	4 (0)	4,88 (0,25)	2,9 (0,55)	2,5 (0,58)	0,002
Odor	4 (0)	3,2 (0,84)	4,12 (0,85)	4,62 (0,48)	4,38 (0,48)	4,75 (0,5)	3,9 (0,74)	3,38 (0,75)	0,016
Taste	4 (0)	3,2 (0,84)	4 (0,82)	5 (0)	5 (0)	5 (0)	3,8 (0,57)	3,5 (0,58)	<0,001
Texture	4 (0,41)	3,8 (0,45)	4,25 (0,5)	4,62 (0,48)	4,75 (0,5)	4,75 (0,5)	3,7 (0,67)	3,75 (0,5)	0,011
SQI	3,67 (0,15)	3,07 (0,48)	3,68 (0,41)	4,22 (0,31)	4,54 (0,23)	4,81 (0,18)	3,5 (0,48)	3,02 (0,26)	<0,001

Source: own research

Products E and F received the highest notes regarding shape and size (4,67). The statistically significantly lower scores and the lowest in the analyzed group of products were granted to products B (2), H (2), C (2,38) and A (2,75).

The color of product F received the highest ratings (mean - 4,88). The worst products regarding color included sample H (2,5), B (2,8) and G (2,9). The differences in mean scores between product F and products B,G and H were statistically significant.

Product F was also appreciated for its odor (4,75). Product B (mean - 3,2)receivedsignificantly lower scores and the lowest among all analyzed samples.

The highest ratings for taste were granted to products D, E and F (5). Significantly lower ratings were assigned to products B (3,2), H (3,5) and G (3,8).

According to the assessors, potato chips E and F had the best texture (4,75). Significantly lower ratings for this parameter were given to product G (mean – 3,7).

Products E and F were of significantly highest sensory quality in the analyzed research material. Their sensory quality indices (SQI) were accordingly: 4,54 and 4,81. Samples B and H were assessed as being of the worst sensory quality (3,07 and 3,02 respectively). It should be noted that according to Polish StandardPN-A-74780 products A, B, C, G and H should be disqualified for the shape and size as well as color ratings.

Conclusions

Today's consumers choose food that has desirable sensory properties. Nevertheless, more and more people begin to realize that nutrition affescts their health. Potato chips are not among products that are advised to be included in everyday diet. Yet, unique sensory characteristics influence their high consumption rates.

Among commercially available potato chips, differences regarding quality, nutritional value and sensory properties may be found. The best nutritional value can be attributed to products that actually cannot be classified as potato chips. They are made of potato flour and baked. This results in lower fat content. Nonetheless, they are still highly appreciated by consumers, what is proved by the results of sensory analyses conducted for product F.Certainly products of well-known manufacturers are of the highest sensory quality among the analyzed samples. Nevertheless, potato chips sold under delicatessen brand showed great similarity to these products. It is also worth noticing that the differences of salt content among products may reach even 40%.

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The Quality of Traditional and Conventional Sausages from Poland

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Abstract. Traditional food products are characterized by specific appearance, smell and taste. Therefore, they are now gaining popularity among consumers, despite having significantly higher price than their conventional equivalents.

Meat products are one of the most willingly purchased food products by Polish consumers. Among them, sausages are highly valued. On the market, however, productsof uneven quality are to be found.

The aim of this paper is to present the results of a comparative analysis of three types of sausages, i.e. traditional and regional products registered on the List of the Ministry of Agriculture and Rural Development or by European Commission with protected geographical indication, products whose names, retail prices, appearance and manufacturer's description suggested traditional methods of production, and finally conventional sausages. In this research physical and chemical parameters, the content of additives (nitrates, phosphates) as well as color and sensory quality were determined.

The results show that traditional sausages have a higher nutritional value than conventional ones. Traditional products are also distinguished by high sensory quality. In addition, it was found that traditional products, registered and

unregistered, show great similarity regarding physicochemical parameters and sensory quality.

Keywords*:traditional sausages, conventional sausages, protected geographical indication, PTI, the List of Traditional Products*

Introduction

Consumers now more often look for foods which not only have proper sensory qualities, but are also produced by traditional methods, without any additives that they commonly find adversely affecting their health. Regional and traditional foods are characterized by such properties. These food attributes result from the use of specific methods of production, unique composition or origin (Korfel, 2008).

Meat products are very popular among Polish consumers. It is estimated that the average household purchases 250 to 500 grams of meat products a week. As many as 50% of consumers eat such products at least five times a week (Obidzińska, 2009; Florek et al., 2013). In recent years, an increasing stratification of the meat products market has been observed. On the one hand, there is a demand for meat products from the economy segment, sold under the private labels of retail chains. On the other hand, consumption of high-quality meat products is increasing. Premium meat products market began to develop in 2000. By 2010, sales in this segment had grown by approx. 48% compared to 2000. It is associated with increasing wealth of society, as well as greater health awareness of customers. The consumer prefers to purchase smaller quantities of better quality meat products of very good taste, than greater of meat products from the economy segment. There is also a trend to return to the tastes of "childhood". Therefore some manufacturers expand their offer with traditional and regional products (Commercial news, 2013; Górska-Warsewicz, 2006).

In Poland, a number of specific products typical to certain areas has been created. The list of products registered by the European Commission contains only four Polish meat products. Three of them are Traditional Speciality Guaranteed: "jałowcowa sausage", "myśliwska sausage" and "kabanosy". Lisiecka sausage as the fourth product has a Protected Geographical Indication. List of Polish traditional meat products, however, is very long and many of them in the future have a chance to be registered at the level of the European Union as regional products or Traditional Speciality Guaranteed (Makała, 2004; Krajewski et al., 2009).

Unfortunately, alongside high quality products, a wide range of high-efficiency products are available on the market at a lower price. Such products are produced, however, with a number of additives. Meat is injected with brine and expensive raw materials are replaced by cheaper substitutes (Florek et al., 2013).

The aim of this study was to compare the quality of three groups of meat products. These were: sausages registered on the List of the Ministry of Agriculture and Rural Development, sausages whose names, retail prices, appearance and manufacturer's description suggested traditional methods ofproduction and conventional sausages.

Material and methods

The research material comprised of eleven sausages, which formed three groups. Group I comprised of four products, that were on the list of traditional products of the Ministry of Agriculture and Rural Development (samples: J, K, L and N) and one that was registered by the European Commission as a regional product PGI (sample M). Group II was formed of the samples representing products whichnames, retailprices, appearance and manufacturer'sdescriptionsuggestedtraditionalmethods ofproduction (samples: O and P) and group III of conventional products with low retail prices (samples: R, S, T and U). Products came from six production batches. Purchases were made in

manufacturers' stores, delicatessens, as well as in supermarkets located in Cracow and surrounding area.

The research program was developed on the basis of literature data, and in particularPolish StandardPN-A-82007:1996/A1:1998. The analyses included determination of color in the CIE L * a * b * system as well as content of:water, sodium chloride, fat, protein, total ash, total and added phosphorus, nitrates and nitrites.The sensory analysis was based on standard cards developed using the methodology presented in PolishStandardPN-88/A-82062:1988. Weighting coefficients were determined with the use of expert analysis of the significance of individual meat products' characteristics.

The obtained data were statistically analyzed. Using the tools of exploratory multivariate analysis (profile charts, cluster analysis with the use of Ward's method, dendrograms) similarity of the tested products was determined.

Results and discussion

The literature highlights the wide variation between the nutritional value of meat products manufactured on a mass scale and those that have been produced without food additives. The products from the first group contain much more water, which in turn enforces the use of polyphosphates and thus emulsifiers and, consequently, preservatives. Production on a smaller scale allows selection of better quality meat derived from animals properly treated before slaughter, what has a significantly positive effect on the sensory qualities of finished products (Litwińczuk et al., 2010; Wszołek, 2006).

According to the information presented in the literature, the most important feature distinguishing traditional and regional products is their specific quality resulting from a recognized and consistent with the culinary heritage production methods and the exceptional qualities of soil, climate associated with the production site and the local know-how (Stadnik, 2009).

In order to illustrate the differences between the analyzed products, obtained data were presented in graphic form in the Figure 1. The profile chart shows the determined values in the form of squares. The larger the squares are, the more the actual value deviates from the average total value of the specific parameter calculated for all the tested sausages. The red squares represent variations in plus and blue in minus.

Analyzing the chart (Fig. 1) for sausages it can be concluded that products registered as traditional and of protected geographical indication were of the best sensory quality.Traditional products that were not registered boasted slightly worse sensory quality, whereas conventional products had the lowest quality of all. The sausages from group I were characterised by the lowest value of Feder's number (water to protein ratio) and the lowest fat to protein ratio. The highest protein content was noted in traditional and regional sausages. Not registered traditional sausages contained less proteins, whereas conventional sausages were characterized by the lowest concentration of these compounds. The lowest fat content was noted in product M, thoughno statistically significant differences were found considering three analysed groups of meat products.The conventional sausages contained on average more water than the other two groups of analysed products. However, the highest concentration of water was determined in regional product M.The studies didn't show significant differences in nitrates content. Nevertheless, conventional products contained predominantly more nitrates than other products. The exception was sample N, that was characterised by the highest amount of those substances.

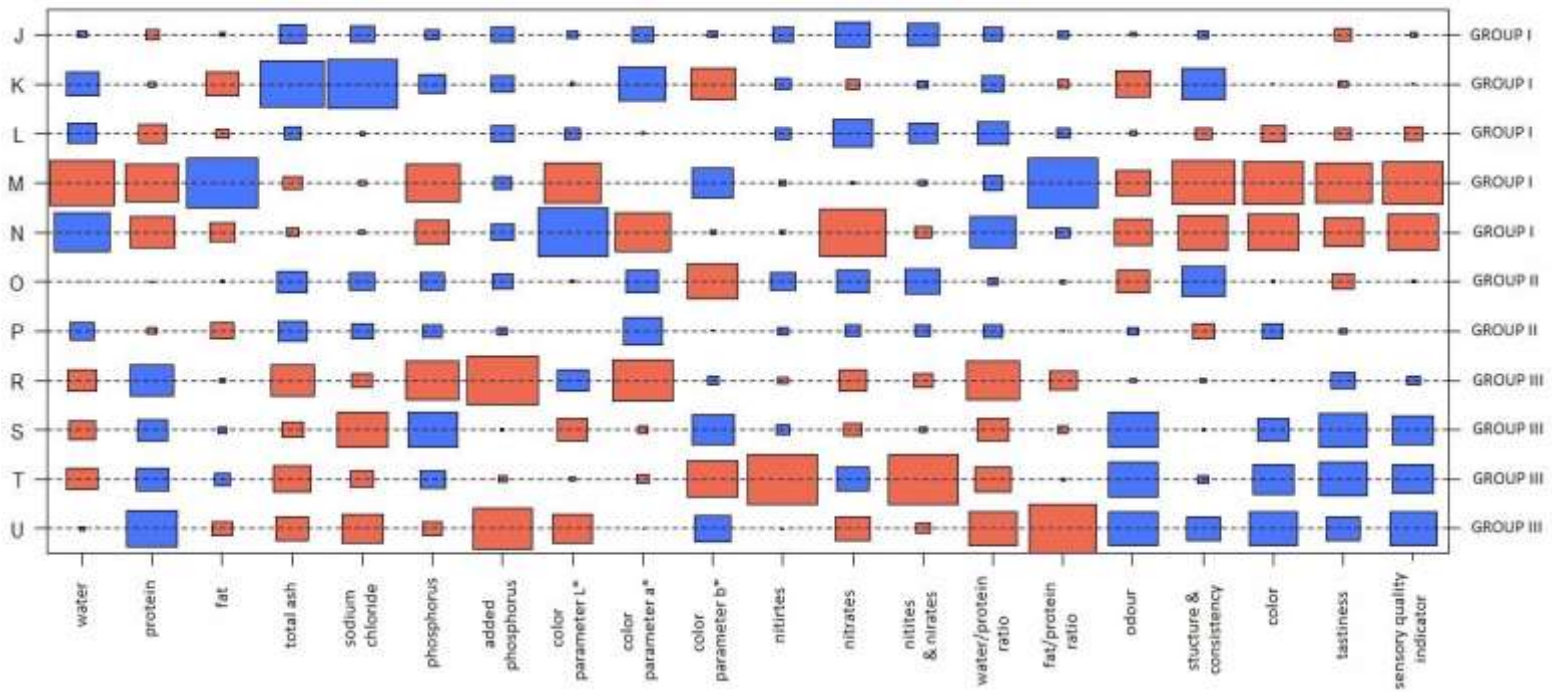

Fig.1. Profile chart for the analyzed sausages
Source: own research

Conventional sausages and sample N were characterised by the highest share of red (magenta) color. Samples N and R had the lowest lightness while samples M, S and U – the highest lightness. The highest value of b* parameter (saturation) was observed insamples: L, O and T, and the lowest value of b* parameterin samples:M, S and U.The significantly highest concentrations of total ash were determined in conventional sausages; however, it is the result of the highest levels of added sodium chloride and phosphates.Conventional sausages were supplemented with phosphates, whereas in the case of traditional, registered and unregistered, products phosphorus was detected in very small amounts and only in very few samples. Conventional sausages contained the highest amounts of sodium chloride.

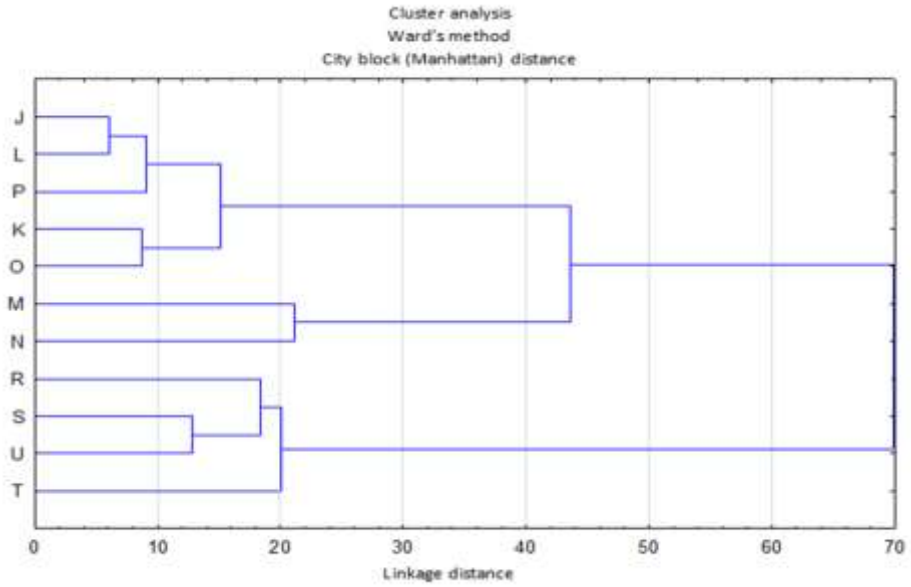

Fig 2. Dendrogram representing the relationship of similarity among a group of sausages (based on all analysed parameters)
Source: Author's own research

The cluster analysis (Fig. 2) showed that conventional sausages comprised the homogenous cluster. The second cluster was formed by samples M and Nsausages (products characterised by the highest quality). The third cluster contained registered and non-registered traditional sausages. The obtained results have proved that sausages from group I and group II are characterised by high similarity. However, the differences among products in each group can be observed.

Conclusion

According to authors' own research it can be stated that traditional and regional products are characterised by higher nutritional value and higher sensory quality in comparison to conventional products. Sausages whose names, retail prices, visual appearance and producer's description suggested that they were produced with traditional method had slightly lower quality in comparison to registered traditional and regional meat products. Therefore, the majority of those non-registered products may be officially registered on the List of Traditional Products by Ministry of Agriculture and Rural Development.

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The Assessment of the Risks Caused by Heavy Metals Contained in Consumer Products by the Use of Bioindicative Measuring Method

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Abstract. The problem taken at this research refers to not unequivocally definedsafety requirements that relateto consumer products as clothes, shoes, toys, upholstered furniture and decorative items.The aim of the study was to find out if so called heavy metals those are included in products as components of chemical substances used while finishing processes might pose a real risk to consumers. For the realisations of the research purpose the samples of materials, in which high amount of cadmium, lead, chromium and copper were detected, have been subjected to extraction in different kind of solution extracts, including water, physiological saline and hydrochloric acid solution. To verify the toxicity effect of extracts the bioindicative measuring method based on *ciliate sp.* test organismswas applied. Changes in test organisms' behaviour were analysed based on microscopic observations and spectrophotometric measurements. The researches have shown that despite of high heavy metals content in the samples subjected to mineralization the content of these elements in analysed extracts is significantly lowand their toxicity effect on test organism depends on kind of the element and its amont in the extract.

Keywords*: safety, risk assessment, heavy metals, consumer products*

Introduction

Consumer products comprise a large and diverse group of common or daily use items available on the market that are ordinarily bought by individuals for private consumption. Quite considerable group of these products, as clothes, shoes, toys, upholstered furniture, decorative items are made of fibres or leather. Leather and natural fibres are perceived as rather friendly raw materials, while synthetic materials and especially chemical additives that are used in

manufacturing process to improve the product appearance or its utility properties may pose health problems for consumers. Among substances that arise number of scientific problems are so called heavy metals, as arsenic, cadmium, chromium, copper, lead, mercury or nickel. These elements and their compounds are known from their toxic effect on live organisms. They may have a negative influence on human metabolism and internal organs. They may cause heart disease, disorder to nervous system or allergies (*Contemporary toxicology,*2006; Shekhawat, Chatterjee, and Joshi, 2015). Due to their known negative impact to human being the use of heavy metals is banned or limited by law regulations. The most restrictive requirements are defined in REACH regulation (Regulation (EC) No 1907/2006). In accordance with this document, such elements as arsenic, cadmium, mercury and lead should not be used as substances, constituents of preparations or colorants in textile and leather materials. Another approach to the presence of heavy metals in textiles and leather is presented in:

— standard EN 71-3+A1: 2014-12that relates to toys

— and ecological requirements defined in:

- criteria for the OEKO-TEX® Standard 100 that is a comprehensive, third-party testing and certification system for textile products at all stages of production (https://www.oeko-tex.com/de/business/business_ home/business_home.xhtml),
- EU Ecolabelcriteria introduced withCommission Decision of 5 June 2014 establishing the ecological criteria for the award of the EU Ecolabel for textile products (OJ L174/45 13.06.2014).

They allow for the presence of heavy metals in these materials and specify limits values for element migration from a product into the acid sweat solution. In accordance with ecological criteria, in dependence on kind of the heavy metal and the product destiny, the migration limits various from 50 mg/kg for Cuin decoration materials, through 1 – 2 mg/kg for Cr; 0.2 – 1 mg/kg for Pb; 0.1 mg.kg for Cd to 0.02 mg/kg for Hg.

The different, presented above, approach to the requirements of heavy metals content in consumer products arise the question related to the real risk that these elements may cause to human being, sothe aim of this research was to find out if the heavy metals included in products as components of chemical substances, used while finishing processes, might pose a real risk to consumers.

Material and methods

Samples

Experiments were carried out on 3 textile materials of the following intended use and raw material composition:

- SAMPLE A: clothing knitted fabric made of polyamide (PA), navy blue colour;
- SAMPLE B: furniture woven fabric made of polyester fibres and coated by polyvinyl chloride (PET & PVC), red colour;
- SAMPLE C: furniture woven fabric made of polyamide fibres and coated by polyvinyl chloride (64%) and polyurethane (34%) (PA &PVC+PU),

and on 1 footwear leather material:

- SAMPLE D: cow split leather, natural colour.

The samples designed for mineralization were disintegrated by grinding and held a temperature of 60°C for 1 hour. Afterwards a 1g sample was placed in a Teflon vessel and 6ml of 70% nitric (V) acid was added. Then the samples were mineralized in the WX-6000 microwave oven. After mineralization and cooling dihydrogen peroxide was added, and then after nitric oxides volatilised, water solutions of samples were prepared and subject to FAAS analysis (EN 14084:2004).

For the realisations of the research purpose the samples in which high amount of heavy metals were detected, have been subjected to extraction at three different extract solutions: water, HCl solution at concentration of 0.07 mol/L and0.9% NaClsolution (physiological saline). The use of water as an extract was to simulate the contact of wet materials with the human skin. When using clothes or other textile products it does happen that textile is wetted more or less occasionally. Thus, it is necessary to investigate if such event could lead to migration of harmful metals from wetted textile to the human body through contact with the skin. The use of hydrochloric acid was to determine a possibility of migration of trace elements in gastric acid that may be important in the context of children's products (e.g. toys) that may be swallowed. In turn the use of sodium hydroxide extract was to simulate conditions where a material is exposed to human sweat that is composed mainly of this compound (Salerno-Kochan, 2016).

The samples designed for extraction were prepared according to the procedure specified in EN 71-3+A1:2014-12. This consisted in placing 1 g of a sample in 50 ml of extracting

solution and incubation at 37 ± 2°C for 2 hours. The next step was to separate solids from the solution by using a membrane filter.

Analytical method

The mineralized samples and extracts were analysed by using *Flame Atomic Absorption Spectroscopy* (FAAS) for the presence such elements as nickel, copper, lead, cadmium and chrome. Only extracts from samples where metals were found in its mineralizates were subject to FAAS analysis for the presence of these elements on the Thermo Scientific iCE 3000 spectrophotometer.

Bioindicative method

To verify the toxicity effect of extracts the strain *Tetrahymenapyriformis*(Ehrenberg) Wolff 1947 of reference number CCAP 1630/1W, coming from the Culture Collection of Algae and Protozoa, Ambleside UK, was used. These organisms were selected due to the fact that *Tetrahymenapyriformis*meets most requirements for test organisms and is one of bioindicators commonly used in laboratory tests. *Tetrahymena*belonging to protozoans is an unicellular organism with cell membrane of quite different structure than those of bacteria, yeasts or algae that form a barrier to toxic compounds. In the case of *ciliate sp.,* the interior of the cell is separated from its environment with a thin cell membrane only, thus causing that ciliates are very sensitive even to the trace presence of toxic compounds in its environment. In addition, in the terms of vital functions, cellular structures and also gene functionality, *Tetrahymena* cells are more close to human cells than other model microorganisms (Gutierrez J.C. et. al., 2003).

Changes in test organisms' behaviour were analysed based on(Salerno-Kochan, 2011):

— direct readings of solution absorbance (optical density) measured at 330 nm after 4, 6, 8 and 24 hours;
— microscope observations of *Tetrahymenapyriformis*behavior in extracts;
— organoleptic assessment of color changes for cell vitality indicator.

The measurements were also performed for *Tetrahymenapyriformis* culture solutions in spring water and HCl and NaCl solutions. These measurements were treated as so called control groups.

Results and discussion

Results of analytical measurements

The results of heavy metals contents in mineralized samples are presented in Table 1 and the amount of these elements in the extract solutions are presented in Figure 1.

Table 1.

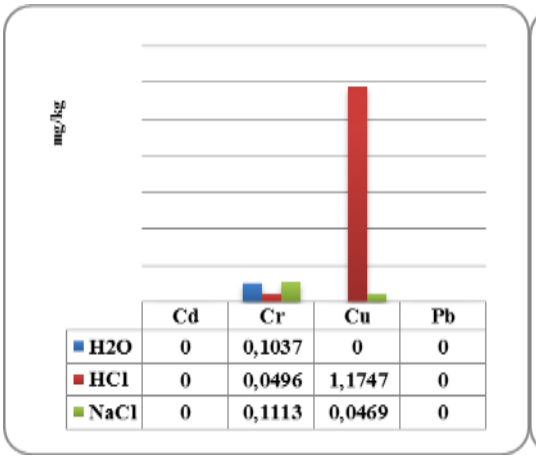
Heavy metals contents in the mineralized samples

Element	Heavy metals contents (mg/kg)			
	SAMPLE A	SAMPLE B	SAMPLE C	SAMPLE D
Cd	0.51	0	10.537.26	0
Cr	285.67	1042.19	0	18 437.81
Cu	335.06	6.00	2.78	1 088.18
Pb	0	6466.91	0	0

The data presented in Table 1demonstrate the presence of heavy metals in all mineralized samples and indicate that these materials do not meet the requirements of the REACH regulation. It should be underline that the content of banned elements in these materials were extremely high, especially in such materials as the SAMPLE D, in which almost 18 500 mg/kg of chromium was detected,the SAMPLE C that contains more than 10 000 mg/kg of cadmium and the SAMPLE B, in which lead and chromium in high concentrations were found.

Considering, in turn, the results presented in Figure 1, related to the amounts of these elements in the extracts of analysed materials, it was observed the significantly low content of heavy metals in extract solutions.

a/



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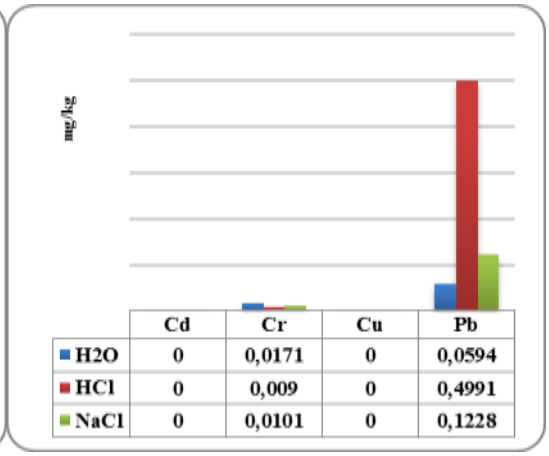

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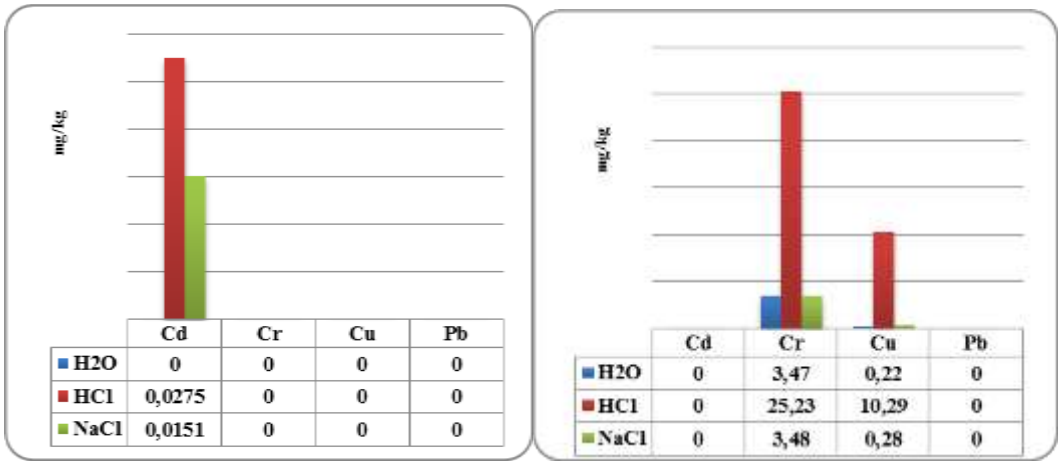

Figure 1. Heavy metal content in samples' extracts: a/ extracts of the SAMPLE A; b/ extracts of the SAMPLE B; extracts of the SAMPLE C; extracts of the SAMPLE D

The amount of detected elements in the extracts didn't exceed 0.1% value of harmful elements found in mineralized samples. Among analysed elements the highest migration capability demonstrates the copper element, contained in the SAMPLE A, probablyas a constituent of textile dye. Also chromium shows a high migration capability and it easily extracted into water and sodium chloride solution.

It has been also stated that among three of used in the experiment extract solutions, the hydrochloric acid solution shows the highest extraction capability, while the lowest amounts of harmful elements were extracted into water.

When analysing the research results related to extracts in the context of environmental requirements for textile and leather materials one should conclude that the amount of heavy metals detected in three of analysed samples reached the values substantially below the specified requirements limits. Only the SAMPLE D does not complay with ecological requirements due to the high amount of total chromium content in all extract solutions used in the experiment.

Results from the bioindicative method

The fundamental experiment aimed at estimation the toxicity effect of sample extracts on test organisms was preceded by the examination of HCl and NaCl solutions impact on *Tetrahymena pyriformis.*Itshowed the negative effect of these solutions on test organisms, so the mainobservations with the use of bioindicative method were performed only in water extracts.The results of spectrofotometric measurements are presented in Table 2.

The bioindicative method showed that the negative impact of the SAMPLES C and D water extracts on test organisms.The proliferation rate of *Tetrahymena pyriformis* culture growth in these two extracts, computed for spectrofotometric measurements, reached 0%of the control group (test organisms incubated in spring water), while in the extracts of the SAMPLE A and B there were not observed any inhibition in test organism growth, what is more,the proliferation rate and behaviour of *Tetrahymena sp.*in theseextracts was comparable to those in spring water (Figure 1a & 1b).

Table 2.

The proliferation rate of test organisms in extracts obtained from spectrophotometric measurements

Water extracts of the samples	**Proliferation rate of *Tetrahymenapyriformis*, % of control**			
	Obtained from the measurement of optical density		Obtained from the measurement of colour change	
	after 6h of incubation	after 24h of incubation	after 6h of incubation	after 24h of incubation
SAMPLE A	100	100	100	100
SAMPLE B	100	100	100	100
SAMPLE C	0	0	0	0
SAMPLE D	0	0	0	0

a/ b/ c/

Figure 2. The microscopic observations of the test organism proliferation after 24h incubation in water extracts of the samples in comparison to *Tetrahymenapyriformis* proliferation in spring water: a/ test organisms in spring water, b/ test organisms in extract of the SAMPLE A, c/ test organisms in extract of the SAMPLE C (as well D)

The negative effect of the extract of the SAMPLE C on test organisms confirmed the harmfulness of this material, evaluated on the base of analytical measurements performed on the mineralized sample. As was mentioned beforethe FAAS methodshowed the high content of cadmium in this sample. On the other hand, it is worth to underline that in the SAMPLE C there were not detected any amounts of heavy metals,even cadmium, as a result of their migration into the water. So, the question arises, why there was such strong impact of this extract on test organisms(the lack of living cells in extract), visible in Figure 2c? To answer of this question

another analytical methods,siutable for analysing other hazardous substances that were beyond this research subject (e.g. azo dyes, amines)should be applied.

The lack of *Tetrahymena pyriformis*culture in the extract of the SAMPLE Dmay testifyabout its high toxicity to living organisms, resulted from the chromium content within the leather as well as the high susceptibility of this element to the migrafion into aquenos environment from material that was proved by analitical measurements.

Conclusions

The research has shown that so-called heavy metals, e.g. copper, lead, chromium or cadmium might not pose a high risk to consumers. Despite of the substantial amount of heavy metals in mineralised samples their content in extracts may be significantlylow and their toxicity effect on test organisms may be unnoticeable.

The study has reaveled the usefulness of the bioindicative measuring method for safety assessment of nonfood products. This method may indicate the present of harmful elements within materials that are susceptible to migration into aqueous environment and may inform if the product poses or not a real risk to live organisms.

The safety assessment of textile and leather materials, as components of nonfood products, depends on the method of their analyse and requirements taken under consideration. It was stated that materials,whichdo not meet legal reqiurements may complay with ecological or standard requirements,and may have not a toxic effect on living organisms.

Acknowledgments

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Impact of Economy and Commodity Science on Sustainable Food System

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Abstract. Authors focus their attention on reviewing the terms „food safety", "food security", „food loses", "food waste" and „sustainable food system" from the position economic sciences including commodity science. They discuss the differences in perception and significance of those terms for customers, producers/suppliers and governmental agencies in different regions. Food security as a mix of availability, access, utilization and stability of food supply over time is strongly linked with food system. Its goals, strengths and weaknesses, necessary changes and future importance is discussed. Authors propose a set of various expected, possible and necessary activities from the managerial and commodity science 2.0 point of view to ensure Sustainable Food System in future.

***Keywords**: food security, food safety, food system, sustainable food system*

Introduction

Food safety, food security, food waste and losses are now in the centre of interest of various scientific disciplines. All of them are interesting and important for its own. However it will be more fruitful to combine them into system e.g. food production system or sustainable food system and examine its properties, challenges and weaknesses. In fact it is necessary to use this reasoning to improve access to food for many people in the World. In our opinion, commodity science (or Warenwissenshaft, towaroznawstwo, towarowiedjenie) have an intellectual capital capable to take an active role in solving the problem of undernourishment.

The aim of this contribution is to show possibilities for joining our discipline into discussion and research.

Food security

Food security is understood as security during various steps of production process, supply chain coordination, availability, continuity and sufficiency for the consumer and the industry and is more interesting for agricultural economists, politicians and the public concerned about e.g. product liability, terms of trade, food regulations, effects of agriculture policy, globalization of safety risk and others.

FAO definition states that, "food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" [http://www.fao.org/economic/ess/ess-fs/en/]. The measuring of it is difficult, if possible at all. However FAO' agency developed a method of measuring it by a set of indicators which describe opposite – i.e. *food insecurity* – understood as food availability, access, utilization and stability. S. L. Hendrics describes food insecurity as a continuous range of experiences between starvation and adequate quality and intake, divided into three stages: food insecure, insecure to vulnerable and food secure [Hendrics, 2015, pp.609-619].

Among current challenges for food security investigation most important now are the impact of climate changes and water shortage on foodstuffs and food production. The authors of well documented research concluded, that the availability and quality of fresh water has become a major international problem [D. Pimentel et. al. 1997, pp. 97-106]. This problem must be solved as soon as possible to meet a future needs of growing population [Pastor et.al. 2015]. Due to the past effort in many underdeveloped countries e.g. Green Revolution). "…Agricultural research was indeed successful in the latter quarter of the 20th century in rapidly and significantly increasing production of staple grains … and total food calories" [Beintema, Elliot, 2009]. B. Campbell [2015] argues therefore in favor of a 'Climate Smart Agriculture'. This strategy incorporates, among others, the reduction of CO_2 emissions and considers the complexity and diversity of activities as well as a portfolio of options and inputs from new R&D projects. According to C. Hawkes [2015], the agriculture, horticulture and husbandry is driven by overconsumption of resources (mainly energy and water).

Despite of productivity growth in last decades, about 2 billion people had continuously insufficient calories intake, consume food of low nutritional quality or were undernourished in 2010–2012 [FAO, 2012]. From another side, the access to highly calorific and new types of food is causing the obesity in many developed countries [Ingram et.all 2015]. Climate changes, demographic growth, decline of natural resources suggest that good quality food supply in future will not cope with growing demand. Thus substantial changes to dietary patterns and significant reductions in food waste, as well as innovative ways to manage food security more effectively are required [Schellnhuber et.al. 2013].

Safety

Properties characterizing consumed food are numerous. From the perspective of commodity science those properties are ordered in form of hierarchical tree. Food safety is the effect of microbiological, chemical and physical parameters of food. Food safety together with energetic (caloric value), nutritional (e.g. content of fat, proteins, carbohydrates, trace elements), dietetic properties yield general healthiness of given food. Finally, healthy food with good sensory properties (e.g. taste, smell, texture, consistency) and expected disposability (e.g. weight, volume, durability) form overall quality desired by consumer [Zalewski, 2008, p.39]. Most important, in our opinion, is safety which results from various properties and functions of given food. It depends on quality of raw and supporting materials, realization of production, effectiveness of distribution channels, behavior of consumer and decrease of the product quality due to ageing.

There are various descriptions of food safety. According to P. Grunert "it can be defined as the opposite of food risk, i. e. as the probability of not contracting a disease as a consequence of consuming certain food" [Grunert, 2005]. In some definitions food safety is perceived as and binded with the risk of consumption [Slovic 2002] and is predictable, quantifiable and in some cases may lead to life's termination [Shaw 2005]. Another descriptions of food safety stress on protection of food against chemical (e.g. naturally occurring yet harmful, additives allowed but exceeding certain concentration, residues of pesticides, herbicides, supporting chemicals, drugs, antibiotics, detergents, hydraulic liquids etc.), biological (presence of pathogen microorganism), and physical factors (as appearance of external materials of various origin) that can endanger human health. Such construct has been adopted in principles of HACCP (Hazard Analysis and Critical Control Point), in the ISO-EN 22000 standard and in many others.

Trust to food producers and sellers is a first line of defense against health risk used by consumers. Only few consumers are able to use their senses to adequately evaluate quality of food products and estimate risk due to their consumption. The evaluation of the sensory attribute (e.g. taste, smell, appearance, texture, sound) comes from experience, heritage and personal sensory threshold of the individual food consumer. In many cases one is not able recognize non-fresh foodstuffs.

Other food attributes (e.g. influence on health and well being, chemical constitution or presence of various substances) are less important in the opinion of consumers. However, their role is growing due to better education, food labeling, decreasing information asymmetry between customer and producer. Better information can be utilized by consumers to choose optimal alternative products [Singham, Birwal, Yadav, 2015].

It is evident that commodity science, as a discipline devoted to quality of goods, is directly linked to food quality and its safety.

Food losses and waste

From farm to table of consumer, along the food production and distribution chain, at various stages, raw, processed, stored, bought food is in part lost. Food losses refer to the decrease its mass throughout the part of food chain that leads to edible food designated for human consumption. Food losses occur at raw production, harvesting, postharvest and processing stages in the food chain. Food losses occurring at the end of the food chain (retail and final consumption) are rather called “food waste” (see fig. 1), which relates to retailers’ and consumers’ behavior [Parfitt et al., 2010]. Food losses and waste are mach larger in developed countries than in underdeveloped ones and must be decreased [Zalewski, Skawińska, 2016]. It is necessary to mention, that during some processes, not only the mass but also quality and safety of food decrease due to defects in production, during the nonproper storage condition and transportation occuring in wholesale and retailing, as well as in consumer’s homes or passing time. The special role of commodity science in this area is to develop new materials for intelligent packaging, new technologies of production and conservation, discovering the more effective analytical tools and many others. Our discipline should take a part in inventing and examining various aspects of new food distribution channels allowing decrease of food waste and losses.

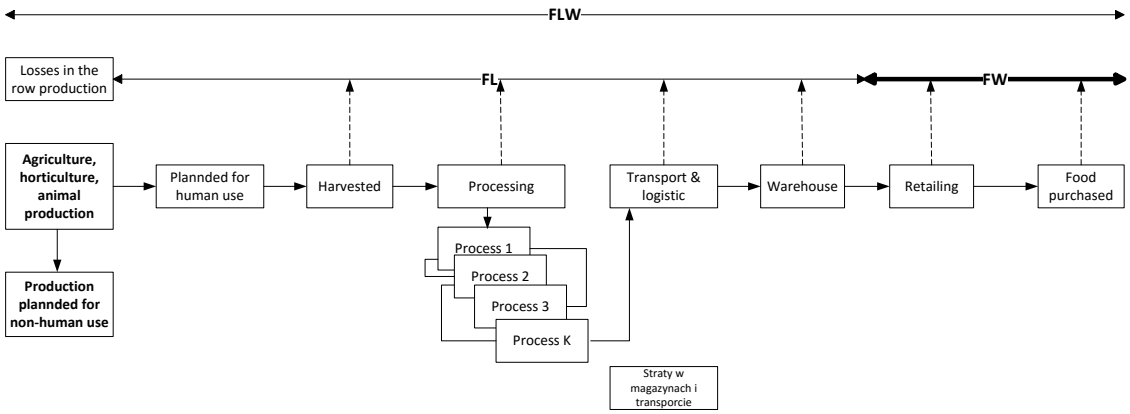

Figure 1. Food losses (FL) and food waste (FW) along food chain

Source: own drawing.

It is necessary to mention, that food waste or loss is measured only for products that are directed to human consumption. Feed and parts of products which are not edible are excluded. Therefore food that was originally meant to human consumption but which fortuity gets out the human food chain is considered as food loss or waste even if it is then directed to a non-food use (e.g. feed, bioenergy). This approach distinguishes "planned" non-food uses to "unplanned" non-food uses, which are hereby accounted under losses [Food losses 2014, p. 31].

Food systems

The definitions of food systems (FS) in literature are numerous [e.g. Ericksen et.al., 2010; Ingram at.al. 2013]. In our opinion compact and complete definition states: "a food system gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes" [Food losses 2014, p. 29]. In other words FS includes all steps from agricultural raw production (including crops and animals) up to the food eaten by consumers and includes all losses occurring between the very source up to the consumers' table.

It is expected that a sustainable food system will, at last in part, help to decrease the problem of undernourishment before 2050. The term sustainability has been proposed, discussed and introduced into science and praxis in the 70'. The number of definitions of sustainability found in literature is vast. Sustainable 'future' and 'growth' is now under priority, especially in

case of natural (eco) and socio-economical systems [Rockström J. et al., 2009. p. 472-475]. In the particular case of the food system, sustainability "ensures food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition of future generations are not compromised" [Esnouf et.al 2013; Garnett 2014] and can be visualized by the model (fig. 2) of drivers and security measures.

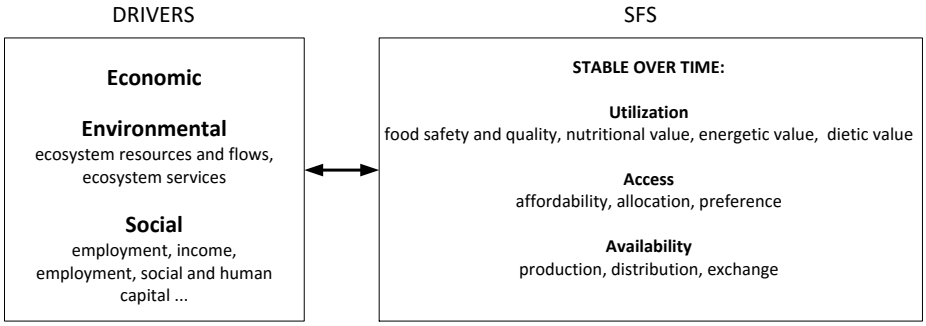

Figure 2. Structure of Sustainable Food System (SFS)
Source: own drawing with use of idea of Ingram et.al. (2013).

Among security measures one can mention availability, access, utilization and stability of supply over time. The exhaustive discussion on those measures is out of scope of this paper, although all of them are strongly linked to food safety, quality and finally to its security. The drivers of SFS are of economic, social and environmental nature, as discussed above. Unfortunately, their directions are frequently opposite. The awaited by Authors activities of commodity scientists that can help to improve up-to-date SFS in different countries in the future are listed in table 1.

Table 1.

Expected activities of commodity science towards SFS

Social	Environmental	Economic
• prevent food waste in the whole food chain • develop salvage networks of unsold food products • adjust food products package to consumer´s needs • changes in eating patterns • build trust about food safety systems (e.g. HACCP) and labeling • improve own skills to become a food quality and safety specialist	• create food anti-waste practices and legislative guidelines • recycling non-consumed food to fodder production or possibly heating energy or electricity production • decrease amount of chemicals used in food processing • to make use of various by-products and food waste in other activities • …	• impose global/regional efficient and effective obligatory and voluntary food safety and security systems • introduce trust and risk to analysis of food production • prevent the food industry from creating demand for too many of wrong food • create innovative solutions in food production, analysis and quality control • invent and introduce methodology of FLCA - food life cycle assessment

Source: own proposals.

Conclusions

It is obvious that growing demand for food in near future must take under consideration various variables improving SFS and decreasing FLW. Innovations on all stages of food production and distribution chain are expected. New methods and technologies as well as behaviors of producers and consumers should increase their quality of life and decrease food looses. The proposed by Authors activities of commodity scientists that can help to build SFS in the future are numerous and were listed above in table 1. We present them for discussion and additional proposals.

In our opinion it is a lot of space for cooperation between commodity scientists from various countries of the World and specially members of IGWT. The people, society and environment are waiting for new ideas, inventions and innovations.

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Focusing on the Dynamic Romanian Market of the Food Supplements

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Abstract. The subject of food supplements raises a lot of questions among both health professionals and consumers, as they directly affects the health, daily activities, physical and mental performance and even the aging process. The concern about food supplements keeps growing more than ever because their consumption expands to reach new market levels across the globe.

Based on researches and scientific results published by the authors over the last decade, this paper aims to analyze the specific of Romanian market for food supplements, highlighting the importance of accountability by producers to ensure and declare their quality, the importance of adapting legislation to market realities and the need for a proper education and information of the consumers.

Notification of food supplements is a prerequisite for putting them on the market; it is aimed to ensure public health protection and commercialization of products that meet the quality and safety features. Production of the nutritional supplements should be based on the rules of good manufacturing practice for foods.

The Romanian consumers' increasingly concern for a healthy lifestyle has significantly contributed to the exponential growth of food supplements market, a market that initially started at a very lower level. In the last years, new and new players are attracted to this market. In Romania there are more than 18,000 registered food supplements and annually over 1,000 such products reach the market.

The explosion of food supplements market was supported by an intense promotion, but this promotion must be fair and honest and not mislead consumers by granting miraculous

effects. Therefore, the issue of notification, quality assurance and specific labelling is different than for food requisites, implying the legal framework imposed by the EU on the harmonization of national laws on food supplements.

***Keywords**: food supplements, Romanian market, business, consumers, legislation*

Introduction

A balanced diet can provide, under normal circumstances, all the necessary nutrients for a normal body functioning and can ensure a healthy life, but this ideal situation is not met for all human categories. Having as a starting point the desire for an optimal diet, suited to their personal lifestyle, the modern consumers are looking forward to using products that can supplement their normal intake of nutrients.

Thus, the consumption of food supplements can become an important part of a healthy lifestyle, which includes a balance diet and daily physical exercises. In order to provide potential health benefits, food supplements must be supervised through the common efforts of food products and food industry's quality control organizations, in order to commercialize only those products that have a scientific back-up regarding the proof of their nutritional value.

Market analyze on food supplements in Romania

In the European Union, developing a unified legislation in the field of food supplements became a necessity, determined by the rapid development registered by the import, production and commercialization of these products. Romania has transposed in the national legislation the specific European regulations.

The notification of food supplements is a mandatory condition for putting these products on the market, which aims to ensure public health protection and commercialization of products that meet the declared quality and safety requirements. The notification is made via the *Romanian Health Ministry* for food supplements containing only vitamins and minerals and for those containing other substances with a nutritional or physiological effect the notification is made at the *Institute of Food Bio-resources*, organism within the Ministry of Agriculture and Rural Development or at the Regional Centers of the *National Institute of Public Health*.

Romanian producers and importers have diversified the range of food supplements in order to:

– cover the specific needs of children, young people, adults and elders,

– sustain the intensity of the physical effort for the adult population during the working hours in various daily activities, cultural and sports activities and also recreation activities,

– offset the trend of reduced physical effort in terms of increasing neuropsychiatric demands, as a modern life condition,

– satisfy the nutritional needs for women in pregnancy period,

– prevent the occurrence of diseases caused by food imbalances.

In terms of composition, two main types of food supplements can be distinguished, according to the harmonized legislation: supplements containing vitamins and/or minerals (minimum 15% of the Recommended Daily Allowance) and supplements containing other substances with a nutritional or physiological effect (amino acids, enzymes, essential fatty acids, pre and probiotics, botanical and herbal extracts, other active substances: Q10 coenzyme, lycopene, inositol).

Food supplements are designed for oral consumption (administration) by healthy people who require a higher exogenously intake due to specific nutritional requirements related to: the physiological condition, such as pregnancy, lactation; age period, for example young children, teenagers, elderly people; intense physical activities – the specific cases of athletes, physical effort-based professions etc.

Depending on the age of the consumers, food supplements aim to satisfy the necessities of *infants, children, adolescents, adults and elders*.

The products required by **infants** consist mainly of powder milk formulas, necessary for the growth and development of babies (Ardeleanu, 2013). Other supplements administered to infants are vitamin D, iron, calcium and magnesium.

Children are administered, by doctor recommendation or parent initiative, nutritional supplements in the form of vitamins, multivitamins, calcium, fish oil, supplements to increase immunity and probiotics.

Food supplements that targeted **adolescents** are those that improve memory, increase immunity and increasing concentration capacity.

Adults use nutritional supplements for multiple purposes, depending on body needs or

individual desires. The most popular are supplements that help to detoxify the body, that help to control the body weight, that maintain a metabolic balance and digestive adjuvants. Other supplements consumed by adults in particular are the ones used to control cholesterol levels, stress or energizers.

Elders are recommended especially cardiovascular nutritional supplements, which help controlling blood pressure and cholesterol, bone and joint health.

A separate category for which nutritional supplements are produced with a special destination is represented by the athletes. They represent a reliable and regular demand for supplements, the overall aim being to increase at a maximum point the effects of exercise (Manescu, 2010).

Summarizing, the consumption of food supplements is customized, based on its frequency and depending on personal needs; so consumers can use nutritional supplements regularly, occasionally, regularly during competition periods (for athletes) or rarely. The Romanian consumer of nutritional supplements can be any person, regardless of age, passing throughout periods of intense activity or wanting to prevent certain deficiencies of nutrients or to strengthen his immune system, he aims to eliminate body toxins or is in a convalescence period or aims to reduce the effects of aging.

Regarding the timeframes for food supplements consumption, they differ according to the consumer group characteristics, but also from an individual to another. For example, in the cold season, the demand for vitamin C supplements is higher than usual, the supplements being consumed by all age groups and being purchased most often on consumer's own initiative.

The offer of food supplements on the Romanian market is much higher now compared to previous years and registered a boom, but not necessarily because of the consumer demand, but because of the interest that various companies have for a sector with great development potential (Muresan, 2015). The Romanian food supplements market has an estimated 250 million value in 2015, meaning an average per capita of 12.5 EUR, compared to western countries where consumers allocate 100 EUR for supplements. The market is continuously growing, new brands and new products are emerging, in 2015 Romania being one of the EU countries with the highest rate of market growth in the food supplements sector, more exactly registering a growth of 8% after Cyprus, Malta, Greece and Hungary, according to the data provided by the research company Euromonitor.

Results and discussions

Food supplements market analysis reveals several important **factors** which lead to an increased interest in a healthy lifestyle and in consuming products that are associated with it. Although the phenomenon is global, this analysis focuses primarily on the characteristics of Romanian market.

1. **An ageing population**. Romania is facing complex economic and social consequences of a population that is slowly but continuously demographically aging. The age structure of the population has the characteristics of a demographic aging process, caused mainly by the decrease of birth rate, which has reduced the absolute and relative number of young people (0-14 years). In parallel, the increase of life expectancy determined a growth in number and share of elderly population (65 years and over).

2. **Raising consumer awareness on medical preventive care**. At a governmental and nongovernmental level and also in mass-media there is an increasingly interest regarding preventive healthcare. It is stated that Romanians consume food supplements, however not covering the necessary intake level, because they do not understand the role of prevention in their personal and even national economy, but also due to the lower levels of income.

3. **The emergence of self-medication or self-directed consumer**. Consumers are interested in identifying their own health needs and seek information on alternative channels (television, radio, Internet, press). Currently, many consumers reach the online environment for health information that help them come to a decision on diagnosis and treatments. An Unlock Market research study from 2012 shows that nine out of ten Romanians are used to treat themselves. Most often administered supplements, without an advised medical recommendation, are vitamins and food supplements.

4. **The offer of food supplements characterized by accessibility and high availability for any consumer category**, with a large number of domestic manufacturers and also importers. Realizing the market's development potential, many pharmaceutical manufacturers have created and introduced new ranges of products registered as food supplements.

5. **New sale channels** - food supplements are sold both through controlled channels (pharmacies, specialty stores) and non-supervised channels (internet, offices, therapists,

newspapers, product presentations in a small circle, individual distributors) to reach a broad and diverse consumer segment.

6. **The transition from advertisements focused on ingredients** (e.g. omega-3 for heart health, lutein for improving eyesight) **to brand positioned messages**. To avoid difficulties in product differentiation, marketing specialists have begun to personalize messages, focusing on total benefits, to encourage the use of a wider range of products (Teichner and Lesko, 2013).

Conclusions

The development of nutritional supplements' market in Romania faces a number main of challenges, including:

- Social challenges – involving the change of consumer's mentality and behavior, as a long-term process, that requires the need of education for a responsible consumption process;
- Technical challenges – regarding the production and commercialization processes which involves costs optimization strategies reported to quality levels; the production process must be based on food production good practices and an efficient control of the process.
- Ethical challenges – involving corporations' social responsibility, compliance with the commercial communication rules, with the Code of Business Ethics and the Code of good labeling and advertising practice for food supplements.

The dynamics of food supplements market in Romania is determined by the producers' ability to supply products that provide benefits which can be easily promoted and by the variance of requirements, which are customized for each category of consumers.

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Study of Gamma Irradiation Influence on the Quality of Stabilization and Safety of Some Food Product

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Abstract. It has carried out a study to develop the elaboration of radurization with number of perishable foods of high water content (Aw=0,65÷0,95), such as cooked sausages, sausages, fruits-vegetables production intermediate moisture (Aw=0,65÷0,85), the different varieties of wheat bread, as well as the "sick" of wine and wine materials. The optimal conditions are determined for the gamma radiation of these products, allowing to preserve the quality of performance and nutritional value, and at the same time increase their shelf life.

Keywords*: food, radurization, safety*

Introduction

Nowdays the electrical radiation technologies are becoming more widespread as an effective means of providing extended shelf life and toxicological safety of food consumption [1]. Unlike traditional storage technology products, requiring large expenditures of manual labor and electricity, radiation treatment is one of the most effective, and in some cases for individual products, and the only way of processing of agricultural products and foodstuffs .

Radiational food products are used in 40 countries by more than 80 names. Radiation treatment, disinfection, pest control and food radurization is carried out taking into account standards of specialized organizations of the UN:FAO / WHO IAEA, in particular, the Code of basic standards for radiational governmental food codex stan / 106-1983 and recommended international code of practice for work on radiation units, used for the treatment of CAC / RCP 19-1979 food. According to these regulations food processing gamma rays are permitted provided that the average dose of energy absorption of less than 10 kGy [2].

However, there were many problems that arise during the processing of food products, such as the preservation of the nutritional value - the stability of the basic food groups (proteins, lipids, water, etc.), to ensure their safety makes the issue date and the subject of many scientific studies. The aim of this work is a comprehensive study of the theoretical and practical problems of quality, conservation and food safety from gamma rays and expanding the list of radiational foodstuff of (in the world), new types of certain perishable goods, such as cooked sausages, frankfurters and sausages, dried fruits and vegetables, wine and wine materials, as well as for the "treatment" of patients with wine and wine materials.

Material and methods

The treatment studied food samples was carried out on a single installation of the Caucasus radiation ^{60}Co brand K-120 000 with an energy of 1.25 MeV RA NAS Institute for Physical Research. All objects of research, as a rule, have been processed in a tightly packed. The studies used the organoleptic (criteria for evaluating organoleptical indicators point system developed by us), physical, physico-chemical, chemical and microbiological analysis of conventional methods [3]. All together investigated to select packing materials of 6 kinds of polymer films, two kinds of sausages and boiled sausage, sausages of local production, 22 species of fresh and dried (intermediate moisture) of fruit and 2 types of vegetables (tomato and eggplant), higher tin bread, I-st and II-nd grades, 8 kinds of ordinary and vintage wines and wine products. Control samples were similar products, of the same date of production in a similar package. Control and treated with gamma rays product samples left at the storage to determine retention periods. Frequency and research program carried out under the MOU 4.2.727-99.

Results and discussion

Results and its discussion- Packed in polietilenpoliamidal (75 microns) or polyethylene film (PE 30-35 microns) cooked samples (Doctoral and Amateur species and sausages) sausages were treated gamma rays dose 0-8,0 kGy and identified by their organoleptic (appearance, color, taste, smell) and physicochemical (moisture, nitrite, peroxide value (Figure 1) and an acid value indicators. According to the research it was found that depending on the dose of gamma radiation sausage products undergo quality is changing. Such as D_{γ}=0,05÷4,5 kGy treated samples on the organoleptic and physico-chemical parameters at an irradiation dose D_{γ} does not differ from the

control samples and correspond to GOST 23070-79 and in the case of Dɣ irradiation dose=5.0÷8.0 kGy changing their appearance: the cooked sausages become bluish-green and sausages - grey-green color, appear and barely perceptible odor and taste, worse at higher doses.

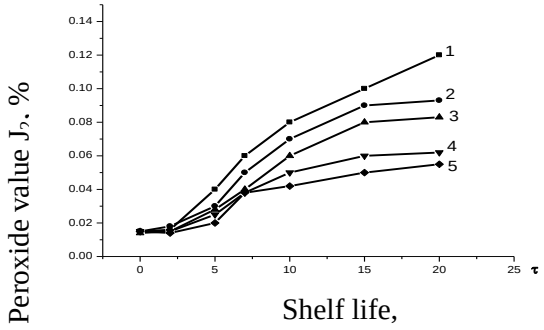

Figure 1. Dependence IF gamma processed samples boiled sausages "amateur" on the radiation dose and storage time:

1- control; 2-1,5 kGy; 3- 2,0 kGy; t = 5-6˚C, φ = 75-80%.

4 - control; 5-1,5 kGy; 6-2,0 kGy; t = 18-20˚C, φ = 75-80%.

Figure 1 shows that the drive gamma handled (Dɣ=4,0÷5,0 kGy) samples boiled sausages "Amateur" approximately 2 times less than the control samples.

As a result of comprehensive research physicochemical processes that occur during radiation treatment of sausages, treatment regimens have been optimized to ensure toxicological and microbiological safety and stability of certain food substances (amino acids, lipids and water) irradiated product. The latter has allowed to choose the optimal treatment dose, namely: Dɣ=1,5÷2,0 kGy for sausages, Dɣ=2,0÷4,0 kGy for cooked sausages and develop a method of radurization that allows you to set the shelf life of these products in taken 8-9 days instead of 48 hours. Concomitant use of radurization (Dɣ=2,0÷4,0 kGy) and cooling (5-6°C) allows to increase the shelf life of up to 10 days.

In the case of dried fruits and intermediate moisture vegetables (35÷40%, Aw=0,65÷0,85), the product is also related to a group of perishable, optimal treatment doses were dose Dɣ=4,0÷5,0 kGy of providing retaining organoleptic (color, taste, texture) and physical and chemical (moisture, acidity and sugar content etc.) of product properties during storage. Microbiological studies showed that the treated samples, in contrast to control rapidly decreases TBC (time 100-150), that allows to offer the method and implement for the treatment of fruits and vegetables with an intermediate humidity (35-40%) in order to increase the shelf life without

the use of preservatives. It should be noted that the radiation treatment of dried fruits and dried vegetables not only ensures that the product quality and microbiological safety during long-term storage at non-regulated temperature and humidity of the environment, but also greatly improves their presentation, also excludes the use of color preservative stabilizer (SO_2), commonly used in the technology of preparation of dried fruits and vegetables .

Another object of our research were different types of bread - the highest, the first and second grades. Bread due to high moisture content (38-45%) also refers to perishable products, as physical, chemical and biological processes that occur during storage dramatically degrade the quality and influence of its retentive [8]. Samples of different kinds of bread packed in polyethylene or cellophane film have been treated with different doses of gamma rays. Studies have shown that treatment of various types of bread in a dose D_γ=0,5÷3,0 kGy virtually no effect on the physical and chemical indicators of the samples (humidity, acidity and porosity) and nutritional value: saves the total protein content (losses are very small and make 0- 0.11%), and amino acid composition (the content of 16 essential and nonessential amino acids) hardly changing, except for a larger (8-10%) content of glutamic acid. Complex studies have found that to store the bread of different varieties, depending on the purpose of storage, are optimal radiation dose D_γ=1,0÷3,0 kGy, increase shelf life by 3-4 times, which undoubtedly is of great practical importance, especially for people in the grain extreme conditions .

Our studies have shown that treatment with ionizing rays is an effective method for the treatment of "sick" of wines and wine products. A comprehensive study of the effect of different doses of gamma radiation (D_γ=0÷6,0kGy) showed that in the treated (D_γ=4,0kGy) wine samples regardless of the type (red, white, firm and dry) twice increased stability and thus does not decrease their value Livestock, not change the organoleptic (transparency, color, aroma, taste, typicality) and physicochemical parameters (ethanol content, shared and active acidity, volatile acids, amino acid composition (Fig. 2) etc.), and macro- trace element composition (K, Na, Mg, Fe, Cu, Zn). As can be seen from Figure 2 ionizing radiation does not influence on amino acid composition, and does not reduce the nutritional value of proteins wines than wine treatment by other methods.

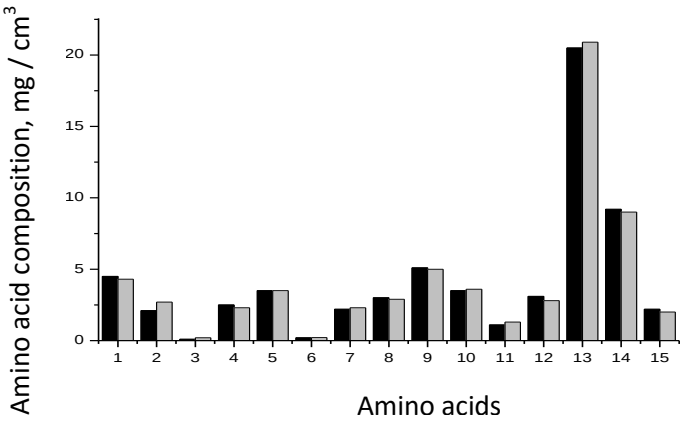

Figure 2. The amino acid composition of wines. (control ` dark and 4.0 kGy)

1 – valine, 2- tyrosine, 3- tryptophan, 4-leucine, 5-lysine, 6-methionine, 7- phenylalanine, 8-isoleucine, 9-arginin, 10-Aspartic acid, 11-histidine, 12-glycine, 13-glutamic acid, 14- proline, 15- cysteine.

Processing "sick" wine and wine products with gamma rays at a dose of 5.0 kGy eliminates microbiological instability by a sharp decline (by 2 orders of magnitude) the content of acetic acid and lactic acid bacteria. As a result of this treatment, "unfit" wine and wine materials are suitable and can be had used a blending of wines at . It should be noted that the content of toxic elements (Pb, Cd, Hg, As, Cu, Zn and Mo) was determined in all treated and control samples of all kinds of products. It is shown that in all cases, as might be expected, the content of these elements is virtually unchanged by exposure to gamma irradiation and remains far below acceptable standards. Similarly, the control and treated samples of all types of products studied do not differ on the content of radionuclides (^{137}Cs and ^{90}Sr) normalized by [3].

Conclusion

1. A comprehensive study to develop a method of radurization number of perishable foods with high water content (Aw=0,65÷0,95), such as cooked sausages, fruits-vegetables production intermediate moisture (Aw=0.65÷0.85) and different varieties of wheat bread. 2. The optimal conditions for the gamma radiation, allowing to preserve the organoleptic, physicochemical and microbiological parameters and nutritional value radio treated samples at the same time increasing their shelf life. 3. Shown radio processing efficiency to increase the stability of wines and "treating" patients wine material. 4. We have developed methods for food processing are possible to implement on an industrial scale in view of efficiency and economy.

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A Comporative Study on Quality of Vinegar and Acid Products Available Commercially

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Abstract. The study aimed to present a comparative analysis of the quality of some brands vinegar and acid products commercially available and offered to the consumers in Bulgaria. Methods used to determine the quality are sensor and physicochemical. The studied sensor indicators show that apple, wine, balsamic vinegar and acid products suit with the requirements specified in the regulations, therefore they are standard. Conducted research on physical-chemical indicators show that the tested samples of vinegar are unqualitative to the following indicator total acidity, with the exception of the following two types: wine vinegar with tharos and acid product "IZZI".

***Keywords**: vinegar, acid products, quality, safety*

Introduction

Vinegar is flavor product, known since ancient times for its medicinal and dietary properties. It is produced from fruit wines with low content of ethyl alcohol and from some cereals (rice, etc.) (Donchev, et.al., 2010, p. 328). Vinegar is a good source of antioxidants, bioflavonoids and contains phenolic compounds, which have a beneficial impact on the health of consumers (Kalcheva, 2011, Stefanova, 2008).

Production of vinegar goes a long way of development - from spontaneous home and craft production until automated methods of deep acetic acid fermentation. Vinegar was prepared in two fundamentally different ways - by an acetic acid fermentation of alcohol-containing products (ie. fermentation method) or by dilution of the pure concentrated acetic acid with water (ie. esentsionen method) (Donchev, et.al., 2011). For the preparation of fruit vinegar are using

various fruit wines, which are normally diluted with water and supplement with alcohol to achieve the necessary strength (Belitz, et.al., 2004, p. 983-984).

Sour symbol of Italian cuisine – balsamic comes from the Mediterranean region. In fact, "sour" is somewhat erroneous definition, because in many cases the predominant flavor is sweet (Strachilova, 2014). Aceto Balsamico di Modena is a dark brown liquid, a mixture of wine vinegar, concentrated by heating the grape juice, colorant caramel (E150d), and sulfur dioxide (E220), which ensures the durability of the product (Lalou, et.al., 2015). Aceto Balsamico Tradizionale is a product of the highest quality, produced only from concentrated grape juice and aged at least 12 years in wood. The slow fermentation and contact with the wood of chestnut, oak or cherry deploy the taste and aroma properties of vinegar (Strachilova, 2014).

Vinegar produced in the Far East is not from fruit but from rice. In Japan, rice vinegar is colorless or pale yellow. It has a lower acidity than the European species, and a weaker flavor. Chinese rice vinegar has a dark brown color as it is produced from rice with hulls black grains. Often taste is supplemented with ginger and orange peel added to the package. Falsified rice vinegar is artificially colored and sweetened with caramel vinegar (Sandeep et.al., 2013).

Acidic products (artificial vinegar) were obtained by dilution of edible acetic acid with water and it is used as a substitute for vinegar. Descriptive name that should be written on the label of artificial vinegar is "Artificial vinegar - acetic acid solution". In recent years on the Bulgarian market increase the supply of product - sour vinegar, made from acetic acid. Mainly is used colored with caramel (E150 typically) 4-8% acetic acid solution added with 1-3% citric acid.

The aim of the study is to present a comparative analysis of the quality of some brands vinegar and sour products offered to consumers in Varna.

Material and methods

The object of study are 2 types of apple vinegar (vinegar "Veda" vinegar from wild apples "Chimsnab-Orbel"), 3 types of balsamic vinegar ("Elia", "Rosso", white balsamic vinegar "San Lazaro"), 3 types wine vinegar ("Culinar", "Carrefour", wine vinegar with tharos "Chimsnab-Orbel"), one type of rice vinegar ("Tao Tao") and 3 types of acid products ("Bulagent", "Libra", "IZZI") of different producers. Methods used to determine the quality are sensor and physicochemical. Studied indicators are: *sensor* (state of package, completeness of marking, appearance, color, taste, smell); *physicochemical* (total acidity, total sulfur dioxide, free

sulfur dioxide, alcohol content) (Zlateva, Pashova, 2013, p. 217-222). The content of total and free sulphur dioxide is defined only in the surveyed vinegar because they are derived from low-quality wine, which fruit mash is sulphited Studies were conducted three times for each of the indicators. The results obtained were statistically processed, summarized in tables and figures. The results were compared with the requirements specified in the regulations (BDS 399:1983).

Results and discussion

The quality of vinegar and acidic products is found after analyzing the results of the studied sensor and physicochemical indicators. The apple vinegar "Veda" is packaged in colored polyethylene container with a capacity of 500 ml. Apple vinegar is a homogeneous clear liquid, easy flowing, free from sediment or discoloration. The color is straw, the taste is pleasantly sour with no aftertaste. The odor is specific, pleasant and congenial for apple vinegar (Table 1).

Table 1.

Results from a study of apple vinegar "Veda" on sensor indicators

Indicators	BDS 399-76	Results
Appearance	Clear or slightly opal without sludge	Clear liquid, without sediment
Color	Yellow-orange to red wine	Light yellow, typical
Taste	Sour, pleasant typical for vinegar	Sour, typical of vinegar
Scent	Pleasant, typical for vinegar	Typical

Balsamic vinegar "Rosso" (Table 2) is packed in a colored glass package with a capacity of 500 ml. Appearance is homogeneous fluid, easy flowing. The color is dark red to burgundy and the taste is pleasantly tart, typical of this type of vinegar. The aroma is inherent to raw materials, pleasant.

Table 2.

Results from a study of Balsamic vinegar "Rosso" on sensor indicators

Indicators	BDS 399-76	Results
Appearance	Clear or slightly opal, without sludge.	Easy flowing liquid, uniform.
Color	Yellow-orange to red wine.	Dark red wine.
Taste	Sour, pleasant, typical of vinegar.	Tart, pleasantly sour, inherent.
Scent	Pleasant, typical for vinegar.	Typical.

The acid product "IZZI" is packed in a plastic pack with a capacity of 700 ml. The pack is easily deformed, which may cause cracking and leakage of product. The acid product is easy flowing liquid without sediment. The color is slightly yellowish. The taste is tart, strong, sour. The scent is typical, inherent (Table 3.).

Results obtained from the study of 9 brands of vinegar and 3 types of acid products on sensor indicators, are showing compliance of the tested types of apple, wine, balsamic and sour product with the requirements, specified in the regulations. Studied types vinegar and sour products have a typical appearance and taste properties, there were no deviations from the requirements. Therefore according to the sensor indicators the studied vinegars and acid products fully meet the requirements specified in the regulations and are standard.

Table 3.

Results from a study of acid product "IZZI" on sensor indicators

Indicators	BDS 399-76	Results
Appearance	Clear or slightly opal, without sludge.	Easy flowing liquid, without sediment.
Color	Yellow-orange to red wine.	Slightly yellowish.
Taste	Sour, pleasant, typical for vinegar.	Sour, tart.
Scent	Pleasant, typical for vinegar.	Typical, inherent.

In the survey of vinegar and acisd products on the indicator total acidity was found (Figure 1) that one of the tested vinegar (wine vinegar with tarragon) and one of acid products ("IZZI") meet the requirements specified in regulatory document (6 (+ -) 0,2 g/100cm^3). The content of total acidity in the studied sour products is lower than that written on the label with: 1.25 g/100 cm^3 in sour product "Bulagent"; 0.39 g/100 cm^3 in acid product "Libra". The results of acid product "IZZI" for this indicator is higher with 0.27 g/100 cm^3 from what was written on the label.

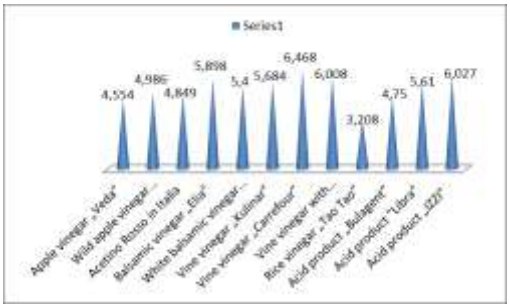

Figure 1. Content of total acid in vinegar and acid products, in g/100 cm^3

After comparing the results obtained of the content of total acidity with information written on the label of the studied types of vinegar and acid products was found, that producers are incorrect and present inaccurate, misleading information to consumers. Based on the survey should conclude that eight of the vinegars and two of the acid products are non-standard of the

indicator total acidity, because the values obtained are under the requirements specified in the regulations.

The results obtained for the indicator *total sulfur dioxide* (Figure 2) in the surveyed types of vinegar are equivalent to the regulatory requirements (not more than 150 mg/dm^3). Therefore studied vinegars are standard on this indicator.

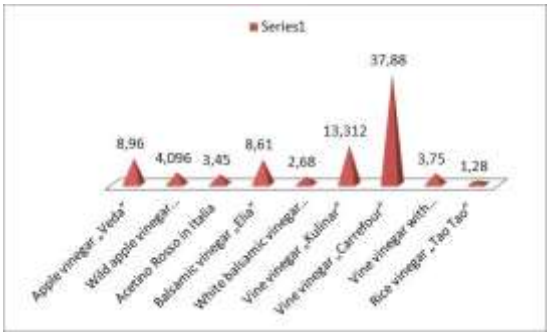

Figure 2. Content of total sulphur dioxide in vinegar, in mg/dm^3

The results for the index *free sulfur dioxide* in eight of the surveyed vinegar (Figure 3) are relevant with those laid down in the regulatory requirements (not more than 20 mg/dm^3). Therefore eight of the vinegars are standard, and one (wine vinegar "Carrefour") is irregular of the studied indicator. In wine vinegar "Carrefour" the content of free sulfur dioxide is higher with 13.28 mg/dm^3 from the legal requirement, and this unfavorably affects the sensor properties of vinegar.

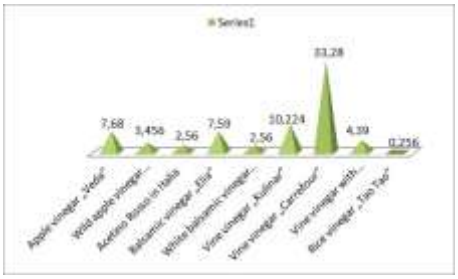

Figure 3. Content of free sulphur dioxide in vinegar, in mg/dm^3

Based on conducted studies of 9 types vinegar and 3 types acid products on physicochemical indicators should make the following conclusions: *on the indicator total acidity* has been found that one of the vinegar (wine vinegar with tarragon) and one acid product "IZZI"

meet the requirements, and the other 8 types of vinegar and two types acid products are nonstandard.; *on the indicator content of ethyl alcohol* was found that the examined vinegars and acid products correspond with the requirements (no more than 0.5vol%).; *on the indicator total sulfur dioxide* was found that 9 types of vinegar comply with requirements (no more than 150 mg/dm^3).; *on the indicator free sulfur dioxide* was found that the 8 types of vinegar comply with requirements (no more than 20 mg/dm^3), and at wine vinegar "Carrefour" was found higher content with 13.28 mg/dm^3, which lowers the sensor properties of the wine vinegar.

Conclusion

The studied sensor indicators show that apple, wine, balsamic vinegar and acid products suit with the requirements specified in the regulations, therefore they are standard. Conducted research on physicalchemical indicators show that the samples of vinegar are unqualitative to the following indicator total acidity, with the exception of the following two types: white balsamic vinegar "San Lazaro" and wine vinegar with tharos. The mark of some of the studied samples vinegar (apple vinegar "Veda", wine vinegar "Carrefour", acid product "Bulagent" and acid product "Libra") is vague and incomplete. There are no details such as expiry date, consignment number and logo on the label of: apple vinegar "Veda", vinegar "Carrefour", acid product "Bulagent", acid product "Libra".

Based on the survey should be made the following recommendations: to impose strict control on input additive and in particular E260 because consumers are looking for natural product and not pure acetic acid. The mark on the label must be clear, precise and to inform consumers correctly which is the true vinegar.; to be prepared a new regulatory document (standard, regulation, etc.), which should include current requirements towards the different types of vinegar wine, apple, rice, balsamic, etc.

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Risk Management and Safety System for Health Services

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Abstract. The concept of risk is located at the basis of business activity. Aim of this work is to interpret this concept in an innovative way. Risk control is at the center of the safety management system: the organization has to manage risk because not capable to completely eliminate it.

Community reference standards are the ISO 31000: 2009, Risk management - Principles and guidelines and Directive 89/391 EEC about workers' safety and health. The latter standard represented a real milestone because it defines minimum requirements for all Europe and innovative elements too: participation of workers, the priority of the principle of risk prevention at the source.

This work emphasizes that process of Risk Assessment is the key tool for planning the security of an organization.

Safety at work in health care, in particular, appears very complex due to characteristics of the services, often highly specialized, as those found in the national Italian health system. This paper identifies procedures aimed at preventing the risk and reducing it to an acceptable level.

***Keywords**: safety management, risk management, health services*

Introduction

Any business organization, including health, implies a risk control embedding the presence of a Safety Management System. Being not capable to completely eliminate the risk, the organization must manage it through the Risk Evaluation process.

This paper has chosen an innovative approach in the definition of the Health and Safety System: Risk is investigated and managed taking into account the plurality of aspects, which it can manifest in the health service organization, and then brought back it to unity. The aim is to prevent the risk and to reduce it to a level that can be "felt" or considered acceptable by the organization itself. The risk is interpreted as the probability that an incident will be exploited as an opportunity.

Material and methods

With reference to Security System in the workplace, interventions were analyzed which are being consolidated and provisions have been identified, aimed to control the activities, among various existing regulatory frameworks.

The Framework Directive 89/391 EEC on the Safety and Health of workers has dictated minimum basic requirements to ensure the improvement of health and safety throughout Europe. Elements of particular innovation are: workers's participation and priority of "eliminating risks at source" principle.

The UNI ISO 31000 "Risk management - Principles and guidelines" establishes principles that must be met to make the risk management effective. To a wide range of stakeholders, objectives are: to improve the identification of threats, controls and prevention of accidents, to increase the performances of health and safety management. The UNI ISO 31000 gives specific guidance for developing a single corporate culture of the risk: it places particular attention to context definition, internal and external one, which the organization operates into and communication with stakeholders. As most of the ISO standards family, it is based on the principle of continuous improvement, to be implemented according to the PDCA scheme (Plain, Do, Check, Act). It places special emphasis too on risk management through a performance review, annually done at least. It defines the organization's objectives, measurement, review and development of processes for the subsequent period.

In addition to the legislative references for the risk assessment, methodologies and tools proposed by the Guidelines such as BS OHSAS 18002: 2008 and IEC / FDIS 31010: 2009 can be used.

The ILO[26] OSH 2001 guidelines are aimed at contributing to the protection of workers from the risks and to elimination of: occupational injury, illnesses, accidents and deaths. They have the goal of developing national guidelines on occupational safety and health (OSH) management systems, responding appropriately to the diverse needs of organizations.

Experiences developed in the Health System have been identified and they have been evaluated by SWOT analysis model in order to define the development paths of the safety management system.

Results and discussion

Introduction of business principles aimed to respond to the needs of the community health has resulted a liability in the area of protection of workers' health, referred to the hierarchically higher figure, having the features of the Employer.

The complexity of the offer of services that is found in the Italian national scene appears immediately and is often highly specialized, with particular reference to occupational safety as part of the Health Service. Accredited actors, both public and private, which operate within the Italian National Health Service, have very different organizational and dimensional characteristics, as it is also found in most EU countries.

The risk has several facets, but they are interconnected in health care: for example, the risk related to the safety of workers can generate strictly intended clinical risk. The challenge to progressive reduction of these risks is reflected in the introduction of new management and new clinical protocols and therapeutic techniques. This challenge is therefore an opportunity to improve the efficiency in the performance of the institutional services, with increasing customer / patient satisfaction. This approach well combines with the principle of continuous improvement, which absorbs the corrective and preventive actions.

[26] The ILO is the only United Nations agency with a tripartite structure: representatives of governments, employers and workers together establish the policies and programs of the Organization. This tripartite approach gives strength, flexibility and appropriate basis for the development of a culture of "sustainable security" organization.

The first risk is not to have awareness of risk, therefore it is essential staff training (life-long learning policy) by consolidating the knowledge of the risk and the ability to address it / prevent it. It is a "cultural" approach from which descend sharing activities and involvement about risk.

In any given context it is necessary to share reasoning to arrive at the risk assessment: what is rated as "risk " and “how” to manage it. Incapable of pursuing zero risk, you must also think about residual risk and identify the pathways to protect yourself (through an insurance system, for example).

Case Study: Clinical risk and safety management system

The system of Joint Commission International Accreditation is based on the concept of hospital organizations as complex systems of interconnected resources and processes and it aims to ensure the most favorable organizational conditions to ensure patient safety. The standards identify areas of the business that may have an impact on patient safety and require organization to ensure an adequate regulation.

The tendency to underestimate risk of events with mild or moderate severity consequences is widespread, even if they have high probability of occurrence, while it is overestimated the risk of very serious consequences events which have low probability of occurrence.

Conclusion

The surveys on the OSH perception have gained increasing prominence, therefore the Italian Ministry of Health supports research for a double aim: realization of a cross-national survey system and realization of a permanent system aimed to detect the perception of the risk and occupational safety by workers.

We need to focus on rooting and evolution of a safety culture, as the EU does by the DIR 89/391 / EEC. It is a directive that aims to prevent and to make effective the employees involvement..

The developed research allowed :

- to create a unified cultural system on the concept of risk, starting from its various enterprise-level expressions and considering it as chance to opportunity or to negative effects;
- to encourage the involvement of all workers, facilitating communications;

- to identify expandable cultural approaches also in other business areas, to improve the organization's evaluation of risks.

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Quality of Fruit Yoghurts

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Abstract. Milk and dairy products because of their outstanding properties are important in human nutrition. Therefore, the market for dairy products has been growing and consumption is still increasing, both in Poland and in the world. A group of products that is developing most rapidly are yoghurts. To fully meet the needs and expectations of consumers, manufacturers have been developing and bringing to market new flavours and forms of yoghurts in the recent years (e.g. liquid or drinkable yoghurt). Fermented dairy products are also good alternative for people with lactose intolerance. The percentage of people with lactose intolerance continues to grow, but this does not mean that they must resign from dairy products.

The aim of the study was to analyze and compare the quality of selected fruit yoghurts. This analysis consisted of three parts: evaluation of the sensory quality, assessment of selected physicochemical parameters, i.e. fat, dry matter, pH, colour in the L*a*b*, assessment of the packaging and of correctness of labeling.

The experimental material consisted of 16 fruit yoghurts of 4 producers. Analyzed yoghurts were produced by both leading manufacturers and as own brands.

The analysis of the quality of fruit yoghurts allowed to verify positively the hypothesis concerning a comparable quality level of yoghurts produced by leading manufacturers and as own brands. All yoghurts received high scores for taste, appearance and texture, and evaluated physical and chemical parameters were compliant with the standards. Detected non-compliance concerned only the fat content, which was slightly lower than that declared by the manufacturer on the packaging. Analysis of the packaging and of the correctness of labelling gave positive results. All analyzed packaging contained a set of obligatory signs and information. To ensure

consumer's convenience, producers put on the packaging also a lot of additional symbols and information.

Keywords*: yoghurt, quality, analysis*

Introduction

Milk and dairy products are considered one of the most important ingredients in everybody's diet. Not only are they very tasty, but they also have very high nutritional value, their components are well absorbed and make the body function properly. These products contain high-quality protein, milk fat, as well as vitamins, including mainly D and A, but also B-group vitamins (above all B2) as well as mineral components, the most important of which is calcium (Nadolna, 2001, p.14-15). They are not only the most important but also the cheapest source of calcium in the diet due to the fact that they contain its most absorbable form (Sienkiewicz, 2010, p.12). These valuable components are of special significance for children and young people as they determine the health over the later years of their lives (Cichosz, 2013, p.5). Fermented milk products have additionally regulatory and stabilising effect on appropriate balance of intestinal flora. Because they contain *lactobacilli* and *bifidobacteria*, they have antimutagenic and anticancer properties (Sienkiewicz, 2010, p.12). This is why yoghurt and other fermented milk beverages should be included in every man's diet.

Fermented milk products are also an ideal alternative for constantly increasing number of people with lactose intolerance. As fermented milk beverages are free from lactose they can be consumed without any health consequences.

In Poland, the production of milk amounts to 12-15% of the total agricultural production, and 8% of the total production of milk in the European Union. Thus, Poland is in the group of the leading producers (Świątkowska 2014, Statistical Yearbook of Agriculture 2014).

The popularity of fermented milk beverages has not been diminishing for many years; quite on the contrary, consumers have been increasingly eager to buy this kind of products. At present, the most popular are yoghurt and kefir. Yoghurts constitute as much as 59% of sales of fresh dairy products (Wieczorkiewicz 2014). From a 2013 study it follows that consumption of fermented milk beverages depends on sex, age and education, as well as place of residence. They are most frequently accessed by women under 30 years of age, residing in cities, with secondary education (Świątkowska, 2014, p.7-9).

In order to encourage consumers to buy yoghurts, producers continuously strive at improving quality and sensory parameters of their products. They also create completely new, sometimes surprising flavours. However, the greatest popularity is enjoyed by fruit yoghurts, chosen by consumers above all for their sensory qualities and high nutritional value. Most consumers prefer the strawberry flavour. Slightly less popular are the flavours of raspberry, vanilla and forest fruit (Stankiewicz and Lange, 2012, p.192).

The objective of the study was to assess the quality of selected fruit yoghurts available on the Polish market.

Material and methods

The study material consisted of 16 fruit yoghurts made by 4 manufacturers. Both well-known brands and private labels of fruit yoghurts were analysed. The flavours were strawberry, peach, raspberry and forest fruit.

The quality analysis comprised:

- sensory evaluation;
- analysis of selected physicochemical parameters;
- analysis of packages and correctness of labelling.

The sensory analysis was performed by 6 specialists with high sensory sensitivity. During the examination appearance and colour, consistence, taste and smell were evaluated. The sensory analysis was performed using a score method in a 5-point scale, where 1 is the lowest and 5 is the highest score. The evaluation was carried out using a reference chart. Also, appropriate importance coefficients were adopted. Prior to the evaluation, the yoghurt samples were coded.

Within the analysis of the physicochemical parameters, the following determinations were made:

- fat content with the Gerber method (Polish Standard PN-75/A-86130) ,
- pH (Polish Standard PN-75/A-86130),
- dry mass content with the oven-drying method (Polish Standard PN-75/A-86130),
- colour in the L*a*b* system using a Minolta CM3500d spectrophotometer.

Evaluation of the correctness of packages labelling was carried out in compliance with the Regulation of the Minister of Agriculture and Rural Development of 10th July 2007 concerning labelling of foodstuffs (Journal of Laws, 2007 no. 137 item 966) and the Regulation

of the Minister of Health of 25th July 2007 concerning labelling of foodstuffs with nutritional values (Journal of Laws, 2007 no. 137 item 967). Each of the packages examined was evaluated with regard to the presence of the obligatory information, such as: the name of the product, composition of the product, nutritional value, the use-by date, the manufacturer's data, the manner of preparation, net content / number of pieces, the place of origin, storage conditions, commercial quality class, the production batch identification. Subject to evaluation was also the presence of other non-obligatory signs and additional information.

Results and discussion

As a result of the organoleptic evaluation (table 1), all of the yoghurts scored good or very good (over 4 points). Despite the fact that the yoghurts are made both as private labels and renowned manufacturers' brands, it is not possible to unambiguously indicate a specific manufacturer whose products stand out with regard to the sensory evaluation. The scores depended to a large extent on the taste of the yoghurts; however, the differences were not great.

Table 1.

The results of sensory analysis of fruit yoghurts

Producer	Yoghurt			
	strawberry	raspberry	peach	forest fruits
A	4,17	4,25	4,79	4,35
B	4,84	4,50	4,55	4,75
C	4,75	4,61	4,79	4,23
D	4,84	4,46	4,45	4,79

Among the yoghurts of producer A, the highest score was awarded to the peach flavour. It has achieved a markedly better final score. All of its organoleptic features achieved the highest scores; in particular taste and smell. The highest scored yoghurt of manufacturer B was the strawberry and the worst the raspberry. With regard to consistency, the scores were very similar, likewise with regard to appearance and colour. The final score of the yoghurts was determined by number of points awarded for taste and smell. Concerning producer C, the highest overall score was achieved by the peach yoghurt, and the lowest by the forest fruit yoghurt. This one received the lowest scores for all the three properties. The highest final score for yoghurt of manufacturer D was awarded the strawberry one.

The content of dry mass in yoghurts with additives should be approx. 18%. The dry mass content in yoghurts with additives is mainly influenced by the percentage content of the

additives. As can be seen in the table 2, some yoghurts contain over 20% dry mass, which indicates a large content of fruits. Only one of the yoghurts contained 16.2% dry mass – the strawberry yoghurt from producer A. The highest values of this parameter had yoghurts from manufacturer B.

Table 2.

The results of physicochemical analysis of fruit yoghurts

Yoghurt	Content of fat [%]				Content of dry mass [%]				pH			
	Producer											
	A	B	C	D	A	B	C	D	A	B	C	D
strawberry	1,9	2,0	1,8	1,2	16,2	21,9	21,5	19,5	4,15	4,36	4,15	4,21
raspberry	1,7	1,5	2,2	1,2	19,1	22,7	20,0	19,5	4,13	4,25	4,14	4,13
Peach	1,7	2,2	2,0	1,2	20,0	22,0	20,0	19,7	4,19	4,26	4,27	4,19
forest fruits	1,7	1,7	1,7	1,2	17,7	22,6	19,7	20,1	4,12	4,27	4,24	4,26

Fat content of the yoghurts was between 1.2% and 2.2%. The lowest fat content had yoghurts from producer D, which contained 1.2% fat regardless of the flavour. The highest fat content was found in yoghurts from manufacturer C. Fat content was not related to the flavour of the yoghurt. However it was observed that the actual fat content (determined during the analysis) was lower than declared by the manufacturer on the package. The greatest disparities were found in yoghurts from producer A.

Active acidity - the pH of the yoghurts, should be between 3.9 and 4.6. The results indicate that each of the examined samples fulfilled the relevant requirements. The active acidity of all the analyzed yoghurts was similar. Like in the case of the other parameters, the flavour of the yoghurt did not affect the pH.

The results of colour determination of strawberry yoghurts were similar. Only yoghurt from manufacturer C obtained the highest value of the parameter a* and the lowest of the parameter b*, thus was characterised by the reddest shade. Among the raspberry yoghurts the one that stood out was form producer B; it achieved the highest value of the parameter a* and the lowest of the parameters L* and b*. This indicates the most intense red shade of this yoghurt. As could be expected, the results obtained for raspberry yoghurts were very similar to those for strawberry yoghurts as both flavours are characterised by a pink-red colour shade. The value of the L* parameter obtained for the peach yoghurts indicate the brightest colour among all the flavours analysed. The most intense yellow-orange shade, what was indicated by the highest value of the parameters a* and b*, had yoghurt form manufacturer D. The results of colour

determination of the forest fruit flavoured yoghurts were also very similar. Relatively low values of the L* parameter indicate the darkest colour of the yoghurts with this flavour. Parameter a* indicates the presence of the red shade and the parameter b* indicate occurrence of the blue shade.

Table 3.

The results of colour determination of fruit yoghurts in the L*a*b* system

Yoghurt	L*				a*				b*			
	Producer											
	A	B	C	D	A	B	C	D	A	B	C	D
strawberry	73,47	76,49	75,32	79,15	10,19	9,85	13,92	10,18	6,34	4,75	3,26	4,68
raspberry	76,09	70,56	78,19	78,32	8,03	12,82	7,05	11,39	5,20	2,06	5,93	5,62
Peach	84,65	88,13	86,15	85,01	1,26	-0,57	3,08	3,38	11,11	15,42	16,22	19,52
forest fruits	66,84	63,39	65,36	69,57	10,61	14,75	9,37	10,35	0,83	-1,18	-0,29	-0,03

The packages were checked for tightness, possible damages and the obligatory marking and information, according to the laws. All the packages were tight and intact. The analysis of the correctness of labelling showed that the yoghurts were labelled correctly. They contained all the required information. Moreover, on the packages there were additional, non-obligatory signs. Thanks to this, the consumer can familiarise themselves with all the essential information and make an informed purchase. By placing additional information on the packages, manufacturers can also make them more attractive.

Conclusion

The quality analysis provided satisfactory results and demonstrated lack of significant differences in the quality of fruit yoghurts made as well-known brands and as private labels. In the sensory evaluation, all the yoghurts were awarded high scores. The physicochemical analysis demonstrated good quality of the yoghurts. The analysis of the correctness of labelling showed that the packages subjected to the analysis had all the obligatory marks and information. Furthermore, manufacturers place additional signs on the packages for the customer's convenience.

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Condition monitoring of in-service lubricants - the analysis of color

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Abstract. The article presents the analysis of color of in-service lubricants under engine operating conditions. Five samples of different engine oils were assigned their code names: CE, MS, ME, PE and PS; and then carefully analyzed. The comparison of selected lubricants was performed all over their lifetime, since the moment they were put into service until the moment of their substitution. Physical tests included the determination of parameters of color in the L* a* b* system. The measurements were obtained with the use of the Konica Minolta Tristimulus Colorimeter - Spectrophotometer CM-3500d.

Considering the degradation of engine oils, after the fourth quarter of the year and with average mileage of 13 400 km, the mean values of the L*, a*, b* parameters were very similar. They were characterized by low diversity and amounted to: from 0.09 to 0.11 (L*), from 0.04 to 0.15 (a*), and from 0.01 to 0.04 (b*). On the basis of the obtained values of the parameter L*, fresh lubricants were divided into three groups. The first one was characterized by the lowest brightness (CE and ME), the second one by the highest brightness (PS), whereas the third group consisted of the remaining lubricants, which were characterized by the parameter L* values ranging between the first and the second group.

Keywords*: engine oil, lubricants, color, operation, in-service, exploitation*

Introduction

The modern-day engine oil is an indispensable component required for the proper functioning of the engine. It must meet the design specification requirements stipulated by the engine constructor. Manufacturers are now developing oils that are of increasingly high quality and efficiency. They are trying to adapt their products to the specific conditions in which lubricants are going to be used. Oftentimes, these conditions tend to be extremely adverse and as a result, the performance quality of oils gradually decreases. This process is called in-service aging. Changeable operating conditions of in-service lubricants strongly

contribute to the aging process. On the one hand, there are frequent cold starts, on the other – engine working at high speed. As a result of an interaction between oxygen in the air and high temperatures, the oil oxidizes. This, in turn, leads to a partial decomposition of the components as well as to polymerization and condensation of certain products of the decomposition. As a consequence of oil aging, neutral and acidic substances are produced. They strongly affect the contacting metal causing its corrosion and increased wear. Acidic substances, mainly organic acids, react with metal, producing salts which are responsible for the formation of sludge in the oil systems. Among neutral substances, there are mainly alcohols, aldehydes, esters, ketones, asphaltenes and resins [2, 3, 4]. An increase in the concentration of oxidation products in the lubricant alters its physicochemical properties and performance [12, 13, 14, 15, 16, 17]. The external signs of the in-service lubricant aging are: changes in its color (strong darkening), changes in viscosity (an increase or a decrease – depending on the degree of dilution of the fuel and the degree of shear), a characteristic smell of the exhaust gas and fuel, and the precipitation of the suspension in the form of a solid [6, 7, 10]. Currently, the most commonly used method for measuring the color of the oil is the determination of parameters of color in the CIE L*, a*, b* system. The three-dimensional color space, L * a * b *, was standardized in 1976 by CIE (Comission Internationale de l'Eclairage). It came into being as a modification of the earlier system - Hunter L, a, b. In the CIE L * a * b *: parameter L * represents lightness and can take values from 0 to 100 (from white to black), parameter a* denotes a shade (from green to red if the value is negative or positive, respectively), and parameter b * refers to the saturation of the color (from blue to yellow if the value is negative or positive, respectively).

Research conducted by Siwiec and Gradowski confirms that the evaluation of color of in-service lubricants is a very valuable source of information. In their view, the process of aging of in-service oils is primarily reflected by a change in color, and then by a change in the acid and alkaline number [11]. Niewczas et al. draw similar conclusions. They believe that contamination and chemical processes in engine oils lead to their aging, which is revealed in a change in their properties, including viscosity, color and odor (the smell of exhaust gas in the used lubricating oil) [9]. According to Kim et al., fresh oil is characterized by high homogeneity and brown color, whereas the color of the used oil is described as “darker brown” or “black”. It is also pointed out that metal particles can be found in the used engine oil, and that affects its heterogeneity [8].

According to Santana et al., the analysis of color is one of the most important parameters determining the quality of the engine oil (it incurs lower costs than the analysis of other physicochemical properties). The authors confirm that the color change can be indicative of engine operating problems, contamination, degradation, or the oxidation of the lubricant [5].

The present article introduces the method of determination of parameters of color in the L* a* b* system as a quick, fast and reliable tool facilitating the determination of the moment of in-service lubricant's wear when it no longer exhibits properties allowing safe operation and, therefore, should be replaced. This is only the first part of the study, containing a description of the research methodology and the obtained results. In the second part, the lubricant's color is compared with the results of physicochemical tests. The main objective of the two-part study is to attempt to answer the following question: do the results obtained with the presented method accurately determine the exact time when the dissipative properties of in-service lubricant are no longer sufficient for safe and trouble-free operation of the engine?

Materials and methods

Physical tests included the determination of parameters of color in the L* a* b* system [1]. The measurements were obtained with the use of the Konica Minolta Tristimulus Colorimeter - Spectrophotometer CM-3500 (fig.1). A glass cuvette CM-A97 (dimensions 50x38) of optical path length of 2mm was used in the test. The cuvette, made of optical glass, is designed for transmission measurements. Due to the optical path length of 2 mm, it is very well suited for the measurement of dark transparent liquids.

Figure 1. Minolta – Spectrophotometer CM-3500d
Source: own work

In the study, 10 samples of in-service lubricants from five different manufacturers were tested. The comparison of selected lubricants was performed all over their lifetime, since the moment they were put into service until the moment of their substitution. All in-service lubricants were tested in identical cars and in the same period of time. The cars used in the study were a consistent fleet, in terms of brand, type, and operating conditions. The fleet belongs to the Małopolska Training Center for Drivers (Małopolski Ośrodek Ruchu Drogowego). The total number of ten vehicles with the cylinder capacity of 1332 cm3 with petrol engines and operating on the same batch of fuel were used in the research. At first, the freshly applied oil was tested and then the test was repeated at the end of every quarter of the year in the course of a twelve-month. After the first, second, third and fourth quarter of the year, the total number of ten oil samples was collected, which makes 40 samples within a year. Table 1 presents the total kilometers traveled by each car in the study.

Table 1.

The number of kilometers traveled by each car.

The sample code	Mileage at start [km]	Mileage after 1st quarter [km]	Mileage after 2nd quarter [km]	Mileage after 3rd quarter [km]	Mileage after 4th quarter [km]
CE 17760	12858	4401	7931	11358	13220
CE 17943	14571	4215	7996	11450	13907
ME 18345	9753	3176	5922	8196	9234
ME 18760	15307	4654	8641	12018	14573
MS 18361	14988	3790	7654	12331	14166
MS 18817	14666	3832	8037	11439	13877
PE 18207	12209	3836	7311	10663	13223
PE 18591	15409	4738	8697	13073	15188
PS 18149	13556	4269	8317	12412	14384
PS 18784	11948	3177	7249	10907	12317

Source: own work.

Table 2 shows the lubricants used in the study (class SAE 5w/30), together with the requirements of API, ACEA classifications, and of engine producers.

Table 2.

Quality and viscosity classifications of the engine oils selected to the research.

OIL	**SAE**	**ACEA**	**API**	**Classification by engine manufacturers**
CE	5w-30	A3, C3	SH	VW 504 00; BMW Longlife-04; MB-Approval; 229.31/ 229.51; Porsche C30
ME	5w-30	C2/C3	SM/SN	BMW: Longlife 04; MB-Approval: 229.31/229.51; chrysler: MS-11106; Porsche: C30; Chrysler: MS-11106; Peugeot/Citroën Automobiles: B71 2290, B71 2297; AvtoVAZ: Group "Luxe"; AAE: Standard STO 003-05, Group B6
MS	5w-30	C3	SM/SL	General Motors Service Fill dexos2TM (license number GB1A0914015); BMW Longlife 04; Dopuszczenie MB 229.31/229.51; Volkswagen (benzyna) 502 00 / 505 00
PE	5w-30	C2	-	JASO - DL-1
PS	5w-30	A3	SM	VW 504.00-507.00

Source: own work

When analyzing the results, it should be considered that the operating conditions were "difficult", which means that the actual vehicle driving conditions were as follows:

- car operation requiring a large and variable engine load (alternating between rapid overheating and cooling of the engine)
- extended periods of engine operation on idle mode (due to traffic congestion)
- short distance driving (multiple warming and cooling of the engine)
- frequent engine starting at low temperatures
- driving in traffic jams (driving conditions referred to as “drive-stop”)

Results and discussion

Among the selected fresh lubricants, the highest levels of lightness (parameter L*) were found in the PS group samples – the value of L* was 97.07. A similar value was recorded for ME and CE groups (95.29 and 95.09, respectively). However, the share of green color in fresh lubricants (parameter a*) was the highest in the products from ME group (-6.05), and the lowest in the products from PS group (-1.79). The saturation of yellow (parameter b *) was the highest in the ME group of oils (36.02). A similar value was recorded for PE and CE groups (25.32 and 26.38, respectively), whereas the lowest value was found in PS group of oils (12.78). Based on the obtained results, it can be observed that the fresh lubricants from the ME group were characterized by a higher proportion of green color, lower level of lightness and high color saturation compared to other groups. Fresh lubricants from the PS group were characterized by the lowest share of the color green, the highest level of lightness and the lowest saturation of color. Tables 3-5 present the changes of parameters L *, a *, and b*.

Table 3.

Changes of the parameter L* in the lubricants tested

LP.	The sample code	Fresh oil	after 1st quarter	after 2nd quarter	after 3rd quarter	after 4th quarter
		L*				
1.	CE 017760	95,29	1,63	0,46	0,12	0,10
2.	CE 017943	95,29	2,49	0,49	0,15	0,10
3.	ME 018345	95,09	5,50	0,38	0,11	0,10
4.	ME 018760	95,09	2,52	0,26	0,11	0,09
5.	MS 018361	96,26	2,63	0,68	0,15	0,11
6.	MS 018817	96,26	3,58	0,48	0,14	0,10
7.	PE 018207	95,93	2,07	0,36	0,15	0,10
8.	PE 018591	95,93	2,44	0,45	0,11	0,10
9.	PS 018149	97,07	7,75	0,87	0,17	0,11
10.	PS 018784	97,07	11,00	0,73	0,12	0,11

Source: own work.

Table 4.

Changes of the parameter a* in the lubricants tested

LP.	The sample code	Fresh oil	after 1st quarter	after 2nd quarter	after 3rd quarter	after 4th quarter
		a*				

1.	CE 017760	-3,91	8,86	2,40	0,18	0,04
2.	CE 017943	-3,91	15,17	2,65	0,42	0,09
3.	ME 018345	-6,05	23,11	1,77	0,14	0,07
4.	ME 018760	-6,05	15,09	1,13	0,17	0,03
5.	MS 018361	-3,32	14,45	3,77	0,41	0,13
6.	MS 018817	-3,32	19,32	2,51	0,34	0,06
7.	PE 018207	-4,36	12,41	1,79	0,38	0,04
8.	PE 018591	-4,36	14,49	2,33	0,15	0,04
9.	PS 018149	-1,79	28,50	4,79	0,51	0,15
10.	PS 018784	-1,79	28,83	3,88	0,2	0,11

Source: own work.

Table 5.

Changes of the parameter b* in the lubricants tested

LP.	The sample code	Fresh oil	after 1st quarter	after 2nd quarter	after 3rd quarter	after 4th quarter
		b*				
1.	CE 017760	26,38	2,66	0,63	0,04	0,01
2.	CE 017943	27,38	4,12	0,69	0,11	0,02
3.	ME 018345	36,02	9,31	0,49	0,03	0,02
4.	ME 018760	37,02	4,18	0,30	0,04	0,01
5.	MS 018361	19,33	4,38	1,01	0,1	0,03
6.	MS 018817	20,33	6,01	0,67	0,08	0,01
7.	PE 018207	25,32	3,41	0,47	0,1	0,01
8.	PE 018591	26,32	4,04	0,62	0,04	0,01
9.	PS 018149	12,78	12,79	1,35	0,13	0,04
10.	PS 018784	13,78	18,76	1,10	0,05	0,03

Source: own work.

After the first quarter, and an average of 4000 km traveled, the mean values of parameters L*, a*, b* in the CE and PE groups were ranging: from 1.63 to 2.49 (L*), from 8.86 to 15.17 (a*) and from 2.66 to 4.04 (b*). The highest level of lightness (parameter L*) was recorded in samples coded as PS 018784, PS 018149, ME 018760 and MS 018817. These lubricants also had the highest share of the red color and the highest saturation of yellow.After the second quarter, and an average of 7 800 km traveled, the highest level of lightness (parameter L*) as well as the highest share of the red color and the highest saturation of yellow were recorded in the following samples: PS 018784, PS 018149, CE 017943 and MS 018361. In other cases, the mean values of the parameters ranged between 0.26 and 0.48 for L*, between 1.13 and 2.51 for a* and between 0.30 and 0.67 for b*.

After the third quarter, and an average of 11 400 km traveled, the mean values of parameters L*, a*, b* were similar: from 0.11 to 0.17 (L*), from 0.14 to 0.51 (a*) and from 0.03 to 0.13 (b*).

Considering the degradation of engine oils, after the fourth quarter of the year and with average mileage of 13 400 km, the mean values of the L*, a*, b* parameters were very similar. They were characterized by low diversity and amounted to: from 0.09 to 0.11 (L*), from 0.04 to 0.15 (a*), and from 0.01 to 0.04 (b*).

The relationships between the parameters L *, a *, b * and the kilometers traveled are shown in the tables below. The aim was to determine the strength of the correlation between the results of color measurement and the time of oil use, expressed by the kilometers traveled (km). For this purpose, the Pearson's correlation coefficients were calculated. The correlation figures for each analyzed sample indicating the strength of the relationship (defined as a value ranging from -1 to 1) can be found in the last three columns of Table 6.

Table 6.

Dependence between the parameters L * a * b * of the lubricants tested and the km traveled

The oil code	The sample code	Mileage [km]	Minolta			Correlation coefficient		
			L	a	b	mileage - L	mileage - a	mileage - b
CE 17943	0716	4215	2,49	15,17	4,12	-0,892	-0,895	-0,892
	0749	13907	0,1	0,09	0,02			
	0831	11450	0,15	0,42	0,11			
	0527	7996	0,49	2,65	0,69			
CE 17760	1844	13220	0,1	0,04	0,01	-0,928	-0,938	-0,927
	1713	4401	1,63	8,86	2,66			
	1939	11358	0,12	0,18	0,04			
	1324	7931	0,46	2,4	0,63			
ME 18760	2418	4654	2,52	15,09	4,18	-0,857	-0,859	-0,857
	2336	12018	0,11	0,17	0,04			
	2323	8641	0,26	1,13	0,3			
	2645	14573	0,09	0,03	0,01			
ME 18345	3144	9234	0,1	0,07	0,02	-0,881	-0,890	-0,880
	3127	5922	0,38	1,77	0,49			
	3111	3176	5,5	23,11	9,31			
	3234	8196	0,11	0,14	0,03			
MS 18361	4545	14166	0,11	0,13	0,03	-0,916	-0,927	-0,916
	4118	3790	2,63	14,45	4,38			
	4821	7654	0,68	3,77	1,01			
	4839	12331	0,15	0,41	0,1			

Table 6. cont.

The oil code	The sample code	Mileage [km]	Minolta			Correlation coefficient		
			L	a	b	mileage - L	mileage - a	mileage - b
MS 18817	5611	3832	3,58	19,32	6,01	-0,884	-0,891	-0,884
	5234	11439	0,14	0,34	0,08			
	5622	8037	0,48	2,51	0,67			
	5445	13877	0,1	0,06	0,01			
PE 18207	6919	3836	2,07	12,41	3,41	-0,868	-0,872	-0,869
	6549	13223	0,1	0,04	0,01			
	6227	7311	0,36	1,79	0,47			
	6731	10663	0,15	0,38	0,1			
PE 18591	7845	15188	0,1	0,04	0,01	-0,886	-0,890	-0,887
	7516	4738	2,44	14,49	4,04			
	7122	8697	0,45	2,33	0,62			
	7433	13073	0,11	0,15	0,04			
PS 18149	8345	14384	0,11	0,15	0,04	-0,874	-0,902	-0,876
	8821	8317	0,87	4,79	1,35			
	8139	12412	0,17	0,51	0,13			
	8619	4269	7,75	28,5	12,79			
PS 18784	9825	7249	0,73	3,88	1,1	-0,879	-0,910	-0,879
	9839	10907	0,12	0,2	0,05			
	9115	3177	11	28,83	18,76			
	9143	12317	0,11	0,11	0,03			

Source: own work.

The final stage of the research was an attempt to determine the relationship (Table 6) between the kilometers traveled and an instrumentally determined color. After analyzing the correlation coefficients in Table 6, it was found that the highest correlation between kilometers traveled and parameter L* was recorded in the oil sample CE 17760 (-0.928) and MS 18361 (-0.916). The negative correlation coefficient for the other lubricants tested ranged between -0.857 and -0.8923. The strength of the correlation between kilometers traveled and parameter a* was also negative; however, it was on a relatively high level (from -0.859 to -0.938). This means that with an increasing

value of kilometers traveled, the value of parameter a* is going down. Similar situation was observed in the case of the correlation between kilometers traveled and parameter b*.

Tables 7 and 8 present the descriptive characteristics of the lubricants' color tests conducted in each measurement period. The tables contain arithmetic means, standard deviations and p-value (a function of the observed sample results). The p-value was used as a numerical expression of statistical significance. In the present study, the typical threshold level of significance was 0.05. Below this value, the results obtained were evaluated as statistically significant (in the tables, these values are distinguished in bold). The p-values lower than 0.01 were considered highly significant (these values are presented in bold and underlined).

Table 7.

The mean values, standard deviations and p-values for the selected parameters after the first measurement period

	In all	[CE]	[ME]	[MS]	[PE]	[PS]	CE vs ME	CE vs MS	CE vs PE	CE vs PS	ME vs MS	ME vs PE	ME vs PS	MS vs PE	MS vs PS	PE vs PS
	N=10	N=2	N=2	N=2	N=2	N=2										
	$\bar{x}$(s)						p									
L	4,16 (3,04)	2,06 (0,61)	4,01 (2,11)	3,11 (0,67)	2,26 (0,26)	9,38 (2,30)	0.495	**0.027**	0.572	0.103	0.725	0.485	0.335	0.209	0.116	0.127
a	18,02 (6,76)	12,02 (4,46)	19,10 (5,67)	16,89 (3,44)	13,45 (1,47)	28,67 (0,23)	0.504	0.093	0.621	0.113	0.789	0.464	0.262	0.246	0.121	**0.037**
b	6,97 (5,18)	3,39 (1,03)	6,74 (3,63)	5,20 (1,15)	3,73 (0,45)	15,78 (4,22)	0.494	**0.030**	0.568	0.115	0.726	0.485	0.351	0.209	0.129	0.139
N - the number of oil samples, $\bar{x}$ - arithmetics mean, s - standard deviation, p - value																

* P-value resulting from the application of Student's t-test for independent samples

Source: own work.

Table 8.

The mean values, standard deviations and p-values for the selected parameters after the second measurement period

	In all	[CE]	[ME]	[MS]	[PE]	[PS]	CE vs ME	CE vs MS	CE vs PE	CE vs PS	ME vs MS	ME vs PE	ME vs PS	MS vs PE	MS vs PS	PE vs PS
	N=10	N=2	N=2	N=2	N=2	N=2										
	$\bar{x}$(s)						p									

L	0,52 (0,19)	0,48 (0,02)	0,32 (0,08)	0,58 (0,14)	0,41 (0,06)	0,80 (0,10)	0.287	0.529	0.258	0.163	0.097	0.567	**0.013**	0.441	0.086	0.180
a	2,70 (1,12)	2,53 (0,18)	1,45 (0,45)	3,14 (0,89)	2,06 (0,38)	4,34 (0,64)	0.250	0.565	0.192	0.197	0.116	0.489	**0.030**	0.442	0.093	0.196
b	0,73 (0,32)	0,66 (0,04)	0,40 (0,13)	0,84 (0,24)	0,55 (0,11)	1,23 (0,18)	0.281	0.533	0.238	0.171	0.106	0.540	**0.023**	0.441	0.074	0.182
N - the number of oil samples, $\bar{x}$ - arithmetics mean, s - standard deviation, p - value																

* P-value resulting from the application of Student's t-test for independent samples
Source: own work.

Looking at individual variables presented in tables 7 and 8, it can be concluded that after the first three months of operation, the largest number of statistically significant differences between the mean values applies to the pair of lubricants CE and MS. In case of the parameter L*, the lubricant coded as CE showed a lower mean value of lightness compared with other lubricants. Moreover, all analyzed lubricants, with the exception of the pair PE and PP, may be considered homogenous in terms of the parameter a *. After the first quarter, the most homogeneous lubricants were ME and MS, then CE and PE, followed by CE and ME. On the other hand, the biggest differences occurred in pairs CE and MS, then PE and PS, followed by MS and PS.

After the second quarter, the largest number of statistically significant differences between the mean values applied to the pair of lubricants ME and PS. In case of the parameter L*, the lubricant coded as PS showed a higher mean value of lightness compared with other lubricants. All analyzed lubricants, with the exception of the pair ME and PS, may be considered homogenous in terms of the parameters L*, a*, and b*. After the second quarter, the most homogeneous lubricants were CE and MS, then ME and PE, followed by MS and PE. On the other hand, the biggest differences occurred in pairs ME and PS, followed by MS and PS. After analyzing the first two measurement periods, it should be highlighted that, in the case of some variables, the comparisons almost reach statistical significance, which suggests a potential existence of some differences. For example, after the second quarter, a particularly high mean value of parameter b* was recorded in the lubricant coded as MS. The value, however, did not reach the threshold level of statistical significance.

No statistically significant differences were analyzed after the third and fourth measurement period because the results were very similar to each other and could stem from inaccuracies in the actual measurements.

Conclusion

On the basis of the obtained values of the parameter L*, fresh lubricants were divided into three groups. The first one was characterized by the lowest level of lightness (CE and ME), the second one by the highest level of lightness (PS), whereas the third group consisted of the remaining lubricants, which were characterized by the parameter L* values ranging between the first and the second group. Based on the obtained results, it was also found that the color of the lubricants coded as MS and PE is characterized by numerically similar parameters. After the first quarter, and an average of 4000 km traveled, the mean values of parameters L*, a*, b* in the lubricants tested varied and this may actually reflect the level of degradation of engine oil (a possible confirmation shall be presented in the second part of the study which focuses on the comparison of these results with the results of physicochemical tests). After the second quarter, and an average of 7 800 km traveled, the analyzed figures maintained at a slightly lower level. After the third quarter, and an average of 11 400 km traveled, the mean values of parameters L*, a*, b* were quite similar. Considering the degradation of engine oils, after the fourth quarter of the year and with average mileage of 13 400 km, the mean values of the L*, a*, b* parameters were very similar. They were characterized by low diversity and amounted to: from 0.09 to 0.11 (L*), from 0.04 to 0.15 (a*), and from 0.01 to 0.04 (b*). In this study, the correlation between the kilometers traveled and instrumentally determined color was investigated. After analyzing the individual correlation coefficients, it was found that a negative correlation between kilometers traveled and L *, a * and b * parameters maintained at a high level. This means that with an increase in kilometers traveled, the value of the examined parameters goes down. These observations are confirmed by a visual examination of the color.

In conclusion, there is a pressing need for further studies in this area.

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