

**Institute of Animal Reproduction and Food Research
of the Polish Academy of Sciences**

BONDING TRADITION WITH INNOVATION

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INTRODUCTION

XXIth century in Poland and other European countries has been marked by a clear division of the food market. On the one hand, we are surrounded by the ubiquitous supply of mass-produced standardised and unified global food. On the other, however, we may observe a growing interest of consumers and producers in traditional food, which stands out with its distinctive quality. Such phenomenon results from the increased awareness of the society, paying more attention to the prohealth functions of the food consumed.

Our conference will provide a forum for the exchange of opinion and expertise on the challenges and future prospects for traditional food. Bringing together specialists in different fields, we wish to discuss the possibilities of increasing the attractiveness of traditional food products through the transfer of innovation and research results.

The EU project TRAF00N (November 2013 – October 2016) aims at the transfer of knowledge to small and medium size enterprises (SMEs) to strengthen their market position. SMEs in the food sector are increasingly under pressure due to developing open markets, increasing demand of standardized and price-competitive food products, increasing importance of large retailers, and challenges in obeying governmental regulations. This raises the risk of losing many local and traditional foods and processing techniques.

The meeting is dedicated to i.a. scientists conducting research focused on developing and improving traditional food, as well as on introducing products of this type into a human diet. Entrepreneurs, local authorities, social organisations and other entities professionally related to traditional food will also considerably benefit from participation in this conference.

Appreciating a wide and appealing range of Polish traditional foods, we invite the producers to introduce their products during our conference.

We wish you a successfull conference

Organizers

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ORAL PRESENTATION

MODERN FOOD SAFETY LAW VERSUS TRADITION

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Responding to animal health concerns and food safety incidents world-wide systems of food legislation have emerged that aim at protecting consumer life, health and other interests to the highest attainable standards. Being based on 21st Century science, food law may be at odds with the wisdom born from the experience of generations.

For analytical purposes, the subject matter of food law can be subdivided into three main categories: requirements on the product, requirements on processes and requirements on presentation.

Requirements on the product can be further distinguished into requirements addressing the safety properties of categories of foods in general and requirements addressing the condition of individual foods in concrete situations. Generally speaking, foods that have a history of safe use ('conventional foods') are considered safe on the basis of experience. Non-conventional foods may require prior authorisation based on a scientific assessment of their safety. Foods which are traditional in a given area almost by definition will be considered conventional in the same area. In this sense traditional foods enjoy a presumption of safety. However, outside the area where they are traditional such foods may be considered non-conventional. Baobab, for example, which is a traditional food in many areas in Africa was considered a novel food in the EU and had to undergo an authorisation procedure before being granted access to the EU market. Such foods which are traditional in the country of origin but novel in the country of destination may be referred to as 'exotic foods'. The EU is introducing a lighter authorisation regime for exotic foods than for foods that do not have a history of safe use anywhere in the world.

Requirements in the condition relate, among other things, to levels of contamination with residues from plant protection products, veterinary drugs, naturally occurring chemicals, chemicals from environmental pollution, substances used in processing, pathogenic microorganisms and the presence of foreign objects.

Among the process requirements prescriptions on 'hygiene' (or 'sanitation' in the USA) stand out. Current approaches to dealing with hazards occurring in food production such as pathogenic micro-organisms differ considerably from approaches applied in traditional processing. These differences cover the whole range from raw materials (raw versus pasteurised milk) to utensils (wooden or plastic) to premises (concrete covered in ceramic tiles versus caves). Hygiene legislation in the EU includes certain flexibilities to enable the continuation of traditional production methods, particularly in the dairy sector.

Requirements on communication demand fair information practices enabling consumers to make informed choices. It remains to be seen if consumers are sufficiently protected from the illusion created when industrially produced products parade as traditional. The EU has introduced a protected designation for certain recognised traditional products. So far, it does not seem to have gained much popularity. It places the burden to prove traditionality on legitimate businesses leaving a free field to all others who claim "grandmothers' recipe" or "artisanal production".

On the one hand, traditional food procedures will have to make do with the legal requirements as they are. On the other hand the law needs constant criticism and scrutiny of its shortcoming to grow and thrive and fulfil its function in a society where old and new, science and wisdom daily interact in discord and harmony.

Keywords:

Food law, traditional foods, novel foods, food hygiene, protected designations

CONSUMER PREFERENCES FOR AN ARCHETYPAL TRADITIONAL FOOD PRODUCT IN HUNGARY

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EU farmers confront worsening terms of trade and declining real incomes, and generally remain dependent on direct payments and other subsidies for survival. In 2012, subsidies accounted for over 50 per cent of EU farmers' net income, and farm incomes are lower in absolute and relative terms in the New Member States (NMS) from Central and Eastern Europe. Rural areas in the NMS are more dependent on agriculture as a source of income and employment, with opportunities for gainful employment in the non-farm rural economy relatively scarce.

To boost competitiveness and profitability, the EU seeks to stimulate enhanced value-added production, drawing on its reputation for quality goods. One potential type of quality goods are Traditional Food Products (TFPs). These goods generally possess positive images due to superior taste, nostalgia and / or ethnocentrism. However, the ability of TFPs to contribute to improved farm incomes, without recourse to subsidies, depends on whether consumers are willing to pay a premium for them compared to cheaper alternatives. In other words, with TFPs not receiving any direct, supplementary subsidies, additional value added has to come on the demand side but the willingness of consumers to pay for such goods, and specific attributes that may be attached to them, remains unclear.

The paper addresses this central question, building on recent advances in Willingness to Pay (WTP) methodologies, which are applied to an exemplary case of a Traditional Food Product (TFP) – that of Hungarian mangalica sausage. Mangalica sausage is an ideal product for exploring WTP for a TFP as the main motivation for its purchase in Hungary, as discussed below, is its indigenous origin and heritage. Data collection occurred in the North Great Plain of Hungary, a lagging region, which is characterized by a relatively high dependence on agriculture and real farm incomes below the EU average. The study seeks to understand consumer perceptions of value and identify promising segments for targeting. Specifically, using a Discrete Choice Experiment (DCE), explicitly accounting for unobserved heterogeneity in correlated WTP coefficients and observable demographic / socio-economic characteristics, our model is estimated in WTP space.

Train and Weeks advocate this approach and reparametrize the random parameter (mixed) logit model (RPL) by defining the distribution of WTP directly. Nevertheless, despite the clear advantages of the WTP space framework, it has been used, notwithstanding some notable exceptions, infrequently in the food policy literature. As a result most previous food-related WTP studies assume that the price coefficient is fixed across consumers, so that the moments of WTP are equal to the moments of the non-monetary attribute coefficient scaled by the price coefficient. However, this is an unnecessarily strong assumption of homogeneous price sensitivities. Moreover, as Train and Weeks note, a fixed cost coefficient implies that the scale parameter, and consequently the variance of unobserved utility or the degree of certainty in decisions, is the same across respondents. Hence, in such models, potential scale heterogeneity across decision-makers may be falsely attributed to variations in WTP.

Results indicate that traditional food products can command a substantial premium, albeit contingent on effective quality certification, authentic product composition and effective choice of retail outlet. Promising consumer segments and policy implications are identified.

Keywords:

Traditional foods, Mangalica sausage, Discrete choice experiment, Preference heterogeneity, Generalized multinomial logit model, WTP space

TRADITIONAL FOOD AND ITS ALLERGENICITY

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Food allergy is an adverse reaction of human immune system to a harmless food component, occurring after the ingestion of food. According to the European Academy of Allergy and Clinical Immunology, the prevalence of food allergy in Europe amounts up to 3%. It has been estimated that approx. 160 foods may cause allergic reactions, yet as many as eight most common allergenic foods account for 90% of food allergic reactions, i.e. milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, and soybeans. Some food compounds cause IgE-mediated immediate reactions, occurring within minutes to hours of ingestions. Sensitisation is often associated with a severe clinical manifestation and sometimes anaphylactic reaction. There is no food free from potentially allergenic proteins.

Traditional food is defined as food with specific feature/s, which clearly distinguish it from other similar products of the same category in terms of the use of 'traditional ingredients' (raw materials of primary products) or 'traditional composition' or 'traditional type of production and/or processing method'. *Chłodnik*, a cold beetroot soup, is very popular in the Polish cuisine. This soup is either made with soured beetroot juice or the juice of soured cucumbers, mixed with sour cream or sour whole milk. Minced dill and chive are used for seasoning. *Chłodnik* is likely to trigger some allergenic reaction because of the allergenic potential of its ingredients: egg white, egg yolk, milk, onion, cucumber, and potato. The literature data indicate that the Italian fully matured cheese *Parmigiano-Reggiano* appears to be well-tolerated by the patients suffering from cow's milk allergy. The preliminary digestion of casein induced by *Parmigiano-Reggiano* maturation process, facilitating a further loss of allergenic reactivity during gut digestion, may explain this tolerance. The study concerning allergenicity of traditional food shall be further enhanced.

Keywords:

Food allergy, allergenicity of traditional food

ITALIAN TRADITIONAL FOODS: NOT ONLY PIZZA

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Italian traditional foods (TFs) characterize the identity of Italian people. Although the food industry is one of the main businesses in Italy, the value of TFs is more than production processes and their economic value, and more than a way of eating. Primary production as well as derived foods represent a meeting point between nature and culture and express the huge geographical and historical diversity of the Italian regions.

Italian TFs are the foundation of the Mediterranean Diet, which has been inscribed in 2013 on the Representative List of the Intangible Cultural Heritage of Humanity, and is widely considered as a healthy dietary pattern. Grains, grapes, olives, vegetables, dairy and specific processed foods are the basis of the Italian food industry with significant economic and export value. The economic importance drives research and innovations towards studies in the traditional food sector. For instance, genetic and genomic studies evidenced different phenolic acid content in durum wheats as well as their effect on the quality of processed end-products. In wine production, the selection of autochthonous yeast strains with peculiar oenological properties serve for preparation of a model for transfer of the innovation to SMEs. The valorization of table-olives can be carried out through selection of microorganisms as autochthonous starters of fermentation. Functional foods as plant compounds or end-products enriched with bioactive compounds can be obtained with innovative technologies, such as supercritical CO₂ extraction or using by-products of the food industry. Overall, several studies demonstrated the healthy promoting feature of several compounds of some traditional foods. Finally, Italy may play a significant role also in promoting novel foods, as demonstrated at Expo 2015.

Keywords:

Italian traditional food, functional foods, food innovation

DIET FOOD DELIVERY SERVICES – AN INNOVATIVE USE OF TRADITIONAL FUNCTIONAL FOODS FOR HUMAN NUTRITION

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Diet food delivery services are becoming increasingly popular in Poland. The idea started about 20 years ago providing customers with delivery of meals designed to promote weight loss, now there are over few hundred delivery services in Poland providing local food preparation and delivery or preparing meals in central kitchen and delivering them in several largest cities across the country. Interest in diet food delivery services is growing with an increase in work load and changes of life style, especially with single living people. While at the begging those services were used mostly by dieting people nowadays with growing knowledge of correlation between diet and health there are also many wellness programs available providing balanced meals for everyday use, being healthy alternative to ready-to-eat processed foods. It is estimated that in coming years a few percent of larger city population may be using diet food delivery services as a basic model of everyday nutrition resigning from shopping and preparing food at home. This creates an opportunity to introduce traditional functional foods as a part of daily nutrition on a larger scale.

Meals for diet food delivery services are prepared similar to restaurant kitchens or big catering services, packed individually and in cooling conditions delivered to the customer. There are several technological aspects that need to be considered which differ that kind of food production from traditional restaurant or industrial food production with a careful selection of meals as a primary issue. Traditional functional foods should be used when composing those meals, especially traditional cereal products, fruits and vegetables, seeds, oils as well as meat products and herbs. They can be used as a basic nutritional components providing balanced diet and fulfillment of nutritional requirements as well as they can contribute health-promoting constituents like fiber, vitamins, antioxidants, proteins and others supporting overall wellness of diet food delivery services customers. That direction of utilizing traditional functional foods in human nutrition requires several actions from producers, distributors and scientific society. Information pertaining those products must be available across community of nutrition specialists, especially about regional functional foods. In order to make those products a part of carefully planned nutrition, which is a goal of diet food delivery services, scientific community must provide nutrition specialists with accurate data on nutritional properties of traditional functional products which is still lacking in food databases. Also availability of those products in distribution for catering services must be improved in order to ensure production of meals based on discussed products. With growing demand for diet food delivery services an increase in traditional functional foods market should be observed which should lead to a better nutrition model of population and a decrease in obesity and diet related health problems.

Keywords:

Diet, catering services, food delivery, health, functional foods

SLOVAK FOODS WITH LABELS OF SPECIFICATIONS

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In accordance with the European policy of quality, a development of original agricultural and food products coming from traditional regions is supported. The protection of those products characterized with high quality and specific requirements on raw material and technology process differentiating them from similar products is arranged via three categories: a protected designation of origin (PDO), a protected geographical indication (PGI), and a traditional specialty guaranteed (TSG). Up to now, in cooperation with the Ministry of Agriculture and Rural Development of the Slovak Republic, following Slovak products are registered in the aforementioned list of protected brands:

Protected designation of origin (1 product): 'Paprika Žitava'/'Žitavská paprika' (grinding dried sweet chilli pepper grown in the Danubian Lowland)

Protected geographical indication (10 products): 'Levický slad' (a light pilsner-type barley malt from Levice region); Klenovecký syrec (Slovak cheese); Skalický trdelník (a fine bakery product of hollow cylindrical shape produced in a specific area of the Slovak Republic); Slovenská bryndza (a natural, white, mature, spreadable cheese with the percentage of lump sheep's cheese greater than 50 %); Slovenská parenica (a steamed, lightly smoked cheese wound into two rolls); Slovenský oštiepok (a half-fat semi-hard cheese with a large egg shape); Tekovský salámový syr (a natural semi-hard, ripened full-fat cheese in the shape of a cylinder produced in the Tekov region); Zázrivský korbáčik (a steamed cheese product, smoked or unsmoked, in the shape of a little whip produced in the municipality of Zázrivá); Zázrivské vojky (a steamed cheese product in the form of strings produced in the municipality of Zázrivá); Oravský korbáčik (a steamed cheese product, smoked or unsmoked, in the shape of a little whip produced in the Orava river basin).

Traditional specialty guaranteed (7 products): Bratislavský rožok/Pressburger Kipfel/Pozsonyi kifli (fine bakery or pastry ware with poppy-seed or walnut filling and a glossy and marbled surface); Ovčí hrudkový syr – salašnícky (a cheese produced from fresh sheep's milk in shepherd's huts shaped by hand into a lump); Ovčí salašnícky údený syr (a cheese produced from fresh sheep's milk, processed in shepherd's huts, smoked and often formed into specific shapes (hearts, cockerels or other animals, hemispheres); Lovecký salám/Lovecká saláma (a long-keeping fermented meat product intended for direct consumption, usually as a cold cut); Liptovská saláma/Liptovský salám (a meat product with an homogeneous appearance, delicate meaty taste and the specific aroma); Špekáčky/Špekačky (a heat-processed meat product made from a continuous strand several metres long stuffed into casing made of pork small intestine or beef rounds); Spišské párky (a meat product contained in sheep-intestine separated by twisting, typically pinkish-red in colour, owing to the paprika seasoning, and have a slightly piquant taste).

The Food Research Institute encourages producers to apply for the brand protection and provides valuable support at preparing applications for registration in the list of protected products.

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Keywords:

Policy of quality; protection of origin; protection of geographical indication; traditional specialty guaranteed

CURRENT PRODUCTION, IMPORT, EXPORT, CONSUMPTION OF FISHERY PRODUCTS AND THEIR DEVELOPMENT IN THE CZECH REPUBLIC

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Fish production in the Czech Republic has long tradition and is based on extensive and semi-intensive carps farming in ponds and salmonid intensive culture in raceways in highland regions. Production averages around 450 – 500 kg per hectare. Currently, fish production fluctuates between 17 to 21 thousand tonnes per year and its steady for last 20 years. Common carp (*Cyprinus carpio*) is the dominant produced fish (86-88%), but polyculture stocks are an important aspect of pond Czech farming. Chinese carps together with traditional supplementary fish (tench – *Tinca tinca*) and predatory species (pike – *Esox lucius*, pikeperch – *Sander lucioperca*, European catfish – *Silurus glanis* and perch – *Perca fluviatilis*) are all produced in ponds. About 25 to 30% of carp production originates from supplementary feeding, however, an overwhelming majority of carp production is based on natural food. Over than 700 tonnes of market size salmonids (rainbow trout - *Oncorhynchus mykiss*, brook trout – *Salvelinus fontinalis*) are produced annually. Live fish (carp in particular) are the most important product of Czech aquaculture, because carp is a traditional Czech dish. Most sales of live fish occur during the Christmas period in December. The Czech Republic is the largest exporter of carp in Europe, where 40, 15-30 and more than 10 % of exports go to the German, Polish and Slovak markets, respectively. Approximately half of the Czech fish production is consumed domestically and the other one is exported. Fish processing is performed in 14 facilities, ten of them being eligible for export into EU countries. There are also about 25 smaller processing units that only work, at their full capacity, in December to meet the demand for fish products during the Christmas season. These products include frozen, chilled, smoked and marinated fish. The proportion of exported and home-sold processed fish comes to 8-10 %. The marketing trends are currently focused on higher and more diverse offer and consumption of processed fish. Annual fish consumption in the Czech Republic was only 5.5 kg/cap/year included following categories: 3.6-4.1 kg of both marine and freshwater fish, 0.02-0.20 kg of crustaceans, and 0.04-0.14 kg of molluscs. Only 1.3-1.4 kg per capita and year of the locally produced fish has been consumed in the Czech Republic. The import of live, fresh, chilled, frozen and smoked whole fish and fish fillets to the Czech Republic annually fluctuated from 37 127 to 42 645 tonnes what accounts to 92.4-98.1 %. Import of molluscs is minor compared to fish and fluctuated from 467 to 1470 tonnes and import volume of crustaceans (mainly shrimps) was currently increased to 2000-2100 tonnes. Most imported fishery products (45.2-67.5 %) are fresh, chilled and frozen fish fillets and frozen whole fish, which represent 16.8-25.7 %. Import of smoked and dried fish ranges 2.9-5.2 %. Atlantic salmon (19.7% of all imports i.e. 8 068 tonnes of fresh or chilled whole fish or frozen fillets) dominates the fish import to the Czech Republic. Other the most important fish species imported to Czech market are herring, mackerel, walleye pollock and European hake. Traditional Czech aquaculture needs further aquaculture innovation providing an increased production and processing of higher-value fish (such as pikeperch, pike, sturgeon, catfishes etc.) and other aquatic organisms (shrimps and crayfish), an all-year-around supply to consumers. Further improvements are also needed in marketing and marketability of fish products. Czech Fish Farmers Association (CFFA) which covers 90 % of fish farms in the Czech Republic owns a registered trademark “Czech carp”. Only high-quality marketable carp produced by members of CFFA using the typical Czech pond culture technology can be sold under this trademark on the market. Other trademarks as “Třeboň carp” (protected geographical indication), “Pohořelice carp” (protected designation of origin) and Omega 3 carp (registered trademark) have been developed to support the marketing of carp in the Czech Republic.

Keywords:

Aquaculture, Czech, innovation, market, marketability, traditional fish sector

NEGLECTED TRADITIONAL FOODS AS TRIGGER FOR NEW GENERATION OF FOOD PRODUCTS

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Traditional foods sector is not able to exploit all the innovative opportunities of modern processing due to technical but also consumers barriers. The project Trafoon, »Traditional Food Network to Improve the Transfer of Knowledge for Innovation« is a 3-year 7FP EU project for improving the transfer of knowledge for innovation in the field of traditional foods, especially in small and medium enterprises (SMEs). This platform gave relevant window of opportunities for improvement on production but also on marketing side.

One of the tasks of the project partners was to prepare the inventory of needs of national SMEs, which are active in production and marketing of specific groups of traditional products. In our case we focused on buckwheat supply chain. With the general questionnaire we addressed 20 producers of traditional products from grains, including buckwheat and buckwheat products. Innovative challenges for combining tradition and innovation for sustainable development of entrepreneurship were carefully addressed. Survey data acquired topics like products and services, company's technology state of the art, research and technology development, especially in primary production, processing, packaging, quality, safety and durability of products, economics and sale of traditional Slovenian grain-mill products etc. In each clusters of questions great attention was focused to elucidated possibility for technological or marketing advancement and improvement. The main safety concerns were linked to allergens and mycotoxins contamination. Open challenges remain rapid detection methods for chemical and microbiological contaminants, traceability and separation techniques for prevention of contamination transmission to the consumers (e.g. scopolamine and atropine in buckwheat), gluten free separated production, controlled origin of raw materials, but also demand for novel solution in development of suitable equipment and machines for buckwheat processing.

All data collected were analyzed according to SWOT principles. The main strength of this traditional food sector is a direct link of traditional products to the consumers, availability of plethora of traditional recipes and ingredients and consumers awareness that the quality has a cost. Among weaknesses are lack of effective marketing strategies and limited interest of the food processing industry towards traditional foods and limited possibilities for new generation of functional food development.

We planned to give flavor of practical experience to selection of interested stakeholders. Respecting that concept we organized a theoretical and practical workshop, which provided desired and missing knowledge and skills to more than one hundred participants of educational workshop for stakeholders. The conclusion which can be drawn out of this exercise is that real practice needs regular theoretical and practical education, although they are not willing to pay for it. The food professionals who need this type of brush up knowledge see importance of such education only after it was conducted. It looks that current philosophy of companies has some weakness to understand that they should keep traditional knowledge and skills if they want to add novelties on top of it. Only such continuity in education opens real space for implementations of most advanced knowledge in traditional skeleton of food items which can be expected and trusted by consumers.

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Keywords:

Traditional foods, knowledge transfer, SWOT analysis, educational workshops for stakeholders

PROMOTION AND DEVELOPMENT OF PLANT-BASED PROTEIN SOURCES IN DENMARK TO MITIGATE CLIMATE CHANGE AND CONSERVE BIODIVERSITY AND TRADITION

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Between 50-70% of the average European's protein consumption comes from animal sources. The replacement of animal protein with vegetable protein in the European diet constitutes an important step to mitigate climate change. The diversification of agricultural systems with high protein crops is a promising and challenging alternative that has been proposed by the PROTEIN2FOOD project. This project proposes the development of high quality food protein from multi-purpose crops through optimized, sustainable production and processing methods. It considers the introduction of new protein crops to Europe and the promotion and development of traditional crops with reduced production in Europe.

We present a collaboration case between PROTEIN2FOOD and a project stakeholder – Aarstiderne – a Danish box scheme farm that combines concepts of agro-ecology, healthy food and education. We highlight the effectiveness of combining narratives of heritage and climate mitigation to engage farmers and consumers with tradition and biodiversity conservation. Three focus crops are quinoa (*Chenopodium quinoa*, W.), amaranth (*Amaranthus* spp) and horse beans (*Vicia faba*, L.). The first two species are introduced cultivated crops that are related to native weed species (*Chenopodium album*, L.; *Amaranthus retroflexus*) that have been important food resource since the Iron Age. The third species is a traditional bean that in recent history has been fed predominantly to animals in Denmark.

We present the histories of the plants and the challenges encountered in their development and management. We highlight different promotion strategies such as projects with chefs and restaurants, farm tours with school groups, and the creation of a cookbook. The overall project strategy combines cultural and climate-focused approaches to maintain genetic diversity and local resilience in food systems as well as to add value to traditional crops in modern food chains.

Keywords:

Breeding, Conservation, Promotion, Climate Change

CLUSTER OF INNOVATION IN AGRIBUSINESS AS A PLATFORM FOR COOPERATION BETWEEN SCIENCE AND BUSINESS

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The cooperation of regional actors from science and business practices within the cluster affects both the competitiveness and innovativeness of companies and regions. The economic benefits achieved by companies participating in the cluster are varied and depend on the individual's experience, human and intellectual capital, organizational efficiency, etc. However, the clusters are an important mechanism for stimulating innovation, and therefore in the knowledge-based economy, it is important to form such structures.

The accession to the European Union created also new opportunities for improving Polish regions. One of the major's beneficiaries of integration into the European Union represents the food sector. Nevertheless many challenges face agro-food enterprises in Poland, as they want to remain competitive in local, national and international markets. Also regional competitiveness plays a prominent role in the enlarged European Union and in the framework of globalised markets that is characterized by enhancing competitiveness and growth.

The long-term prosperity of an undertaking is determined by its innovation which is recognized as a vital instrument of competition in the global market. One of the factors that may play a role in the process of economic development of enterprises in agro-food sector is creating regional clusters.

Keywords:

Cluster initiatives, competitiveness, innovativeness of companies and regions, agribusiness.

TRADEIT PROJECT IN POLAND

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The TRADEIT project is a multidisciplinary, multi-sectorial collaborative project supporting a Network of Traditional Food SMEs and Food Researchers in the areas of Collaboration, Innovation, Entrepreneurship, Knowledge and Technology Transfer to increase the competitiveness and inter-regional advantage of Traditional Food Producing SMEs, in the dairy, meat and bakery sectors.

This will be achieved through focused regional coordination and support activities and events facilitated by the establishment of 9 Regional Traditional Food Knowledge and Technology Transfer Hubs.

Dynamic start of the TRADEIT project in Poland through WORKSHOPS and analysis of barriers and the needs of the environment of traditional dairy producers. Workshops in Poland were attended by 90 large subjects, 75 % micro SME and 25% SME which filled in the needs and barriers questionnaire. Therefore, we have obtained a full review of all the groups producing traditional dairy products in Poland.

Development of the TRADEIT Network – we have about 350 Polish stakeholders in the TRADEIT network.

A large number of scientists together with traditional cheese producers and reputable companies providing technology for the traditional dairy sector have participated in the TRADEIT network and in the WP2 event.

The Conference INNOVATIVE TECHNOLOGIES FOR TRADITIONAL DAIRY PRODUCERS CONFERENCE AND BROKERAGE EVENT POZNAN in POLAND, 18-19 JUNE 2015 was attended by over 100 operators.

The 4-TRADEIT Missions in Warsaw on December 11 was attended by over 60 entities related to the traditional dairy sector. We effectively provide knowledge to the traditional dairy sector – 202 Polish cheese producers participated in WP3 trainings.

Efficient encouragement of 5 university research centers, about 50 scientists and also about 50 specialized companies to participate in the TRADEIT project – they actively participated in all TRADEIT events and donated 170 dairy technologies from Poland and 220 dairy technologies useful for traditional food producers.

We have established efficient cooperation with local governments and agricultural advisory services to actively participate and support the achievement of the TRADEIT goal.

We have been building active interaction and principles of cooperation between TRADEIT shareholders for further cooperation.

We have been calling the discussion in the circle of traditional cheese producers in order to increase the quality and competitiveness of their companies in today's food market.

Keywords:

SMEs Network , Traditional Food, Food Researchers, Innovation, Entrepreneurship, Technology Transfer

FOOD SAFETY CHALLENGES ASSOCIATED WITH TRADITIONAL FOODS

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Europe offers a large variety of regional food specialties and long tradition in craftsman's skills in safe small-scale food processing and preservation. There is also a strong public and political interest to maintain this diversity, not only for culinary purposes but also for supporting sustainable rural development and local value-added chains. This paper discusses the safety of some traditional food products of animal origin, the relevant hazards and the preventive measures to control them.

(1) In traditional manufacture of fermented sausages, growth of pathogens is controlled by appropriate combinations of sugar, salt and ripening temperature. Outbreaks caused by salmonellae and *Staphylococcus aureus* were mainly caused by deviations from traditional practice in order to save costs by accelerated ripening, without modifying the formulation. Moreover, in the manufacture of some undried, spreadable types, levels of salmonellae (especially in pork sausages) and shigatoxin-forming *Escherichia coli* (STEC; especially in sausages containing meat from ruminants) are frequently reduced only by one log cycle or less. Hence, the safety of these products critically depends on the quality of the raw material.

(2) Even though raw milk occasionally contains pathogens, hard cheeses made from raw milk are safe, due to effective hurdles which eliminate pathogens during production and ripening, and the health risk of consuming semi-hard cheeses made from raw milk - which are generally ripened for more than 60 days – is very low if the cheesemaker has good control on milk production (in particular, milking hygiene and mastitis control) and starter activity.

(3) *Listeria monocytogenes* may grow on the surface of smear- and mould-ripened soft or semi-soft cheeses after recontamination, whether or not the milk has been pasteurized before. To prevent contamination, appropriate cleaning and disinfection procedures must be implemented.

(4) Botulism has been the consequence of poor practices in home preservation of food, in particular, canning of low-acid food such as meat and vegetables, salting of raw hams and marinating of fish from waters frequently contaminated by spores (e.g. catches from parts of the Baltic or from poorly managed aquaculture). Commercial products were rarely involved, but *Clostridium botulinum* must be considered as a hazard for in-pack pasteurized perishable foods if their acidity is too low and if they are stored at abusive temperatures.

Data from outbreaks of foodborne diseases indicate that a major risk factor was to move away from traditional processed in order to save costs and to scale up production, or simply ignorance of the implicit knowledge of craftsmen.

Manufacturers of traditional products are subjected to the European Union legislation on food safety. They are responsible for the safety of their products and must organize their preventive measures in line with the HACCP principles. However, in the “Whereas” section of the EU regulations, as well in the guidance documents provided by the EU, it is stressed that legislation should not put small and medium-sized food processors at a disadvantage, and official food control should act in a flexible and risk-based manner. Disputes may arise from shortcomings in implementation of the official regulations by national or local authorities, but also from ignorance of the manufacturer about the relevant hazards and the importance of food safety management. Relevant food safety plans and records can – and should be - kept slim and fit-for-purpose, and often, there is no need for a full HACCP system.

Keywords:

Traditional food, Food safety, Dairy products, Meat products, Food safety management, HACCP

NUTRIGENOMICS IN THE CONTEXT OF THE TRADITIONAL FOOD

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Modern societies live in a ‘nutritional environment’ that is very different from the environments to which we had genetically adapted. Major changes in human’s food supply accompanied the domestication of animals and the agricultural revolution about 10000 years ago. Later, the Industrial Revolution and especially developments in chemicals usage in agriculture and developments in food technology during the last 20-40 years (depending on country) brought about further major changes in the composition of food, also in the context of huge numbers of chemical additives. Rapidly diet changes can be potentially connected not only with nucleotides sequence, but also with different gene expression what is investigated by epigenetics.

Nutrigenomics, nutrigenetics and epigenetics are terms which probably will be more and more used in the context of traditional food. So what these terms mean? In the simplest words it can be written that: 1) Nutrigenomics is a branch of nutritional genomics and is the study of the effects of foods and food constituents on gene expression. 2) Nutrigenetics aims to identify how genetic variation affects response to nutrients. 3) Epigenetics is the study of cellular and physiological phenotypic trait variations that result from external or environmental factors that switch genes on and off and affect how cells express genes.

The word “nutrigenomics” seems to be the most popular in Poland (of these 3 words), so often all these terms can be found in the texts where interactions “genes-food-environment” are considered, but only word “nutrigenomics” is given in the title as a main “key word” (like in present abstract).

The concept that diet influences health is an ancient one, but modern investigations includes known interactions between food and inherited genes (such examples can be Phenylketonuria or lactose intolerance).

Often it can be found in different scientific text descriptions of single nucleotide polymorphism (SNP) - i.e. a local variation of a DNA sequence in the chromosome, which is subject to inheritance. SNPs make up about 90% of all human genetic variations; humans have about 5 to 8 million SNPs. Some of them may be partially responsible for variations in individual’s response to bioactive food components. Present studies are focused also on SNPs and its associations with such diseases like cancer, obesity, diabetes, cardio vascular diseases (CVD), neural tube defect (NTD), leukemia, Down syndrome, spina bifida, etc. Nutrigenomics investigations in disease prevention are often connected with another ‘omics’ studies like genomics, proteomics or metabolomics.

Epigenetics mechanisms include DNA methylation, histone modifications, gene silencing by microRNA and chromosome stability. Epidemiologic evidence suggests that early-life environmental exposures are related to disease risk, what was investigated in well known long-term studies on people born during the Dutch Hunger Winter 1944/1945. Recent studies suggest that diet and environmental factors directly influence epigenetic mechanisms. Some nutrients seems be especially very important in nutrigenomics and epigenetics context, like: Folic Acid, Vitamins B12, B6, E, D, A, Niacin, Zinc, Fatty Acids, Flavonoids or even Proteins.

It seems that nutrigenomics / nutrigenetics and epigenetics studies are revolutionary way of viewing the food, but finding new genome and epigenome based biomarkers of the early phase of diet related diseases is very important. Another conclusion is that if we do not know exactly all environmental and food factors and mechanisms influencing human health, we should eat more traditional and regional food, because probably human genome and epigenome is best suited to food of our ancestors living in the same geographical conditions during hundreds or even thousands of years.

MUSHROOMS: MORE THAN A SIDE DISH

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The market for edible mushrooms in Europe is dominated by the white and brown button mushrooms (champignons). As for many other crops, economies of scale has taken place in the last decades leading to fewer but bigger companies competing merely by production costs. With a lack of product innovation and marketing, a stagnation is seen in consumption of button mushrooms. On the other hand, an increase in production and consumption is seen in “exotic” mushroom species represented predominantly by grey oyster mushrooms, king oyster mushrooms and shiitake. These mushroom species are mainly produced by small and sometimes micro enterprises. The EU project Trafoon has carried out an inventory of needs of SMEs and generated a strategic and innovation research agenda to generate project to fulfil the needs of this sector. A SWOT analysis has shown that a professionalization of the production system is needed with emphasis on substrate and new varieties. There are, however, also opportunities such as the interesting combination of nutritional value of edible mushrooms. Treats are the lack of training/teaching and research. The lecture will give a short mushroom tour the production, SMEs and properties of the mushrooms itself. It will also demonstrate interesting application of these fungi in unexpected application that might attract investment in research of these fungi with pay-off to the SMEs producing exotic mushrooms.

Keywords:

Edible mushrooms, exotic mushrooms, nutritional value, biobased economy

THE ROLE OF DRYING IN THE DEVELOPMENT OF TRADITIONAL MUSHROOM PRODUCTS

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Although cultivated mushrooms (*Agaricus bisporus*, *Pleurotus ostreatus*, *Lentinula edodes*) are usually preferred in their fresh state, drying is a standard postharvest technology to extend the shelf life of wild edible mushroom species for off-season use by reducing water activity to a microbial safe level for storage. Solar drying, for instance, traditionally extends the shelf life of mushrooms, maintaining their quality, intensifying their nutritional value, boosting the intensity of flavors in an uncomplicated manner. Immediately after harvesting, mushrooms are sorted, cleaned, dried and stored. In particular, convective air drying of some commercially important wild mushrooms (*Boletus edulis*, *Morchella esculenta*, *Cantharellus cibarius*, *Craterellus cornucopioides*) is carried out using various drying technologies and drying systems. Correctly dried mushrooms with a maximum moisture content of 12% intensify their distinctive flavour without significant loss of their colour and pleasant texture. Optimal final moisture content is also required to avoid spoilage of mushrooms due to insect infestation during storage. Both cultivated and wild-edible dried mushrooms are valuable ingredients in several traditional dishes such as mushroom soups, pasta with mushrooms, mushroom risotto, truffle products and mushroom snacks i.e. mushroom chocolate and mushroom cookies. Therefore, drying represents a fundamental processing step for the formulation of traditional as well as novel value-added products. In addition drying could also reduce the losses caused by surplus production enhancing the income of the mushroom growers. Few technical details are available about the various drying technologies used for industrial applications, and what details are available can be hard to interpret by small scale or even micro enterprises. An overview of the capabilities and limitations of technical drying for the development of traditional- as well as innovative mushroom products will be presented.

Keywords:

Mushroom, tradition, innovation, processing, product, quality

WILD EDIBLE MUSHROOMS FROM ROMANIA - INNOVATIVE VALORISATION OF THEIR FUNCTIONAL PROPERTIES

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Edible mushrooms from the spontaneous flora represent a valuable alternative food source for a continuously growing population. They contain eight essential amino acids and a number of other compounds with high nutritional value (polysaccharides, phenolic compounds etc.). In Romania, there are officially 35 species of edible mushrooms from the spontaneous flora which are allowed to be harvested and commercialized. These species are also the subject of scientific researches aimed at obtaining functional natural supplements without negative effects on human health.

The aim of this research was to identify the most valuable wild edible mushrooms species that are harvested in Romania. The tests were performed by *in vitro* methods in a gastrointestinal simulator - GIS1 system (www.gissystems.ro). The researches were focused on the modulation capacity of the microbial structure of human microbiota after the consumption of certain mushrooms species (*Boletus edulis*, *Boletus pinophilus*, *Boletus aureus*, *Armillaria mellea*, *Tuber aestivum*, *Lactarius piperatus*, *Lactarius deliciosus*, *Pleurotus eryngii*, *Ramaria botrytis*, *Russula virescens*). There were performed molecular biology tests in order to establish the microbial structure of simulated microbiota, and the results were correlated with the presence of certain compounds released by microbial metabolism.

The best results were obtained with *Boletus* species, *Tuber aestivum* and *Pleurotus eryngii*. They determined an increase in the number of favorable microorganisms and a well *balanced microbiota* composition in the three segments of the human colon. The strains of *Bifidobacterium* were identified mainly in the terminal segment of the colon and their presence was correlated with a high samples digestibility. The results were most relevant for *Boletus aureus* and *Pleurotus eryngii*.

Keywords:

Boletus, *in vitro* tests, microbiota, simulator, human colon

FLAVOURS FORGOTTEN AND UNFORGOTTEN TRADITIONAL VEGETABLES IN POLISH CUISINE

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Vegetables are a source of some essential nutrients, like vitamins A, C, E, and K, macro- and microelements, flavonoids, and other antioxidants. Thus, they have been consumed commonly as a supplement to staple food based on cereals, which are deficient of those compounds. Besides their nutritional value, vegetables become popular as food due to their taste and flavour, which increased the attractiveness of daily diet.

Archaeological excavation shows that vegetables have been cultivated in Near East since paleolith and has been popular in ancient Egypt, Greece and Rome. In Poland, cultivation of vegetables started in early Middle Ages. The accounts of the court of Polish king Władysław II Jagiełło show, that their diet included cabbage, peas, cucumbers, beets, turnip, broad beans, lentils, onion, carrots, turnip, curly kale, lettuce and fennel. In peasant families, the food was supplemented also with wild vegetable plants, like sorrels (*Rumex acetosa*), hogweed (*Heracleum sphondylium*), goosefeet (*Chenopodium album*), bear's garlic (*Allium ursinum*) and common nettle (*Urtica dioica*).

In 16th century the selection of vegetables on Polish tables was significantly enriched by the quin Bona of the Italian family Sforza, who imported many vegetables from her home country. This included cauliflower, parsley, celery, artichoke, leek, broccoli, green beans, garlic, lettuce and spinach. Because of the Italian origin, a new name “włoszczyzna” (in the free translation means “originated in Italy”) was coined for these novel vegetables. This term is still used in Polish language, but nowadays it is applied only to the mix of vegetables used for soups.

Since 17th century, vegetables native to Americas, like tomatoes and pumpkins are being cultivated in Poland. In 19th century kohlrabi, radishes, peppers, egg plants, Brussel sprouts and a number of lettuce species have been introduced.

At present, over 40 vegetable species are cultivated commercially in Poland, of more than 250 species cultivated worldwide. The most important are: cabbages, cucumbers, tomatoes, carrots, onions, red beets, cauliflower, beans and peas. With annual production ranging from 4.9 million tons to 5.6 million tons, depending on a season, Poland is the third/fourth producer of vegetables in the EU. Open field production is carried out on 90 thousands farms and 12 thousands farms produce vegetables under covers. Approximately 25% of vegetable produced is exported, either fresh or processed.

Vegetables are important constituents of traditional foods in Poland. They are eaten raw in salads and stewed, fried or boiled. Some of foods have history dated back to 17th century, like potato noodles and pancakes, “hunters stew” (in Polish “bigos”), red beet soup, white borscht, bear's garlic soup, cooked rice wrapped in cabbage leaves (in Polish “gołąbki”) and others. The “quin” of polish tables is cabbage, which may be cooked fresh, but more frequently after souring/fermenting into sauerkraut. It is hard to imagine Christmas dinner in Poland without “bigos” or dumplings staffed with sauerkraut and mushrooms. The barrel with sauerkraut has been a must in the pantries of traditional Polish homes and cabbage harvest and preparation of sauerkraut (shredding the heads and stamping them in barrels) has been the occasion for festivities comparable to winemaking in wine countries. A common equipment of the pantries was also a barrel of soured cucumbers (dills).

Keywords:

Vegetables; traditional food, Poland

HEALTH BENEFITS OF A TRADITIONAL FOOD: CABBAGE

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Biological studies have shown that the consumption of cruciferous vegetables, like cabbage, is associated with a reduced risk of degenerative diseases such as cancer. This chemo-protective action is often attributed to isothiocyanates (ITCs) which are enzymatic hydrolysis products of glucosinolates (GLS). These sulfur-containing glycosides are a group of secondary plant metabolites present in cruciferous vegetables belonging to the Brassicaceae family. When the plant tissues are damaged by chopping, crushing or chewing, GLSs are brought into contact with the endogenous plant enzyme myrosinase. The types and amounts of hydrolysis products formed depend on the parent GLS that have either aliphatic or aromatic side chains and on reaction conditions. GLS are hydrolyzed into thiocyanates, nitriles, oxazolidinethiones and ITCs which constitute the main group of enzymatic hydrolysis products.

In recent years, ITCs have been studied for their potential anticarcinogenic effect. This cancer protective effect has been attributed to the ability of these molecules to inhibit phase I enzymes, responsible for the bioactivation of carcinogens, and to activate phase II detoxification enzymes. In addition, a recent study showed the role of ITCs in the inhibition of the growth of cancer cells through the induction of apoptosis. In this way, ITCs can prevent the development of various human cancers, such as colon, oesophagus, rectum, bladder and mammary cancers.

Due to the growing interest in their potential protective effects, dietary ITCs attracted much attention from analysts. Several analytical methods using gas chromatography (GC) and liquid chromatography have been developed. However, only a limited number of ITCs could be simultaneously investigated using a single chromatographic method. In fact, given that ITCs show various physicochemical properties, especially in terms of polarity and volatility, the analysis of a wider range of compounds often calls for the use of two methods in conjunction, e.g. GC and LC.

In this presentation, an overview of analytical methods and health benefit of ITCs will be presented.

Keywords:

Isothiocyanates, analytical methods, biological effects

TECHNOLOGICAL INNOVATIONS AND SAFETY ASPECTS OF FERMENTED TABLE OLIVES IN GREECE

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Greece has a long tradition in table olive processing including both Spanish-style green olives as well as natural black olives, whereas other traditional preparations with local interest, such as dry salted olives, are produced in considerable amounts. The main economically important varieties employed in table olive processing are Conservolea, Kalamata and Halkidikis that are prepared according to well-established procedures. One of the main characteristics in the processing of natural black olives is the high salt concentration used in fermentation that makes this product less attractive to modern consumer trends. For this reason, considerable efforts are undertaken to produce less salt products with a health benefit to the consumer based on partial or total substitution of salt. In the case, the negative effects of high sodium chloride intake could be overcome by substituting, at least partially, this salt by other chloride salts with more favorable effect on human health. Lately, the focus in table olive research has been given on the functional properties of the drupes and especially on the potential of olives to act as carriers of beneficial microorganisms, resulting in the production of probiotic olives. Finally, the safety of Greek table olives has been extensively studied for a wide variety of foodborne bacteria indicating that table olives is not a favorable vehicle for the transmission of pathogenic bacteria, given that they have been subjected to adequate fermentation and attained the appropriate physicochemical characteristics to ensure the shelf-life of the product.

PRODUCTS BASED ON FLAX AS A VALUABLE FOOD INGREDIENTS

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Flax (*Linum usitatissimum* L) is one of the major oil-producing plants, used in the food industry. It is an important functional component of food with significant content of α -linolenic acid (ALA), ω -3, fatty acids, lignans and fiber. Flax is also a potential source of antioxidants, soluble fiber and proteins.

The aim of this work was to focus on the evidences of the potential health benefits of flaxseed discussed in human and animals recent studies and commercial use in various food products in Poland.

Flax seeds have a huge potential in prevention of cardiovascular disease, renal disease, diabetes, atherosclerosis, constipation, obesity, cancer (breast, colon, ovary and prostate), inflammation, osteoporosis and arthritis. Flax also controls the reproductive functions, regulates sleeping cycle, menstrual cycle and relieves stress.

Based on the analysis of the Polish market of products from flax, there were 91 products' data collected, many of which were food products, medicinal products, food supplements and foods for particular nutritional uses. 21% of all products were flaxseed, 21% - products with the addition of flax, 21% - food supplements, medicinal products, foodstuffs for particular nutritional uses, 19% - flaxseed oils, 15% - flax powder, 4% - other products of flax.

On the Polish market there was variety of products with the addition of flax such as: bread, blends with flax, snacks, bars, breadcrumbs. There were also other products from flax, apart of flaxseed, flaxseed oil and flax powder, in such forms as flax flour, flax flakes, cereals with flax.

The analyzed dietary supplements, medicinal products and foods for particular nutritional uses with flax, occurred mainly in such forms as tablets and powders (48% vs 42%), less as liquids (5%) and teas (5%). In that kind of products an active substances were used in the form of flax powder, flaxseed oil, linseed cake and flax extract.

Among all analyzed products only 2% were placed on the list of traditional products of Ministry of Agriculture and Rural Development in Poland while 23% were organic products.

Flax improves the nutrient profile of foods by increasing the content of ω -3 fatty acids and other bioactive compounds and should be used by producers more often to increase the availability of healthy food products among consumers, especially by promoting it as the functional ingredient in food and traditional product.

Keywords:

Flax, *Linum usitatissimum*, flax seed, flaxseed oil, products from flax

SEA-BUCKTHORN INNOVATIVE CEREAL PRODUCTS

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Our experience with cooperation among enterprises producing and manufacturing sea-buckthorn in the Slovak Republic and applications of research innovations in food industry is presented. The main objective of our research was focused on a stabilisation of health-promoting components of sea-buckthorn such as rutin and L-ascorbic acid during thermal processing as well as an elimination of health risks from acrylamide formation. Acrylamide as a probable carcinogen is formed at temperatures higher than 120°C from an amino acid L-asparagine. Sea-buckthorn fruits represent a rich source of amino acids, therefore the content of L-asparagine determines the extended acrylamide level in final bakery products containing sea-buckthorn. In Slovakia, sea-buckthorn fruits are produced by the national exclusive producer. The usage of these valuable fruits is not current yet, so innovative cereal products containing sea-buckthorn fruits were developed and incorporated in a personalised diet providing by a specialised nutrition company.

This work was supported by the European Regional Development Fund in the frame of the projects ITMS 26240120041 "Establishment of a HiTech centre for research on formation, elimination and assessment of contaminants in food" and ITMS 26240120042 "The Centre of Excellence for contaminants and microorganisms in foods".

Keywords:

Sea-buckthorn, thermal processing, ascorbic acid, rutin, acrylamide

GLUTEN-FREE GRAIN PRODUCTS: PROCESSING, PRODUCTION, MARKETING

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The incidences of celiac disease or other allergic reactions / intolerances to gluten are increasing largely due to changes in eating habits and improved diagnostic procedures. This creates a high demand for high quality gluten-free products. This presentation gives an overview on applied approaches for the development of gluten-free cereal products focusing on gluten-free bread and conclusions drawn from market studies. The first part of the presentation provides a brief summary of marketing studies, the market growth of gluten-free products and marketing trends which can be applied to gluten-free products. The second part of the presentation gives a brief introduction on coeliac disease and its main restrictions, for people suffering from this or other gluten-related disorders. It also covers the difference between the productions of gluten and gluten-free products. Furthermore it discusses the techno-functional properties of different ingredients, such as fibres and hydrocolloids, sourdough and enzymes on gluten-free bread quality.

Keywords:

Gluten-free, bread, marketing, processing, production

TRADITION AND INNOVATION IN BAKERY PRODUCTS

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The transfer of knowledge from science to industry by finally development an innovative bakery products was an aim of the joint project between IAR&FR PAS and group of enterprises in the bakery products sector titled “Innovative bakery products with health-promoting properties for Warmia-Masuria Province” (POKL.08.02.01-28-010/13, EU).

Wheat-rye bread named “Baltonowski” and spelt bread were used as a reference traditional bakery products. The innovative products were enhanced by onion dry skin, dry cherry and cherry concentrate. Wheat-rye bread was supplemented by onion dry skin (2%), while spelt bread was enriched with dry cherry (10%) and cherry concentrate (2%).

The innovative breads were characterized by the functional, nutritional and sensorial properties. The new products showed higher antioxidative potential and total phenolics content as compared to the reference products. Incorporation of 2% of onion dry skin to the wheat-rye bread recipe resulted in an increase of tocopherols content. Also for that kind of bread the increase of FAST index was observed, while the cherry in spelt bread affect the decrease of this index. Spelt bread with 10% of dry cherry and 2% of cherry concentrate offered innovative bread with higher available lysine content. The browning index was higher for innovative breads as compared to reference traditional bakery products. It should be noted that application of onion dry skin, dry cherry and cherry concentrate positively affects the sensory properties of innovative breads.

Keywords:

Bread, dry cherry, onion dry skin, antioxidative potential

TRADITIONAL FOOD WITH AUTHENTIC RAW MATERIAL: THE SICILIAN WHEAT LANDRACES

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Sicily, with an area of 25,711 km², is the largest island in the Mediterranean sea and due to its geographical position and extremely diversified ecological condition, hosts an ideal environment for the cultivation of cereals. For this reason, Sicily is known as “Republic granary” since III-II century b.C., as reported by Caton the censor.

Recently, the oldest traditional Sicilian landraces of wheat have received great attention once again, by producers as well as consumers, both at regional and national level. Nevertheless the reduced productivity, the reconsideration of the traditional varieties is due to many factors. These landraces have high level of adaptability and they perfectly fit with sustainable agronomical systems; they characterize and give value to traditional products, such as bread, pasta and sweets; they are nutraceuticals with extra health benefits as lower gluten index, higher content in natural antioxidants, and when milled with stone mill, their amount of fiber and microelements is extremely high. Moreover, this renewed attention have increased the price of the traditional wheat landraces, with consequent producers’ satisfaction.

The growing interest in these productions suggests to find new control methods against frauds, protecting producers and customers. Glumes image analysis and chemotaxonomic characterization proved to be useful tools supporting the common visual inspection on farm.

Keywords:

Germplasm, Old varieties, Seed conservation, Varietal identification

INFLUENCE OF RS3 RESISTANT STARCH ON THE PROPERTIES OF HOME-MADE WHEAT BREAD

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Resistant starch (RS; not accessible to human digestive enzymes) has beneficial effects for health, it positively influences digestive tract; its fermentation in the colon causes formation of short chain fatty acids and lowering of the pH. It further increases faecal bulk, protects against colonic cancer, improves blood cholesterol level, assists in the control of diabetes glucose tolerance and causes lower blood lipid levels. But the intake of RS as well as of dietary fibre in Europe is insufficient. RS is classified into several categories; among them the group RS3 is retrograded amylose. The change of starchy materials into RS3 is re-association of amylose chains into the form of double helices which are loosely arranged into a partially crystalline system; it hinders diffusion and binding of hydrolytic enzymes.

RS3 originates easily from starches having high content of amylose, therefore there are RS products based on amylo maize on the market, e.g. Hi-maize® or Amylo maize N-400. Hi-maize commercial product claims to have resistant starch (RS) in the product (found RS content 15.6 g/100 g DM).

Bread is a traditional component of the human diet. High fibre breads have certain negative attributes like reduced loaf volume, dark colour, poor mouthfeel, and masking of flavour which paved the way for using resistant starch. The aim of the study was the evaluation of impacts on properties of dough, resistant starch content, physical and sensory attributes of bread when wheat flour was substituted by 5-25 % Hi-maize.

Hi-maize had a great influence on viscosity peak, pasting temperature, breakdown, holding strength and final viscosity in RVA curves. But the difference in fall of viscosity between wheat flour and the blend having 5 % of Hi-maize were not big. The increasing concentration of Hi-maize worsened rheological quality and hence took up a negative effect on protein and mainly on the starch part of Mixolab curves. Nevertheless recorded composite dough consistencies (C1) have fallen minimally. 15% Hi-maize addition caused changes in (C5-C4) 0.46 Nm and 0.43 respectively. For 15 % Hi-maize, the contribution of RS was 1.6 times higher compared to the incoming RS content from maize starch, i.e. RS content of the bread was 4.9 %.

Additions of 5 % and 15 % Hi-maize caused worse appearance, lower volume and a light colour of crust. The stiffness of the bread was worse when compared with normal one for the first three days but after that the breads were softer. The best results in shelf-life of bread were achieved by 5 % and 15 % Hi-maize additions.

RS3 starches offer an exciting new potential as a food ingredient since it is generally stable to heat treatments.

This research was supported by the "Wheat with specific starch composition and features for food and non-food purposes" QJ1310219 research grant of the Czech Ministry of Agriculture.

Keywords:

Resistant starch, application, enriched bread; Mixolab; baking quality

INULIN-TYPE FRUCTANS AS AN ADDITIVE TO GLUTEN-FREE BREAD

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Cereal products, including bread, are the base of the human diet. However increasing portion of the global population must avoid the consumption of cereals because they do not tolerate gluten proteins. Therefore, the gluten-free foodstuff production is one of the most dynamically growing branch of the food industry. Gluten-free products are characterized by lower overall quality and not sufficient sensory properties. To meet the growing demands of gluten-free food consumers, many studies have been performed with the aim of improving the quality of these products. The replacement of gluten in the gluten-free bakery technology is a challenge. Bread dough without gluten is more liquid, cohesive and sticky, while the final product is characterized by a reduced quality as compared to gluten-containing foodstuff.

Recently, inulin-type fructans (ITFs) were proposed as beneficial ingredients of gluten-free baked products. Based on the positive experiences of ITFs utilization in the traditional breadmaking, studies of their applications in gluten-free bread production began. Inulin and oligofructose are the most researchable functional dietary fiber in gluten-free bread formulations. Therefore, the aim of this work is to present the current application of ITFs as ingredients of gluten-free breads by reviewing the existing data concerning their effect on the technological properties and sensory quality of these products in the light of their physicochemical characteristics.

In this work, we summarize recent studies on gluten-free breads enriched in ITFs which were applied as valuable ingredients affecting the rheological and technological parameters of bakery products. ITFs added to gluten-free bread interact with other ingredients and additives, but, in general, they have the potential to improve the sensory perception of obtained gluten-free products. The facts are promising and therefore could provide the impulse for further development and intensified research on the new gluten-free bakery products of superior quality dedicated to people suffering from gluten-related disorders.

Keywords:

Inulin-type fructans, inulin, gluten-free bread, technological properties

FACTORS AFFECTING APPLE AROMA AND TASTE

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Nowadays the consumer want to buy high quality fruits which are characterized by high storability and good taste. Good Agricultural Practice and modern storage technologies give the opportunity to extend the storage potential of fruits and their shelflife. Flavor is a one of quality attributes including sweet taste, sour taste, bitterness, astringency and aroma. Volatile compounds produced by apples constitute a major portion of fruit aroma which is a complex mixture of a large number of volatile compounds. Over 300 volatile compounds have been measured in the aroma profile of apples. These compounds include alcohols, aldehydes, carboxylic esters, ketones and ethers. Qualitative and quantitative volatile emission during fruit ripening is determined by a number of factors including cultivars, fruit maturity at harvest, postharvest treatment, storage duration, and composition of storage atmosphere.

Flavour as well as aroma of fruits is influenced by genetic, preharvest, harvesting, and postharvest factors. The breeding programme of apples are focus on fruits with resistance to major diseases (scab and mildew) and good storability. The fruits of some cultivars, harvested at optimum maturity stage can be stored for twelve months at innovative storage technologies with maintain texture (high firmness and juiciness) and acidity. So, apples are available all year, but extending the storage life quite often reduce the fruit aroma.

Increasingly, consumers are looking for traditional apple varieties to remember the past. Unfortunately, those cultivars quite often are not resistant to storage disorders and diseases and are characterized by low storability. However those cultivars are suitable for home garden.

Keywords:

Maturity, storage conditions, flavor, firmness, diseases, disorders

ENVIRONMENTAL SAFETY AND INNOVATIVE PLUM GROWING TECHNOLOGY

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The seventy-year long tradition of continuous, systematic and multi-disciplinary breeding work at the Fruit Research Institute, Čačak (Republic of Serbia) has resulted in 41 released cultivars of pome, stone and small fruits, including fifteen plum cultivars. One of them is a mid-early, high quality plum cultivar named 'Čačanska Lepotica', which is dominantly present in the assortment of not only the Republic of Serbia, but of many European countries as well. The fruits are suitable for fresh consumption and production of high-quality brandy.

In order to improve the technology of growing stated plum cultivar, and bearing in mind that intensive development of agriculture and increasing utilization of synthetic nitrogen fertilizers significantly contributes to a series of undesirable effects and results in excessive environmental pollution we conducted comparative study of the effect of bio- (application of microbial inoculants) and chemical fertilizer applications on morfometric (fruit weight, length, breadth and thickness) and chemical properties (SSC, TAC, TPC) of 'Čačanska Lepotica' plum cultivar. The analysis of the results points to the fact that application of biofertilizer in the 'Čačanska Lepotica' growing technology should ensure this production in a manner that satisfies basic postulates of sustainable agriculture. In this respect this approach seems to contain a certain potential as an appropriate technique in commercial plum production to obtain health and environment safe products.

Keywords:

Plum, biofertilisation, chemical properties, morfometric properties, sustainable agriculture

PLUM CULTIVARS FROM FRUIT RESEARCH INSTITUTE ČAČAK INTENDED FOR DRYING

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During the end of 19th and the first half of 20th century, prunes were one of the most important export article of former Kingdom of Serbia. Production of prunes was based in the largest percentage on well-known old cultivar 'Požegača' which accounted more than 90% of total production. Due to very high susceptibility of cultivar 'Požegača' to Sharka virus (Plum Pox Virus), after spreading of this virus across whole territory of Serbia during the second half of 20th century, prunes production was devastated. In that period great importance was given to cultivar 'Stanley' which became the most important plum cultivar for drying in Serbia. Today, this cultivar accounted more than 80% of prunes production, although it has a lot of deficiencies.

One of plum breeding objectives in Fruit Research Institute Čačak is good suitability for drying. Since 1979, seven plum cultivars, which are more or less suitable for drying, are named and released: 'Čačanska Rodna', 'Čačanski Šećer', 'Valjevka', 'Mildora', 'Krina', 'Pozna Plava' and 'Nada'. Cultivar 'Čačanska Rodna' is the second most important cultivar for drying after 'Stanley'. It gives prunes of extraordinary quality, but very often to small, due to unstable growing technology. Prunes from 'Čačanski Šećer' and 'Valjevka' had very high quality, but this cultivars has irregular bearing and yields. On the other hand, new cultivars 'Krina', 'Pozna Plava' and 'Nada' showed very good results in different trials and gives very good quality and dark blue to black colour of prunes. All of these cultivars had soluble solids content higher than 20°Brix. Soluble solids content of 'Mildora' is mostly higher than 25°Brix. Prunes of this cultivar had outstanding quality and amber colour, so that could be interesting for markets which prefer different colours than black.

Keywords:

Plum cultivars, breeding, prunes, high quality

POSTER PRESENTATION

PP 1

ADDING VALUE TO TRADITIONAL RYE-BASED FERMENTED BEVERAGE KVAASS: APPLICATION OF ENZYMES AND LACTIC ACID BACTERIA

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Among foods which play a crucial role in many diets worldwide, and are nutritionally important, or which use is extended as an ongoing part of a healthy and consumer-appreciated diet, are traditional fermented products. Fermented foods are produced world-wide using various manufacturing techniques, raw materials and microorganisms. The problem is, that for the most of traditional fermented foods, production methods are not optimized or industrialised, and are rather small scale, localized (often in homes) processes. It is beneficial to revisit such traditional products and to conduct biotechnological investigations to explore and enhance their functional properties (antimicrobial, enzymatical, probiotic and prebiotic quality), and thus promote their commercial exploitation outside of their local regions. The growing interest in foods and beverages with increased dietary fibre content is observed worldwide. Such foods and beverages often are called as prebiotic foods, because of their ability to stimulate the growth of beneficial colonic microflora. Research on prebiotics and other novel health-promoting food components has been active for over a decade. Arabinoxylan (AX) derived arabinoxyloligosaccharides (AXOS) stand increasingly in the spotlight as potential prebiotics. The diversity of these compounds is higher than other prebiotic carbohydrates, but isolation and purification is expensive, complicated and time consuming process. Therefore, development of new methods to increase oligosaccharide content in foods and beverages is important task.

The aim of this study was to develop a new technology for making traditional Lithuanian non-alcoholic beverage kvass (also known as Gira) from fermented cereals by extending the spectrum of raw materials (extruded rye) and applying new biotechnological resources (xylanolytic enzymes and antimicrobial active lactic acid bacteria (LAB)) to improve the functional properties. The influence of four commercial xylanolytic enzyme preparations Ceremix Plus MG, Pentopan Mono BG, Depol 680, Depol 692 on the degradability of AX in extruded rye were investigated, identification and quantification of oligosaccharides (AXOS, XOS) formed after enzymatic hydrolysis and fermentation by LAB was performed. The changes of oligosaccharides were monitored by HPAEC-PAD. Bacteriocins producing LAB (*Lactobacillus sakei* KTU05-6 and *Pediococcus pentosaceus* KTU05-10) from the collection of Department of Food Science and Technology, KTU were used for rye fermentation.

AX in extruded rye were very efficiently hydrolysed into AXOS and XOS by xylanolytic complex from *Humicola* & *Bacillus* (Ceremix Plus MG). Short-chain AXOS (A³X, A^{2,3}XX, A²XX) and XOS (X₂-X₆) were identified after hydrolysis in amounts of 16.9 mg g⁻¹ and 53.6 mg g⁻¹. Using Ceremix Plus MG and LAB fermentation, the yield of AXOS and XOS in beverages was increased to 300 and 1100 mg L⁻¹, respectively. Beverages fermented by had lower pH values and ethanol volume fraction compared to the traditional yeast-fermented beverage. The acceptability of the beverage fermented by *Lactobacillus sakei* was higher compared to *Pediococcus pentosaceus*- or yeast-fermented beverages and similar to the acceptability of commercial kvass made from rye malt extract. The results showed that extruded rye, xylanolytic enzymes and LAB can be used for production of novel and safe and added-value non-alcoholic beverages.

Keywords:

Non-alcoholic fermented beverage, extruded rye, lactic acid bacteria (LAB), xylanase, oligosaccharides

PP 2

THE IMPACT OF DIFFERENT PLANT GROWTH STIMULANTS ON TOMATO SEEDLINGS GROWTH

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This paper presents the results of the impact of plant growth stimulants Bio-algeen S-92, Ergonfill and Ruter-AA on the parameters of the growth of tomato seedlings. The examine parameters of tomato seedlings growth were: fresh weight of roots, stem and leaves, leaf area, and the ontent of photosynthetic pigment in leaves. Fresh weight og roots, stem and leaves were determined by weighing, leaf area by contours method on paper, and the content of photosynthetic pigment inseedling leaves by UV/VIS spectrophotometric method.

In relation to the control, untreated variant, the treatment of tomato seedlings with all use growthstimulants showed a positive impact on increasing the examined parameters, which is an important factor of faster adaptation of seedlings to the stress caused by transplanting. The biggest effect was achieved in variant with application of growth stimulants Bio-algeen S-92, irrespective of the examine parameters.

Keywords:

Plant growth stimulants, seedlings, tomato

PP 3

SHAPING THE SENSORY CHARACTERISTICS OF MEAD BY TECHNOLOGICAL PARAMETERS

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Sensory quality of mead is highly dependent on accuracy of four principal production stages performance. Wort preparation, wort heat treatment, fermentation and maturation. Each of these four steps determines the sensory characteristics of final product. The aim of this study is to determine the influence of additives on wort preparation stage and maturation process on qualitative and quantitative sensory characteristics.

Mead wort was prepared by diluting multiflower honey (Miody Polskie Ltd., Poland) in spring water with mineral content of 284mg/L achieving total extract of 36°Bx. Wort was gently boiled for one hour with continuous removal of scums from surface. After cooling to 25°C extract was regulated to defined value with distilled water. Mead wort was supplemented in nutrients with use of yeast complex supplement with vitamin B₁ PO-B (Biowin, Poland) and spread into three batches: a) control (no additives), b) hopped with addition of 10g/L Saaz hops, c) with 5% (v/v) addition of fresh pressed cranberry juice (*Vaccinium oxycoccus*). Each batch was inoculated with *Saccharomyces cerevisiae* yeast strain from Tokay breed (Biowin, Poland). Fermentation of mead batches was conducted for 70 days with temperature control in range of 18-20°C. After fermentation mead was separated from the yeast slurry by decantation and placed in sterile flasks for maturation.

Mead samples after fermentation and maturation were analyzed for parameters such as: carbohydrate profiles (fructose, glucose, sucrose and maltose), ethanol, glycerol content by means of high performance liquid chromatography (HPLC) on Shimadzu Prominence (Japan) equipped with refractometric detector RID-10A (Shimadzu, Japan) and Rezex ROA Organic Acid H+ (Phenomenex, USA) chromatographic column. Afterward samples were tested for their organoleptic quality according to regulations of Polish Standard PN-A-79120-02:1990.

Conducted research showed that changes during maturation helps to balance the content of ethanol and glycerol in meads which makes a great on organoleptic quality. Use of additives such hops or juice in fermentation stage helps to result in better organoleptic quality and better consumer acceptance.

Keywords:

Mead, wort, quality, colour, haze, thermal processing

PP 4

COLOUR AND HAZE FORMATION DURING THERMAL PROCESSING OF MEAD WORT

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Colour and haze are one of the most critical parameters of mead quality. Their intensity are highly dependent on honey quality and origin as well as on thermal processing of wort. Either through traditional gently boiling or pasteurization pretreatment procedures prior to ethanolic fermentation.

The aim of this study was to determine the influence of thermal processing parameters of mead wort pasteurization on colour and haze formation.

Mead wort was prepared by diluting multiflower honey (APIMED, Slovakia) in distilled water obtaining extract concentration of 36°Bx. Mead wort was placed in volume of 40mL in 100mL glass bottles secured with caps to prevent water evaporation and extract alteration. Bottles were inserted into water bath at 65°C ± 0,5°C. The moment when samples reached the equilibrium temperature, time was measured. After exactly 10, 20, 30 and 40 minutes bottles were removed from water bath and immediately cooled to room temperature. Samples were analyzed using density meter DMA 4500 M (Anton Paar, Austria) coupled with turbidity meter HazeQC ME (Anton Paar, Austria) and alcolyzer Beer ME (Anton Paar, Austria) module. Colour, haze, density and extract were registered. The exact procedure was repeated for temperatures of 75°C and 80°C. All samples and analyses were performed in triplicates. Due to lack of regulations and normalized methodology for instrumental analysis of colour and haze in meads, EBC scale was used.

Performed measurements showed a qualitatively important changes of colour and haze. Observed increase of colour intensity was caused mainly by Maillard reactions leading to formation of melanoidins and 5-hydroxymethylfurfural. Within duration of thermal treatment process, a strong positive linear correlations between time and colour intensity were observed, which enables to estimate progression of colour formation.

Increase of haziness within rising of process temperature and duration was observed. Mainly caused by proteins precipitation from the solution through thermal denaturation. In tested conditions haze parameter showed strong positive linear correlation between process temperatures and duration. Proteins precipitation and denaturation helps to result in faster and more efficient clarification of mead during fermentation as well as releases free amino acids which are excellent source of nitrogen for yeasts.

PP 5

THE USE OF STEVIOL GLYCOSIDES TO REDUCE SUGAR CONTENT IN OF OSMODEHYDRATED CRANBERRIES

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In recent years increased consumers interest in natural foods due to the increasing nutritional awareness can be observed. Consuming too much sugar in the diet is one of the biggest problem, which have a negative impact on human health. According to the rapidly growing number of people with overweight and obesity, products with a reduced sugar content are more and more popular. Reducing the consumption of high-energy food is very important in the prevention of lifestyle diseases. Because of that food producers looking for sugar alternatives. They have to choose substances which do not reduce the quality of food products, will not adversely affect human health and at the same time will enjoy the sweet taste of the product.

One of the new food ingredients used in the food production are steviol glycosides, which have a sweetness about 300 times greater than sugar. Use of steviol glycosides can be a perfect substitute for sucrose and the sweetening products using this compounds may affect the reduction of product calorie.

The aim of the study was use of steviol glycosides to reduce the sugar content of the osmodehydrated cranberries. In the investigation frozen cranberries var. *Vaccinium oxycoccus* were used. The untreated, cut and blanched cranberries was treated with ultrasound waves with 21 kHz frequency for 30 and 60 minutes to accelerate the dehydration process. In order to conduct pre-treatment before subjected to ultrasound, fruits was cut and/or blanched for 5 minutes at 90°C. Ultrasound treatment was conduct in two liquid medium as 61,5% sugar solution and 30% sugar solution with 0,1% steviol glycosides addition. The sugar content including sucrose, glucose and fructose were investigated. HPLC method was used for determination of sugar content. Statistical significance were examined with the analysis of variance and homogenous groups were determined using Duncan's multiple range tests with $\alpha=0.05$.

The results shows that ultrasound treatment conduct for intact tissue did not influence on sugar content because hard skin prevents penetration of sugar into the interior of raw material. In the case of cranberries this is a rather disadvantageous effect due to the high acidity of cranberries. The cranberries must contain sugar or other sweetener to be acceptable for the consumer.

Increased sugar content was observed when the process was conduct for cut and blanched cranberries. The use of the 61,5% sucrose solution for 30 and 60 minute ultrasound treatment resulted in more than a twofold increase in sugar content in cranberries, compared to the tissue prior the treatment. However, the use of 30% sugar solution with 0,1% steviol glycosides addition for osmotic dehydration allowed to obtain a lower sugar content. The use of natural sweetener in addition to the sucrose solution allowed to reduce the sugar content from 45 to even 100% in comparison with the tissue dehydrated in a 61,5% sucrose solution. Moreover, longer time treatment resulted in higher sugar content in treated cranberries, especially for samples which were cut before treatment, regardless of kind of pretreatment.

These results indicated that the use of steviol glycosides allowed to obtain cranberries with lower sugar content than when the standard sugar solution was used.

Keywords:

Cranberry, steviol glycosides, sugar content, fruit snack

PP 6

RASPBERRY POMACE REGULATES CAECAL MICROBIAL ACTIVITY AND REDUCES FORMATION OF DEOXYCHOLIC AND LITHOCHOLIC ACID IN RATS FED HIGH-FAT DIET

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It is well known, that high-fat diet causes increased secretion of bile acids into the gastrointestinal tract. The higher level of bile acids, especially deoxycholic and lithocholic acid, may increase neoplastic changes in the lower gut. The metabolism, and thus profile of bile acids largely depend on microbiota enzymatic activity but this could be modulated by dietary addition of biologically active compounds e.g., polyphenols and polyunsaturated fatty acids. Popularly consumed fruits rich in biological active compounds are raspberries. During raspberry processing, e.g. production of concentrates juice, a significant part of these compounds, like fiber and polyphenols, remains in the pomace. The raspberry pomace consists over 70% of the seeds, which include approximately 23% oil, rich in essential fatty acids. Therefore, the aim of this study was to examine the effect of dietary raspberry pomace on microbial activity and bile acids profile in the rat's caecum fed a high-fat diet.

Male Wistar rats were allocated to 6 groups of 8 animals each. Group C was fed a standard diet for laboratory rodents (modification of AIN-93 diet) and group HF a high-fat diet containing 20% fat and 2% rapeseed oil. Another experimental groups were fed high-fat diets enriched with 7% of four different types raspberry pomaces, standard grinded (granulation $\phi < 1.25$ mm) with or without seeds (HFSG and HFSGs, respectively) and non-standard grinded (granulation $\phi < 0.65$ mm) with or without seeds (HFNG and HFNGs, respectively).

After 6 weeks, the feeding with high-fat diet resulted in increased caecal ammonia concentration ($p < 0.05$ vs. C), however treatments HFSGs and HFNG reduced that effect to the C group level. In the HF group, the caecal activity of selected microbial enzymes and concentration of short chain fatty acids (SCFA) were comparable to group C. Nevertheless, the highest activity of the α -galactosidase, β -glucosidase and highest concentration of the SCFA were noted in the HFNG group. Irrespective of grinding type, seedless raspberry pomaces significantly elevated butyric acid concentration in the caecal digesta ($p < 0.05$ vs. pomaces with seeds). High-fat diet used in this study significantly increased caecal concentration of cholic, deoxycholic and β -muricholic acid ($p < 0.001$ vs. C group). Dietary application of raspberry pomaces with seeds reduced that effect. The non-standard grinded raspberry pomaces also considerably reduced concentration of chenodeoxycholic, lithocholic, muricholic and ω -muricholic acids in the caecal digesta ($p < 0.05$, < 0.001 , < 0.005 , < 0.05 , respectively vs. standard grinded). Among all examined groups, HFNGs presented the highest reduction in deoxycholic, lithocholic and ω -muricholic acid levels in the caecum. To conclude, all dietary treatments with raspberry pomaces positively modulated microbiota activity, thus bile acids profile, however non-standard grinded pomaces especially with seeds exhibited the greatest beneficial effect in the caecum.

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Keywords:

Raspberry pomace, microbial activity, bile acids, rat

PP 7

HORSE MILK WITH TRANSGLUTAMINASE – CAN IT SUCCEED IN MOLECULAR GASTRONOMY SAFE FOR ALLERGICS?

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Molecular gastronomy experiments have resulted in new innovative dishes. However, not every dish is safe for allergics. Nowadays, it is observed a trend to create products refer to the individual needs of customers. Transglutaminase, as an enzyme used in molecular kitchens that can be used to bind proteins to produce food that look good and reduce waste. What about application transglutaminase in milk? Cow's milk proteins are one of the most allergenic proteins. Mare's milk, known for reduced allergenic properties, is considered as a substitute for cow's milk, directed to people who suffer from cow's milk allergy. However, our previous study showed that mare's milk proteins have the similar immunoreactive epitopes to cow's milk proteins. Therefore, the aim of the project is to explore the possibility of reducing the immunoreactivity of two mare's milk proteins by microbial transglutaminase linking.

The immunoreactivity level of mare's and cow's milk was compared with use of antibodies directed to proteins of cow's milk: beta-lactoglobulin and alpha-casein (competitive ELISA). The immunoreactivity was calculated from the standard curves of the standard antigens. All the analyses were carried out in triplicate and the average values were converted to concentration equivalents in μg per μl . A nonlinear adjustment of a data obtained for each dilution was applied for each for rabbit serum. The adjustment model was a sigmoidal curve and was obtained with the program GraphPad PRISM.

The transglutaminase linking modify the level of immunoreactivity of studied proteins depending on the quantity of the enzyme, while visual properties are unchanged. However, future research in this area should focus on mare's milk processing resulting in the destruction of most allergenic epitopes with use of combine techniques e.g. cross-linking and lactic acid fermentation.

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Keywords:

Horse milk, allergy, transglutaminase

PP 8

AGRICULTURAL EXTENSION AND ITS ROLES IN ENSURING FOOD SECURITY IN POLAND

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In Poland Agriculture is one of the branches of the national economy, which are the basis of life and maintenance of the population. It produces about 90% of food products and raw materials for food processing. The appropriate level of agricultural development is one of the pillars of the development of the whole economy (FAO, 2015). Poland receives a lot of attention beyond their Expo presence. The country is often called a success story in Europe, with its dynamic economy and years of uninterrupted growth. Poland's economy has grown by 33 percent since 2007, compared with two percent for the Eurozone. Poland is one of four European countries in which food security has increased according to the latest update of the Global Food Security Index 2015. Poland raised its score by half a point compared to the last year and by a total of 2 points over the last four years. Among the European countries, Poland ranks 17th, just behind the Czech Republic and before Greece. Poland holds the 28th position in the world. Poland improved its score mainly in the area of access to food. The score rose from 66.3 points last year to 70 points this year. In this category, the country holds the 25th position in the world. In terms of food affordability, Poland lost its 27th position – this year it holds the 28th position despite the fact that the value of this index recorded only a small decrease: it was 78.4 points compared to 78.6 points last year. In terms of food quality and safety, Poland's score remained stable. It has been at roughly the same level for four years. Otherwise the Extension and outreach strategies are carried out by extension agents to build farmers capacity in utilizing improve crop and animal production techniques. Also, helps in designing innovative pathways for disseminating research results and innovations to farmers and industry. Because the Extension is a support and educational agency focusing on changing human behavior in positive sense, and as such is a very important actor in any national strategy of food security. However, no matter how efficient is an extension system, how qualified and competent its human resources, how generous financing it enjoys and how sound is its operational strategy, extension alone cannot guarantee sustained food security (FAO, 2003). Agricultural extension (also known as agricultural advisory services) plays a crucial role in promoting agricultural productivity, increasing food security, improving rural livelihoods, and promoting agriculture as an engine of pro-poor economic growth. Extension as a rural support service is needed to meet the new challenges agriculture is confronted with: changes in the global food and agricultural system, including the rise of supermarkets and the growing importance of standards and labels; growth in non-farm rural employment and agribusiness; constraints imposed and other health challenges that affect rural livelihoods; and the deterioration of the natural resource base and climate change.

TRADITIONAL PRODUCTS OF PLUM AND RASPBERRY IN SERBIA

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Western Serbia, hilly and mountainous area of Serbia provides the best conditions for raspberry and plum cultivations. In these regions, plums are present as we are and are deeply rooted in our traditions and customs. In the past, in the Middle Ages plums mostly grew on the monastery and the feudal lands and from the XIII century, planted less frequently on farms. Since the mid-XIX, plum takes priority over the other fruits and a real expansion reaches on the beginning of the XX century. Serbia holds second place in the world with the production of plums up to nearly 600,000 tons in a favourable seasons. It is estimated that there are around 48 million plum trees in Serbia of which 'Požegača' was the most abundant in the past. The majority of produced plums (more than 90% in some years) were processed into the famous plum brandy 'Šljivovica'. From eighties, Čačak plum varieties are intensively introduced along with other foreign varieties, which thus significantly increase their quality, increasing their use value and the economic importance. Further, new plum orchards with modern production technology significantly increase engagement of labour in production, processing and marketing. Serbia mainly exports fresh, frozen and dry plums. Several other products such as brandy, jam, marmalade, the sweet of plum, compote, juice and plum puree are also produce.

Rubus ideas L., also known as European red raspberry, is present in our forests since the ancient times. But, the first important varieties of raspberry were brought by our emigrants from America at the end of nineteen century, more precisely in 1880 year, when variety 'Marlboro' star to cultivate in the Valjevo area, where domestic people called it Valjevka. Later it spread to other regions especially to western Serbia. Nowadays, raspberries are grown on 16 thousand hectares throughout Serbia with an average annual production about 70,000 tons (for period from 2011 to 2014), but could be reached 95,000 tons in some years (in 2002). Serbia holds a high position in value of produced quantities of raspberries in the world. Serbia was on the second place in 2011, on the forth place in 2012 and on the third place in 2014. The most of produced raspberry (over 90%) is being deep frozen in large warehouses and the rest is being sold fresh or made into other products. The main product of deep frozen raspberry is rolend. Other products are frozen crumbles raspberry, raspberry in blocks and whole and broken raspberry. In recent years, besides frozen raspberry, fresh raspberries increasingly used in the processing industry, manufactures and homes. There is a whole range of processed products such as freez dried raspberry with or without chocolate coat, juices and shakes, compote, marmalada, frozen puff pastry of raspberry, raspberry cakes and raspberry brandy.

Keywords:

Raspberry, plum, traditional products, Serbia

PHYSICO-CHEMICAL PROPERTIES OF HERBHONEYS FROM MALOPOLSKA REGION

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Herbhoneys are bee products obtained by feeding bees by a sugar medium enriched with plant extracts. In the study the selected physico-chemical properties of four herbhoneys received from Beekeeping Apipol-Krakow company: pine, nettle, hawthorn and coffee were examined. It was found that the tested herbhoneys met the basic standard requirements for herb honeys, including values of water content, electric conductivity, pH and amount of sugars and enzyme activity (diastase number).

The studies focused on determination of antioxidant activity measured as a percentage of free radicals (DPPH[•]) scavenging ability and reducing power. The total polyphenol content (TPC) was also determined. Results of the study showed that the total polyphenol content and antioxidant activity differed widely among different herbhoney types and were depended on their colour. A darker herb honey a higher antioxidant activity and total polyphenol content were observed. Coffee herbhoney was the most active in neutralizing free radicals, contained the most polyphenol and the highest value of reducing power. That probably resulted from the strong antioxidant properties of coffee, used for the production of feed medium for bees.

Additionally, a thermogravimetric analysis (TGA) were conducted for the studied herbhoneys, in which a mass loss as a function of temperature was recorded at a given heating rate and in a given atmosphere. TGA enabled to observe the vaporization of volatiles of original components of studied samples and the products of the thermal decomposition of some of them. The percentage loss of mass in a given temperature range was determined and correlated with water and sugar contents obtained from other methods.

Keywords:

Herb honey, antioxidant properties, physic-chemical properties, thermogravimetric analysis

PRO-HEALTH PROPERTIES OF POLISH TRADITIONAL FERMENTED PRODUCTS

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Fermented food is an important component of well-balanced diet due to the high content of easily available vitamins and minerals. Technology used to produce such food is one of the oldest methods of food preservation that belongs to the biological methods and results in obtaining products with new properties. Mainly, materials of plant origin containing large amounts of water and juice rich in sugars and vitamins necessary for the development of microbial fermentation, are subjected to this process. Properly fermented products have a pH of approx. 3.5 and total acidity in the range of 1 - 1,8% and low acetic acid content. The hydrogen ion concentration remaining at an appropriate level fully protects the product before the development of putrefactive bacteria and other undesirable micro-organisms. During fermentation the stabilization of vitamin C and vitamin A is observed, and following enrichment of the product with vitamins PP and B₂, thus increasing the biological value, furthermore the loss of labile compounds are limited. The content of antioxidants in fermented food may be up to twice as compared to the raw counterparts .

The aim of the study was to investigate the antioxidant activity of selected products obtained by lactic fermentation available on the local market and some self-produced.

The products purchased in the local market were: sauerkraut without and with additives (caraway, carrot), and fermented cucumbers. Products prepared on their own were fermented: apples, mushrooms and beetroot. The antioxidant activity was determined by scavenging free radicals DPPH[•] and ABTS^{•+}, as well as by determining FRAP and reducing power. Total polyphenol content was also assayed.

The study demonstrated that the highest polyphenol content was in fermented apples, 1086 mg/L, whereas in the case of red borscht, sauerkrauts (with additives and plain) polyphenol content did not exceed 700 mg/L. The lowest content of phenolic compounds, characterized fermented cucumbers and mushrooms, respectively, 20.2 mg/L and 34.2 mg/L. The lowest ability of quenching free radical DPPH[•] have fermented cucumbers and mushrooms, in a case of fermented apples and both sauerkrauts, this ability was above 95%, and for the red borscht - 73%. Almost 100% ability of reduction ABTS^{•+} showed beetroot and fermented apples. Slightly lower values were obtained for sauerkraut with additions (approx. 85%) and without additives (approx. 72%), while the lowest antiradical properties was determined for fermented mushrooms, only approx. 23%. The highest capacity of iron ions Fe³⁺ reduction (FRAP method) had fermented apples and beetroot. Worse ability of Fe³⁺ reduction showed fermented mushrooms and cucumbers. The highest reducing power, expressed as ascorbic acid concentration was determined for fermented apples (201 mg /100 ml). At a comparable level reducing power was determined for both sauerkrauts and red borscht. The smallest reducing power characterized fermented mushrooms and cucumbers.

The study showed that fermented products have relatively high antioxidant activity, the greatest had fermented apples and the smallest - fermented mushrooms and cucumbers. Polyphenol content had a big impact on antioxidant activity of the products, the amount these compounds probably increased during lactic fermentation.

Keywords:

Fermented food, traditional product, antioxidant activity, polyphenols

**ANTIOXIDANT PROPERTIES OF POLISH TRADITIONAL TINCTURES
BASED ON POLYPHENOL-RICH PLANTS**

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Food of plant origin is a rich source of biologically active substances both nutrients and non-nutrients. The important group of compounds with the beneficial effects are the antioxidants, which are found in nature in fruits, seeds, flowers, leaves and roots; they can also be present in food produced from these materials, eg. wines or teas. Tinctures are alcoholic extracts of fresh fruits, herbs, seeds, roots with the addition of sugar or honey. These drinks can be sweet or dry, made from a composition of different fruits in different proportions, sometimes from the juices with herbs. Regular and moderate consumption of these alcoholic beverages can protect the human body against many diseases, since these drinks are rich in beneficial pro-health substances of plant origin, including antioxidants.

The aim of the study was to determine the antioxidant potential of tinctures made on the basis of plant material rich in polyphenols, according to traditional regional recipes from Małopolska.

For the preparation of tinctures 70% ethanol and sucrose in different proportions were applied. There were used fruits of: blueberry (*Vaccinium myrtillus*), rowanberry (*Sorbus aucuparia*), rosehips (*Rosa canina*), blackthorn fruits (*Prunus spinosa*), forest blackberries (*Rubus plicatus*), as well as a flower of small-leaved linden (*Tilia cordata*). As supplementary materials dried plums (*Prunus domestica*), dried figs (*Ficus carica*), chamomile (*Matricaria chamomilla*), leaves of peppermint (*Mentha piperita*), cloves (*Eugenia caryophyllata*) and the bison grass blades (*Hierochloe odorata*) were applied.

Alcohol content was determined by distillation method, extract was measured with the use of refractometrical method and density was assayed by pycnometric method. Total polyphenol content was determined with the use of Folin-Ciocalteu reagent and anthocyanins amount was analyzed by differential pH measurement. Antioxidant activity of tinctures was measured through the ability to scavenge free radicals DPPH[•] and measurements of reducing power.

Alcohol content in tinctures ranged from 35% to 50%, extract was from 12% to 24%, and a density in the range of 1.0469 to 1.1006 (g/ml). The greatest amount of total polyphenolic compounds contained tincture "Różana" (1360 mg/L), while the highest concentration of anthocyanins was determined in "Żubrówka", made on blueberries with the addition of bison grass blades (285 mg/L). About half the level of the later compounds was found in "Tarninówka" made on the basis of blackthorn fruits (139 mg/L). The greatest ability to quench free radicals DPPH[•] showed "Jarzębiak", which included dried rowanberry and dried plums and figs, as well as fresh fruits of blackthorn. High antioxidant properties have also "Różana" and "Lipówka", made on the basis of linden flowers and honey with cloves addition. The highest reducing power was determined for "Różana". It was observed that a greater impact on the antioxidant properties of the products had a content of total polyphenols than the amount of anthocyanins.

Keywords:

Traditional product, tinctures, antioxidant activity, polyphenols, anthocyanins

PP 13

EFFECT OF DIFFERENT LEVEL OF SPIRULINA ON THE CHOSEN QUALITY PARAMETERS OF SHORTBREAD BISCUITS

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Shortbread biscuits with *Arthrospira platensis* (spirulina) may promote healthy lifestyle and provide an excellent deal for those people who do not want to give up certain eating habits. This will be possible because spirulina is a good source of protein, dietary fiber, polyunsaturated fatty acids, antioxidants, vitamins and minerals. It will allow for an alternative to what is already available on the market and will be in line with the current trend favoring natural foods. Additionally, antioxidant activity of Spirulina arising from the presence of phycobiliproteins, phycocyanin and aphycoyanin, may contribute to extend shelf life of spirulina enriched biscuits. Despite all these advantages, the question remains whether such recipe modifications will be accepted by consumers?

Therefore the aim of the study was to evaluate the influence of different levels of spirulina powder (1%, 3% and 6% respectively) on the color, firmness, water content, water activity, free radical scavenging activity as well as consumer acceptability of shortbread biscuits characterized by high nutrient value. A significant ($p < 0.05$) change in color, increase in firmness and decrease in water activity of biscuits was evidenced with an increase of added spirulina. An increase in free radical scavenging activity compared with the control biscuits, despite the slightly lower overall acceptability of spirulina enriched biscuits, which would still provide satisfactory quality for consumer, could be promising solution to obtain high health quality products.

Keywords:

Spirulina, shortcrust biscuits, quality

**COMPARISON OF FATTY ACIDS PROFILE AND RHEOLOGICAL PROPERTIES OF
MONOACYLGLYCEROL OLEOGELS AND CLARIFIED BUTTER**

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Butter is commonly used in traditional Polish cuisine as a bread spread, bakery fat or frying fat. Clarified butter is a pure milk fat rendered from butter to separate the milk solids and water from fat. It has a higher smoke point and longer shelf life than fresh butter. Such butter has very good properties as a bakery fat. Products with clarified butter have very good sensorial quality, texture and volume, which is due to the high solid phase content related to high amount of saturated fatty acids (SFA) and *trans* fatty acids (TFA) in cow milk fat. Unfortunately SFA and TFA have an adverse influence on human health, it increases the risk of cardiovascular diseases.

Oleogelation is a new method to obtain solid fat out of liquid oil reach in unsaturated fatty acids by adding oil structuring agents such as monoacylglycerols (MAG). Oleogels can improve nutritional value by replacing butter in traditional food products.

In this study oleogels were obtained by diluting MAG in rapeseed oil at three levels 5%, 6% and 7%. The fatty acids profile of oleogels and clarified butter were analyzed by gas chromatography. Texture of samples were compared using spreadability test on TX.XA plus texture analyzer. Apparent viscosity was measured by Brookfield HA rheometer.

Clarified butter used in this study contained high amount of SFA (63,5%) and TFA (4,3%), while in oleogels content of these compounds was much lower and the highest was in oleogel with 7% of MAG (13,6% of SFA and 0,1% of TFA).

Oleogel MAG 7% had the most similar hardness to clarified butter, while MAG 6% stickiness. Clarified butter had higher apparent viscosity than oleogels. All samples were non-Newton fluids, the viscosity in 25°C was decreasing with higher speed. Results were fitted to Power Low model, which classified butter and oleogels were pseudoplastic fluids. Hardness, stickiness and apparent viscosity was increasing with a higher content of MAG in oleogel.

It has been demonstrated that it is possible to obtain a similar to the clarified butter solid fat products (in terms of physical parameters) with a more nutritionally desirable fatty acids composition.

Keywords:

Oleogels, clarified butter, monoacylglycerols, rheology, texture, fatty acids

INFLUENCE OF INULIN ADDITION ON THE QUALITY OF TRADITIONAL FATTY SPONGE-CAKES

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Consumers, while making food product choices, draw attention not only to the sensory features (appearance, taste, smell), but also to the nutrition value. Public education, prevalence of civilization illnesses, also obesity, made people more interested in traditional foods with lowered fat content. The aim of the study was to determine the possibility of reducing the fat content in traditional fatty sponge-cake products by the addition of inulin.

The bakery fat was replaced by inulin in an amount 2.0 g; 3.5 g; 5.0 g and 6.25 g/100g (0% fat), respectively. To prepare control samples of the bakery products the following ingredients were used: flour, fat, sugar and fresh egg pulp in the ratio 1:1:1:1. Batter was baked in moulds at 185°C for 45 minutes in an electric oven.

Physical characteristics of products were made (eg. porosity, water content). Texture of the products was analyzed by the instrumental method using a ZWICK 1120 texture meter. Hardness, cohesiveness, elasticity and chewiness of products were determined. Sensory evaluation was performed by a trained 20-person panel by assessing samples for appearance, smell, texture and flavor characteristics. Detailed sensory characteristics of products was performed by quantitative descriptive analysis (QDA) using the analytical procedure described in ISO 13299. Statistical preparation was carried out using the software Statgraphics Plus 4.1. The assessment of the significance of differences between the means was performed using Duncan's procedure with $p < 0.05$.

The addition of inulin in the study, significantly reduced fat content and energetic value of the obtained products. With a total elimination of fat, energetic value of traditional fatty sponge-cake products decreased by as much as 215 kcal/100 g of the product. It was found that the mechanical properties of products showed statistically significant correlation with the density of the batter and with the crumb of finished product, as well as with its porosity. In addition, one demonstrated the existence of a strong positive correlation between the water content in the products and their cohesiveness as well as elasticity. Addition of inulin did not affect negatively the sensory quality of traditional fatty sponge-cake products.

It was shown that it is possible to substitute fat by inulin in traditional fatty sponge-cake products. Substitution of fats by inulin allows to eliminate dangerous fatty acids, reduces energetic products value, and simultaneously enriches them in nutritionally valuable oligosaccharides. Furthermore, products without the addition of fat on the inulin base can be an alternative to the conventional fatty sponge-cake products as a factor that support prevention in many diseases and food related disorders.

Keywords:

Sponge-cake, inulin, fat replacer, texture, sensory analysis

PP 16

THE CONTENT OF CONJUGATED LINOLEIC ACID (*CIS9TRANS11 C18:2*, CLA) IN COMMERCIAL SMOKED CHEESES AND SMOKED CHEESES MADE BY FARMERS

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The term “linoleic acid with conjugated bonds” (CLA) refers to a group of positional and geometric isomers of linoleic acid (C18:2), in which two double bonds are separated with only one single bond. In fat of the ruminants, the highest concentration has been reported for *cis9trans11 C18:2* acid which in milk fat constitutes from 75 to over 90% of the sum of C18:2 acid isomers with conjugated bonds. This acid is beneficial to our health due to its anticarcinogenic, anti-atherosclerotic, antioxidative and anti-inflammatory properties. Milk and its products, especially cheeses, are a rich natural source of CLA in human diet. The assortment of cheeses on Polish market is very large. Besides commercial cheeses you can buy cheeses from individual farms, which are getting more and more popular among consumers.

The aim of this study was to determine content of *cis9trans11 C18:2* (CLA) acid in fat separated from commercial smoked cheeses and cheeses made by farmers available on our market.

The study evaluated commercial smoked cheese from different manufacturers (10 products) and smoked cheese derived from individual producers (8 products). Fat of cheeses was isolated with the Folch's method. Methyl esters were prepared from the isolated fat according to the IDF method using a methanolic solution of KOH. Determinations of CLA were carried out with gas chromatography method using a Hewlett Packard 6890 chromatograph with a flame-ionization detector and 100m capillary column with CP Sil 88 phase.

In fat obtained from all examined cheeses the presence of conjugated linoleic acid *cis9trans11 C18:2* was determined. Conducted studies have shown that examined farmer cheeses were characterized by a significantly higher content of CLA than analyzed commercial cheeses. In fat from smoked farmer cheeses the content of CLA acid was between 3.38 mg/g of fat and 7.46 mg/g of fat. The content of conjugated linoleic acid in smoked commercial cheeses ranged from 2.60 mg/g of fat to 4.74 mg/g of fat.

Keywords:

CLA, gas chromatography, smoked cheeses

PP 17

APPLICATION OF SEA BUCKTHORN JUICE AND FLOUR IN PRODUCTION OF RYE BREAD

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Rye bread due to the high content of group B vitamins, lysine, iron and phenolic acids, has a valuable pro-health properties. Particularly noteworthy is the content and composition of dietary fiber, which consists of pentosans, fructans and β -glucans. The application of flour extracted from the pomace of sea buckthorn berries and the juice obtained from sea buckthorn berries, containing large amounts of organic acids, such as malic acid or citric acid, could contribute to a proper growth rate of acidity, thereby improving the structure of rye bread. The additional advantage of sea buckthorn fruit juice and flour are biologically active ingredients: carotenoids, tocopherols, fatty acids - especially palmitoleic acid (omega 7), which could contribute to improving the sensory attractiveness of rye bread.

The aim of the study was to determine the possibility of using of sea buckthorn juice and flour extracted from the pomace of sea-buckthorn berries in the production of sourdough used for baking rye bread.

The research material accounted for four types of bread: rye sourdough bread (rye flour TYPE-720), sourdough bread with the 20% addition of sea-buckthorn juice, sourdough bread with the 20% addition of flour extracted from the pomace of sea buckthorn berries and sourdough bread in which water was replaced by the sea buckthorn juice.

The application of sea buckthorn juice and flour extracted from the pomace of sea buckthorn fruit contributed to the increase in bread volume, acidity and humidity of the crumb. The obtained bread characterized by a rich aromatic bouquet. In the samples containing as the juice as the flour of sea buckthorn fruit, the increase in the total baking loss of 12% compared to the control sample was observed. The crumb of bread obtained very good flexibility as well as good and evenly porosity for each variant of bread.

Keywords:

Rye bread, sea buckthorn juice, sourdough, biologically active substances, consumer evaluation

PP 18

TRADITIONAL FOOD IN DIETS OF PREGNANT WOMEN

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Recently an increasing interest in proper dietary rules has been observed among consumers and it is probably owing to a growing awareness in good nutrition. Pregnant women are a social group who especially pays attention to their quality of diet as well as foods eaten because nutrition plays a key role in pregnancy.

The aim of the study was to assess eating habits of pregnant women. The research held in the years of 2013-2016 by the means of direct interviews was conducted among 410 pregnant women who were in- and out-patients of the Saint Family and the Transfiguration Hospitals in Warsaw.

The age of women ranged from 18 to 44 years old, so an average one was ± 29 . More than 65% women lived in towns of more than 100,000 inhabitants. 79% women have secondary or higher education, 81% still worked during their pregnancy. More than 80% of the pregnant women introduced changes in their diets aiming at eating food of a good proved quality and of a high nutritional value. Only a small percentage – 10% - paid attention to certificates and quality marks on the labels of groceries.

About 20% of the women who were the subject of the study declared to buy and eat organic products and about 3% responded to consume traditional foods whose quality was proved by the suitable marks and certificates.

Among the organic foods which were the most commonly bought were such as: eggs – 61%, milk and dairy products – 30%, of which cheese -5%, fruit with apples and bananas mainly – 5%, other products, therein vegetables, oil, meat – about 4%. The women questioned responded that the reason for buying such products was that they are considered to be healthy (this is do not contain artificial fertilizers, hens are bred on a free run, there is a lack of GM food), have a better taste, a good price (discount stores) and are widely accessible (online shopping).

The studied women ate such traditional food as: bread with other bakery goods – 36%, oil cold-pressed – 17%, milk and dairy products – 13%, therein cheese -2,5%, fruit and vegetables – 10%, mayonnaise – 8%, honey – 3%, other products with meat, macaroni and dumplings, juice and syrup as well as ready -made food and dishes – 13%. While responding the women said that they bought traditional and regional food of a guaranteed background and quality or they declared that their purchase was according to family customs (they were bought not by a pregnant woman herself but her family members - a husband, parents, in-laws). What is more, they know the product themselves as it was either grown in the place they come from or lived at present. Furthermore, they underlined their high quality and taste. The pregnant women also wanted to buy foods they ate once only, for example during the holidays, but it was not accessible at their place of living.

Eating traditional foods during pregnancy can be a good way of enriching the menu of a pregnant woman and lead to introducing valuable nutrients to their diet. A low consumer awareness referring their marking and a quality in comparison to ecological and conventional products is the reason that they are rare in a diet of a pregnant woman.

Keywords:

Traditional food, organic food, eating habits, pregnancy

PP 19

TRADITIONAL BUTTER AND BUTTER-LIKE PRODUCTS AT THE ŁOMŻA MARKET

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The aim of the study was to assess the availability of traditional butter and butter-like products at the Łomża market.

The aim of the work was carried out by determining the assortment of shops in Łomża for the presence of milk fat in the form of traditional butter and butter-like products. The study was conducted in large and local shops. There were analyzed 287 pieces of butter manufactured by 17 butter producers and one own brand distributor as well as 167 pieces of mixes from 9 manufacturers. The correctness of packages labeling with legal requirements were also studied.

The weight of butter in shops in Łomża ranged between approximately 10g to 300g and participation of butter with a weight of 200g was 70% while the remaining 30% of the products was as follows: 2% with the weight of 10g, 10% with the weight of 80g, 4% with the weight of 125g and also 4% with the weight of 170g, 2% with the weight of 270g and 8% with the weight of 300g. The shops in Łomża offered for the sale the butter with salt and with such spices as: chive, garlic and a mix of parsley and garlic. Apart from Polish manufacturers there were also the butter from Finland, Ireland and Belgium.

The weight of butter-like products ranged from 100g to 275g and participation of products with a weight of 200g was 66%, with the weight of 100g was 3,5%, with the weight of 225g was 17%, with the weight of 270g was 3,5% and with the weight of 275g was 10%. In the case of mixes there were found salted butter with the addition of rapeseed and camelina oil from Finland.

It can be concluded that analyzed shops in Łomża offered for the sale mainly traditional butter. All products packages contained the necessary information required by legal regulations but more than half of examined fatty mixes packages had graphic design and own names which could mislead consumers as to the type of product. All analyzed products were in the proper shelf life according to the producer's declaration.

Keywords:

Milk fat, butter, butter-like products, spices, local market

PP 20
SLOW FOOD IN POLAND

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Slow Food is a social organization founded in 1986 in Italy in order to protect and promote traditional and regional food products and cuisine in different parts of the world. Nowadays the organization works in 160 countries and has 100.000 members. Its headquarter is located in Bra in Italy. In Europe, all countries, except Montenegro, are represented by Slow Food. The premise of the organization is to protect and support small regional food producers, especially of the traditional food produced in a way not seen in other places in the world. It is the opposite of fast-food, because it focuses on discovering new flavours and celebrating the meal. Slow Food also organizes different social actions to show consumers their regional products and to promote the idea in itself. The symbol of Slow Food is a red snail.

Slow Food Poland was established in 2002 and now unites 7 teams (in Slow Food structure called *convivia*) in the Poland and its main department is located in Cracow. The organization set up different regional and all-Polish actions which may help to introduce regional food products to consumers. One of the most popular are *Gęsina na św. Marcina*, which have had already 7 editions, the aim of which is to encourage people to eat goose on 11 November and *Czas dobrego sera*, which is a festival concentrated on Polish regional cheeses.

An important part of the Slow Food Poland activity is to give Slow Food recommendation for restaurants, where the menu is composed of unique, regional products. From 2002 to July 2016, 30 restaurants in Poland have been awarded by Slow Food: 7 restaurants in Pomorskie province, 5 in Kujawsko-Pomorskie province, 5 in Małopolskie province, 3 in Mazowieckie province, 2 in Podlaskie province, 1 in Zachodniopomorskie, Lubuskie, Dolnośląskie, Śląskie, and Warmiństwo-Mazurskie province. In certain parts of Poland, there are no Slow Food restaurants, but in some there are couple of them – 5 restaurants can be found in Cracow, 3 in Warsaw and Lublin, and 2 in Sopot.

The activity of Slow Food in the international area, especially in the USA and in some European Union countries, is significant and probably it will be increasing also in Poland.

Keywords:

Slow Food, Traditional Food, Regional Food, Slow Food Restaurant

THE INFLUENCE OF BLACK CHOKEBERRY ADDITION ON SENSORY PROPERTIES OF TRADITIONAL COOKIES

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Black chokeberry (*Aronia melanocarpa E.*) contains a lot of valuable, healthy compounds, including anthocyanins, epicatechins and hydroxycinnamic acid derivatives, which contribute to its very high antioxidant activity. Both flesh and skin are rich in substances with antioxidant properties that protect cells against harmful effects of free radicals. Fresh black chokeberry fruits have intensive, tart flavor and are used only in some products such as fruit teas, juices and jams.

In last years, cookies have gained importance as popular ready-to-eat snacks that provide a good source of energy and nutrients. There is a need to look for new raw materials that could enhance the physical and sensory properties of traditional cookies. According to European studies Polish consumers prefer lightly spiced, crunchy, dry and not too hard cookies. Therefore, the aim of the study was to evaluate the impact of black chokeberry addition on sensory properties of traditional cookies.

The material consisted of three versions of cookies, which were enriched with 5%, 10% and 15% of freeze-dried chokeberry. A consumer sensory testing was carried out among 104 people (81 women and 23 men) aged 18 to 35. The desirability of colour, colour on cutaway, aroma, crumbliness, taste and overall desirability was assessed on 9-hedonic scale. Simultaneously, the panel consisting of 11 trained persons performed sensory evaluations (Qualitative Descriptive Analysis). The intensity of several attributes was evaluated: colour, colour on cutaway, sweet, creamy and earthen aroma, chokeberry, sweet, sour and tart flavour, crumbliness and overall quality of cookies. The 10-point structured scale with labelled ends was applied.

The study showed that the most desirable colour had the cookie with 15% of freeze-dried chokeberry and in panel opinion its colour was the most intense. The cookie with 5% of additive had the most preferable aroma as the sweet and creamy aroma was strongly noticeable with unnoticeable earthen aroma. The higher amount of additive the sourer, tarter and less sweet the cookie was. All versions of cookies exhibited high quality, among which a cookie with 10% of chokeberry powder gained the highest notes.

The results indicate that freeze-dried chokeberry might be an interesting and innovative additive enhancing the sensory quality and consumer acceptance of traditional cookies.

Keywords:

Black chokeberry, traditional cookies, sensory consumer testing, sensory profile

**CAROB FLOUR AS MULTIFUNCTIONAL SUPPLEMENT EXHIBITS ALSO
ANTIMICROBIAL ACTIVITY IN BREAD**

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Carob (*Cerastion siliqua* L.) is an evergreen shrub or tree in the pea family, Fabaceae, native to the Mediterranean region and cultivated for its edible pods. Carob flour is processed by crushing dried seedless pods (pulp) roasted and milled into fine powder - health-promoting ingredient of feed and food products with high content of dietary fiber, minerals (Fe, Ca, Na, K, P and S), and vitamins (E, D, C, Niacin, B6 and folic acid) (Kamal et al., 2013). In previous work we evidenced also antimicrobial and product shelf-life prolongation of gluten free buckwheat products with carob flour addition as well as sporogenic bacteria and mould growth inhibition with carob flour phenolic extracts in *in vitro* tests (Avbelj et al., 2016).

In this work wheat flour was substituted with 20% of carob flour and antimicrobial (fungal and bacterial growth inhibition and consequent shelf-life prolongation) as well as technological, sensory and nutritional properties of carob enriched wheat bread were evaluated in: a) control bread samples with only wheat flour (CON), b) control bread samples with usual 0,4% of preservative Propisan (CONP), c) control wheat bread with microbiologically high loaded sugar beet fiber (3%) (CON-SBF) and two types of bread with 10-20 % of carob flour substitution: d) CON-CAR with 20% of carob flour and e) CON-SBF-CAR with 3% of sugar beet fiber and 10% of carob flour. For microbial analyses breads were baked in four repetitions and sampled after 4, 8, 12 and 16 days of storage to detect bacteria and moulds on selective media. Visual monitoring of moulds on aseptically incubated bread slices was performed as well. Water activity of bread slices during incubation was followed as well. Technological, sensory and nutritional properties were tested by standard methods as described before (Avbelj et al., 2015, 2016).

In general the mould growth was inhibited in CAR samples. On 16th day of experiment, the plates of CAR were still mould free and CONP low contaminated, so carob (20%) better inhibited the growth of moulds than preservative. CON, CON-SBF and CON-SBF-CAR were highly contaminated which was in high water activity correlation in the latter samples, but carob addition again reduced contamination. The bacteria were mostly killed during the baking, but still high contamination was found for sample CON-SBF but lower contamination for CON-SBF-CAR where reduction might be also due to carob's antimicrobial characteristics. CON, CONP and CAR plates were comparable and had low or even no contamination. Visual monitoring the bread slices in aseptic environment exhibit the longest shelf life for the CAR slices which started to mould after 17 days. On the last sampling day, breads without any antimicrobial substance in package were at least 50% covered with various moulds as well CON-SBF-CAR, where 10% of carob could not stop the growth of moulds. CAR and CONP samples showed comparable results. These samples were visibly less overgrown with moulds than CON and CON-SBF and CON-SBF-CAR.

Beside improvement of nutritional phenolics and thus antioxidative characteristics, carob addition to bakery/confectionary products also improves microbiological stability and prolong shelf-life of the products via fungal and bacterial (bacilli) growth inhibition.

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Keywords:

Bread, functional food, microbiological stability, carob flour, innovative bakery products

SENSORY PROPERTIES OF BREAD FORTIFIED WITH OLIVE CAKE

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Olive cake, a by-product of olive oil production, is a great source of phenolic compounds and dietary fiber. Olive cake is a residue which contains pieces of pit, skin and pulp. The continuous three-phase centrifugation process of olive oil production generates a solid residue (olive cake) and a liquid residue (olive mill wastewaters), while the two-phase centrifugation process generates a very wet solid residue (olive wet cake). Only about 2 % of the total phenols found in olive fruits are transferred to the extracted olive oil, while the other 98 % are retained in the olive cake.

Bakery products are widely consumed as staple food all over the world. Bread represents an important part of balanced diet and extremely wide varieties are available on the market. Due to their important place in the diet, easy and safe production, bakery products are suitable to be supplemented also with olive cake, because of its high nutritional value. In developing functional bakery products such as bread with alternative ingredients, it is also of paramount importance that a product would result in desired sensory properties in terms of appearance, taste and texture.

Olive cake from local olive oil producer, obtained with two-phase centrifugation process (85,6 % moisture and 1,1 % fat) was used in ratio 6 %, 10 % and 15 % of olive cake to wheat flour. Technological and sensory properties were evaluated and compared to the control sample. Firmness, color and volume of the bread were determined. Sensory evaluation was performed by the trained panel. The addition of olive cake had a significant impact on the sensory and technological properties of the bread. This impact was dependent on the amount of addition. The addition of olive cake affects the volume and firmness of the bread. Intensity of odor and taste has increased. By increasing the olive cake addition also increased the intensity of aftertaste, bitter taste and decrease springiness of the crumb. Bread colour became darker and crumb pores structure more inhomogeneous.

Development of innovative bakery products is a need for supply of consumers with bread products that combine improved nutritional quality with sensory attractiveness. Olive oil cake is an interesting material for bread enrichment, especially in increasing dietary fibers and antioxidants content, but rather due to the large impact on the sensory properties, it should be used only in lower concentrations.

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Keywords:

Bread, olive cake, sensory properties, technological properties, functional food, innovative bakery products

MUSHROOM EXTRACTS AS NOVEL BACTERIAL ANTI-ADHESION COMPOUNDS

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Mushrooms have been traditionally used for food, tinder, spiritual uses and most importantly as traditional medicine for different diseases. Also in modern times mushrooms are known for their nutritional and medicinal activities, which makes them good natural source for development of new medicines and nutraceuticals. Glucans, especially β -glucans, were determined as main bioactive compounds in mushroom extracts. Besides polysaccharides also proteins (peptides and lectins), terpenoids, phenols and alkaloids are active compounds found in mushrooms. Despite mushrooms and their biologically active compounds are already being used in feed and food industry for their bioactive properties, knowledge on anti-adhesion activity of mushroom extracts and possibility of their use in anti-adhesion prevention is scarce.

Anti-adhesion activity testing in sub-inhibitory concentrations in *in vitro* assay with *Listeria innocua* in polystyrene microtiter plates was performed with 25 samples of 13 mushrooms species. All tested samples showed some anti-adhesion activity. Effects of hot water and hot alkali extracts of *Piptoporus betulinus*, *Fomitopsis pinicola* and *Schizophyllum commune* were all around 50%. The observed effect correlated with the amount of total glucans and especially with β -glucans; extracts with a higher content of β -glucans were more effective. *S. commune* hot water extract showed the highest anti-adhesion activity ($71.32 \pm 4.23\%$) and the highest amount of β -glucans ($25.12 \pm 2.00\%$). The amount of bioactive polysaccharides appears to be strongly correlated with the anti-adhesion activity ($R=0.9061$), indicating that the type of extraction, as well as the mushroom species, plays an important role in mushroom extracts anti-adhesion activity.

The possible mechanism responsible for anti-adhesion activity of higher basidiomycete mushrooms is unknown, but the presented study gives insight in a new area of mushrooms biological potential. Elucidation of the mechanism behind the adhesion prevention might be of great interest in the development of future bacterial anti-adhesion strategies. Also use of mushrooms for medicinal/veterinary and nutraceutical purposes should be researched for development of new products.

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Keywords:

Anti-adhesion, mushroom extract, β -glucans, functional food

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NUTRITIONAL AND ORGANOLEPTIC ASPECTS
OF SELECTED TRADITIONAL DISHES OF KUJAWY

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The aim of this paper was characteristics of dietary habits and familiarize with traditional cuisine of Kujawy. In order to accomplish assumed objective selected dishes were prepared, then they were examined for nutritional value, and their organoleptic evaluation was carried out.

The research material consisted of three dishes from the List of Traditional Products of Kujawsko-Pomorskie province created by the Ministry of Agriculture and Rural Development. They were grzybowniczki (yeast buns stuffed with wild mushrooms), pyzok (potato casserole) and katarzynki from Toruń (a kind of ginger bread cookies). All dishes were made three times, the first series was without any recipe modifications, while in the remaining two the necessary changes were introduced. Each series was assessed organoleptic by the ten persons team of trained evaluators. A scaling method with a 10 cm, unidirectional, structured linear scale with boundary markings was used. The features which were taken under consideration were desirability of appearance, texture, flavor and scent and intensity of each discriminants. The results were analyzed in the Statistica 12.0 PL. The normal distribution was not obtained (The Shapiro-Wilk test), therefore a non-parametric tests for many dependent samples were used (ANOVA). The nutritional value of dishes was assessed in the Diet 5 Program in relation to the basic recipe (without modification). This program was developed by the Institute of Food and Nutrition in Independent Laboratory of Epidemiology and Nutrition Standards in 2011. It is used to calculate the nutritional value, the composition of the consumed diet and diet planning.

Dishes of Kujawy cuisine are characterized by simplicity. To prepare them a small amount of ingredients coming from own farms is applied. Seasonal products are used. The recipe modification did not significantly affect the quality of dishes ($p>0.05$) but varied significantly different discriminants. To grzybowniczki in second and third series besides wild mushrooms a champignons was added (in a ratio of 1:1 - series II and 1:2 - series III). This was to emphasize the mushroom taste. There was a significant increase in the intensity of the fungal, yeast and butter smell and taste, the most favorable in the second series (the highest overall rating 9.9 points, increase the desirability of these features).

Pyzok recipe was the least modified. In the second and third series a butter was added (25 and 50 g respectively) in order to prevent adhering a potato dough to the baking mold. This modification did not significantly impact the improvement of the analyzed organoleptic characteristics of the dish.

To katarzynki in second series an egg was added and true honey was replaced by an artificial one. In third series except the egg addition, a baking soda was used instead of baking powder, a smaller amount of honey was used (200 g instead of 250 g) and the addition of lard increased (from 1 to 3 tablespoons). Applied changes significantly affected the overall assessment of the dish (from 8.9 points in second series to 9.2 points), but they had no impact on the individual differentiators.

Examined dishes were characterized by high nutritional value (the energy was provided mainly by fat and carbohydrates). It was quite low in vitamins and minerals. From the point of view of the modern nutritional recommendations is not preferred. However, compared to the nutritional value of counterparts available in shops, traditional dishes, prepared independently, fall out much more advantageous. Their additional assets are the naturalness of raw materials used, lack of additional substances and to maintain culinary traditions of the region.

Keywords:

Traditional dishes, Polish cuisine, nutritional value, organoleptic assessment

THE SOLID PHASE MICROEXTRACTION (SPME) AS A NOVEL TECHNIQUE OF VOLATILE COMPOUND ISOLATION FROM BUCKWHEAT-BASED FOOD

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Aroma is one of the key determinants of flavor perception and therefore one of the main factors driving consumer preferences. A great variety of analytical methods have been developed to isolate and determine the concentration of volatile compounds in food. Moreover, advanced techniques have been applied to understand the effect of food components on the aromatic balance of the final product. Among a wide range of volatile compounds analysis, it is pointed out that solid phase microextraction (SPME) is a great tool to evaluate food odor. Mainly analysis of complex mixtures of volatile compounds is performed by SPME and gas chromatography coupled to mass spectrometry (GC-MS). The simplicity of the SPME technique expands research area on aroma of food products e.g. buckwheat-based.

Buckwheat as rich source of starch, proteins, minerals and antioxidants, become a popular ingredient of functional food. Due to gluten absence, buckwheat has received an increasing interest in food sector over the years, as a main component of gluten-free product formulas. Therefore various buckwheat-based products have been developed and appeared in the food market such as bread, tea, mead, honey, fermented milk with buckwheat, vinegar or Shochu.

The aim of this research is to present a review of recent advances on the key aroma compounds analysis in buckwheat and its products evaluated by analytical techniques. Therefore, it is demonstrated that the volatile compounds profile of common and tartary buckwheat is dominated by alcohols, aldehydes, ketones, benzene derivatives, terpenoids, alkanes and furanoids. However pattern of aroma compounds between tartary and common buckwheat kernels, and then in their products is not unified. In this research volatile flavor compounds identified in buckwheat and its products is presented. For example, researchers observed that furfural, 2- and 3-methylbutyraldehyde were the compounds with greatest quantities in a volatile fraction of examined Polish buckwheat honey. However, pyrazine derivatives were established as compounds with a high odor active value contribute buckwheat tea aroma. Moreover, in this study individual or groups of volatile compounds and their odor properties are demonstrated. The results collected in this review, highlighted that SPME is simple and quick method to monitor volatile profiles in food and might be used to complemented sensory panel evaluations.

Keywords:

Volatile compounds, aroma, SPME, GC-MS, buckwheat-based products