4TH NORTH AND EAST EUROPEAN CONGRESS ON FOOD

ABSTRACT BOOK
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4TH NEEFOOD CONGRESS AIMS TO ANSWER AT LOCAL AND GLOBAL CHALLENGES BY THE FOLLOWING TOPICS:

1. Food Ingredients, Food Structure
2. Food Production, Engineering, Processing and Sustainability
3. Food Analysis, Food Microbiology, Chemistry, Biochemistry
4. Food Quality, Safety and Traceability
5. Hygienic Engineering and Design
6. Packaging and Shelf Life, Product Design
7. Food Refrigeration and Cold Chain
8. Food Biotechnology and Novel Bioproducts
9. Consumers, Health, Nutritional labelling and Sensory Science
10. Eco-biotechnologies and Minimal Processing in Food Industry
11. Gastronomy and Sanogeneous Food
12. Traditional Food and Ethno-Pharmacology
13. Food and Feed Chain Management
14. Advanced valorisation of waste and by-products from agri-food area
15. Education, Innovation and Knowledge Transfer
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KEYNOTE PAPERS

KP01

Why incorrect use of biocides can worsen the problem of antibiotic resistance

Veslemøy ANDERSEN

Global Harmonization Initiative, Vienna, Austria

The food industry is dependent on biocides to prevent spreading of pathogenic bacteria through the production chain. There is much concern about the possibility of worsening the problem of antibiotic resistance in pathogenic bacteria due to bacterial cross- and co- resistance as a result of incorrect use of biocides. Understanding the importance of correct biocide use means that we follow the instructions of the biocide manual and that we have knowledge about how the antimicrobials react on the bacteria and the different mechanisms in bacteria to antimicrobials. The natural mechanism of bacteria to form biofilms is a matter of serious concern and a lot of research is going on to try to find solutions to stop the bacteria from forming biofilms.
Technological and innovation needs of small scale food producers in Europe

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In the European Union, small and medium enterprises (SMEs) in the food sector are increasingly under pressure due to the opening of markets, an increasing demand of standardized and price competitive food products by the consumers, the rising importance of large retailers, and the challenges of conforming to governmental regulations. To be able to face these challenges, SMEs food producers must extend their skills in modern as well as competitive marketing and production techniques to comply with existing European regulations and to promote the aspects of their products related to nutrition, health and quality.

In the framework of the European Union’s Seventh Programme for research, TRAFOON project (www.trafoon.eu) established a knowledge transfer network to support SMEs of different food product sectors in Europe, and identified and analysed their main technological and innovation needs to foster sustainable innovation and enhance competitiveness of SMEs on future markets. The list of needs will be extensively discussed and, additionally, compared to identified needs for ongoing projects (e.g. Interreg CE I-CON project, ERASMUS+ EuFooD-STA). Related to the technological and innovation needs, the importance of a successful knowledge transfer in the European food industry, especially in the case of SMEs, will be highlighted as a relevant topic on the European research agenda.
KP03

Sustainable solutions for the valorization of grape processing by-products

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This lecture explores the alternatives of upgrading grape processing by-products, denoting their industrial potential, commercial applications and sustainable solutions in the field. The top trending topics of winery sustainable management are covered, whereas emphasis is given to the current advisable practices in the field, general valorization techniques of grape processing by-products (e.g. vermi-composting, pyrolysis, re-utilization for agricultural purposes etc.), the newly introduced biorefinery concept, different techniques for the separation, extraction, recovery and formulation of polyphenols, and finally, the healthy components of grape by-products that lead to target applications in the pharmaceutical, enological, food and cosmetic sectors. This presentation is a foreword of the recently published book entitled: “Handbook of Grape Processing By-Products: Sustainable Solutions”. The latest reference presents in-depth information on grape processing, addresses the urgent need for sustainability within wineries, reveals the opportunities of reutilizing processing by-products in profitable ways, and ultimately explores general valorization methods as well as separation and extraction methods for the recovery of high added-value extracts/compounds and their transformation to final products.
Development of a global alert network to limit the consequences of unreported food safety incidents

Huub LELIEVELD, Chin-Kun WANG and Veslemøy ANDERSEN

Global Harmonization Initiative (GHI)

Everywhere in the world there are food safety incidents resulting in illness and deaths, that could have been prevented if those who knew would have reported the incident when discovered. The main reason not to do so is being afraid of the consequences of reporting, such as demotion or losing the job, while there is a family to be fed. Although in many countries there are regulations to protect whistle blowers, they often do not work, because there are many ways to retaliate and it is difficult to prove such matters. Moreover, sometimes it is also not in the interest of the country to make wrongdoings known, because the reputation of a national product may be at stake or even the reputation of the country. This happens in the entire world, east and west, north and south. Because this scare to report incidents have lead to thousands of deaths and many more severe illnesses, GHI is developing a system that will allow anybody to report food safety incidents anonymously. GHI will use their global network of ambassadors and experts to verify whether such reports are honest and true and then, after verification to alert everybody who should know, again globally and in local languages.
Encapsulated systems for fermented food/beverages production

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Encapsulated cell systems has shown a significant positive effect on kinetics of fermentation of alcoholic beverages such as beer, wine and cider. These systems also offer a possibility to run stable continuous fermentation processes. In this review various types of carrier materials and encapsulation methods proposed for application in beer, wine, fruit wine and cider production are presented. Engineering aspects with special emphasis on encapsulated cell bioreactor design (batch and continuous) are also discussed. In addition to that, examples of products within the alcoholic beverages, their properties, quality, comparative analyses with those ones traditionally produced are addressed, together with identification and description of the future perspectives and scope for cell encapsulation in fermentation processes. Ultimately, application of encapsulated bioactives in non-alcoholic beverage production is shown as well.

Key Words: Encapsulated cell systems, beverages, carrier materials, bioreactor design.
Industrial processing of fruits and vegetables generated huge amounts of wastes which remained globally unvalorized despite their potential economic value as various survey demonstrated. In the same time, flavor industry searched for natural flavorings which could be used directly by consumers and having a natural label. The present market approach was mainly focused on the development of natural infused oils or flavored flours respectively based on mix of dry herbs and spices in vegetal oils (eg spicy herb oil for pizzas) or in cereals flours. An innovative approach for designing similar products could be to use wastes of selected fruits and vegetables rich in both lipids, proteins and aromatic compounds, in order to propose, in an one pot process, naturally flavored vegetal oils and flours having the aromatic typicity of the vegetal source. The potential technological approach used, based on the agrorefinery aka biorefinery concept, allows to upgrade wastes to new raw material status for the production of a new generation of co-products. Examples of pips, kernels and seeds valorizations of various fruits and vegetables (local, exotic) generated by process or storage in food industry or by farm production (spent seeds) will be presented. A green processing of such kernels, pips and seeds will be set up by using a coupled single-screw extrusion-centrifugation & milling processes, allowing direct expression of aromatic vegetal oils while extruded pellets (extraction cake) being dried and grounded in order to give flavored flours ready to be used in bread making. Case studies of valorization of various Apiaceae seeds (coriander, fennel, carraway and cumin) will be highlighted.

Key Words: fruit and vegetable wastes, aromatic vegetal oil, flavored flour, extrusion.
**ORAL PAPERS**

**OP01**

Konjac gum as potential prebiotic for *Lactobacillus acidophilus* (LA5), *Lactobacillus casei* and *Bifidobacterium BB-12*

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Amorphophallus konjac has been used in China, Japan, and Southeast Asia as a food source and traditional medicine. Purified konjac flour is commonly known as konjac glucomannan (KGM) which is a linear, biodegradable polymer of 1,4-linked-β-D-mannopyranose and β-D-glucopyranose units. KGM and its derivatives cannot be hydrolyzed by digestive enzymes in the upper gastrointestinal tract of humans and therefore are considered indigestible dietary fibers. Prebiotics are defined as non-digestible food ingredients that beneficially affect the host by selectively stimulating the growth and/or activity of one or more desired bacterial species in the colon, thus improving host health. In this study prebiotic effect of konjac gum on *L. acidophilus* (LA5), *L. casei* and *Bifidobacterium BB-12* was investigated. For this purpose 12% reconstituted skim milk were prepared. The cultures were grown for 18 h at 37°C, using a 0.05% (w/v) inoculum. For propagation of probiotic bacteria, sterile reconstituted skim milk was supplemented with 0.25%, 0.50%, 0.75 and 1% konjac gum. The cultures were kept cooled at 4°C until for enumeration. Bacterial counts were determined after 8 h fermentation. Fermented milks were decimaly diluted in 100 ml sterile peptone water (0.1%) and 1 ml aliquot dilutions were poured onto plates of the various selective and differential agar s in triplicate. *L. acidophilus, L. casei* and *Bifidobacterium BB-12* were incubated anaerobically by using MRS with sorbitol, MRS and MRS-NNLP agar, respectively. All plates were incubated at 37°C for 72 h. Anaerobic conditions were created using Anaerocult A sochets (Merck). The results were expressed as colony-forming units per gram (cfu g⁻¹) of sample. Results showed that konjac gum at a rate of 0.25% had stimulated *L. acidophilus*, *L. casei* and *Bifidobacterium BB-12*. The numbers of *L. acidophilus*, *L. casei* and *Bifidobacterium BB-12* decreased as konjac gum level increased.

**Key Words:** Konjac flour, prebiotic, *L. acidophilus*, *L. casei*, *Bifidobacterium BB-12*. 
In order to enrichment of many foods, addition of dietary fiber (DF) into them have been very popular for the last decades. DF is a remnant of the edible part of plant; it is analogous carbohydrates that are resistant to digestion and absorption in the human small intestine and undergo complete or partial fermentation in the human large intestine. DF includes oligosaccharides, lignin, resistant starch, tannins and associated plant substances. Many oligosaccharides, are added to food as prebiotic, mainly to allow the preferential growth of probiotic organisms. In this study prebiotic effect of inulin, lemon and pea fibers on *L. acidophilus* (LA5) grown in reconstituted skim milk was investigated.

The non-fat milk powder (96 % total solids) (Pınar Dairy, Turkey), *Lactobacillus acidophilus* LA-5 (Peyma-Chr. Hansen, Turkey), inulin (Sigma), lemon and pea fibers (Arosel Food, İstanbul) were used as materials. For propagation of *L. acidophilus* LA-5, sterile reconstituted skim milk (12%) was supplemented with 0.25%, 0.50%, 1 and 2% inulin, lemon and pea fibers. The culture was grown for 18 h at 37°C, using a 0.05% (w/v) inoculum. The cultures were kept cooled at 4°C until for enumeration. Bacterial counts were determined after 8 h fermentation. Fermented milks were decimally diluted in 100 ml sterile peptone water (0.1%) and 1 ml aliquot dilutions were poured onto plates of selective and differential agar in triplicate. The plates were incubated anaerobically by using MRS with sorbitol agar at 37°C for 72 h. Anaerobic conditions were created using Anaerocult A sochets (Merck). The results were expressed as colony-forming units per gram (cfu g⁻¹) of sample. Results showed that all fibers used in the research had stimulated *L. acidophilus* at a rate of 0.5%, 1% and 2%. So inulin, lemon fiber and pea fiber could be used as prebiotic.

**Key Words:** Inulin, lemon fiber, pea fiber, prebiotic, *L. acidophilus*
OP03

Fluoride intake from fluoride-rich drinking water with black tea and dental fluorosis in school age children in southeastern Turkey

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Seasonal average concentrations of fluoride (F) were found a little high (>1.5 mg/L) in Sarım and Karataş villages and the cases of fluorosis were detected by the dentists. Fluoride-rich groundwater is almost the only drinking water resource in the rural study area. Tea is the most popular local beverage for people. Therefore traditional tea drinking is considered to be a source of another important F intake in human dietary. The objectives of the study were to investigate the effects and the source of fluoride contamination in groundwater in Sanliurfa and to evaluate the effects of black tea consumption with the fluoride-rich drinking water on the F intake of body.

Fluoride analyses in water samples and tea infusions were performed by Hach-Lange HQ40d multi-measurement device (Fluoride Meter - product code: 2589 99) by TISAB (total-ionic strength adjustment buffer) method. All analyses were performed in duplicate.

Results revealed that the dental fluorosis cases can develop even at low fluoride levels of water. Because the consuming of especially black tea may lead to explosion to a high amount of fluoride and may increase the risk of developing dental and skeletal fluorosis in local people. The fluoride contents of Turkish and Ceylon black tea were determined 1.687 mg/L and 1.136 mg/L, respectively. An adult will take average 42.2% of his daily fluoride requirement of body from Turkish black tea extracts considering a mean consumption as five cups (1000 ml) per person per day. This rate will rise to 67.5% for children and teenager person. As a conclusion, traditional tea drinking is found another important source of F intake in human dietary. Therefore local food and beverage varieties can contribute the daily F intake of adult or children.

Key Words: Beverage, Turkish black tea, fluorosis.
Trace elements in herbal beverages in Southeast Turkey

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Tea is one of the oldest and the most popular beverage in the world. In addition to traditional beverages of tea and coffee, there are some another plant stimulants, prepared as a hot water infusion, which have been used only for a very short period in history, no longer than several hundred years (Malik et al., 2008). It is to be noted that the term “herb” may be confusing, since it popularly refers to a part of a plant valued for its medicinal, savory and aromatic qualities (Bragança et al., 2011). Herbal beverages are widely consumed due to their refreshing and mildly stimulant effects (Harbowy & Balentine, 1997) and play a major role in the intake of a number of nutritional and toxic trace elements in humans (Nkono & Asubiojo, 1997). Many plants have been collected or cultivated for stimulating properties. Herbal plant infusion is prepared by pouring boiling hot water over cured leaves of plant (Kottiappan et al., 2013). During plant infusion, both essential mineral elements and toxic metals are extracted into the beverage. The health benefits herbal beverages have been well documented. However, consuming herbal tea may provide also a significant contribution for intake and accumulation of trace metals in the human body which was not fully studied (Polechonska et al., 2015). Industrial wastes, agricultural applications, mining activities and emissions are the main pollution sources of metals in the environment. Traces of undesirable and toxic metals, i.e., Cd, Cr, Cu, Fe, Ni, Mn, Pb and Zn, from these sources can easily contaminate tea plants (Szymczycha-Madeja et al., 2015). The growth media, nutrients, soil and agrochemical inputs contribute the contamination (Dambiec et al., 2013). However not all of the elements or metals are leached from plant to the infusion. Brewing time, plant concentration, plant type, element or metal contents of plants are all affect their concentrations in infusions. The objective of the study was to determine and compare the essential element contents and toxic heavy metal concentrations in 3 types of herbal plant tea infusions.
**OP05**

**Lupine (*lupinus angustifolius* L.) Protein isolates: improvement of functional properties by protein hydrolysis and application in gluten-free products**

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Lupine is increasingly used as a protein source for replacement of potentially genetically modified soya products. Lupine seeds are rich in protein and have a good nutritional balance of essential amino acids. Besides, lupine does not contain gluten thus it could be used as a functional ingredient in gluten-free foods. The main objectives of our study were to determine the effect of enzymatic hydrolysis with some commercial peptidases and proteases on narrow-leaved lupine (*Lupinus angustifolius* L.) protein functionality and to evaluate the effect of lupine protein addition on the quality of gluten-free muffins. Protein isolates were prepared from lupine seed flours by two different methods: alkaline water extraction/isoelectric precipitation (PI) and micellisation (MI), and studied with regard to functional properties. Lupine isolate-PI had higher total and soluble protein contents than the isolate-MI, but no significant differences were found between these isolates in their hydrolysis efficiency. Enzymatic hydrolysis for 3 h yielded in degrees of hydrolysis ranging from 8% to 15%. The highest degree of hydrolysis was reached using peptidase and protease complex from Aspergillus oryzae (Flavourzyme, Novozymes), the lowest – protease from Bacillus licheniformis (Alcalase, Novozymes). The protein hydrolysates showed better functional properties such as foam capacity and stability, emulsifying activity, but less emulsion stability than the protein isolates. Moreover, lupine protein hydrolysate as an egg protein substitute had bigger influence on rice muffins texture characteristics than protein isolate. The results suggest that lupine protein hydrolysates generated by Flavourzyme provide a versatile supply of the benefits and can be used in the development of higher nutritional value products.

**Key Words:** lupine protein, hydrolysis, functionality, gluten-free muffins.
Potential use of pulsed electric fields in berry juice processing

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In berry juice processing significant amount of phenolic phytochemicals are left in the press residues. The combination of pulsed electric fields (PEF) and mechanical pressing is a promising technique for juice extraction. PEF induce permeabilization of cell membranes, which can facilitate the release of juice as well as recovery of intracellular compounds from the plant cells. The aim of this work was to investigate the effect of pulsed electric fields treatment on juice yield and extractability of anthocyanins from bilberries and sweet cherries. Mechanical pressing was used for juice extraction. The experiments were carried out using a lab-designed press cell. PEF treatments of varying electric field strength (0.5-5 kV/cm) and varying specific energy input (1-10 kJ/kg) were applied to berries prior to juice pressing. The content and composition of anthocyanins in the juice obtained was determined by reverse-phase HPLC. The antioxidant activity of the juice was tested using the ferric reducing antioxidant power (FRAP) assay. The application of PEF pre-treatments significantly increased the juice yields of bilberries and sweet cherries as compared with the untreated sample, which rose by 34 and 40%, respectively. The total anthocyanin content of juice obtained from PEF treated bilberries was up to 1.5 times higher and from PEF treated sweet cherries – up to 1.8 times higher compared to corresponding controls. In the juice of bilberry malvidin 3-glucoside, cyanidin 3-glucoside and peonidin 3-glucoside were identified as predominant anthocyanins, whereas in sweet cherry juice cyanidin 3-rutinoside was the most abundant. The FRAP of the juice positively correlated with the content of total anthocyanins determined in the samples. The results obtained from this study indicate the potential of PEF to improve the efficiency of the industrial processing of berry fruits.

Key Words: Prunus avium L., Vaccinium myrtillus, PEF pre-treatment, juice pressing, HPLC, anthocyanins, antioxidant activity.
OP07

Effects of whey protein isolate coating enriched with lysozyme on the microbial quality of chicken fillets during refrigerated storage

Mojtaba BONYADIAN, Najmeh MOGHIMI

Introduction
Increase the shelf life of food is one of the important issues for many researchers. This study was conducted to investigate the effects of whey protein isolate containing Lysozyme on the shelf-life of chicken fillets during refrigerated storage.

Material and Methods
Chicken fillets were treated in whey protein isolate and whey protein isolate containing 0.5, 1 % Lysozyme and compared with chicken fillets without any coating (control). The microbial parameters (Total Mesophilic, Enterobacteriaceae, Psychrotroph and Pseudomonas spp count) were evaluated for 12 days.

Results
Results showed that during the storage time, in the samples coated with whey protein isolate containing different concentration of Lysozyme, a significant reduction (P< 0.05) were observed in the entire evaluated microorganism groups compared to the control samples. Also a dose related trend was observed due to addition of Lysozyme.

Conclusion
Overall the findings of present study suggest that whey protein isolate contain with Lysozyme, may use as a natural coating and preservative to extend the chicken meat shelf life.

Key Words: Edible coating, Whey Protein Isolate, Chicken fillet, Lysozyme, Microbial quality.
The article discusses the development of mixing technology for soft ice cream on the basis of protein-carbohydrate raw milk (PCRM), including serum. We have the task of getting ice cream high nutritional and biological value, reducing energy consumption for the process by adding in recipes cream egg products, plant material, including mashed apricots and pumpkin, which has a high content of fiber, potassium, vitamins A and C, thereby ensuring high biological and nutritional value of the final product. The object of research – the process of homogenization of the mixture for the production of soft ice cream. The aim of this study was to establish rational modes of homogenization process developed mixtures. In order to obtain the optimum conditions of the process of homogenization designed mixes, we investigated the influence of homogenization pressure on the composition of the fat phase, and organoleptic qualities of soft ice cream on the basis of serum. Study the number of fat globules, their volume and the average diameter was determined by microscopy. Organoleptic characteristics determined by the developed 100-point scale based on weighting coefficients.

Studied fashion soft ice samples from serum, containing 25% apricot puree and pumpkin puree, duration of homogenization pressure (at sugar content 25% and egg powder 3%).

It was found that for new compounds for soft ice cream on the basis of rational PCRM is carrying out the process of homogenization under a pressure of 15 ... 20 ± 1,0 MPa.

Keywords: whey, soft ice cream, homogenization, pressure, fat phase.
The study for elimination of spore-forming bacteria activity in Maasdamer cheese

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Introduction
Butyric acid fermentation is highly undesirable for Maasdamer cheese production. *Clostridium tyrobutyricum* induces production of off-flavours and late blowing of cheese. Spores can be eliminated either by physical treatment or by preservatives in order to restrict germination. The application of preservatives into Maasdamer cheese production is controversial because the part of preservatives may pass into whey during cheese grain processing. Lysozyme which is most favourable preservative has allergen to some consumers. The ways for spores' elimination are different but most of them are unsuitable for practical implementation. The aim of the present study was to evaluate the solutions for spore-forming bacteria elimination into Maasdamer cheese production.

Materials and methods
The experimental cheeses were made (5 batches) in cheese production factory. The different pre-treatment technologies were applied for Maasdamer cheese production, skimmed milk bactofugation and cream pasteurisation prior cheese milk preparation and selection of bulk milk samples for cheese production based on milk microflora analysis data. The control cheese was produced using bactofugation only for skimmed milk and cheese milk was prepared mixing clarified skimmed milk with untreated cream. The spore-forming bacteria were measured by microbiological testing. The volatile compounds were determined by Clarus 500 GC/MS (PerkinElmer®, USA) at the end of cheese ripening.

Results
Analysing volatile compounds results we make conclusions on excessive lipolysis under the influence of spore-forming bacteria in all analysed cheese samples. Differences in the detected aroma compounds are observed among the analysed cheese samples. The butanoic acid concentration was following in control cheese – 4.71%, but in experimental cheeses varies from 3.17 to 4.84%.

Conclusions
The study showed possibility to reduce spore-forming bacteria activity and butanoic acid concentration in experimental cheeses but detected volatiles compounds indicated on untypical flavour notes for analysed experimental cheese samples.

Key words: spore-forming bacteria, Maasdamer cheese, butanoic acid, volatiles
Folates losses in canned beans during processing

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Folates (vitamin B9) are water-soluble vitamins of great nutritional importance. Vegetables and especially green vegetables are a good source of folates. Most people should be able to obtain sufficient folate in their diet by eating plenty of vegetables, fruit, beans and whole grains. Folates, however, as a very unstable nutrient, may be degraded during the production process and storing, to the form, which have no biological function. The purpose of the study was to determine folates content in selected canned beans. These products are very popular, especially during the winter months, and it seems, that knowledge about the content of some biological active components is very important for consumers.

Eight cans of different kinds of beans were bought at local supermarkets. Folate were extracted from canned beans by homogenizing samples in the 0.1 M phosphate buffer (pH=6.1) and boiling (15 min.), followed by deconjugation with conjugase (rat plasma) and destruction of matrix by amylase (incubation: 37°C/4 h). Folate were separated by HPLC after clean-up using SAX spe cartridges. For detection a fluorescence detector was used (ex. 290 nm and em. 360 nm).

Based on the literature data, folates concentration in raw beans are in the range 170 – 526 μg/100 g of dry wet and different cultivars have shown variation in their amount. The contents of folates in the tested canned products was significantly lower, it is in the range from 4.2 to 21.5 μg/100 g of dry wet, with the highest amount found in chickpeas. The only one form of folate was identified (5-methyltetrahydrofolate - 5CH3THF) in contrast to raw beans with two more forms of folates notified. This study demonstrates that retention of folates in various canned beans is very low. It is believed that many factors can be responsible for folate and another biological active components losses. Our future aim will be to identify which steps is involved in folates losses in industrial processing chain, and which mechanisms is underlying these losses.

Key Words: folates, canned beans, HPLC.
Production of a novel yogurt using some local vegetable raw materials

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Introduction
In recent years, there has been observed an increase in the consumption of fermented dairy products, due to their nutritional value and for their therapeutic benefits. The aim of the proposed study is to generate original results on the achievement of a novel yogurt by harnessing some local vegetable raw materials with beneficial effects on consumer health and antioxidant activity, with a role in the stability of yogurt and thus in increasing their shelf-life.

Materials and methods
For this purpose the local vegetable raw materials (seabuckthorn, rosehip, Jerusalem artichoke) in different percentages were added to yogurt. Yogurt enriched with different vegetable powder improves the rheological, physicochemical and sensory properties of natural yogurt. Rheological characteristics were performed using the Modular Advanced Rheometer System Haake Mars, determining: viscoelastic properties, thixotropy and flow and viscosity curves.

Results
The results of the study lead to the determination of the optimum formulation of a novel yogurt, with best sensory acceptance, rheological, textural and physicochemical properties. Because of its universal popularity, there is a high economic importance in diversifying yogurt products.

Conclusions
The above results are encouraging for the production of a novel yogurt with improved sensorial and nutritional characteristics in industrial and/or small industrial scale.

Key Words: functional product, vegetable raw materials, rheological properties.
Double (w/o/w) emulsions with encapsulated beetroot juice: stability evaluation and application in meat systems

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In this study double (water-in-oil-in-water) emulsions containing beetroot juice as inner water phase, sunflower oil as oil phase and 0.5% or 1.0% whey protein isolate solution as outer water phase were prepared in a two-step emulsification process, using a rotor-stator system as well as a hybrid premix membrane system. In order to investigate the role of the lipophilic emulsifier polyglycerol polyricinoleate (PGPR) in water transfer double emulsions were prepared with various PGPR concentrations (0.5 – 5.0 %) in the oil phase. It was found that hybrid premix membrane system used for double emulsion homogenisation resulted lower droplet size (~ 20 μm) in comparison with rotor-stator system (32 μm); while maintaining high encapsulation efficiency (>98 %) in both cases. High creaming and thermal stability of the double emulsions prepared with encapsulated beetroot juice is related to their high viscosity (~2.9 Pa·s) that prevents creaming and coalescence. Viscosity increased as a consequence of osmotic pressure difference (1.1 MPa) between the water phases that caused swelling of the inner water phase. It was also obtained that PGPR is involved in water transfer between the water phases through reverse micelle formation, and this allows for controlled swelling. It was showed that 7 % and 11 % of pork backfat could be replaced by double emulsions while maintaining good water and fat binding properties, at slightly reduced hardness. Most importantly, the red colour was retained by the double emulsion even after heat treatment, leading to the dual functionality in meat systems.

Key Words: double emulsion, encapsulation, fat replacers, swelling.
Characterisation of exopolysaccharides derived from selected bacterial strains isolated from yogurt and sourdough

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Lactic acid bacteria (LAB) are a heterogeneous group of organisms, widely found in different environments and in many naturally fermented products. These microorganisms are known to form extracellular polymeric substances characterised as exopolysaccharides (EPS). These polymers can be used in food industry as a potential thickening and gelling agent to improve rheological properties of the products. EPSs can also promote adhesion of bacteria to biotic and abiotic surfaces and are a key component of the extracellular matrix of many biofilms. This study aimed to investigate and compare the molecular, thermal and rheological characteristics of EPSs obtained from six different LAB strains isolated from yogurt and sourdough to assess their potential use as an interface between food powder particles and food surfaces to improve particle adhesion. EPSs were precipitated by using cold ethanol and the precipitates were lyophilized to obtain partially purified products. CLSM views proved the EPS presence in growing medium after fermentation. FTIR analysis proved that the EPSs extracted from all strains corresponded to typical EPS, as revealed by the presence of carboxyl, hydroxyl and amide groups as well as α-glycosidic linkages. GPC measurements revealed that EPSs exhibited varying molecular size distribution and the size of the molecules were in the range of 4x10³ - 9x10⁶ Da. According to DCS thermograms relatively close endothermic transition temperature values were observed and ranged from 114 to 135 °C. Rheological analysis revealed that the EPS samples showed pseudoplastic behaviour.

Key Words: Exopolysaccharide, lactic acid bacteria, adhesion, food powders.

Note: This work was supported by The Scientific And Technological Research Council Of Turkey (Project No: 215O307).
Identification and quantification of several phenolic compounds from grape pomace

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A great amount of waste is generated by the wine industry every year. The valorization of it is of great importance because of the content in phenolic compounds that are proven to possess' health benefits. This study was conducted using a by-product from the winemaking industry: the fermented red pomace from Cabernet Sauvignon and Feteasca Neagra cultivars. The phenolic compounds were extracted using four different extractions and the amount of total polyphenols was determined using a spectrophotometrical method. Several phenolic compounds like gallic acid, (+) - catechin, syringic acid, cinnamic acid, resveratrol, chlorogenic acid, caffeic acid, ferulic acid, rutin and quercetin were analyzed using an HPLC method that was optimized for the identification and quantification of these compounds. The greatest amount of total phenolic compounds analyzed was found in the pomace of the Cabernet Sauvignon cultivar alongside with the greatest amount of quercetin, rutin, ferulic acid and resveratrol. The pomace from the Feteasca Neagra cultivar possessed the greatest amount of gallic acid, syringic acid, cinnamic acid and (+) - catechin. Cafeic acid and chlorogenic acid were the phenolic compounds that were not identified in any of the analyzed pomaces.

In conclusion, the valorization of by-products from the winemaking industry could be a valuable source of phenolic compounds, which could be used for their health benefits.

Key Words: phenolic compounds, polyphenols, HPLC.
The effects of defatted grapes seed flour on bakery products

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Introduction
Grape skin is considered as a valuable by-product for antioxidant and antibacterial agent preparation. The grape skin contain some active compounds, such as, dietary fibre, poly-phenols, flavones and resveratrol, is commonly used as a nutritional supplement.

The main aim of this study was to establish the optimum dose of defatted skin grape flour, flour to be used as a functional ingredient in the bakery products industry, from both a nutritional and technological point of view.

Materials and Methods
The laboratory experiments evaluated the functional potential of wheat flour enriched with grape skin flour, in different proportions, by examining the chemical composition and rheological behaviour of the doughs. Moisture was determined at 103 0C (±2 0C) using test samples weighing 2 g, until constant weight was achieved between measurements, as described in the ICC Standard No. 110/1. The ash content was determined by incineration at 525 ± 250C (ICC No 104/1). Total fat was determined by extracting 10 g of sample with petroleum ether 40-650C, using a semiautomatic Soxhlet Foss Extraction System 2055 (Foss, Sweden). Total nitrogen (N) and crude protein content (N 6.50, conversion factor) was estimated using the Macro Kjeldahl Method (Kjeltec System, FOSS, Sweden). Total fibre was measured using the enzymatic gravimetric method, Mes-Tris buffer, AOAC (1995) method 991.43. The determination was performed using the Fibertec 1023 system (FOSS Sweden). Each sample was analysed in triplicate. The rheological behaviour of doughs was analysed using the predefined “Chopin +” protocol on Mixolab, a piece of equipment created by CHOPIN Technologies, which uses the international standard ICC-Standard Method No. 173 protocol for a complete characterization of flours and produces a simplified graphic interpretation of the results.

Results
In this study, grape skin flour was incorporated into wheat flour at three different levels and it was found that incorporation up to a 15% level into the formulation of wheat flour yielded an acceptable product in terms of rheological parameters, with improved nutritional and functional properties.

Conclusions
This study provides useful information toward using defeated grape seed flour as source of functional ingredients in the bakery industry.

Key Words: Grape skin, functional ingredient, fat, crude fibre, bakery.
**OP16**

**Volatile compound composition in cacao bean fractions depending on fermentation and roasting technology**

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**Brief Introduction**

The process parameters may have significant effect on the chocolate taste and aroma precursor formation in cacao beans starting from harvest and through all production steps – fermentation, drying, roasting, blending. The objective of this study was to investigate the influence of accelerated fermentation and roasting technology on the volatile compound profile in cacao bean fractions.

**Materials and methods**

Cacao beans cv Criollo were harvested in Belize, 2016. Fermentation was carried out at three different regimes – traditional and two accelerated regimes. Then cacao beans were separated into three fractions – vella, nibs, and liquor, which were roasted at 110 °C for 10-15 minutes. Volatiles were extracted on SPME and analysed in GS-MS.

**Results**

Main aroma precursor in unroasted and roasted samples was acetic acid, from 63.19% (from total volatile peak area) in unfermented sample to 80.34% in traditionally fermented sample. Content of acetic acid has been reduced 2–5 times in roasting process, depending on the type of fermentation and cacao sample particular size roasting. Unfermented sample differed the most from the unroasted samples with aroma precursor composition and their quantities (p≤0.001). Pyrazines and pyrroles were formed during the roasting process and those are the major components which gives roasted aroma in cacao beans. Roasting method affected decrease of aroma precursor concentration – cacao beans, which were roasted like cacao liquor, had smaller content of aroma precursors than other samples, because sample had bigger surface area in contact with heating surface and therefore intensified evaporation of volatile compounds was observed.

**Conclusions**

The study suggests that altering the fermentation parameters (duration, temperature and stirring rate) and roasting of different particle size of cacao beans affects (p≤0.001) composition of volatile compounds.

**Key Words:** Cacao beans, accelerated fermentation, chocolate aroma precursors, acetic acid, pyrazines, pyrroles.
OP17

Immature grains for improvement nutritional value of biscuits

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Different grains’ flour as the basis of product is used for preparing of bread, pasta, pastry etc. If we analyse the chemical composition of different kinds of pastry products, it is evident that they are not suitable for a healthy and balanced diet requirements because products are rich in high glycemic carbohydrates, but lacking in fiber, vitamins, macro- and microelements, this is due to the fact that the flour used for pastry products preparation usually is obtained from maturate grains. Immature grains have a higher nutritional value (higher content of fiber, vitamins and minerals, etc.) compared to the mature grain. In this research we are applied the flour of immature wheat, triticale and hull-less barley to raise the nutritional value of biscuits and to determine the impact on the product physical and sensory characteristics. The aim of investigation was to analyse the physico-chemical and sensory properties of biscuits prepared from immature compared with maturate flour. Experimental samples were prepared 30 % maturate flour substituted by maturate flour in traditional recipe of biscuits. The moisture content, water activity of biscuits are determined by ISO standards. The amount of fiber and biscuits structure are determined by AACC standards. The colour is analysed by CIEL*a*b*. For sensory evaluation of biscuits are used 5 points scale (ISO 4121:2003) and insensitivity of sensory properties (appearance, colour, flavour, and aroma). The biscuits prepared from traditional - maturate flour are used as control samples.
Results of the research showed the moisture content and water activity a significant increase in biscuits made from immature grain (p<0.05). The highest harness was observed for samples with mature wheat and immature triticale flour, respectively – 17.30 ± 3.03 and 19.20 N ± 2.41 N. Immature grain has a significant impact on the biscuit colour difference, leaving the most important changes to the L* value of the samples of wheat um barley flour. Based on obtained results fiber content of experimental biscuits was increased. Generally experimental samples made both mature, and immature grain flour got high sensory evaluation, especially biscuits made from triticale and wheat flour.

CONCLUSIONS
Obtained results showed that difference between moisture content, water activity and structure of experimental samples compared with control are depended on grain variety. The amount of fiber was higher in hull-less barley samples. Triticale and wheat immature flour usage for biscuits preparation is possible without significant impact on sensory characteristics.

Key Words: immature grains, biscuits, quality parameters of pastry products.
Extraction, characterisation and application in food of essential oil from dill seeds

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Essential oils are natural products which have special characteristics and many interesting applications. The present study investigated the extraction, chemical composition and antimicrobial activity of the essential oil from dill (*Anethum graveolens*) seeds harvested in Transylvania County, Romania. The essential oil was obtained by hydrodistillation in a neo-Clevenger apparatus and a detailed chemical analysis was conducted by gas chromatography – mass spectrometry (GC-MS). The essential oil was screened for antimicrobial activity against pathogenic bacteria and fungi by using the disk diffusion test.

In order to find new formulations with new applications, essential oil was encapsulated. Sodium alginate and chitosan-based microspheres were prepared via spray-drying to encapsulate dill seeds essential oil. The microspheres containing encapsulated dill oil were used as flavour enricher in jelly. Jelly was prepared with gelatine as gelling agent, natural colorant from spinach and cardamom together with encapsulated dill oil as flavourers.

Results showed that the dill seeds contain 0.5% volatile oil. A total of 5 volatile components were separated and identified. The major components were carvone which is a very strong antioxidant, apiole, camphor, limonene and dyhidrocarvone.

The essential oil showed antimicrobial activity against pathogenic microorganisms in the order: *Aspergillus niger* > *Candida albicans* > *Escherichia coli* > *Salmonella anatum* > *Bacillus cereus*. No action against *Staphylococcus aureus* was observed.

Both the microscopically and sensorial analysis did not identified the microspheres in the final product; the sensorial analysis identified flavour improvement in samples prepared with encapsulated oil, compared with samples containing the oil in liquid form. Flavour was maintained for longer term in jelly prepared with encapsulated oil.

**Key words:** essential oils, dill seeds, GC-MS, encapsulation, antimicrobial activity, jelly.
Phenolic compounds and antioxidant activity of *Phyllanthus phillyreifolius*

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*Phyllanthus phillyreifolius* (Euphorbiaceae) is indigenous to Reunion Island plant, which has been locally used for treating diarrhea and as a diuretic. Previously reported information about this plant is rather scarce; therefore, the main objective of this study was to evaluate extraction methods, phytochemical composition and antioxidant activity of *P. phillyreifolius* extracts, obtained using conventional and innovative extraction methods and applying both one step and sequential extraction procedures with various polarity solvents. Antioxidant properties of extracts were evaluated by total phenolic content (TPC) and other widely used assays, namely DPPH and ABTS radical scavenging, FRAP, ORAC. In addition, the intracellular antioxidant activity as well as cytotoxicity of extracts were also evaluated. The results demonstrated that 70% ethanol was the most effective solvent for recovery of antioxidants from *P. phillyreifolius*. Analysis of polar extracts by UPLC-MS/MS demonstrated that geraniin, phyllanthusiin D, ellagic acid and elaeocarpusin are the main constituents of *P. phillyreifolius*. Three isomers of tocopherol (α, β and γ) were quantified by HPLC in lipophilic extracts. Generally, *P. phillyreifolius* extracts may be considered as potential natural antioxidants and might be promising source of valuable ingredients for functional foods, nutraceuticals and pharmaceutical formulations.

**Key Words:** P. phillyreifolius, antioxidant properties, phenolic compounds, geraniin.
**OP20**

**Microalgae based innovative animal fat and proteins replacers for application in functional baked products**

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**Introduction**

Baked products (breads, biscuits, cakes, and pastries), are the base of daily diet in developed countries. These products contain eggs, milk butter, animal proteins and saturated fats being accused for food allergies and obesity. Therefore, there is an urgent need to replace these ingredients with lipids and proteins from algae that are a great source of minerals, proteins and polyunsaturated fatty acids (ω-3, ω-6) such as EPA and DHA, which show proven beneficial effect on human health.

**Materials and Methods**

Dry biomass from *Chlorella sp.* microalgae was used because of its high content in proteins (48%) and in lipids (14%). Ultrasound assisted extraction was applied for the optimum yielding. For lipids extraction, a mixture of hexane: isopropanol (2:3) was used. The solvent was removed under vacuum by rotary evaporator. In the residual biomass, deionized water and ammonium sulfate were used as solvent to isolate proteins. The supernatant was freeze dried to create a protein powder.

**Results**

The recovery of protein was 20% and the powder consisted from 100% protein as implied from Bradford and Kjeldahl method. Moreover the lipid recovery was 98%. The microalgal lipid and protein extracts were applied in brioche type baked products as milk butter and egg replacers. In the developed products 100% replacement was achieved. The organoleptic control (20 people) scored nine out of ten.

**Conclusions**

The innovative replacers based on *Chlorella sp.*, successfully substitute animal fat and protein and can develop functional bakery products with no significant difference from conventional products. Finally this process can be applied in an industrial scale because of its high effectiveness.

**Key Words:** Chlorella sp, microalgae fractionation, ultrasound extraction, polyunsaturated fatty acids, proteins, high nutrient content.
OP21

Physicochemical properties of kurut produced in Turkey

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Kurut is a product from the Middle East and in Turkey it is produced in the eastern Anatolia, Southeast Anatolia, Black Sea and Mediterranean regions. Name of this product comes from the word “kurutmak” which means drying in Turkish Language. This fermented dairy product is known as Kurt (Қурт) in Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan and Tajikistan as Aarrul in Mongolia, as Kashk in Iran, as Quroot in Afghanistan and as Jameed in Saudi Arabia. Kurut is obtained from the filtration, forming and drying of yogurt. It is generally produced by low-income families during early and mid-lactation periods with traditional techniques to satisfy their needs. Kurut which has a sourish taste, resembles like yogurt when diluted and has thicker consistency is consumed in making of soups, Turkish type ravioli, macaroni and many other local foods after it is grated to small pieces. Highly nutritious Kurut contains substantially amount of animal proteins and minerals like calcium, potassium and phosphor which are necessary for healthy life and development of the human.

In this research, some physicochemical properties of Kurut samples produced in Turkey are investigated. For this purpose, 25 samples of Kurut with different production dates, were collected from the market of Bolu city, and have been subjected to analysis. The pH value, titratable acidity (as lactic acid %), dry matter %, fat %, fat-in-dry matter %, protein %, protein-in-dry matter %, salt % and ash % of collected Kurut samples is studied.

Key Words: Kurut, Курт, Kashk, physicochemical properties.
Quality parameters of pumpkin puree enriched with pumpkin (‘Butternut Waltham’) byproducts

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Introduction
Pumpkin processing causes large amounts of waste which are mostly a combination of pumpkin peel, seeds and the flesh between seeds. Pumpkins are rich in content of carotenoids, different vitamins and minerals, pectin and dietary fibre. The aim of the research was to analyse the effect of added pumpkin by-product powder and pomace to pumpkin puree quality.

Materials and Methods
The research was conducted in Latvia University of Agriculture (2014). Pumpkin by-product powder (P) and pomace (S) after juice extraction where added in different concentrations to the pumpkin puree made from pumpkin cultivar ‘Butternut Waltham’. Puree was enriched with powder in concentrations (5%; 10%; 20%) and pomace (10%; 20%; 30%). The enriched purees and a control sample with no additives where tested on their content of vitamin C (iodometric method), total carotenoids (TC), phenols (TPC) (Folin-Ciocalteu method), moisture content and puree firmness.

Results
The added pumpkin powder (P) significantly decreased the moisture in puree from 88.29% in control sample to 74.12% in sample with added 20% of powder (P20%), the added pomace (S) didn’t show any major moisture changes. This coincided with product firmness. Sample (P20%) showed firmness increase by 10 times also samples with added pomace showed a gradual firmness increase. In puree of sample P20% TC and TPC significantly increased by 25.5% and 45% and in sample S30% by 3.5% and 11%. However the content of vitamin C decreased both in fresh sample and in puree with added pomace by 0.98% (S30%) compared to control sample. A slight increase of vitamin C (dry mater) in samples with added powder was detected because of degrease in water content in puree.

Conclusions
1. The use of pumpkin powder and pomace improves the consistency of purees with liquid consistency.
2. By-product incorporation with pumpkin puree improves the nutritional value due to the increase of bioactive compound content.

Key Words: Vitamin C, total carotenoids, total phenols, structure, by-product powder, pomace

Acknowledgements
Program ‘Scientific Capacity Building LUA’ project A05-06 ‘Development of special dietary foods with high bioavailability’
The diversity of the products produced by the bees are unique. *Apis mellifera* are the most popular domesticated bee species used among beekeepers. Probably there are not animal or insect species in the nature producing such a variety of products suitable for human consumption. Honey, bee pollen, bee bread, propolis, royal jelly, wax and bee venom are the whole family of the products produced by the bees. However, some products are more suitable for food (such as honey), others – for health. Because of possible allergic reactions, bee venom is not recommended to use for self-treatment. The diversity of the bee products’ biological activities are described in the literature: antioxidant, antibacterial, antifungal, antiviral, anti-inflammatory, antitumor, antiproliferative, antimetastatic, immunomodulatory, antiseptic, antistress, antiulcer, antihyperlipidemic, antidiabetic, anticancer and etc. The activities list is not final, as various bee products or their mixtures are highly investigated nowadays. It is difficult to distinguish what has the highest impact to their biological activity. Probably the activity depends on a complex set of factors, such as botanical origin, related to phytochemicals in the bee products, secretion of the honey bees, containing proteins, amino acids, fatty acids, enzymes, pheromones, vitamins and minerals, which are secreted from different glands of the bees, varying the proportions of these compounds among the different bee products, or interaction of these factors.

**Key Words:** bee products, biological activity, nutrition, human health.
Recovery of cannabinoids and antioxidants from industrial hemp threshing residues by high-pressure and enzyme-assisted extractions

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Processing of industrial hems (Cannabis sativa L.) into seed oil and fiber generates large amounts of by-products, retaining substantial portion of important nutrients, aroma compounds and bioactive phytochemicals. This research was aimed on hemp threshing residues biorefining into valuable non-psychotropic cannabinoid, cannabidiol (CBD) and cannabidiolic acid (CBDA) and antioxidant fractions, applying supercritical carbon dioxide (SFE-CO₂), pressurised liquid (PLE) and enzyme-assisted (EAE) extractions.

The obtained results showed that at optimized parameters (465 bar, 70ºC, 120 min) SFE-CO₂ yielded 8.30 % (w/w) of lipophilic fraction, containing 0.2 and 2.2 g of CBD and CBDA, respectively. The recovery of both cannabinoids from plant material by SFE-CO₂ was > 93%. Optimized PLE-acetone (100ºC, 45 min) and PLE-EtOH/H₂O (100ºC, 45 min, EtOH/H₂O 4:1 v/v %) amounted 4.3 and 18.9 g/100 g DW of flavonoid-containing polar extracts. Finally, 20.2 % (w/w) of water-soluble constituents were isolated from PLE residue after its EAE using Viscozyme, increasing release of mono- and disaccharides up to 94%. Antioxidant capacity of non-polar and polar fractions was in the range of 0.9-23.5 mg gallic acid equivalents and 0.6-205.2 mg Trolox equivalents per g DW, with the highest activities measured for PLE-EtOH/H₂O extract. The combined SFE-CO₂, PLE and EAE reduced antioxidant capacity of starting plant material by 90-99%. Thus, suggested multistep fractionation procedure may be considered as a promising way of obtaining several bioactive products from hemp.

Key Words: Industrial hemp, extraction, cannabinoids, antioxidants.
Effect of packaging to volatile profile of extruded pea product during storage

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Brief Introduction
Legumes are valuable source of different nutrients, as proteins, fibers, vitamins etc. and in the world their consumption is promoted in all levels - by consumers’ information and new innovative product development. One of the possibilities is to produce extruded legume based snacks, and to maintain their quality during storage it is very important to find the most appropriate packaging material. The aim of current research was to determine the effect of packaging technology to volatile profile of extruded pea products during storage.

Materials and Methods
Three grey pea based extruded products (control, with onion and barbeque flavour) were packed in OPP / CPP and PET / ALU / PP / PA materials and stored for 2 years. In order to reduce oxygen influence on products, O₂ sorbent was placed in part of pouches. Volatiles were extracted by solid phase microextraction technique (PDMS/Car fibre) and analysed by GC/MS.

Results
Volatiles of extruded products before storage differ significantly and the lowest peak are in control samples were determined. After storage the main volatiles were hexanoic acid and hexanal and these compounds could be characterised as the markers for oxidative stability of extruded products. The highest content of these compounds in extruded pea products with onion was detected and it is due to oil fraction in flavouring that oxidases during storage. PET / ALU / PP / PA and O² sorbent reduced formation of oxidation products.

Conclusions
Volatile composition of extruded pea based products differ depending on selected flavouring and packaging material and as the best material PET / ALU / PP / PA with O₂ sorbent should be selected.

Key Words: extruded pea products, packaging, O₂ absorbents, volatiles.

Acknowledgement
The research leading to these results has received funding from the European Project EUROLEGUME “Enhancing of legumes growing in Europe through sustainable cropping for protein supply for food and feed” (Seventh Research Framework Programme of the European Union, FP7 research project no 613781).
Effect of pear pomace powder and xanthan gum on batter rheology and gluten-free cake properties

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Use of gluten free flours, starches, gums, hydrocolloids, dietary fibers and combinations of them make it possible to improve the quality of the gluten free products. This study investigated the influence of pear pomace powder PPP, xanthan gum and combination of them on quinoa-based gluten-free batter rheology and physical, chemical and quality parameters of cake samples.

Pear pomace was produced in the laboratory using juice extractor, dried and ground. Blends were prepared by addition of PPP (0, 4, 8 and 12% (w/w)) and/or xanthan gum (0, 0.5 and 1% (w/w)) into quinoa-based flour mixture (quinoa flour/rice flour/potato starch, 50/25/25). Density of the batters and water holding capacities of flours, PPP and mixtures were measured. To investigate the rheological properties of the batters; flow ramp, amplitude sweep and frequency sweep tests were carried out. Also, chemical compositions, specific volume and crumb texture of the cake samples were determined. Sensory analyses were carried out to determine the acceptability of the samples.

Addition of PPP and/or gum increased the water holding capacities of the flour mixtures and the batter viscosity (p<0.05). All batters showed pseudo-plastic behavior and Herschel-Bulkley is the most suitable model to represent the rheological characteristics of batters (p<0.05) and also an increase in elastic (G') and viscous (G'') modulus values (p<0.05). Cake volume decreased but hardness values of the cakes increased with the increasing of PPP (p<0.05) and with the addition of gum to the blends, volume of the samples increased and hardness values of the samples decreased (p<0.05).

According to the results; PPP which is by-product of fruit juice industry, can be use as a dietary fiber source with the purpose of gluten-free cakes enrichment which have lower levels of nutrients than the gluten containing counterparts

Keywords: Gluten-free cake, Dietary fiber, Batter rheology
Composition, technological properties and digestibility of milk proteins from native breed - Lithuanian black and white, cows

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The aim of this research was to study the effect of proteins composition on the technological properties of raw milk from an individual native breed - Lithuanian Black and White, cows. The biological value of the proteins was evaluated by their digestibility and composition of bioactive peptides released during gastro-intestinal digestion in vitro. Milk samples were taken from 20 cows once a month during one year and analysed for the contents of calcium, αS1-, αS2-, β-, κ-casein and β-lactoglobulin and for rennet and acid coagulation properties. The digestibility of acid or rennet induced milk gels were evaluated by fluorescamin assay and electrophoresis method (SDS-PAGE). The polypeptide profile analysis of digested proteins was performed by LC-ESI-MS/MS. The contents of different caseins, calcium and rennet coagulation time demonstrated seasonal trends, while other properties displayed considerable variations, which were apparently unrelated to the season. Milk from Lithuanian Black and White cows exhibited superior rennet and acid coagulation properties. Only 2 % of non-coagulating milk was found among the 219 of milk samples. The present study suggests that Lithuanian native cattle breed milk is suitable for cheese and fermented milk products manufacture. Peptides profile analysis showed that acid and rennet gels produced from native breed and from Holstein cow's milk were a great source of bioactive peptides (mostly angiotensin converting enzymes inhibitors). However, different profiles of peptides were derived from the different casein fractions depending on the protein coagulation method (rennet or acid). Faster protein hydrolysis during digestion under simulated gastro-intestinal conditions was determined in acid gels.

Key Words: native cattle breed, milk composition, casein, coagulation, digestibility, bioactive peptides.
Food safety aspects of impregnated paper food packaging

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Nowadays, food safety is a crucial aspect in every part of the food chain. There are many factors which have an impact on the food safety. One of them is packaging, with the possible various effects, including changes in the sensory quality. Controlling the features and parameters of each layer of the packaging might improve manufacturing of a safe food product.

The aim of the study was to investigate the food safety aspects of paper based material impregnated with different emulsions. The food contact materials were evaluated organoleptically and a global migration was determined using the MPPO as simulant of dry food. Moreover, the water and oil contact angle was analyzed in order to determine the resistance of material for moisture and grease penetration.

The impregnated paper was characterized by a barely noticeable or moderate foreign odor and taste, whereas for the control sample the foreign odor and taste was practically unnoticed. In most cases, the use of impregnation for paper did not exceed the legal limit, which is no more than 10 mg of substances per 1 dm² of surface area of the material. Moreover, obtained results showed that paper covered with emulsion was characterized by greater resistance to moisture, depending on the applied coating, in comparison to uncoated paper sample.

Key Words: packaging, paper, food safety, overall migration.

This work was supported by the National Center for Research and Development (Poland) within a framework of BIOSTRATEG program, No. BIOSTRATEG2/298537/7/NCBR/2016.
OP29

Study about optimization of the techniques for cleanability and decontamination of the hog casings processing equipment

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Brief Introduction
For traditional sausage production, the natural membranes are increasingly sought after by manufacturers. The cleaning and decontamination of the equipment on the hog casings processing line is also an obligation to endorse the operation of the technological line.

Materials and Methods
The study aims to optimize the process of preparation and maintenance in good functioning, according to three criteria: reduction of food risk, observance of imposed hygienic norms, and reduction of the interruption of the working process.
It was realized a monitoring of the cleaning and decontamination processes on a hog casings processing line.
It was applied 3 different variants of cleaning and decontamination program for the equipment, which were used during 3 weeks of operation. In all 3 variants, it has been gathered information from the sanitation tests carried out on the surfaces of the equipment, especially those that come in contact with the hog casings during processing. Also have been collected samples out of some collateral surfaces.

Results
After applying the three cleaning and decontamination variants no significant negative effects on the quality of the resulting membranes were identified.
Sanitary tests have highlighted different values related to the total number of NTG bacteria (SR EN ISO 4831: 200), and about coliforms bacteria from surfaces.

Conclusions
The optimal cleaning and decontamination solution of the hog casings processing equipment is characterized by the following parameters, within the ranges prescribed by the supplier company: medium level of wash solution concentration, low scrubbing pressure for applying of the liquid solution, and high water pressure rinsing, higher application temperature and lower rinsing temperature. The optimal application time was found to be inversely proportional to jet pressure.

Key Words: hog casings, equipment, cleanability, decontamination, optimization.
The effect of silicon on the organically grown leaf lettuce growth and quality

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Abstract
Silicon has many beneficial effects on plants. Silicon enhances growth, improves protection against pathogens and abiotic stresses like metal, salinity, water, temperature. Therefore, Si addition in crop cultivation might be major possibility for improvement of crop production economy. There were two treatments: 1. stabilized silicic acid treatment; 2. control. Silicic acid treatment was carried through as followed: First spray, when plants were growing and when 1 real leaf was present; second spray was 2 weeks after spray 1; third spray as 2 weeks after spray 2. Sprays were followed: First spray: 1ml silicic acid was solved in 0,5 liter clean (demineralized water, pH neutral) water; second spray: 2 ml silicic acid was solved in 1 liters clean (demineralized water, pH neutral) water; third spray: 2 ml silicic acid was solved in 1 liter (demineralized water, pH neutral) water. pH of spray solution was 5,5. Control plants were untreated. Leaf lettuce plants were taller and more bread in silicic acid treatment compared to control. The content of P, Ca and Mg were higher in Si treated plants. The purpose of the investigations was to look the effect of Silicon on the leaf lettuce growth and quality. The present research was carried through with financial support from Estonian Agricultural Registers and Information Board and with the help of the Jaagumäe Agro Ltd. and Estonian Crop Research Institute.

Key Words: growth, lettuce, quality, silicon.
Review on the potential healthy risk of nanotechnology applications in food industry

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Abstract
Nanotechnology is opening up new horizons in nearly all technological and scientific fields. The applications of nanotechnology is a great potential for many fields. Nanotechnology is a technological advancement that could improve and transform the whole food sector, with the potential to rise agricultural productivity, food security, food packaging, transportation, storage, delivery and also economic growth for industries. Recently, there has been an increased in the investments for nanotechnology applications and researches. It leads to increase people’s concerns about safety of nanotechnology. Although nanotechnology has many applications from environmental to medicine sciences, public perception about nanotechnology in food sector is different from the other industries. The rapid using of nanotechnology applications in food industry in a wide range of consumer products has also increased a number of, environmental, safety, ethical, policy and also regulatory issues. Nanotechnology applications are expected to play an important role on human health. Risk assessment and safety issues are discussed and an overview of applications of nanotechnology to the food industry. This review emphasize that the potential risk of the using nanotechnology applications in food industry on human health.

Key Words: Nanotechnology, Health, Potential Risk.
Consumer acceptance regarding organic berries-based products processing techniques

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Introduction: Berry-based products could be obtained using new sustainable technologies which are less harmful for the nutritional content of raw material and at the same time could be more attractive for the conscious people. In this regard, the purpose of this research was to gain in-depth analysis the factors that influence the consumer choices and behavior towards organic berry based food products in Romania. Previous research results on three European states consumers’ attitude towards organic berry and berry-based products revealed the focus on freshness, taste and hygiene than on the price or nutritional value. The present work further studied the Romanian consumer’s acceptance of organic berry-based products obtained by new technologies.

Methods: A random group of 729 respondents from Romania urban area were interviewed on their purchasing decision process, labelling impact, acceptance of new products. Tastes, package, marketing drivers, new technological developed products were separately analized on a number of demographic and personal characteristics variables: age, gender, occupation or marital status.

Results: Education or ages have no influence on attitudes toward unknowed or ‘strange’ food or on some new technologies used for organic berry-based products (sulfites treated products or infrared dried fruits). By contrast, most of the consumers show increased interest in products taste, price or nutritonal and health information. Marital status is influencing the behaviour towards new products, as well the attitude on products attributes.

Conclusion: The method offers demografic information on Romanian consumer’s attitude towards new technologies for organic berry-based products. This could be a usefull instrument for processing stakeholders in desingning new products. Also nutrition educators and marketers will be able to use this study results about consumers’ attitudes and behaviors to customize programs that more accurately address consumers’ preferences.

Key Words: consumers’ attitude, organic berry-based products, new processing techniques.
Smart valorisation of industrial tomatoes by-products
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Brief introduction
With increasing global trade of products obtained from tomatoes, the tomato processing industry also expands. At the same time, the amount of by-products: seeds and tomato skin is growing. They are an excellent source of bioactive substances. The use of tomato by-products in order to obtain new products of higher economic value will become an important issue.

Materials and methods
Tomato by-products were obtained as a result of the manufacturing process of tomato juice at industrial scale at "Orhei Vit" SA. The extraction technique was carried out using the pilot plant HA 120-50-01 C with supercritical carbon dioxide. Using the central composed programs of the second order factorial design of experiments it was constructed the planning matrix in real variables, resulting in the need to perform 30 experiments at 15 extraction regimes. The yield of the lipid fraction extraction was taken as the output factor.

Results
The maximum yield of 74.43% was noted at the extraction parameters of 40 MPa, 70 °C and 90 min and the minimum yield of 24.86% at 20 MPa, 40 °C and 30 min. It was established the final form of the second order regression equation characterizing the process of supercritical fluid extraction of bioactive compounds from tomato by-products.

The regression equation allowed the optimization of the output parameters, using the gradient rise method. Thus, optimal parameters for obtaining the bioactive compounds were set: temperature 60 ... 75 °C, pressure 33 ... 42 MPa and time 64 ... 76 min.

Conclusions
As a result of the establishment of optimal extraction regime it will be able to design and prototype innovative functional food products with the addition of CO₂-extract from tomato by-products rich in bioactive compounds, which may have beneficial health effects.

Key Words: tomato by-products, bioactive compounds, supercritical fluid extraction.
Effects of antioxidant extracts isolated from Vaccinium vitis-idaea L. leaves on the formation of Maillard reaction products in food models

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Abstract

Application of plant origin antioxidants is considered as a promising concept for enriching animal origin foods with bioactive phytochemicals and inhibiting some undesirable reactions in such foods resulting in the formation of toxic compounds. In this study, the antioxidant capacity of deodorized and non-deodorized extracts of lingonberry leaves (LL) were characterized by DPPH• and ABTS•+ radical scavenging, oxygen radical absorbance capacity (ORAC), Folin–Ciocalteu (total phenolic content) and on-line HPLC–UV–DPPH• assays. The differences in phenolic composition of extracts were compared by using ultra performance liquid chromatography quadrupole time of flight mass spectrometry (UPLC/qTOF–MS/MS). Water extract (WE) of LL and some phytochemicals present in LL such as catechin and quinic acid were tested to evaluate their effects on the formation of Nε-(carboxymethyl)lysine (CML) and Nε-(2-furoylmethyl)-L-lysine (furosine) in a milk model system. All additives at 0.1 and 0.3 mg/mL concentration demonstrated strong inhibitory effect on furosine and CML formation. In addition WE and acetone extract (AE) were used to assess their effects on the formation of heterocyclic amines (HAs) in a meat-protein and meat model systems. Results revealed that AE has greater potential to reduce the formation of HAs despite its lower antioxidant capacity compared to WE. Furthermore, the results showed that WE showed both promoting and inhibiting effect on the HAs formation depending on model system and concentration. Together, these findings suggested that, LL is a potential source of valuable phytochemicals, which might be used for controlling the formation of the hazardous Maillard reaction products.

Keywords: Lingonberry leaves; Vaccinium vitis-idaea L.; Maillard reaction; CML, furosine, heterocyclic amines
Japanese quince (*Chaenomeles japonica*) – new promising fruit crop for Baltic Sea region countries

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Japanese quince (*Chaenomeles japonica*) is a dwarf shrub belonging to the Maloideae (*Rosaceae*). In the Baltic Sea region Japanese quince as a fruit crop was developed in Latvia in 1951 along with its processing technologies and cultivars, and now has become a crop of high market potential. In the last decade can be observed rapidly increased interest in the cultivation of Japanese quince crop in Baltic Sea countries such as Poland, Estonia, Latvia and Lithuania. The fruits have valuable biochemical content and under-used processing possibilities. However, the cultivar selection is an important challenge from a food technologists’ point of view, since it allows the choice of the most valuable plant materials for different processing directions. As a consequence, the priority in cultivation is to create genotypes adapted to the growing conditions of the region, with preferred chemical composition and high content of bioactive compounds. Japanese quince fruits are a rich source of organic acids, pectin, and vitamin C, therefore is suitable for development of pro-healthy products. During the fruit processing, a significant amount of seeds, 5-10% the weight of fruits, is generated with limited application. Japanese quince seeds contain about 10% of oil which is a rich/good source of essential fatty acids, tocopherols, carotenoids, sterols and squalene, with the potential applications in food, cosmetic, pharmaceutical and biodiesel sectors.

Conclusions: The present data about the biochemical composition of *Chaenomeles japonica* as well as its potential utilization in different industrial sectors are still limited. We are hoping, that the future research activities in ERDF project Nr. 1.1.1.1/16/A/094 will provide the new valuable information and technological solutions for improved production and utilization of Japanese quince.

**Key Words:** Chaenomeles japonica, Japanese quince, bioactive compounds, fruit, seeds, technological innovations.
**OP36**

**GC-MS-Olfactometric characterization of key odorants in foods**

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The aroma of food products is undoubtedly one of the most important quality parameters influencing the consumer acceptance and preference. Therefore, evaluation of food potent aroma is important for flavour scientists and food industry. The aim of this paper is to describe the state of the art of gas chromatography-olfactometry (GC-O) techniques, considering the different approaches and the different methods for evaluating the key odorants in different food samples. In GC-O analysis, the analytes are first separated by GC capillary column and then delivered to an olfactometry port for sniffing. Panelists continuously sniff the air emitted from the olfactometer port, and record the perceived odour characteristics of the key odorants. The methods of GC-O are generally divided into three main groups: (1) Dilution methods; (2) Time intensity and (3) Detection frequency. Dilution to threshold methods and especially AEDA are often used for their simplicity and uncomplicated data processing in flavor research. The paper also includes examples of specific applications for the characterization of key odorants in different food samples.

**Key Words:** food aroma, gas chromatography-olfactometry, AEDA, representative test, extraction technique.
Health benefits of functional food based on beta-glucans

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Beta-glucans are fibers readily from oat and barley grains and from fungi that has been gaining interest due to their multiple functional and bioactive properties. Application of beta-glucans as a food ingredients could be considered with the dual purposes of increasing the fiber content of food products and enhancing their health properties. Beta-glucans can influence activity of macrophages and other immune cells and modulate of metabolic dysregulations associated with the metabolic syndrome. In our research it was demonstrated, that beta-glucans can help to weight loss, decrease of cholesterol and glucose levels in blood serum, and selectively support the growth of Lactobacilli and Bifidobacteria, which are antagonists to pathogenic bacteria in the digestive system. Development of functional food products containing beta-glucans can be important and prospective in prevention or treatment of disorders associated with obesity or metabolic syndrome.

Key Words: beta-glucan, functional food, obesity, metabolic syndrome.
Methods used for the recovery of antioxidant compounds from food waste - review

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Introduction: The increase awareness of nowadays consumers regarding the relation between the food they consume and their health, has led to an increase demand of foods containing biologically active compounds, namely antioxidants, which can help the body to fight against oxidative stress. As a consequence finding new or non-conventional sources of antioxidants is a priority for food and also pharmaceutical industries.

Discussion: Wastes from fruits and vegetable processing are shown to contained valuable molecules (antioxidants, fibres, proteins, natural colorants, aroma compounds) which can be extracted, purified and valorized in value-added products. There is no universal method for the extraction of bioactive compounds, but in order for a method to be suitable it has to fulfill several requirements, including selectivity towards the analyte, high extraction yields, possibility of solvent recovery or using “green solvents”, maintaining the functionality of the recovered molecules, low cost reagents, possibility to be implemented from laboratory scale to industrial scale and so on. Among the classical methods used for the isolation of bioactive compounds the most common ones are solid-liquid extraction, Soxhlet extraction and liquid-liquid extraction. The modern extraction techniques comprise microwave-assisted extraction, ultrasound-assisted extraction, pressurized liquid extraction, enzyme-assisted extraction, supercritical CO2 based extraction and other emerging techniques.

Conclusion: From the laboratory scale and testing, the procedures used for the recovery of bioactive compounds are now facing the challenges for the scaled-up and further commercialization. The industrial recovery of antioxidants from food wastes, on one hand, is sustained by the numerous studies which have demonstrated their health benefits and on the other hand, by the food companies which foreseen the manifold applications of these compounds.

Key words: extraction methods, antioxidants, waste valorization, bioactive compounds, functional products

Acknowledgment: This work was supported by a grant of the Romanian National Authority for Scientific Research, CNCS–UEFISCDI, project number PN-II-RU-TE-2014-4-0842
Foodomics: an advanced technology to integrate Food Analysis in the systems’ biology approach (a progress review)

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Foodomics was defined for the first time in 2009 by a Spanish group specialized on Food Analytics. It represents an integrated scientific area related to Food and Nutrition, applying advanced high-throughput omics technologies [1]. Studies in foodomics aim new findings in the composition of different foods, identification of the bioactive components as quality and authenticity markers, the mechanisms of bioactives in the body, their quantification, or identification of the body’s biological response to different nutritional patterns and disease.

This complex area of research is integrating the knowledge accumulated in the analytical chemistry (LC or GC-chromatographic separations coupled with mass or NMR spectrometry) and can provide information on food composition, quality and safety, traceability and bioactivity, but also food technology and biotechnology, in the new concept of systems biology.

The food metabolome represents also a part of the human metabolome, derived by the digestion and biotransformation of food constituents. More than 25,000 compounds are known as food constituents, which may be modified during digestion and interaction with microbiota, so its complexity and variability is high and personalized, depending on many factors (mainly genetic and dietary).

A special focus will be addressed to dietary biomarkers, measured in biofluids (blood and urine) which can accurately reflect the food composition, e.g. vitamins and fatty acids, food additives or contaminants. Dietary biomarkers can reveal the relation between the nutritional status and food intake, possible associations between diet and disease outcomes, as well monitoring the dietary changes in populations.

An increasing number of scientific papers the last years deals with foodomics, especially on food of animal origin [3]. Here we present as well some of new results from foods of plant origin (fruits and aromatic/medicinal plants) [4]. A special attention will be given to the analytical methodology, from sampling, sample preparation, fast analytical procedures, followed by adequate biostatistical interpretation [5].

Acknowledgements:
This work was supported by European Projects (EU-FP7-DISCO project (2014-2017) and ERANET-LAC-SCREAM project (2015-2018).

Key Words: Omics technology, food metabolome, food analysis, dietary biomarkers, bioinformatics.
OP40

Tomato biorefinery: minimal processing by green chemistry techniques to obtain added value products for food, feed and cosmetic applications

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Introduction
Bioefinery represents an alternative, environmentally friendly technology to process natural bioresources in order to obtain valuable products for food/feed or cosmetic applications e.g. plant pigments, phenolics, essential vitamins [1, 2]. It is presented an overview of the experimental data obtained the last years about the valorization of phytochemicals from supramolecular chromoplastic structures of keto-carotenoid-rich tomatoes obtained by metabolic engineering.

Materials and methods
The separation of bioactive lipoprotein/fibre supramolecular fractions was achieved mainly by physical techniques, avoiding organic solvents. Two fractions were differentially obtained, separating a low density fraction (LDF) rich in functional lipids (including carotenoids and lipophilic vitamins) and a high density, more hydrophilic fraction (HDF). Such fractions were differently processed to obtain formulations which improve their stability, availability and activity. Innovative recipes using microencapsulation on natural polymers (alginites) or powders or emulsions are also presented.

Results
There were obtained three different product lines from tomato LDF and HDF: oil/water emulsions to be used as ingredients for cosmeticeuticals, a freeze dried formulation to be used as ingredient for food supplements, micro- or macro capsules to be used as fish meal additives or ingredients. All steps of processing and formulation were assisted by advanced analysis involving UV-Vis spectrometry, UPLC-QTOF-MS analysis, microscopy, rheological properties and in vitro testing of their stability.

Conclusion
The biorefinery-based technologies can offer improved solutions to obtain safe and cheap formulations and final products to be realized at pilot or industrial scale, with relevant impact on food/feed and cosmetics applications. Further studies will be developed for the standardization of final products, to be commercialized in the future.

Acknowledgements
This work was supported by an EU-FP7-DISCO project (2014-2017) and a Romanian grant financed by UEFISCDI (EU 252/2014)

Key Words: Biorefinery, green chemistry, tomato, innovative food/feed formulations.
Optimization of the recovery of bioactive compounds from industrial fruit waste

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Brief Introduction
Worldwide, there is a growing appreciation that the management and utilization of natural resources need to be improved. The demand of natural resources has been growing fast and exceeds what the Earth can sustain in the long term. In addition, the fruit producing industries reject high amounts of fruit waste with high biological value that remain until now unexploited. Fruit waste is a rich source of nutrients and bioactive compounds, which can be easily recovered through eco-friendly extraction processes and then be incorporated in innovative food products or packaging.

Materials and Methods
In the present Work, bioactive compounds, such as phenolics and carotenoids, were recovered from peach and apricot waste through the green and efficient method of the microwave assisted extraction (MAE). Except for the conventional solvents of water and ethanol, ionic liquids were used in the extractions, minimizing the solvent losses and leading to ecological benefits. The qualitative and quantitative determination of the recovered bioactive compounds was achieved through the high-pressure liquid chromatography (HPLC) method. In addition, the antioxidant activity of the extracts was measured using the DPPH method.

Results
The peach waste extracted with the ionic solvents presented the best results, concerning the recovery of carotenoids, as shown by the HPLC method. The extraction of the apricot waste with ionic solvents, however, presented the best antioxidant activity.

Conclusions
The use of ionic solvents is extremely innovative and effective and, according to literature, is not sufficiently explored yet. In addition, both types of waste were proved to have a significant content of valuable compounds. Thus, the important, but until now unexploited amounts of waste can be valorised through simple techniques and can be incorporated into functional food products.

Key Words: carotenoids, phenolic compounds, antioxidant activity.
Bread making potential of winter wheat varieties cultivated in different nitrogen fertilization system

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The aim of this study was to assess the effect of different levels of nitrogen fertilization and the crop year on the bread making potential of eight winter wheat varieties cultivated in Poland. Wheat varieties was chosen to represent three technological group admitted to the Polish National List of Agricultural Plant Varieties published yearly by The Research Centre for Cultivar Testing: elite bread (E), quality bread (A), bread (B).

Wheat was sown in the years 2014 and 2015 at the RZD Osiny belong to the Institute of Soil Science and Plant Cultivation – State Research Institute, Poland as a two-factor field experiment conducted with the method of randomised blocks, in four replicates. Two levels of nitrogen fertilization was applied in the experiment: high level 200 kg ha⁻¹ and medium level 120 kg N ha⁻¹. Protein content, gluten content, Zeleny sedimentation index and alveograph properties were determined to assess the baking quality of tested wheat varieties.

Wheat cultivated under high level of nitrogen fertilization was characterized by higher protein and gluten content and Zeleny sedimentation index whereas there was no significant influence on alveograph properties of wheat flour dough. Alveograph properties were affected by wheat varieties. Among the analyses wheat varieties Astoria and Bamberka were characterized by the highest baking value (average “W” over 340×10⁻⁴ J) which indicates their suitability for production of hamburger rolls, pizza and frozen dough. Other tested wheat varieties were characterized by the baking value “W” in the range of 176 to 242×10⁻⁴ J. Among the analyses samples the bread quality wheat variety Kampana was characterized by the lowest extenstensibility “P” and the highest elasticity “L”. Crop year had a significant effect on Zeleny sedimentation index. Wheat samples which were characterized by higher protein and gluten content were characterized also by higher baking value “W” and elasticity “L”.

Key words: alveograph, bread making quality, nitrogen fertilization, wheat varieties
Optimization of supercritical fluid extraction of cranberries pomaces using response surface methodology

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Cranberries are considered as a super-fruit by the nutritionists and therefore every year their production is increasing. Cranberries are mainly processed into juice and after berry pressing large amounts of press-cake (pomace) is formed as a residual by-product. Currently most of such by-products are discarded as a waste causing the loss of valuable nutrients and creating environmental problems. The nutrients in berry pomace include various valuable bioactive constituents such as polyphenolic antioxidants, vitamins, pectin, lipids, unsaturated fatty acids and other substances. The aim of this study was to optimize supercritical carbon dioxide extraction process for the recovery of lipophilic fraction from cranberries pomace. For this purpose widely used response surface methodology (RSM) was applied in order to determine optimal extraction parameters. Three independent variables, namely pressure (25, 40, 55 MPa), temperature (50, 65, 80 °C), and dynamic extraction time (60, 120, 180 min) were selected as the most important characteristics for the optimization of extraction process. Based on RSM model the highest yield (11.32 %) was predicted at 42.4 MPa, 168 min, 53 °C. These parameters were tested on a pilot scale supercritical extractor: experimentally achieved yield of cranberry pomace extract was 8.64%, i.e. lower than the theoretically predicted. Extract properties and composition were analyzed by using in vitro antioxidant capacity assays and chromatographic techniques. It may be concluded that the lipophilic extract isolated from dried cranberry pomace by supercritical extraction is be a good source of bioactive compounds, which might find applications in the formulation of functional foods and nutraceuticals.

Acknowledgments
This study was supported by Research Council of Lithuania, grant no. P-MIP-17-228.

Key Words: optimization, cranberries, supercritical fluid extraction.
Creation of desirable cake texture directly related to batter rheology. Although many food processes are occurring in nonlinear regime, rheological properties of many food systems are analyzed in linear mechanical regime. So, traditional rheological analysis are inefficient to determine nonlinear rheological properties of batter. In this study, Large Amplitude Oscillatory Shear (LAOS) method was used to determine the viscoelastic properties of different gluten free batter samples. In this study, the influence of addition different dietary fiber (orange) level (0/100, 4/100, 8/100, 12/100, 16/100) on rheological properties of gluten free cake batter were determined. Large amplitude oscillatory tests were carried out 0.01-300% strain range at constant frequency (10 rad/s) by using parallel plate with a gap height of 1 mm. During the tests, elastic-viscous modulus, phase angles, dynamic viscosity, Chebysev coefficients and Lissajous figures data were collected. In addition, physical, chemical properties and quality parameters of gluten free cakes were determined.

The results showed that storage ($G'$) and loss ($G''$) moduli values increased with an increase in dietary fiber level. Lissajous figures and phase angles results showed that increasing strain caused turning the dominant behavior from elastic to viscous. According Chebysev coefficient intensity values, elastic and viscous properties such as stiffening, softening, thinning, thickening behavior of batter samples were also determined. Normalized elastic and viscous Chebysev coefficients for all samples indicated strain softening behavior at 0-300% strain range and shear thinning behavior at 0-300% strain range, respectively. Dietary fiber addition in gluten free cakes decreased hardness and increased specific volume of cakes.

LAOS method operates outside the traditional limits of linear viscoelastic region. In food processing industry, commercial gluten-free products exhibit quality deficiencies because of gluten replacement. Determination nonlinear rheological properties allow to get more information about batter rheology and obtain desirable texture in final product.

**Key Words:** Batter rheology, LAOS, gluten-free cake.
The influence of enzymes in red wines

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The aim of this study is to determine what is the role of specific enzymes in red wines in various stages of technological process. Maceration and fermentation is a specific operation and ensures the obtaining of a high quality products with specific chromatic indices and in this case was used the version of maceration in vinification tanks, which were administered 5-15g/hl SO\textsubscript{2} liquid and was homogenized 5 minutes at every 2 hours in the first three days after their filling. Vinification tanks were filled 80\% by volume, was added the Enovin color enzyme and Enozym Enovin Vintage enzyme. Was used Viniferm TTA yeast, Fermactive Rouge Expression (in doses of 12 to 22 g/hl), and the medium was heated to 18\degree C. It was also added tannin Vinitanon (2 g/hl) to increase and stabilize the color. The stimulation of the complete fermentation of sugars was realised by wort recycling. After maceration the must was clarified, the operation will stop when 70-75\% of coarse impurities have been submitted. Fine suspensions have a beneficial role because of their compound in nitrogenous substances which can help the yeast fermentation process. Malolactic fermentation of red wines significantly improves the sensory qualities of red wines, the best conditions being a temperature of 18-22\degree C, pH 3.2-3.4, up to 15-17 mg/l free SO\textsubscript{2} and a density of 2.5x10\textsuperscript{6} cells /ml wine. Obtaining quality red wines with chromatic index is dependent on a number of factors: variety of vines, vineyard conditions, time of harvest, fermentation-maceration technology applied, the type of enzymes used in maceration.

Key Words: red wines, enzymes, chromatic indices, maceration.
The biologically active compounds from tomato by-product obtained by SC-CO₂ technology and anti-inflammatory properties of extracts

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Industrial vegetables, fruits and berries processing generates large amount of low-value by-products. There is the interest to use the biologically active compounds from plant original by-products to produced high value-added products in food, cosmetics, or pharmaceutical applications. Tomato by-products also represent a promising, low-cost source of biologically active compounds may be used in the end-products because of their favourable nutritional and technological properties. The aim of this study was to determine the biologically active compounds from tomato by-product obtained by supercritical carbon dioxide (SC-CO₂) technology and to determine the anti-inflammatory properties of the extracts in cell culture. The SC-CO₂ was applied to produce the biologically active compounds enriched oleoresin extract from tomato cv. ‘Admiro’ F1 by-products. In this work, the recovery of biologically active compounds (carotenoids (especially lycopene and its isomers); fatty acid composition; the content of tocopherols) was obtained by SC-CO₂ technology. Carotenoids and its cis-isomers (lycopene and β-carotene) and the content of tocopherol in extract from tomato by-products were determined by high performance liquid chromatography (HPLC/DAD). The fatty acid composition of the lipid fraction obtained by SC-CO₂ at optimal conditions was analysed by gas chromatography. The anti-inflammatory activities of this extract were evaluated by assessing the production of hydrogen peroxide in a mouse’s macrophage J774 cell culture. Results showed that the major fatty acids in tomato by-product extract isolated by SC-CO₂ were polyunsaturated linoleic acid (52±2%), followed by monounsaturated oleic (19±1%) acid. The concentration of the tocopherols was 3.01±0.04 g/kg. The extract was characterized for total β-carotene (63 mg/100g), lycopene (115 mg/100g) and lycopene different isomers (15-cis-lycopene; 13-cis-lycopene; 9-cis-lycopene; 7-cis-lycopene; trans-lycopene; 5-cis-lycopene) concentration. SC-CO₂ cis-lycopene isomers tomato by-product is a potential source of cis-lycopene isomers (about 60%) oleoresin with promising applications in food and pharmaceutical industries.

Key Words: lipophilic extract, lycopene, cis-isomers, fatty acids, Lycopersicon esculentum, anti-inflammatory properties.
Study of the survival of staphylococcus in fruit semi-finished products aseptic preservation

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The aim of the studies was to determine the possibility of survival of the staphylococcus in fruit semi-products of aseptic preservation, used as additives of fermented milk products.

In the work we used industrially manufactured samples of the fruit semi-finished product "Blueberries" (mass fraction of soluble solids = 60-64%, index \(a_w\) = 0,800-0,846, pH = 3,45-3,68) containing pectin and starch as thickeners. One strain of staphylococcus was used: Staphylococcus aureus ATCC 25923. The investigated products were contaminated with a daily culture of the test strain in an amount of \((3.5-7.5)\cdot10^5\) CFU / ml, and then stored at different temperatures: 6, 24 and 37 °C. The samples were taken every two days for physicochemical studies and for the detection of viable test microorganisms.

The results of the studies indicated that almost 99% CFUs of the staphylococcus did not survive in the contaminated products after 4 days of storage, regardless of temperature conditions. After 11 days of storage at different temperatures, viable CFUs of the test strain were not detected in any of the contaminated samples of the products. At the same time, the physicochemical indices of the contaminated products (mass fractions of soluble solids and titrated acids, indexes \(a_w\) and pH) fluctuated within the error of the measurement methods.

The results obtained confirm the data that the values of water activity below 0.85 and the high concentration of sugars (≥60%) prevent the development of staphylococcus in the food product. In addition, the data obtained can be used to determine the shelf life and storage conditions of fruit semi-finished aseptic preservation after a breach of the tightness of their consumer packaging and to develop an appropriate prognostic model.

Key Words: survival, staphylococcus, fruit semi-finished products.
Influence of peppermint and thyme extract on the starter culture and mold and yeast counts of stirred type yoghurt

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Recent years yoghurt consumption has increased worldwide because of its natural appearance, its organoleptic characteristics, nutritional, prophylactic and therapeutic properties, and its moderate cost. The main deterioration in yogurt is the development of mold and yeast. Natural antimicrobials are receiving a good deal of attention for a number of microorganism-control issues. Spices and essential oils (EO) are used by the food industry as natural agents for extending the shelf life of foods. A variety of plant- and spice-based antimicrobials is used for reducing or eliminating pathogenic bacteria, and increasing the overall quality of food products. The aim of this study was to determine to effects of peppermint and thyme extract on the starter culture of yoghurt and also prevent to mold and yeast development of yoghurt.

For this purpose three different stirred type yogurts (A: control, B: 0.075% peppermint extract and C: 0.075% thyme extract) were manufactured according to Tamime and Robinson. Yogurts were stored for 20 days and S. thermophilus, L. delbrueckii subsp. bulgaricus and mold and yeast counts determined 1, 10 and 20 days after production.

According to the results obtained, the extracts of peppermint and thyme caused a decrease in the number of S. thermophilus and L. delbrueckii subsp. bulgaricus. Whilst peppermint extract didn’t affect mold and yeast numbers, thyme extract has reduced mold and yeast counts of yoghurts.

Key Words: Stirred type yoghurt, peppermint and thyme extract, mold and yeast.
Some properties of probiotic yoghurt fortified with liquorice extract

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Liquorice, is the root of Glycyrrhiza glabra from which a sweet flavour can be extracted. Liquorice is used as a flavouring agent for tobacco, candies, sweeteners, yogurt or ice cream. In this study, the effects of liquorice extract level on the some properties of probiotic yoghurt were investigated.

For this purpose three different probiotic yoghurts, which contain 0% (as control), 0.25, % 0.5 and 1% liquorice extract, were produced according to Tamime and Robinson. Two different trials were performed for the manufacture of probiotic yoghurt. After addition 3% non fat milk powder, milk was divided into four portions (A, B, C, and D), followed by addition of and 0.25, % 0.5 and 1% liquorice extract B, C and D, respectively. Then the milks were heat-treated at 90°C for 10 min, cooled to 45°C and were inoculated with yoghurt and probiotic cultures at a rate of 2 and 5%, respectively. Then they dispensed into plastic cups (200 ml). and incubated at 37 °C until reaching pH 4.6. Then they were immediately transferred to a cold store (4±1°C). Physicochemical and microbiological properties of probiotic yoghurt were determined at 1st, 10th and 20th days of storage.

The rate of liquorice extract and storage period significantly affected all properties of probiotic yoghurts. With the increase in liquorice extract content, pH, viscosity, L. acidophilus, Bifidobacterium BB-12 counts of yoghurts were increased, but titratable acidity (%L.A.), whey separation, S. thermophilus and L.delbrueckii subsp. bulcaricus counts of the samples decreased.

During storage period whilst pH, viscosity, whey separation, S. thermophilus L.delbrueckii subsp. bulcaricus, L. acidophilus, Bifidobacterium BB-12 counts of yoghurts were declined, titratable acidity (%L.A.) of the samples were increased. According to the results, addition of 0.5% liquorice extract can be recommended for probiotic yogurt production.

**Key Words:** Yoghurt, probiotic, liquorice extract.
Effect of using different ratios resistant starch on some bread quality parameters

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Abstract

In recent years, there is a high consumer demand on functional foods due to, its not only nutritive properties but also health benefits on obesity, diabetes, hypertension, dyslipidemia and cardiovascular disease. In this regard, resistant starch is a promising ingredient to food industry, particularly in bakery sector.

The first aim of this study is to research the influence of adding different amount of high amylose maize starch (from 10% to 50% w/w) as a resistant starch (type II) on wheat flour dough and some technological properties of bread (moisture, specific volume, crumb softness, crumb grain, colour). Additionally, sensory analysis; “crust colour, texture, taste, odour, general structure” was evaluated with ranking test. Secondly, measurable bread quality parameters based on increment of resistant starch were recompensed with vital wheat gluten, and also to evaluate this hypothesis the same analyzes were carried out for this treatment.

The results showed that water absorption of dough was increased depending upon rise on resistant starch ratios whereas degree of softening and development time decreased in terms of farinograph datas. This reduction was compensated with gluten supplemented samples relatively. By considering the results of this study, it was ascertained that specific volume and crumb softness of bread samples declined based on growth of resistant starch however, moisture content raised. Moreover, added to 50% resistant starch samples both of gluten supplemented and non-gluten supplemented ones had the lowest crumb-grain numbers which was determined according to the Dallman scale. According to colour measurements, L and b* values of crumb and crust parts increased depending on augmentation of resistant starch ratios. The sensory analysis findings highlighted that except general structure the most preffered samples were belonging to control group while 50% resistant starch with non-gluten supplemented samples were the least preffered in all quality parameters.

The results derived from this experimental study confirm that it is possible to production of low-calorie and low glysemic breads with utilizing resistant starch and diminishment in bread quality parameters based on increment of resistant starch can recompensed with using vital gluten.

Key Words: Resistant starch, wheat bread, bread quality.
Lactic acid production from wheat bran using by lactic acid bacteria belonging to Lactobacillus genera

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Recently, considerable interest has been arisen to bio-recycle of the agro-industrial by-products into the valuable chemicals such as lactic acid. The chemical route produces a racemic mixture of DL-lactic acid, while optically pure L(+)- or D(−)-lactic acid can be obtained by microbial fermentation. Since elevated levels of the D-isomer are harmful to humans, L(-)-lactic acid is the preferred isomer in food and pharmaceutical industries, therefore the search of microorganisms producing high content of L-lactic acid from lignocellulosic material is outstanding importance.

The aim of research was to investigate the usability of wheat bran in the production of L-lactic acid via fermentation applying by newly isolated lactic acid bacteria (LAB) strains belonging to Lactobacillus genera. Bioconversion of wheat bran to lactic acid was carried out by a three-step procedure consisting of: (i) physical pre-treatment, (ii) an enzymatic hydrolysis and (iii) fermentation by LAB strains under laboratory conditions. The content of residual sugar, lactic acid isomer, and number of lactic acid bacteria cells, antioxidant activity and total phenolic content, pH medium of wheat bran medium were examined. The results show that the highest lactic acid content is produced by Lactobacillus sanfranciscensis MW15 strain (108.6 g/kg), whereas Lactobacillus crustorum W19 and Lactobacillus sanfranciscensis MR29 strains produce pure L-lactic acid isomer (respectively 84 and 67.8 g/kg).

The application of LAB strains combinations for lactic acid production via fermentation increased total lactic acid production by 14.6 % by revealing the possible synergistic effect of combined LAB strains fermentation. Moreover, the fermentation using by combined L. crustorum W19 and L. sanfranciscensis MR29 strains increase pure L-lactic acid isomer production from wheat bran medium by 29.4 %.

The results show that the application of combined LAB strains as starter cultures can be successfully used to enhance lactic acid production from bio-treated wheat brans.

Key Words: lactic acid, wheat bran, lactic acid bacteria, fermentation.
Fractionation of berry pomace of *Hippophae rhamnoides* L. and *Viburnum opulus* L. Into functional ingredients

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Guelder-rose (*Viburnum opulus* L., Adoxaceae) and sea buckthorn (*Hippophae rhamnoides* L., Elaeagnaceae) are the plants bearing red and yellow colour berries, respectively. Guelder-rose is native to northern Africa, central Asia and Europe, while sea buckthorn is spread in the cold-temperate regions of Asia and Europe. Both types of berries are not consumed fresh however they are excellent sources of biologically active compounds, mainly natural polyphenolic antioxidants, carotenoids, polyunsaturated fatty acids and vitamins. They are processed into longer shelf-life products, e.g. juices, jams and others. Production of berry juices results in large amounts of berry pomace, which are generally discarded as a waste causing remarkable losses of various valuable constituents present in the residual berry press-cakes. This study aimed at the recovery of valuable fractions from the selected berry pomace. So far as the seeds present in berry pomace contain high amount of lipophilic compounds first fractionation step included supercritical fluid (SFE-CO2) and Soxhlet extraction with hexane (SE). The yields of oily extracts were 17% and 24% in SFE-CO2, 20% and 26% in SE from sea buckthorn and guelder-rose berry pomace, respectively. The composition of lipophilic fractions was preliminary characterized by using GC-MS. Crude lipophilic extracts were further fractionated using different solvent systems in order to separate different classes of valuable constituents and to determine their yields and composition. The fractions obtained will be tested as the ingredients possessing specified health effects in the formulation of new functional foods, nutraceuticals and cosmetic preparations. Acknowledgments: This study was supported by Research Council of Lithuania, grant no. P-MIP-17-228.

**Key Words:** Hippophae rhamnoides, Viburnum opulus, berry pomace, lipophilic compounds, fractionation.
PP06

Antibacterial effects of microencapsulated probiotic and synbiotics on *Escherichia coli*

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Abstract

In this study, inhibition effect of microencapsulated probiotic culture with prebiotics on *Escherichia coli* growth was evaluated. *Lactobacillus rhamnosus* was used as probiotic, inulin and fructooligosaccharide were used as prebiotic. Microencapsulation maintained with three different combination as only probiotic culture, probiotic culture with inulin, probiotic culture with fructooligosaccharide. In addition, inulin and fructooligosaccharide effect on survival of *L. rhamnosus* was determined. *L. rhamnosus* was microencapsulated by the extrusion technique and it’s antibacterial effect on *E. coli* growth was evaluated. According to the obtained results, microencapsulated probiotic culture with prebiotic didn’t show any inhibition effect on *E. coli* growth. Furthermore, viability of probiotic culture was changed according to the prebiotics. Furthermore, it was found that the viability of the probiotic culture cells varied according to the prebiotic used. It was determined that inulin increased *L. rhamnosus* cell viability more than fructooligosaccharide.

**Key Words:** Lactobacillus rhamnosus, Escherichia coli, probiotic, synbiotic.
Whey and *Lactobacillus casei* Shirota effect on carotenoid production of *Rhodotorula* spp.*

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**Abstract**

In this study, 6 different *Rhodotorula* spp. (*R. glutinis, R. mucilaginosa, R. bogoriensis, R. minuta, R. graminis* and *R. armeniaca*) were used to carotenoid production. Yeast Malt Extract (YME) broth and whey were used as culture medium. *Lactobacillus casei* Shirota was co-cultured with *Rhodotorula* spp. pH value of cultivation medium was set to 6, incubation temperature was 30°C and flasks were agitated at 150 rpm for 7 days. According to the obtained results from study, the highest carotenoid amount was produced by *Rhodotorula mucilaginosa, R. armeniaca* and *R. graminis* in YME broth, respectively. The lowest carotenoid production was determined in whey by *R. armeniaca*. Although carotenoid production was increased in *R. glutinis, R. mucilaginosa, R. minuta* and *R. armeniaca* co-cultured with *L. casei* Shirota, there was a decrease in carotenoid production by *R. bogoriensis* and *R. graminis* co-cultured with *L. casei* Shirota. The results obtained from this study were evaluated in R statistic program and it is determined that substrate was found to be important statistically in carotenoid production.

*This study was supported by Cukurova University Scientific Research Project Coordination Unit (Project no: FBA-2015-4497). We would like to thank the Cukurova University Biotechnology Research and Application Center.*

**Key Words:** Carotenoid, *Rhodotorula*, whey.
PPO8

Chemical and rheological influence of Helianthus tuberosus L. flour used as a source of bioactive compounds in bakery product

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Brief Introduction
Known for over 2000 years, Helianthus tuberosus L. (Jerusalem artichoke) it is known as a source of inulin, which has aperient, cholangogue, diuretic, spermatogenic, stomachic and tonic effects, its tuber has been used as a traditional remedy in the treatment of diabetes and rheumatism (Pan et al., 2009). The main aim of this study was to establish the optimum dose of Helianthus tuberosus L. flour to be used as a functional ingredient in the bakery products industry, from both a nutritional and technological point of view.

Materials and Methods
Four samples of mixtures of wheat flour (type 550) with different proportions of Helianthus tuberosus L. tuber flour were obtained by mixing in the following ratios: 95:5, 90:10, 85:15 and 80:20 (w/w). Inulin was determined according to the “Determination of inulin in dough products” method, Petkova et al., 2012: the inulin extraction from the samples was carried out in an Ultrawave ultrasonic bath operating at a 60 Hz ultrasonic frequency and at 240 V. The sample was centrifuged in an Eppendorf 5804 R centrifuge. The spectrophotometric experiments for the determination of fructans were carried out using resorcinol and by measuring the absorbance of pink coloured compounds at 480 nm against distilled water. The rheological behaviour of doughs was analysed using the predefined “Chopin +” protocol on Mixolab.

Results
Protein, inulin, fibre, fat, ash, and mineral contents were determined. It was found that incorporation up to a 5% level into the formulation of wheat flour yielded an acceptable product in terms of rheological parameters, with improved nutritional and functional properties.

Conclusions
The main conclusion in our study with respect to rheological properties of dough made from wheat flour and Helianthus tuberosus flour was that the P2 sample (5 g Helianthus tuberosus tuber flour added to 95 g wheat flour) retained suitable rheological parameters for obtaining bakery products of a good quality. This study provides useful information toward using Helianthus tuberosus L. flour as source of functional ingredients in the bakery industry; in particular, this flour can be
regarded as a valuable “Source of fibre” (more than 3 g/100 g), according to Regulation 1924/2006 (García Herrera et al., 2010).

**Key Words:** bakery functional ingredient, inulin, mineral.

**PP09**

**Effect of structure forming additives on the of water bond forms in gluten-free macaroni dough made from corn flour**

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**BRIEF INTRODUCTION**

The water bond forms in dough for gluten-free macaroni products made from corn fine meal flour with addition of different structure forming additives have been investigated. Analysis suggests the correlation between the amount of unbound and bound moisture, rheological properties, both kinetics of drying process and quality of macaroni products. The effect of structure forming ingredients, namely xanthan, carboximethylcellulose (CMC), gelatin and dry egg white on the water bond forms in corn dough was also investigated. Research shows that structure forming ingredients should be added in colloidal solutions.

**BODY OF TEXT**

Study of the forms of moisture were carried out by means of "Derivatograph Q-1000" differential-thermal analysis unit for temperatures ranging from 0 - 200 °C. The samples weighing 1 g were heated at 1.25 °C min⁻¹. As shown by our study the amount of moisture of macro and microcapillaries is prevalent in corn dough, 39.40 – 54.69 % of the overall mass of water. The amount of this moisture bond is higher in dough with gelatin and dry egg white. Amount of osmotically bound moisture in the dough is 18.75-28.04 % of the total mass of water, where most of it is in the dough with xanthan and dry egg white. Amount of adsorbed bound moisture in dough samples made from corn flour is 18,49-23,13 % of the total mass of water, and most of it is in the dough with structure forming ingredients of carbohydrate origin. Research shows correlation between moisture bond forms in the dough with different structure forming ingredients and speed of drying of macaroni products. As can be clearly seen that increasing of amount of moisture of macro and micro capillaries and lower content of adsorbed bound moisture results increasing of speed of drying of corn macaroni products.

**CONCLUSION**

Speed of drying of macaroni products made from corn flour with different structure forming ingredients (till first critical moisture (W1 cr)) is higher that contribute to apply harder drying regimes in first period. It is more evident for samples with xanthan, gelatin and dry egg white, which have higher speed of drying compared to other samples made
from corn flour and significantly exceeds for samples from the wheat flour. $W_1^{cr}$ for corn macaroni samples is 28.70-23.40 % that is less than in the wheat products.

**Keywords:** gluten-free macaroni products, forms of water bonds, structure forming additives, speed of drying.

**PP10**

**Safety of spices used in raw-smoked sausage processing**

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Microbiological safety of spices is important factor in the production of fermented meat products. The low water activity of spices is not a preventing factor for the survival of the mycelial fungi of potential producers of mycotoxins. The contamination of spices used in the production of sausages and smoked sausages by micromycetes-potential producers of mycotoxins (aflatoxin B1 and ochratoxin A) was monitored.

**Material and methods**

Mycological analysis of 35 samples of red and 40 samples of black pepper was carried out by dilution and direct plating methods. Water activity was also determined.

**Results**

The results of mycological analysis of red pepper with water activity less than 0.4, have shown their high contamination by Aspergillus flavus. More than $10^2$ cfu/g yeasts have been detected at water activity level of 0.520. Inhibition of the growth of A. flavus by yeasts was noticed. It has been experimentally shown that the use of red pepper with a high level of contamination by filamentous fungi and yeasts significantly reduces the shelf life of the product at the storage temperature of 15-18°C. There was no any deterioration of microbiological quality and safety at 4-5°C storage temperatures of experimental samples. The following species were dominated in the black pepper samples. The growth of Penicillium spp. was occurred during storage of the experimental samples of smoked sausage at 15-18°C, with the water activity of 0.78.

Study the toxigenic potential of A. flavus showed the presence of aflatoxin A in 70% of the studied strains, in an amount up to 300 μg / 100 ml. Ochratoxin in an amount up to 20 μg / 100 ml was found in P. viridicatum. In experimental samples of smoked sausage artificially inoculated with toxigenic strains, trace amounts of aflatoxin B1 were found.

**Key Words:** spices, fungi, water activity, aflatoxin B1, shelf life.
Macro and trace elements in barley (*Hordeum Vulgare L.*) breed in Latvia

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Abstract
Cereals, including barley, are important food source for human consumption. Cereal products provide significant amounts of most nutrients including relevant quantities of minerals and are an important part of a balanced diet. Macro element and trace element concentrations were determined in 48 barley samples (4 genotypes cultivated both organically and conventionally (with different N supply) and collected in the time period from 2011 to 2013). Thirteen macro elements and trace elements were detected. Five elements (Cd, Cr, Al, Pb, Ni) were detected by electrothermal atomic absorption spectrometry with Zeeman background correction (ETAAS; Perkin Elmer AAnalyst 600, Shelton, USA) after dry digestion, and eight elements (K, Na, Zn, Cu, Ca, Mg, Mn, Fe) were detected by flame atomic absorption spectrometry (FAAS; Perkin Elmer AAnalyst 800, Shelton, USA). The concentration of Cd, Pb, Cr, Ni, Cu, Zn, Al, K and Na in barley grains between the study years varied statistically significant (Kruskal-Wallis test, p<0.001). The concentration of Ca, Mn, Mg and Fe did not differ statistically significant between the study years (Kruskal-Wallis test: p>0.06). Consumption of products from Latvian barley is safe: mean concentrations of potentially hazardous elements Cd, Pb, Cr were 0.0092, 0.023 and 0.205 mg kg⁻¹ respectively, and mean concentrations of possibly harmful elements Ni, Cu, Zn, Al were 0.38, 3.6, 24.9 and 3.14 mg kg⁻¹ respectively. Barley products can contribute in the consumption of necessary micro and trace elements, especially in case of Mn, Mg, Fe and Zn (if 130 g of barley products are consumed per day, it can cover 53, 43, 27-49 and 23% from recommendations of Latvian Ministry of Health respectively).

Key Words: barley, macro elements, trace elements, statistical indicators, risk assessment
Cereals breadmaking potential evaluated by different rheological devices

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Brief introduction
Development of new cereal based food products needs characterization of the dough rheological properties by application of rapid method with a small amount of flour. Thus, the aim of this study was to determine the quality of the flour of different cereals using Farinograph (10 g sample) as a standard method and micro-doughLAB (4 g sample) as a novel device.

Materials and Methods
Wheat, barley, oat, triticale, durum, rye, sorghum, and millet flours were used in this study. The flour samples were analyzed using standard protocol of Farinograph (63 rpm) and two micro-doughLAB protocols (low speed kneading dough mode 63 rpm and high-speed kneading dough mode 120 rpm).

Results
Dough quality parameters obtained by Farinograph and slow mode of micro-doughLAB had different values, but trends and graph appearance were identical. However, since the target consistencies in these methods are different, it is possible to obtain different results for the same flour. For example, sorghum flour could not form dough by Farinograph protocol, but it formed dough by both micro-doughLAB protocols. As it was expected, quality indicators determined by MicrodoughLAB high-speed mode are different from indicator values obtained by both slow regimes (Farinograph and MicrodoughLAB 63 rpm). These results better showed differences among different cereals and their quality indicators, such as water absorption, dough development time, dough stability and dough softening. In addition, high-speed mode enables kneading of dough from flours which could not form dough using low-speed kneading mode. Dough prepared from some flours could not reach the target consistency in any of three applied kneading regimes. Farinograph and micro-doughLAB curves of millet flour indicated that millet flour can form dough, but the target consistency of the dough cannot be achieved.

Conclusions
The application of different rheological devices for the assessment of flour quality enables easier development of new cereal based food products.

Key Words: cereals, dough quality, micro-doughLAB, Farinograph.
Low carbohydrate sponge cake creation

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Brief Introduction
Sucrose is the important raw material in sponge cake production and together with wheat flour presents the main source of carbohydrates. Replacement of sucrose in cake formulation is challenging task due to sucrose functionality in forming dough viscosity and flavour, colour and texture of final products. Most of research studies have been focused on partial sugar substitution by polyols and artificial sweeteners in developing of low carbohydrate sponge cake. The aim of this work was creation sponge cake of high quality by total sucrose and partially wheat flour substitution in order to achieve the maximum carbohydrate content reduction.

Materials and Methods
Wheat flour, sucrose, eggs, and dough raising agents were used for production conventional sponge cake, while in low carbohydrate sponge cake formulation sucrose was totally replaced by xylitol and part of wheat flour was substituted by hydroxypropyl methylcellulose. The standard production process which was applied for control cake was modified for low carbohydrate cake production. Modification was necessary due to hydrocolloid needed premix with egg yolks and part of water before addition in foam produced from egg white and xylitol. The quality of end product was evaluated by digital chromameter MINOLTA, CR-400, (Konika Minolta), Texture analyzer - TA.XTPlus (Stable Micro Systems, Ltd), Stable Micro Systems’ VolScan Profiler and sensory expert panel.

Results
Compared to control sponge cake, the low carbohydrate sponge cake had higher specific volume, softness and similar colour, better sensory properties and longer shelf life. Moreover, carbohydrate content of created low carbohydrate sponge cake was only 15.0%.

CONCLUSIONS: Polyols and hydrocolloids present successful combination in reducing carbohydrate content in wheat flour based confectionary products.

Key Words: low carbohydrate, sponge cake, polyols, hydrocolloids.
Antifungal metabolite production by newly lactic acid bacteria using rice polish as substrate

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The aim of the study was to analyze the potential of brown rice polishing waste as substrate for antifungal metabolite production by newly lactic acid bacteria (LAB) isolated from cereal based sourdoughs. The Lactobacillus plantarum, L. brevis, L. paracasei, L. uvarum, L. farraginis, Pediococcus pentosaceus and P. acidilactici strains were used for the experiment. The antifungal activity of the strains was evaluated against variety of agronomical important filamentous fungi as Fusarium graminearum, F. culmorum, F. nivale measuring the inhibition zones. The rice polish fermentation was carried out in a single step without growth supplementation at solid state fermentation (SSF) conditions. The results confirmed that rice polish is suitable substrate for the production of antifungal metabolites by selected LAB strains. The P. acidilactici LUHS173 and L. brevis strains LUHS100 and LUHS140, and P. pentosaceus LUHS22 showed the highest antifungal activity against F. graminearum. However, metabolites of tested LAB showed lower fungicidal activities against the F. culmorum. Taken together, the results of this study indicate that certain metabolites would be suitable candidates for use as antifungal agents.

Key Words: rice polish, lactic acid bacteria, Fusarium, antifungal activity, inhibition zones.
Traditional fermented dairy product: Kurut

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Abstract
Kurut is produced in countries such as Turkey, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, Mongolia, Iran, Afghanistan, Azerbaijan and Armenia where Turks live or those countries which are influenced by Turkish culture. Kurut is a traditional fermented dairy product which is generally obtained by drying of yogurt or ayran after filtration, adding salt and forming. Due to the lack of standard production techniques and different storage conditions in each country, the physicochemical, sensory and microbiological properties of Kurut differ. Kurut is highly nutritious dairy product because its water content is reduced and its dry matter is increased. Therewithal in the case of well-preservation its shelf life is not shorter than a few years. Despite Kurut is well known and it is consumed in the Turk culture, to the best of authors’ knowledge a research which studies the Kurut from different countries has not been reported yet in the literature. In this research, the physicochemical and microbiological properties of kurut were compiled.

Key Words: Kurut; Production Techniques, Physicochemical Properties, Microbiological Properties
Cereal based fermented dairy beverage of West Africa: Déguê

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Brief introduction
Fermented foods contain beneficial probiotics which are highly potent detoxifiers, capable of drawing out a wide range of toxins and heavy metals, digestive enzymes, and health essential nutrients. Traditional fermented cereal-based foods are produced in small scale production units in urban areas in African countries. Like other parts of the globe, dairy products are an integral part of food habits of African people. The most consumed dairy products in West-Africa are cow’s milk cheese, sour milk, fresh milk, concentrated milk, toffee, yoghurt and Déguê.

Body of Text
Déguê is a fermented drink made from milk and cereals flour. Déguê is a very smooth and delicious dessert which quickly conquered main of West-African countries such as Senegal, Mali, Benin Republic and Guinea. Formerly, traditionally made Déguê is nowadays an agribusiness product manufacture in a semi-industrial manner throughout the whole west-African region. The manufacturing of Déguê has three different steps. First, the smooth yoghurt is manufactured with fresh cow’s milk. Secondly, sorghum, maize, or millet’s couscous (pellets) is made and finally both product is mixed. To this product sugar is added and flavours (lemongrass flavour or artificial flavour of banana, strawberry, pawpaw, mango, guava, etc.) depending on the taste and sensibility of everyone. Déguê can be drink fresh with ice cubes or storage in refrigerator for many days.

Conclusions
Until recently, very limited scientific studies have been done on this product in international literature, which has begun to be introduced in the agro-food industry in the world. It is necessary that detailed scientific studies should be carried out on the Déguê in order to promote the introduction of traditional dairy product to the world, increase its use in diets as a healthy and a highly nutritious product and improve its nutritional, microbiological and organoleptic quality. This paper is aimed to describe characteristic properties, ingredients, and its traditional/technological processing methods of Déguê.

Key Words: Déguê, millet’s couscous, yoghurt, fermented food.
The biotechnological utilization facilities of dairy industry waste: Whey

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Brief introduction
Whey is a by-product that is obtained from cheese production and it has an important risk in terms of environmental pollution since it is dairy waste. High organic load of waste whey, especially its lactose content is the major problem for dairy industry and the requirement of waste treatment grows every day.

Body of text
Many alternative methods have been developing for reducing environmental damages and evaluating waste whey to make valuable products. The purpose of this review is to present biotechnological methods for treatment and utilization of waste whey, for reducing environmental pollution and obtaining valuable chemical compounds. Biotechnological processes are generally based on lactose fermentation into different products. In this review, general information about dairy by products and their utilization methods, some chemical properties of whey, the situation of whey as a waste, biotechnological evaluation facilities such as synthesis of lactose-derived nutraceuticals, biogas production, hydrogen production, organic acid production like lactic acid and citric acid, alcohol production like ethanol, biobutanol, 1,3-propanediol and 2,3-butanediol, single cell protein (biomass) production, single cell oil production, bioplastic production, biosurfactants, metal recovery and bioelectricity production are given.

Conclusions
Waste treatment has a critical importance in human life since ecological reasons. Environmental pollution threatens life of every living thing. Therefore, waste treatment is applied for saving ecological equilibrium. Whey has very large amount in dairy wastes and its evaluation is compulsory. It is possible to use it in the fields of health, pharmaceuticals, food, plastics, and fuels. There are many biotechnological methods for this purpose. However, it is considered that further researches about potential of whey are required to have more efficient and economic processes. The researches especially about synthesis of nutraceuticals, citric acid, single cell oil, metal recovery and bioelectricity production are limited and to develop new processing techniques further researches about these subjects are needed.

Key Words: Biotechnology, utilization, waste, whey, lactose fermentation.
Fresh cheese biopreservation using bacteriocins producing lactic acid bacteria

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Introduction
The search and research of bacteriocin(s) producing lactic acid bacteria (LAB) has become popular at the end of 2000. The usage of bacteriocin(s) (in pure form or using bacteriocin(s) producing LAB) as natural antimicrobial compounds are promising technology in food industry, medicine and marine environmental research. The application of bacteriocin(s) producing LAB may be quite wide: from biopreservation of milk, meat, poultry, vegetable and fruit products to incorporation it in the product packaging. The aim of the present study was to evaluate a few bacteriocin producing LAB as fresh cheese biopreservation agents.

Methods
Fresh cheese was produced using three Lactococcus lactis strains producing bacteriocin, isolated from raw goat milk, and reference L. lactis (ATCC11454) bacteria producing nisin. Before making cheese raw milk was tested for total bacteria, coliform bacteria, E. coli, Listeria monocytogenes, Salmonella and staphylococci. Microbiological evaluation of produced cheese was performed after 0h, 24h, 48h, 72h and 4 days. The changes of volatile compounds in fresh cheese were evaluated immediately after production and after 4 days using solid phase microextraction (SPME) coupled with GC-MS.

Results
There were not detected pathogenic bacteria, while other bacteria did not exceed standard requirements in raw milk. Salmonella, E. coli, Listeria and coliform bacteria were not detected during the storage of fresh cheese. Amount of LAB remain constant during the whole storage period. Both qualitative and quantitative changes of volatile compounds were observed by SPME-GC-MS.

Conclusions
Bacteriocin producing L. lactis bacteria may be used for fresh cheese biopreservation.

Key Words: bacteriocin, lactic acid bacteria, volatile compounds, biopreservation, fresh cheese.

Acknowledgements
The study was funded by the Research Council of Lithuania (BIOLACTIS, Grant No. MIP-063/2015).
Purification of hydrophobins from Aspergillus Niger

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Hydrophobins are a large class of low-molecular structural fungal proteins, which have extremely high surface activity. Hydrophobins even at low concentrations in the solution can create highly stable foams and emulsions. The effect of foaming caused by hydrophobins is much higher than that of all known natural foam stabilizers used in the food industry. The taste and consistency of the emulsions formed by hydrophobins are resembling food fats. Using these emulsions is possible to replace up to 50% of the fat basis in food. The use of hydrophobins in the food industry will allow development of fundamentally new textures, reducing calories and increasing functionality of food products.

The biomass of Aspergillus niger was used as a source for the extraction of hydrophobins. This fungus is an industrial producer of citric acid, and its biomass is a waste of production. The proposed method of obtaining of two valuable products as a result of a single fermentation will significantly increase the efficiency of production of both substances.

For the extraction of hydrophobins, 1% SDS (sodium dodecyl sulphate) in 100mM Tris-HCl buffer (pH 9) was used. After extraction, mycelium was separated by filtration. SDS was removed from the extract with a 2M KCl. After that, the extract was foamed using an aerator and the foam was treated with 98% ethanol solution so that the concentration of ethanol in the resulting solution was 60% of the total volume. The residue was separated from the solution with centrifugation. Ethanol was removed by evaporation and hydrophobine solution was purified from low-molecular impurities by exclusion chromatography, using Sephadex-G25.

As a result, hydrophobins were completely purified from SDS and low-molecular impurities.

Key Words: Hydrophobins, Fungi, Surfactant, Emulgator.
Evaluation of quality of jams produced from different colored carrot roots

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According to the European Union directive, jam is a mixture, brought to a suitable gelled consistency, of sugars, the pulp and/or purée of one or more kinds of fruit and water. To include several unusual kinds of the jams made in the EU, definition of "fruit" was expanded to raw material that are not culinary treated as fruits, such as pumpkin, cucumber, tomato or carrot. The aim of this work was to evaluate of quality of the jams produced from pulps of different colored carrot roots. The jams were prepared with five carrot varieties: white, yellow, orange, red and purple. Also white sugar, water, citric acid and low acylated citrus pectin were used for the jams production. The samples were prepared with 35, 40 and 45% of carrots pulp content in final product and analyzed for pH, soluble solids, total phenolic content, antioxidant capacity, colour parameters and sensory features. All obtained samples showed similar pH (about 3.5) and soluble solids (about 30%), while differences in other parameters were observed. The jams prepared with purple carrot pulp had the highest total phenolic content, reached from about 820 to 1000 mg per 100 g. The jams prepared with white, yellow and orange carrot pulp possessed only from 70 to 100 mg phenolic compounds per 100 g. The total phenolic content of red carrot jams was about 200 mg/100g. Antioxidant capacity of jams prepared with purple carrot pulp was about 10 μmol Trolox per 1 g. Also in sensory evaluation, the purple carrot jams had the highest notes. The high obtained values in case of purple carrot suggest that this vegetable could be a good raw material for jam production.

Key Words: jam, carrot, quality, bioactive compounds, phenolics
Chokeberry anthocyanin stability during heating

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Colour is one of crucial quality properties of food, therefore, minimisation of pigment losses during processing and storage is very important. The red colour of chokeberry juice is due to the occurrence of cyanidin glucosides. The anthocyanins are seriously affected by the heat treatment, which is the most widely used during processing and preservation of food products. The aim of this study was to compare the chokeberry anthocyanin stability during heating in presence of different sweeteners. Chokeberry juice, sucrose, inulin and stewioside were used in this work. The degradation of total monomeric anthocyanins and colour parameters changes of chokeberry juice were studied during heating at 90°C for 120 min. It was found that heating led to changes of samples colour. In all samples values of L* and a* decreased, while ΔE values increased during heating. Anthocyanin degradation fitted to a zero, as well as, first order kinetics reaction model. Half live of chokeberry anthocyanin degradation at 90°C was about 180 minutes for examined sweeteners solutions. Information provided by this research could be helpful to decide compositions and processing of chokeberry antocyanin containing food.

Key Words: chokeberry, anthocyanin, sweeteners, colour, degradation kinetics.
**PP22**

**Food safety practices, levels of knowledge and problems of of dairy companies: the case of Burdur province**

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**Brief Introduction**

Burdur is one of the major cities in Turkey in terms of the dairy industry. It has significant potential both in terms of dairy farming and processing industry. In Burdur produces 258,000 tons of milk annually. There are 13 milk processing plants in the province. The total capacity of these enterprises 184 807 tons per year, but capacity use is only 69,480 tons per year. Although the province’s milk processing capacity is 68.44 %, only 26.9% of the milk produced in is traded in the province; 73.1% is processed outside in Burdur.

**Materials and methods**

In this study, we examine general characteristics of the 13 operating dairies and 50 milk collection centers in the Burdur province. We used questionnaires to determine the problems and solutions concerning food safety, the level of information on food safety managers, resources and current practices.

**Results**

We surveyed manager and employee concerning their knowledge of food security, sources of information, and problems and solutions. This study show that;

- 87.5 % of business manager had more than 10 years,
- The managers did not have adequate knowledge about food safety regulation,
- A total of 76.9%of managers had received a certificate from a certification institute,
- The most important problem that plants encountered was the high cost of production, followed by technological inadequacy and undercapitalization.

**Key Words**: Food safety, level of knowledge, problems and solutions.

*This study was supported by Mehmet Akif Ersoy University Scientific Research Projects Commission (Project No: 163-Nap-2013).
Long-life yogurt types in Turkey

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Brief Introduction
Fermentation is one of the oldest and most economical methods of producing and preserving food. There are many long-life yogurt types in many regions, especially the rural areas, of Turkey and other countries.

Body Text
Long-life yogurt types are produced by decreasing the normal amount of water in yogurt using various methods. Methods such as salted, cooked, elimination of whey from yogurt and increasing solid, heating and precaution contact with air when preventing is necessary in order to make it strong. These methods have created different traditional yogurt types such as Concentrated yogurt, Winter/salted yogurt, Tulum yogurt and Kurut.

Concentrated yogurt is the name for traditional concentrated yogurt (torba-süzme yogurt) in Turkey. Salted yoghurt is a traditional goat milk product produced in Antakya province (Antiocha) in the Mediterranean part of Turkey and known as “yogurt cheese” or “winter yogurt” due to the high dry matter content and long shelf life. Kurut is a type of dried yoghurt which has a long self life. It is usually produce in the South-Eastern region of Turkey. Tulum or Tuluk yogur, milk were kept in the skin, is fermented milk products. Due to high dry matter, it is a viscous product.

Conclusion
This study’s research spanned thousands of kilometers in Anatolia and aimed to examine the long-life yogurt types in Anatolia, which are consumed in every region of Turkey as a remedy to diseases, in soups, as ayran to have a cool treat and have become irreplaceable items on our nutritions.
Camel milk and human health

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Brief Introduction
Camel milk is known in Asia and Africa for 5000 years for its benefits for human health. Its milk has been used as medicines for diverse ailments since ancient times. In general the average amount of components of camel milk is protein 3.4%; fat 3.5%; lactose 4.4%; ash 0.79%, while water covers 87%.

Body of Text
Camel milk is rich source of various minerals like Na, K, Ca, P Mg Fe, Zn, Cu are present in camel milk. High in natural vitamin C is 3-5 times higher than in cow’s milk. Health benefit potentials of camel milk are obtained through a number of bioactive components in camel milk.

- Contains unsaturated fatty acids, which are healthy fats with a higher percentage than exists in cow’s milk.
- Camel milk helps to reduce atherosclerosis, heart attacks, and strokes,
- Camel milk modulates the immune system
- It has a positive effect on Diabetes II patients.
- Positive benefits to patients with hepatitis, autoimmune diseases, Crone’s disease, Autism and Rheumatism.
- Lactose intolerance might digest camel milk easier than cow’s milk.
- The high iron content found in camel milk makes it ideal for preventing anemia.

Conclusion
Camel milk plays very important role in the treatment of many serious diseases in many parts of the word, because it is rich in numerous bioactive substances. An increasing number of scientific publications focus on the medicinal potency of camel milk with its special components. These potential health benefits of camel milk should be further study.

Key Words: camel milk, benefits, health, medicinal potency
Aroma and antioxidant properties of oregano (*Origanum vulgare* L.) extracts obtained by conventional and supercritical carbon dioxide fractionation techniques

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Oregano (*Origanum vulgare*) is flowering herb, widely cultivated in Europe, Asia, North and South America, with wide applications in food, cosmetics, nutraceutical and pharmaceutical industries. The aim of this study was to apply hydrodistillation, Soxhlet and supercritical carbon dioxide (SFE-CO₂) extractions for valuable aroma compounds and antioxidants recovery from oregano, grown in Lithuania. Essential oils after hydrodistillation from ground plant material amounted 0.13-0.21 ml/g 100 DW. According to the volatile compound composition, oregano was assigned to sabinene/germacrene D chemotype (8.1-33.2% of sabinene and 6.8-12.3% of germacrene D). After SFE-CO₂ (25-70°C, 27.5-45 MPa, 210 min) 1.3-2.3 g/100 g DW of non-polar constituents were obtained from oregano. 5% EtOH modifier resulted in ~1.2-1.9-fold higher SFE-CO₂ yields, similar to those for n-hexane Soxhlet extraction (2.4-3.3 g/100 g DW). The antioxidant potential of water-soluble fraction after hydrodistillation and non-polar extracts after Soxhlet and SFE-CO₂ was evaluated measuring total phenolic content (26-377 mg GAE/g) and radical scavenging properties (TEAC<sub>DPPH</sub>=6-481 mg TE/g; TEAC<sub>ABTS</sub>=16-940 TEAC<sub>ORAC</sub>=125-2082 mg TE/g). Several compounds with well-reported antioxidant properties (e.g squalene) were identified in SFE-CO₂ extracts. Nevertheless, considerable portion of antioxidants remained in *O. vulgare* solid residues (TPC=75-158 mg GAE/g; TEAC<sub>DPPH</sub>=80-251 mg TE/g; TEAC<sub>ABTS</sub>=185-479 mg TE/g; TEAC<sub>ORAC</sub>=299-750 mg TE/g) and could be further recovered applying pressurized liquid extraction (PLE) with different polarity food-grade solvents.

Key Words: Origanum vulgare, extraction, essential oils, antioxidant activity.
Vegetables powders performance in gluten-free pasta production

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The purpose of the current research was to investigate dry beet, pumpkin and cabbage stalk powders application in gluten-free pasta production. Current investigation has been supported by the National research programme AgroBioRes (2014-2017). As a control sample gluten-free pasta made from rice flour was used. The following quality parameters of vegetables powders and pasta using standard methods were tested: carotene, dietary fiber and protein content, pasta texture, water absorption, swelling properties, cooking time, colour and degree of liking. One screw extruder was used for pasta making with screw rotation speed 60 rpm. After extrusion pasta was dried for 3.0±0.5 h at 50±5°C in a rotary-convective oven till moisture content 8±1% and stored in the sealed polyethylene pouches till quality analysis. Result of pasta cooking test demonstrate, that the optimal cabbage stalk powder additive in flour mixture (rice flour and vegetable powder) should be 5%, but pumpkin and beet pomace powder – 10%. Experimentally it was determined, that pasta extrusion temperatures were: rice / pumpkin pomace: 107 : 109 : 112 °C, rice / beet pomace: 105 : 107 : 110 °C and rice / cabbage stalk powder: 105: 107 : 110 °C. Pasta made with vegetables powders additive has lower water absorption, protein content and higher dietary fiber content; they were more fragile and darker in comparison with control gluten-free pasta sample. However, pasta with beet root pomace powder additive has pronounced water binding capacity; however, pasta with cabbage stalk powder additive was not so fragile but with higher dietary fiber content. Results of sensory evaluation by using hedonic scale demonstrate that the highest degree of liking was obtained for pasta with pumpkin pomace powder additive – 7.15, lower – for pasta with cabbage stalk powder additive – 6.38 in comparison with controls pasta– 5.77.
Encapsulation of volatile oil by using an alginate coating method

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Abstract

Essential oils (EO’s) have a variety of practical applications, such as making cosmetics fragrant and protecting sensitive ingredients against oxidative processes in the food industry. However, the volatile nature of EO’s reduces their shelf life and effectiveness when applied. This study investigates the encapsulation of EO’s in alginate capsules as a means of controlling the fast release of their volatile constituents. The development of encapsulation methods is seen as a critical technology to enable the long term stability and deployment of unstable substances. Encapsulation is a relatively used for protection, stabilization, and slow release of food ingredients. This research reviewed the technique for preparing alginate capsules to encapsulate volatile oils and their application in flavoring food. The preparation of alginate capsules with oil-cores was obtained by placing the mixture of one or more EO’s in 1.0% solution of sodium alginate in a solution of 2% CaCl₂. As a result, we obtained capsules with a shell that allows us to keep the benefits of volatile oil and extend their shelf life.

Key Words: essential oils, volatile oil, encapsulation, food industry, alginate.
Milk-clotting activity of Funalia Trogii

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Brief Introduction
The process of cheese making is known from ancient times. The most important point of cheese production is the selection of the milk-clotting enzyme. Traditionally rennet was used for cheese production. But in recent decades, milk-clotting enzymes of microbial origin have been used. However, most of them have a high total proteolytic activity, causing the bitterness of the cheeses and reduction of yield. Submerge cultures of fungi could be a promising source of milk-clotting enzymes.

Materials and Methods
The object of the study was the culture of the fungus Funalia trogii. It was submerged cultured on glucose-peptone medium. After cultivation, the native liquid solution was separated from the biomass by filtration. Finally, enzyme was purified and concentrated using the ultrafiltration method. In the native solution and ultrafiltrate, the level of milk-clotting (MCA) and total proteolytic (PA) activities, as well as the protein concentration, were determined.

Results
Obtained enzyme preparation was compared with commercial preparation of a rennet enzyme (Table 1).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Specific milk-clotting activity, E/mg</th>
<th>Specific proteolytic activity, E/mg</th>
<th>MCA/PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native liquid</td>
<td>51.19±4.67</td>
<td>0.064±0.002</td>
<td>808.59±19.83</td>
</tr>
<tr>
<td>Ultrafiltrate</td>
<td>94.19±4.67</td>
<td>0.11±0.02</td>
<td>823.64±3.64</td>
</tr>
<tr>
<td>Standard rennet preparation GOST 9225-84</td>
<td>72.8</td>
<td>0.082</td>
<td>887</td>
</tr>
</tbody>
</table>

According to the technological requirements for milk-clotting preparations intended for high-quality cheeses, the ratio of MCA:PA should exceed 800:1. The obtained enzyme preparation has a high level of milk-clotting activity and sufficient ratio of MCA/PA.

Conclusions
The milk-clotting enzyme preparation obtained from Funalia trogii culture is not inferior to the commercial rennet preparation by the level of enzymatic activity.

Key Words: milk-clotting enzymes, fungi, submerge culture, rennet.
Total phenolic content in rye - oat based crisps with plant by - product addition

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Abstract
Vegetable processing in food industry results in significant amount of by-products – peel, mark, bark, seeds still rich in bioactive compounds promoting health benefits. Apple, carrot and pumpkin peel, mark dried, and grinded ingredients may be used as functional ingredients in the production of ready to eat snacks with extrusion technologies. The aim of this study is to investigate the stability of total phenolic, antioxidant activity after high temperature short time (HTST) extrusion cooking of cereal based recipes with addition of apple, carrot, and pumpkin by-product flour (BPF) obtained after juice extraction, dried and grinded. Raw materials for crispbread production were rye flour, oat flour (80% and 20% respectively) with addition of dried by-product powder in different amount (5%, 10%, 15% and 20%). Extrusion process was done with a co-rotating twin- screw extruder. Total phenolic content (TPC) was determined using the Folin Ciocalteu method. Antioxidant activity was determined with free radical 2, 2-diphenyl-1-picrylhydrazyl (DPPH) antioxidant scavenging activity using a modified colorimetric method. Comparing different raw ingredients was observed that the TPC of the apple by-product flour was significantly higher (p < 0.05) than in carrot and pumpkin flour. TPC in ready to eat snacks was 37.73±5.96 mg GAEg-1 DW in control sample and DPPH antioxidant activity was 0.20±0.07 mg TEg-1 DW. Addition of apple BPF increased TPC in snacks to 193.32±8.37 mg GAEg-1 DW, carrot BPF 171.36±6.97 and pumpkin BPF to 195.09±4.68 mg GAEg-1 DW. Antioxidant activity of control sample was 0.20±0.07 mg TEg-1 DW but in samples with addition of 20% apple by-products, it was significantly higher reaching 0.88±0.06 TE g -1 DW, 20 % addition of pumpkin BPF increased antioxidant activity to 0.97±0.07 TE g -1 DW.

Key Words: antioxidants, by-products, extrusion, oats, phenolic, rye.
Helicobacter pylori inhibition by natural antimicrobial compounds

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Abstract

Helicobacter pylori is known as a bacterial pathogen associated with acute and chronic gastritis, peptic ulcer and gastric mucosa-associated lymphoid tissue lymphoma and 60% of adults and 30% of children are infected in worldwide approximately. H. pylori is resistant to stomach acid because it is protected by mucosal cells and its urease activity, one of the most important characteristic features. Although H. pylori treatment has improved significantly over the last 20 years, the success of treatments have been compromised by the increasing of antibiotic resistance. In particular, due to the increased antibiotic resistance of pathogenic bacteria, numerous medical and scientific centers around the world call this a serious crisis. In recent years, studies have focused on alternative medicine practices because of side effects on patients and the ability of the infection to recur besides antibiotic resistance.

The thought of plants to cure diseases dates back to the beginning of humanity. Since ancient times, medicinal herbs or plant mixtures have been used as ointment in open wound, consumed by boiling water or directly. Some studies have shown that medicinal plants, herbs and fruit extracts have antimicrobial effect to H. pylori. Thus, awareness of the community on the use of food containing natural antimicrobial components with therapeutic effects compared to synthetic drugs has increased.

This study extensively examines the mechanisms of action limiting the growth of H. pylori by natural antimicrobial components, their application methods and the successful results obtained.

Key Words: H. pylori, natural antimicrobial compounds, medicinal herbs.
High-value product development through the utilization of by-products from Japanese quince (*Chaenomeles japonica*)

Inta KRASNOVA, Dalija SEGLINA, Vitalijs RADENKOVS

Dried candied quince is one of the most popular processing products of Japanese quince (*Chaenomeles japonica*) in Latvia. In order to separate flesh of fruits from the core section together with seeds, different techniques are applied. Due to increased demand for plant-made food products as well as due to lack of innovation in food recycling, fruit and berry processing industries generate a significant amount of the waste, and this amount in the future is expected to increase. The objective of the present study was to investigate the chemical compounds of agro-industrial waste: core section with no seeds obtained after processing of the Japanese quince. The new knowledge towards the chemical composition of the agro-industrial waste will allow in the future using such material for novel and safe value-added food product development. The separation of the seeds from the core section was implemented by the sieving method. In this study the content of polyphenols and tannins as well as antioxidant activity was determined. The total amount of polyphenols in seed section of Japanese quince ranged from 3582 to 4679 mg GAE/100g FW, while total tannin from 3.18 to 4.02 mg 100 g. The antioxidant activity of extracts determined by the ABTS and DPPH was 31.7 - 35.4% and 24.3 - 28.6%, respectively. The results of this study showed that core section of Japanese quince is a valuable source of polyphenols and tannins which could be utilized for value-added products development with no additional costs.

**Key Words:** *Chaenomeles japonica*, polyphenols, tannins, antiradical activity.
Influence of brewing method to phenolic composition in specialty coffees

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Brief Introduction
Recently specialty coffees become more popular and consumers select them due to reliability of origin, taste and aroma nuances. But also composition of biologically active compounds is essential and the aim of current research was to evaluate the influence of brewing method to phenolic composition in specialty coffees.

Materials and Methods
Seven speciality coffees were selected and for comparison also three commercial coffees were analysed. Brewing of coffee was performed using three methods: filtration, French press and espresso technique. For all samples total phenolic content were determined spectrophotometrically, content of individual phenolic compounds by HPLC and antioxidant activity by DPPH and ABTS assay spectrophotometrically. For uniting of samples with similar composition hierarchical cluster analysis were performed. Correlation analysis was used to determine relationship between phenolic content and antioxidant activity.

Results
The highest content of total phenolic compounds were in specialty coffee sample S1 but comparing both groups - specialty and commercial coffees no significant differences were observed and clustering results showed that very important factor is country of origin. Chlorogenic acid is the main phenolic compound in coffee and the highest content in espresso coffee samples were determined. Comparing commercial and specialty coffees the highest content in two specialty coffees were detected. Content of caffeic acid and ferulic acid vary and its content in specialty coffee samples is significantly higher. The highest correlation between antioxidant activity and chlorogenic acid and catechin was determined.

Conclusions
Phenolic composition mainly differ between samples and comparing both analyzed groups no significant differences were detected. As the trend to use specialty coffees become more popular it is important to continue investigations about bioactive compounds.

Key Words: specialty coffee, brewing methods, chlorogenic acid, phenolic compounds.
Functional and nutritional properties of water soluble wheat protein fractions

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Wheat is one of the most important staple crops in the world growing in all continents. Due to its agronomic adaptability, nutritional value, and the ability of its flour to produce a variety of foods, wheat has become a major raw material in various food industries. Fractionation of wheat constituents into starch, gluten and other fractions has become an important and widely used biorefining process. During manufacturing of wheat starch and gluten, the rest of high added value fractions are often neglected and are being sold as low added value by-products. Whereas numerous research papers have revealed that some wheat fractions contain various valuable compounds, including rich in essential amino acids proteins, which may find beneficial applications in foods. Water soluble protein fractions, which are obtained during biorefining of wheat into starch and gluten, were the main objects for analysis of functional properties in this study. Nutritional and functional properties, including amino acid profiling by High Pressure Liquid Chromatography (HPLC), molecular weight distribution by HPLC coupled with Size Exclusion Chromatography (SEC) and by Capillary Electrophoresis (CE), main protein identification by High Resolution MS/MS, thermal stability by Capillary DSC and solubility measured at different pH regions were analyzed. Different proteins such as α-amylase, trypsin and xylanase inhibitors, globulins, peroxidases were identified. Analysis results showed that the fractions are rich in essential amino acids and therefore possessing high nutritional value, high thermal stability, and functional applicability. Considering the results obtained it may be concluded that water soluble wheat proteins may find wider applications, for developing new functional foods and nutraceuticals.

Key Words: Water soluble wheat proteins, Amino acid composition, High resolution MS/MS.
The role of volunteering in the educational management for food scientific research activities

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Brief Introduction
The volunteering is defined as an activity of public interest carried out on its own initiative by any individual for the benefit of others, without receiving any material reward. The universality of nutrition, always correlated with the state of health determines the opportunity of the populations educating towards voluntary involvement in scientific research and dissemination of food outcomes with more secure attitude and professional career prospects in this.

Materials and Methods
In the POLITEHNICA University Timisoara, for many years there has been practice of attracting students from bachelor and masters courses as volunteers in support of scientific research activities in various fields. The research team has focused in last 5 years in particular, a group of students who volunteered for food-related projects, as well as students who undergraduate bachelor and master courses in food-related specializations.
Were collected the data on the career followed by them at the end of the courses and the attitude manifested towards the extremely important nutritional education issue.

Results
From the data analysis, it was found that 72.06% of volunteer students followed their careers in the food sector, or they became promoters of healthy eating principles, compared with only 42.71% of graduated in the food specializations. Significantly, 87.80% of these were also among the volunteers.

Conclusions
The volunteer option is based more on curiosity, the spirit of usefulness in promoting healthy living principles than on profound study, carried out in a more rigorous, forced educational program.
The results of the study highlight the need to expand volunteer activities in organizing scientific research and promoting healthy nutrition principles, the importance of food safety, and responsible implementation of the rules for achieving these goals.

Key Words: volunteering, nutritional education, food, career, research.
Evaluation of amino acids, biogenic amines and peptides levels of raw and sous vide meat

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Sous vide foods are increasingly popular. They meet increasing consumer demand for convenient food offering a reduction in the time devoted to food preparation as well as freshness and high sensory quality. Most research on Sous vide cooking is dedicated to microbiological aspect, especially exploration time and temperature effect that can still guarantee safe products. Nutritional quality indicators revealing that Sous vide cooking are beneficial for the retention of bioactive compound such amino acids, biogenic amines or peptides have not been well studied.

The objectives of the study were to investigate the changes in concentration of amino acids, biogenic amines, and peptides along 12 days of storage at 4 °C in raw and Sous vide (cooked at 58 °C and T₀+ 17 hr) pork M. Longissimus. Analysis revealed that histidine and glutamic acid concentration significantly increased in cooked meat sample compared with those of fresh meat sample, but other amino acids level significantly decreased.

Results indicated that biogenic amines level in samples depended on treatment and samples’ storage time. Sous vide meat samples revealed 2 times higher histamine concentration at the starting point than those from fresh ones. The biogenic amine content increased both the Sous vide and fresh meat samples within the storage time. Peptide results indicated a peptide concentration decrease in Sous vide meat samples versus to fresh ones, revealing that small bioactive fractions might be found in meat juice that was expelled during Sous vide cooking out of meat matrix.

These findings suggest that the selection of Sous vide cooking process affects the chemical composition of meat samples that may have a positive effect on the formation of biologically active compounds (peptides) and can increase usefulness of biogenic amines as quality indicator.

Key Words: Sous vide, meat, amino acid, amines, peptides.
Characterization of black soybean coat as potential functional food ingredient for the soluble and insoluble phenolic compounds

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Recent researches have stated that soybeans with black, brown, green and yellow seed coats might differ in their antioxidant properties, indicating that this may alter their ability to affect health. The phenolic compounds, such as anthocyanins and proanthocyanidins, which exert a strong radical-scavenging activity, are stored in black soybean seed coat and can be associated with a reduction of cancer and cardiovascular disease risk, as well as with a prevention of diabetes and obesity. Black soybeans are widely used in traditional oriental medicine, unlike yellow soybeans which are used mostly as food.

The objective of this study was to characterize black soybean coat, as potential functional food ingredient, for the free soluble, soluble conjugated and insoluble bound phenolic compounds. The content of tannins, anthocyanins and proanthocyanidins was also determined, as well as profile of isoflavones and anthocyanins. In addition, the contribution of phenolic compounds to antioxidant capacity of black soybean seed coat was investigated.

Seed coat of black soybean is rich in phenolic compounds. The content of free soluble, soluble conjugated and insoluble bound phenolic compounds amounted 8453.5, 1363.4 and 4808.9 mg GAE/kg, respectively. The content of total anthocyanins was almost three times higher than in aronia and amounted to 11754.1 mg CGE/kg. Ten isoflavones (daidzein, genistein, glycitein, daidzin, genistin, glycitin, malonyldaidzin, malonyldaidzin, acetyldaidzin, acetylgenistin) and three anthocyanins (delfinidin-3-glucoside, cyaniding-3-glucoside, pelargonidin-3-glucoside) were found in soybean seed coat. These flavonoids are predominantly found in soluble form. Due to high phenolic index, the black seed coat from soybean genotype Black Tokio had a high ABTS•+ scavenging activity (394.61 mmol Trolox Eq/kg d.m.).

The results suggest that the black soybean seed coat could be a potential source of natural antioxidants that may play a crucial role in human health protection.

Key Words: black soybean, phenolic compounds, isoflavones, anthocyanins, antioxidant capacity.
Influence of extraction medium on phenolic antioxidants and natural pigments of red onion skin extracts

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The food industry produces significant quantities of onion wastes, making this ecological and economical issue necessary to investigate for possible utilization solutions. One of the solutions could be the usage of onion skin as a natural source of functional ingredients, since onions are rich in different groups of bioactive compounds which have shown potential health benefits. Among numerous bioactive compounds, in case of red onion skin there is a significant amount of anthocyanins. Red onion skin was used as raw material to produce phenolics- and natural pigment-rich extracts with antioxidant activity using ultrasound-assisted solid-liquid extraction (40 kHz, 1:40 (m/v)). The extraction medium was composed of water and ethanol in different ratio with/without addition of citric and acetic acids. The total phenolics, anthocyanins, flavonoids and flavan-3-ols contents of those extracts were determined by spectrophotometric methods. The antioxidant activity was determined by spectrophotometric (DPPH, FRAP and ABTS) and polarographic (HPMC) methods. The individual anthocyanins were determined by HPLC method. The colour of samples was measured before and after storage period of six months using chromameter. All extracts showed significant contents of total phenolics, flavonoids and flavan-3-ols up to 10567 mgGAE/L, 1409 mgQE/L, 631 mgCE/L, respectively. The cyanidin-3-glucoside was predominant individual anthocyanin in extracts. The highest antioxidant activity was determined in the extract with 50% v/v of ethanol. The highest colour stability was achieved in the extracts with addition of acids (1% v/v), independently which acid, citric or acetic, has been used. These results have shown that red onion skin as by-products of food processing could be used as a source of natural colorants and bioactive compounds. Applications of ultrasound in combination with solvents with high ethanol content showed promising results for the extraction of these compounds and their stabilization in longer periods.

Key Words: Red onion skin, Bioactive compounds, Antioxidant activity, Extraction medium, Colour.
Selecting appropriate Faba Bean var. minor varieties for breeding under Nordic environmental conditions

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The aim of experiments was to provide suitable faba bean var. minor varieties for further breeding on the basis of higher productivity and the physiological and genetic basis of plant growth and performance under Nordic environmental conditions.

Methods
A field experiment was carried out at the Estonian Crop Research Institute in 2015 and 2016. The faba bean var. minor varieties were: Bauska, Favel, Fuego, Gloria, Jõgeva, Lielplatones, Priekulu and Priekulu viltojas. The highest and more stable yield come from accessions Bauska and Priekulu. Flower initiation was shortest with accessions Jõgeva, Priekulu and Favel.

Results
Best accessions regarding flowering period were Favel and Fuego. Full ripening period was shortest with accessions Favel and Jõgeva. The incidence of chocolate spot and rust was in the low to middle level. Susceptibility to chocolate spot was not statistically different in 2015, while in 2016 this disease was present 10-22%, being highest in accessions Favel and Priekulu viltojas. Other diseases were present at very low level or totally absent in both years. Branching from basal nodes was highest with accessions Favel and Gloria. Seeds per pod was highest with accessions Lielplatones and Priekulu viltojas. Plant height was highest with accessions Bauska, Lielplatones and Priekulu viltojas. Resistance to lodging was highest with accessions Bauska and Fuego.

Conclusions
Out of yield and phenotype characteristics results accessions Favel and Lielplatones are most suitable faba bean var. minor varieties for breeding in Nordic conditions. Variety Bauska has high yield. Variety Gloria has the highest number of pods per node. Varieties Favel and Jõgeva are the shortest varieties. Variety Favel is most resistant to lodging. Those single characteristics can be also used for breeding of new varieties.

This investigation was supported by EU FP7 project EUROLEGUME No. 613781.

Key Words: breeding, faba bean, phenotype, plant growth, variety.
The content of bioactive compounds in pumpkin purée prepared with different production technologies

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Introduction
Pumpkin is one of the vegetables that is becoming more and more popular as a part of nealthier diet, therefore many industrial companies show an increased interest in processing products from this vegetable. The problem with processing pumpkins is an extensive use of manual work during pre-treatment operations. Therefore one of the greatest challenges is avoiding of peeling operation in processing pumpkin purée.

Materials and Methods
Five different pumpkin cultivars were chosen for this experiment: ‘Blue Hubbard’, ‘Golden Hubbard’, ‘Uchiki Kuri’, ‘Butternut Waltham’, and ‘Kampemelon’, and two technologies of processing pumpkin purée were used: the first was with peeling of fresh pumpkins, heating at 95-98 ºC temperature 2-10 min, and treating through sieve; the second technology was analog to the first, but without peeling of the pumpkins,. The analyses were done for fresh pumpkin samples with and without peels, and for both types of pumpkin purée. For all samples the ascorbic acid, total carotenes, total phenols content (TPC) and antiradical activity (DPPH’, ABTS’+) were determined.

Results
Purée from peeled pumpkins contained slightly more ascorbic acid than purée from non-peeled pumpkins. The cultivar with the highest ascorbic acid content in both fresh pumpkins and in purée was ‘Uchiki Kuri’. The content of total carotenes in purée from non-peeled pumpkins of the cultivars ‘Blue Hubbard’ and ‘Uchiki Kuri’ was significantly higher than purée from peeled pumpkins and also of peeled fresh pumpkins. The highest total carotenes content was found in the ‘Uchiki Kuri’ purée in fresh sample. The TPC content of purée made from pumpkins with peels was on average about 48% more than in purées from peeled pumpkins. The DPPH antiradical activity in non-peeled pumpkin purée was about 13% more, but the antiradical activity of ABTS’+ was 53% more than pumpkin purée from peeled pumpkins

Conclusions
The most suitable pumpkin cultivar for the production of purée is ‘Uchiki Kuri’. It is possible to preserve a higher content of bioactive compounds in pumpkin purée with peels compared to purée made from pumpkin pulp without peels.

Key Words: pumpkin cultivars, purée, biologically active compounds, peeling.
Review on treatment of Helicobacter pylori infection with probiotics

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Helicobacter pylori infection is one of the most prevalent pathogens in all over the world, causes chronic gastritis and increases the risk of gastric cancer and peptic ulcer. This disease can be treated by antibiotics but it is not a certain solution due to the antibiotic resistant and modulation patient compliance, high cost of antibiotics as well. The aim of the present review is to assess the evidence regarding the impact of the use of probiotics on the duration and symptoms of Helicobacter pylori infections, using antibiotics and also the occurrence of new episodes of the disease in all ages. The thirty randomized control trials were classified. These studies examined the impacts of single or combined of different strains of probiotics and synbiotic for the treatment and prevention of Helicobacter pylori infections. Thirty eligible studies involved 795 infants, 3846 children, 2991 adults and 514 elderly people. Three major databases involved Pubmed/Medline, Scopus (Elsevier), Web of Science were searched from inception to April 2017. In conclusion, it was found that there was not a significant difference reduction in occurrence of Helicobacter pylori infection between study groups, however, probiotics have a good impact on the adverse effects and eradication rate of Helicobacter pylori infection in the general population. In addition, a few adverse effects were reported in studies but they were all mild.

Key Words: Helicobacter pylori, Probiotics, Review
Bread making potential of *Triticum aestivum* and *Triticum spelta* species depending on agrotechnical measurements

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The aim of this study was to assess the effect of different winter species: *Triticum aestivum* ssp. *vulgare* cv. Bamberka and *Triticum spelta* cv. Rokosz on the bread making potential.

The analyzed grain samples were obtained from field experiment conducted in 2012/2013 and 2031/2014 crop years at the Experimental Station in Osiny (51°35', 21°55'), Institute of Soil Science and Plant Cultivation, State Research Institute, Pulawy, Poland. The experimental treatments differed in percentage of cereals in crop rotation (50, 75 and 100%). Wheat cultivation was performed in accordance with good agricultural practice standards. Protein content, gluten content, Zeleny sedimentation index and alveograph properties were determined to assess the baking quality of tested wheat species.

Wheat species strongly influenced the bread potential. The *Triticum aestivum* cv. Bamberka was characterized by significantly higher gluten quality and Zeleny sedimentation index compared with *Triticum spelta* cv. Rokosz. There was also significant influence of the species on alveograph properties. Among the analyses wheat species *Triticum aestivum* ssp. *vulgare* cv. Bamberka were characterized by the highest baking value (average “W” over $330 \times 10^{-4}$ J) which indicates their suitability for production of hamburger rolls, pizza dough and frozen dough. *Triticum spelta* cv. Rokosz was characterized the baking value “W” of $148 \times 10^{-4}$ J. *Triticum spelta* was characterized by the lowest extensibility (P) and the highest elasticity (L) compared with *Triticum aestivum* ssp. variety cv. Bamberka.

Percentage of cereals in crop rotation effects on protein content, gluten content, Zeleny sedimentation index, and alveograph properties. The cultivation of wheat in monoculture caused worse grains and flour dough quality.

**Key Words:** Triticum aestivum, Triticum spelta, alveograph, bread making quality, percentage of cereals in crop rotation.
Contamination of wheat grains with *Fusarium* mycotoxins, depending on cereal crop rotation.

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Agricultural production is often negatively influenced by the occurrence of microscopic filamentous fungi and their toxic secondary metabolites, mycotoxins. Cereals belong to the most frequently affected agricultural commodities, and in the moderate climatic zone *Fusarium* fungi/mycotoxins dominate. Numerous species of the genus *Fusarium* have phytopathogenic and toxigenic properties affecting yield, nutritive value and hygienic quality of harvest products from arable crops worldwide. These fungi can cause serious diseases in different vegetative and generative organs of the plant throughout the cultivation period. Trichothecenes and zearalenone are the most common *Fusarium* mycotoxins contaminating a wide range of crops in Poland. Field experiment was conducted in the Institute of Soil Science and Plant Cultivation – State Research Institute in Pulawy (Poland). Grain samples of two winter wheat cultivars (*Bamberka* - *Triticum aestivum* spp., *Rokosz* – *Triticum spelta* L.) collected in 2013 and 2014 were analyzed for contamination with deoxynivalenol (DON), zearalenone (ZEA), and T-2/HT-2 toxins by the enzyme-linked immunosorbent analysis (ELISA) method. The influence of cultivar and crop rotation on the contamination with mycotoxins was evaluated. Plants were naturally infected by fungal pathogens producing mycotoxins. The agrotechnical treatments differed with percentage of cereals in crop rotation (50, 75 and 100%). It was found that the wheat grains were contaminated with the tested mycotoxins (DON, ZEA, and T-2/HT-2).

The cultivar and percentage of cereals in crop rotation strongly modified the concentration of mycotoxins in grains. The highest level of each tested mycotoxin was found in Bamberka cv. compering to Rokosz cv. Moreover, the determined concentration of DON in Bamberka sample grow in crop rotation with 100 and 75% of cereals was close to safe level for human/animal health and was 1225 µg·kg⁻¹. Samples from crop rotation 100 and 75% of cereals was the most abundant with all analyzed mycotoxins in both cultivars.

**Key Words:** mycotoxins, wheat, crop rotation.
Innovative solutions for dairy free milk processing

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Brief Introduction
Worldwide more than 80% of adults suffer from lactose intolerance. It is caused by reduced or absent activity of lactase. „Help“ for people with lactose intolerance is lactase-tablets, lactose-free milk products, sour milk products and dairy free milk produced from vegetable sources such as cereals and nuts. Dairy free milk innovation is on the increase. For example, the US dairy free milk market gained 9 percent in 2015 and reached $1.9 billion.

Materials and Methods
As components for obtaining experimental samples of dairy free milk walnuts of cultivars Calarash and Kogylnichanu were used. The technology of walnut milk included following main steps: primary walnut preparation, extraction procedure, decantation and homogenization. Standard methods of analysis have been applied for evaluation of walnut milk chemical composition, basic quality properties as well as microstructure and microbiological stability.

Results
In the analysis it was determined the total protein and fat content in walnut milk. Study gives a detailed analysis of the fatty acid composition by GC-chromatography, 20 fatty acids were found. The highest content is in the linoleic, linolenic and arachidonic acids. Analysis of walnut milk microstructure showed that the major part of oil volume is formed by drops with an average diameter of 2.70 microns. The analysis of microbiological properties were carried out due to the total contamination number, contents of yeast and mold, as well as pathogenic microflora. Recepies and technologies of obtaining drinks based on walnut milk with fruits, berries and grains are proposed.

Conclusions
This study showed high potential and positive view on walnut milk production, in agreement with the current demand of healthy products. These results offer new interesting expectations to continue with this research line and demand the application of advanced technologies.

Key Words: walnuts, innovation, health benefits, perspectives.
Potencial of indigenous lactobacilli as starter culture

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Abstract
Traditional production of fermented dairy products involves lactic acid bacteria that are normally present in the milk and production environment. These lactic acid bacteria represent the niche microbiota of the geographical area and they are responsible for local types of fermented products. The diversity of lactic acid bacteria in traditional dairy products and in production environment represents great potential in biotechnology. The study of the technological and probiotic properties of autochthonous lactic bacteria is the first step towards obtaining standardized indigenous dairy products. In order to standardize indigenous products, the basic requirement is the application of the determined indigenous lactic acid bacteria as starter cultures affecting their specific characteristics by performing fermentation and influencing the ripening process. In the process of fermentation of cheese usually participate bacteria of the genus Lactococcus – Lc. lactis ssp. lactis, Lc. lactis ssp. cremoris and homofermentative lactobacilli. However, on the process ripening affecting mainly the so-called nonstarter lactic acid bacteria – lactobacilli and secondary microflora. Lactobacilli during ripening of cheese continue breakdown of rest lactose, but are primarily important in the process of protein breakdown. During metabolism of sugars and amino acids lactobacilli produce aromatic compounds which have a positive effect on the flavor of the product. Also, very important is the activity of extracellular proteinases through the production or removal of various peptides directly affect the taste and texture of the product. Some lactobacilli produce bacteriocins, which prevents the growth of pathogens, as well as many spoilage microorganisms. Some species of lactobacilli are available as probiotics. Indigenous lactobacilli would have application in production of typical local dairy products that are well accepted by the local population. Besides that, use of indigenous lactic acid bacteria as starter cultures would allow the production of cheese with designated geographical origin. Consequently indigenous lactic acid bacteria are challenge for further research and possible their practical application in the dairy industry.

Key Words: lactic acid bacteria, autochtonous cheese, lactobacillus, cheese ripening.
Supercritical CO2 extraction of raspberry seed oil

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Introduction
The soft fruits of red raspberry (Rubus idaeus L.) have a short shelf-life due to their fast deterioration assuming quick consumption of berries. The by-product of raspberry juice pressing is nearly 40% of pomace including seeds, as the juice outcome depending on the cultivar is approximately 60%. The residue could be used for pressing seed oil which is suitable for using in the food and non-food industries being rich in bioactives. The main aim was to investigate the effect of supercritical CO2 extraction temperatures on the yield of raspberry seed oil and composition of fatty acids.

Materials and Methods
The fruits of red raspberry (mainly cultivar 'Novokitaivska') were provided by raspberry grower Raivo Teder (Valga County, Estonia). The technological experiments of seed separation and oil extraction were carried out in Polli Horticultural Research Centre using supercritical CO2 extractor at temperatures of 40, 50 and 60 °C. Before oil pressing, the moisture content of seeds was reduced from 44.5% to 5-6% by drying at room temperature for two weeks. Samples of different oil fractions were collected in 15-minute intervals. In addition to seed quality analysis, the total yield of oil and its composition of fatty acids were determined.

Results
The highest yield of raspberry seed oil was obtained by extracting at 60 °C. The seed oil samples were the richest in two essential fatty acids, linoleic and α-linolenic acid, while lower amounts of oleic, palmitic, stearic, eicosenoic, cis-11-eicosenoic, palmitoleic and basically no γ-linolenic fatty acids were detected.

Conclusions
The aim was to investigate the effect of supercritical CO2 extraction temperatures on the quality of red raspberry seed oil. The temperature of 60 °C provided the highest oil yield. Nine major fatty acids were quantified in the oil samples.

Key Words: red raspberry, oil composition, supercritical CO2 extractor, fatty acids, bioactives.

Acknowledgments
The European Regional Development Fund, the European Agricultural Fund for Rural Development and Raivo Teder are gratefully acknowledged for financing and supporting the research.
The impact of technological pre-freeze processing on spinach stored at -18°C

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Brief Introduction
Spinach is one of the most commonly consumed leaf vegetables. It contains high amounts of vitamins, β-carotene, folic acid and dietary fiber. Fresh spinach leaves when stored in refrigerator, quickly lose the nutritional value and turn wilted and yellow. Unfortunately, freezing and storage of frozen spinach also result in loss of product quality. To determine the degree of chlorophyll degradation and the reaction rate constant for this process, as well as the effect of technological processing of spinach prior to storage, the absorption and fluorescence spectral analyses were carried out.

Materials and Methods
Spinach (Spinacia oleracea cv. Matador) plants were used in all experiments. Leaves were collected and washed and subjected to initial processing. Leaves, intact, blanched or gently ground with a mortar and pestle, were stored for 30 weeks at -18°C. Chlorophyll extraction was carried out according to [1]. Chlorophyll absorption and fluorescence spectra were determined using a Carry 5000 UV-Vis-NIR spectrophotometer and Carry Eclipse Fluorescence Spectrophotometer (Varian).

Results
A decrease of absorbance and fluorescence was observed in chlorophyll isolated from all spinach leaf samples subjected to 30-week storage. The chlorophyll concentration in gently ground spinach leaves dropped from 7.57×10⁻⁵M to 4.82×10⁻⁵M, in blanched spinach it fell from 7.99×10⁻⁵M to 5.47×10⁻⁵M and in intact leaves it decreased from 7.61×10⁻⁵M to 5.54×10⁻⁵M. The drop in chlorophyll concentration in gently ground leaves started as late as after 16-week storage and the reaction rate constant for chlorophyll degradation was k=0.0261±0.0018 week⁻¹ (I order reaction). In blanched spinach and in intact leaves chlorophyll degradation started after the second week of storage, with k=0.0129±0.0006 week⁻¹, oraz k=0.0170±0.0004 week⁻¹.

Conclusions
It was shown that pre-processing of spinach, before freezing, affects its storability at -18°C.

Key Words: spinach, freezing, blanching, food processing, storage.

Nowadays, new raw materials are being sought to improve the physical, sensory characteristics and nutritional value of a food. Potentially one of the following food additives is immature wheat grain. In order to understand whether the immature wheat grain is able to affect the aroma of sourdough, the aim of the research is - to analyze the possibilities of using the immature wheat grain flour in rye sourdough preparation and to determine the effect of the aroma formation in it. The rye sourdough is made using the Detmold’s two-stage preparation method using Böcker (Germany) pure culture. The control sample is made from rye wholegrain flour, but for the second sample in the first stage is added 20% of the immature wheat grain flour. The sourdough pH was 3.5. The gas chromatograph with mass spectrometer PerkinElmer 500 GC/MS (USA) was used to determine volatile compounds. To identify the composition of volatile compounds, it is selected to analyze peak areas that are larger than $10^5$.

Making chromatographic analysis, it can be concluded that the main aromatic substances in the rye sourdough are acetic acid, ethyl acetate and benzyl alcohol. Replacing 20% of rye flour with immature wheat grain flour has seen differences in the composition of aroma compounds, but no significant difference in the size of the peak areas has been detected. In the sample with immature wheat grain, several aroma compounds were identified which were not detected in a control sample using only rye flour. The detected aroma compounds correspond to the aroma in the rye sourdough that is identified in the literature data. Although immature wheat grain does not significantly affect the fermentation processes occurring in rye fermentation and the total number of lactic acid bacteria, their addition contributes to the development of more abundant aroma compounds.

Key Words: sourdough, immature wheat grain, aroma compounds, chromatograph.
Effect of frozen storage on the metabolic and functional properties of baker’s yeast

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Yeast of *Saccharomyces cerevisiae* species find varied biotechnological applications including food industry, and they are a source of low-molecular biologically active substances and different enzymes. The aim of this work is to reveal the comparative changes of biochemical, morphological and technological characteristics of two types of baker’s yeast after long term freezing. The objects of the study were the commercial samples of *Saccharomyces cerevisiae*: dry yeast "Saf-Moment" and compressed yeast manufactured respectively by Russian companies «Saf-Neva» and «Combine foods». The test samples were stored in a freezer at -20 °C for 35 days. Yeast samples were stored in a freezer at -20 °C for 35 days. Aliquots were taken at 5, 10, 15, 20, 25 and 35 days, and the total amount of reduced thiol compounds, reduced glutathione content, proteolytic activity and power of dough lifting were determined. The results of the study showed that for 35 days of storage the total content of thiol substances increased: in dry yeast by 8.3%, in pressed yeast 2.5-fold, the content of reduced glutathione increased in dry yeast by 37.3%, and in pressed yeast 7-fold. Under the same conditions, the proteolytic activity decreased: in dry yeast 3.2-fold, in pressed yeast 8.6-fold, and power of dough lifting were decreased: in dry yeast by 30%, in pressed yeast by 80%.

Conclusion: In baker’s yeast under frozen storage an increase of reduced glutathione as well as a decrease of proteolytic activity and of the power of dough lifting were observed. These changes were most significant in pressed yeast compared to dry ones.

Key Words: yeast, freezing, reduced glutathione, proteolytic activity, power of dough lifting.
Morphometric investigation of plant dry rot disease

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Dry rot of plants brings great losses to agriculture, but the quantitative morphology of this disease causative agent was not sufficiently studied. The purpose of this study was to study the *Fusarium* spp. causing dry rot using a potato model with the application of a computer morphometric method. There were evaluated comparative morphological characteristics of intact fungal mycelium (control) and treated by fungicidal preparation derived from *Bacillus subtilis* (experimental) samples for 2 - 144 hours. The cell area and number of macro- and microconidia cells were analyzed by automatic image analyzer “Nicon” with software program «Image J» under magnification x 400 or x1000. The statistic evaluation was carried out by GraphPad Prism 6.

The results in the control samples were following: the cell area was 32.58 ± 4.24 µm² (2 h) and 74.35 ± 10.46 µm² (144 h); amount of sprouted macroconidia was 0 (2 h) and 43% (144 h); the microconidium cells area size was: 3.81 µm² ± 0.26 (2 h), 3.75 µm² ± 0.15 (144 h).

The area of experimental *Fusarium* macroconidium cells was 35.22 ± 11.30 µm² (2 h) and of microconidium cells was: 3.78 µm² ± 0.19 (2 h); on 144 hours macro- and microconidia were not found, mycelium fragments were detected in some view fields.

Conclusion
The investigation by use of morphometric method provides quantitative characteristics of pathogens of common plant diseases, to monitor the development of pathological process and to test new fungicides. Fungicide preparation derived from *Bacillus subtilis* obliterates macro- and microconidia and thus affects on *Fusarium* spp. reproductive system.

Key Words: potato, dry rot, *Fusarium* fungi, cell area, macro- and microconidia, *Bacillus subtilis*, fungicide.
In vitro antiproliferative and antioxidant activities of apple processing by-products

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Introduction

During the fruits processing, the beverage industry leaves between 25 and 35% mass of the raw material called fruit pomace this causing huge losses of valuable materials. In this respect, the pomace resulted from apple juice processing was analyzed regarding the antioxidant compounds and screened in vitro for their antiproliferative activity.

Material and Methods

The peel and pomace by-products resulted from Jonathan and Golden Delicious apples were dried, finely milled and kept protected from light and humidity. For in vitro evaluation of polyphenols antiproliferative proprieties were selected 2 cell lines models: A549- human lung cancer and Hs27-human fibroblast. Cell proliferation was measured using the MTT (dimethylthiazol diphenyl tetrazolium bromide) assay. The quantification of total phenolic compounds was achieved by Folin-Ciocalteu method, while the flavonoids content was determined using a chromogenic system of NaNO₂–AlCl₃–NaOH. The antioxidant activity was assessed by evaluating their radical scavenging activity on DPPH radical.

Results

The high content of phenolic compounds gives these by-products antiproliferative properties against the tested cancer cells. In this sense, the administration of polyphenols in different concentrations inhibit the cells proliferation in a dose dependent manner

Conclusion

The exploitation of apple processing by-products to recover bioactive molecules and also to develop functional products can be considered a research direction of high interest and novelty due to their functionality and health-promoting effects.

Key Words: Apple by-products, waste valorization, antiproliferative activity, bioactive compounds.

Acknowledgment

This work was supported by a grant of the Romanian National Authority for Scientific Research, CNCS–UEFISCDI, project number PN-III-RU-TE-2014-4-0842.
Determination of glucan content in pleurotus ostreatus polysaccharides preparations

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In recent years, attention of scientists has been attracted to the medical effects of basidiomycetes. The high efficiency of the treatment of bacterial and viral infections, diabetes, hypercholesterolemia and cardiovascular diseases with basidiomycetes preparations is known. β-glucans are the substances, which are thought to be responsible for many of this activities. There is an assumption, that β-glucans have a huge and not fully revealed potential for the treatment of diabetes and related complications.

In our studies polysaccharides were isolated from submerged mycelial biomass and the content of various glucans was measured in the composition of isolated preparations. Isolation of polysaccharides was conducted in the following way: the biomass of Pleurotus ostreatus was dried, then the lipids and triterpens were removed by double extraction with an 80% ethanol. At this moment part of preparation were collected as the first issued preparation (P1); the second one (P2), which must contains water-soluble polysaccharides, was isolated by three water extractions and precipitated with five volumes of 96% ethanol. Both preparations were separated by filtration under vacuum, dried to constant weight and milled.

Contents of total glucans and α-glucans were measured by the assay kit (Megazyme, USA). Content of β-glucans were calculated. The content of β-glucans in the preparations P1 and P2 was 33.5 and 23.8% respectively.

The results show that the content of β-glucans in the preparation P1 is higher than in the preparation P2. Consequently, preparation of biomass after ethanol extraction (P1), could be more suitable for use in food industry.

Key Words: pleurotus ostreatus, β-glucans, polysaccharides.
PP52

Optimization of supercritical fluid extraction parameters for lipophilic extracts of *G. macrorrhizum* leaves

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*Geranium macrorrhizum*, commonly called big root geranium, is a rhizomatous semi-evergreen perennial plant of the geranium family that typically grows in South east Alps and the Balkans. The essential oil of *G. macrorrhizum* is used in traditional herbal medicine and has shown a wide range of antimicrobial activity as well as hypotensive, cardiotonic and sedative properties. The aim of this study was the optimization of supercritical fluid extraction (SFE-CO$_2$) conditions to obtain high yield lipophilic extracts of this plant.

Towards this end, central composite design was used to optimize three independent variables, namely extraction time, pressure and temperature at three levels. Time levels ranged from 15 to 75 minutes, pressure from 200 bar to 500 bar and temperature range was from 40 ºC to 60 ºC. Experimentally obtained extraction yields varied from 1.98 % to 3.29 % (w/w). Response surface methodology showed a combination of 55 ºC, 462 bar and 52 minutes as the optimal extraction conditions. The antioxidant potential of SFE-CO$_2$ lipophilic extract under optimal conditions was evaluated by measuring total phenolic content (TPC) (79.3 mg GAE/g) and radical scavenging properties (TEAC$_{DPPH}$=22.9 mg TE/g; TEAC$_{ABTS}$=243.8). Analysis of plant material before and after extraction revealed the potential of the solid residue after SFE for further recovery of antioxidant rich fractions.

**Key Words:** Geranium macrorrhizum, supercritical fluid extraction, essential oil, antioxidant activity.
High-added value ingredients from lipophilic fraction of cyanobacterial scum

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Cyanobacteria are widely distributed photosynthetic prokaryotic microorganisms that can be found in almost every terrestrial and aquatic habitat. In heavily eutrophicated water bodies, massive proliferation of cyanobacteria can lead into extensive surface water blooms. Over the last decades the presence of this kind of algal blooms has also been reported in the Curonian lagoon. Recent reports indicate that removal of cyanobacteria scums in the Curonian Lagoon as a management measure should be prioritized. The aim of this study was the utilization of lipophilic fraction of cyanobacterial scum as a potential source of high added value ingredients. Central composite design was used to optimize extraction time, pressure and temperature in supercritical carbon dioxide extraction (SFE-CO₂). Extraction yields varied from 0.12 % to 4.76 % (w/w). Response surface methodology defined 55 ºC, 425 bar and 120 minutes as the optimal extraction conditions. The SFE-CO₂ extract contained all four tocopherols, with α-tocopherol being the most abundant. Moreover, fatty acid profiling of the same extract revealed high amounts of polyunstaturated fatty acids. Finally, the antioxidant capacity of SFE-CO₂ lipophilic extract was evaluated by measuring total phenolic content and radical scavenging properties revealing the potential of this biomass as a source of natural antioxidants.

Key Words: cyanobacteria, biomass, supercritical fluid extraction, antioxidant activity.
Changes in bread making quality of wheat during post harvest maturation

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The aim of the study was to determine the changes in protein-starch complex of wheat grain during its post-harvest maturation. Baking properties of tested grain was determined by rheological tests and laboratory baking test. Because of the variability of weather conditions three varieties of wheat were tested from two consecutive crop years: 2014 and 2015. The common wheat varieties: Kandela (spring wheat, group A according to COBORU classification), Bamberka (winter wheat, group A) and KWS Ozon (winter wheat, group B) were tested during this study. Immediately after grain harvest the organoleptic assessment was performed as well as protein content, ash content and impurities content. During the next 12 weeks in two-weeks intervals, the baking value of flour obtained in laboratory milling was performed.

Tested wheat varieties were characterized by varying quality in terms of the properties of gluten proteins. Winter wheat variety Bamberka was characterized by the highest protein content. Tested wheat grain was characterized by low amylolytic activity.

The harvest year had a significant impact on the quality of the tested wheat varieties. Wheat from the 2015 harvest was characterized by significantly lower protein content and gluten content, lower ash content and lower amylolytic activity compared to grain from 2014 harvest.

Changes of the baking value of tested wheat varieties during their post-harvest maturation were dependent on wheat variety and harvest year. During this time wet gluten decreased and the quality of gluten was improved. Changes of the alveograph baking value (W) varied according to tested wheat variety. The increase in this parameter during post-harvest maturation was found in wheat varieties KWS Ozon and Kandela which baking value (W) immediately after harvest of grain was below 250×10^{-4}J. There was a slight increase in the water absorption of flour tested by mixolab during post-harvest maturation.

Key Words: baking quality, gluten properties, post harvest maturation, wheat varieties.
Application of response surface methodology for the optimization of supercritical carbon dioxide extraction of blackberries

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Blackberries (Rubus subgen. Rubus) are the thorny (Rosaceae) family plant. These berries contain vitamins, organic acids, glucose, sucrose, flavonoids and other compounds, including strong antioxidants. Berries are used to produce various longer shelf life products and one of them are juices. Pressing of berries results in large amounts of the residual by-products, pomace, which when discarded are considered as a waste. The aim of this study was to optimize supercritical carbon dioxide extraction process for obtaining the highest yield of lipophilic substances from the dried blackberry pomaces powder. All experiments were performed on a laboratory scale supercritical fluid extraction system. The independent variables, pressure (25, 40, 55 MPa), temperature (50, 65, 80ºC), dynamic extraction time (60, 120, 180 min) were selected as the most important parameters in extraction process. The increase of these parameters resulted in the increase of blackberries extract yield. However, statistical data analysis showed that pressure had the most significant influence on the yield of extract, while dynamic extraction time and temperature in the selected range were less important. The dominating effect of extraction pressure in the extraction of vegetal materials was also reported in many other articles. Maximum yield of blackberry pomace oil was obtained using the following extraction conditions: 54.7 MPa supercritical CO₂ pressure, 75 ºC temperature, 126 min extraction time and 2L/min CO₂ flow rate. Supercritical extraction is considered as a green technology comparing to traditional extraction methods using hazardous organic solvents; therefore, the results obtained in this study may be promising for the recovery of bioactive compounds from blackberry pomace.

Acknowledgments: This study was supported by Research Council of Lithuania, grant no. P-MIP-17-228.

Key Words: blackberries, optimization, supercritical CO₂ extraction.
Optimization of supercritical fluid extraction of lingonberry pomace

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Lingonberries (Vaccinium vitis-idaea) are very popular in Northern countries and Russia and they can be used to produce various food products, such as jams, juices, etc. Recently performed research revealed that berries contain valuable compounds (organic acids, vitamins, anthocyanins, proantocianidines, etc.), which might find application in functional foods and nutraceuticals. Supercritical fluid extraction (SFE) is a green technique, which mainly uses a safe solvent CO₂ and therefore it is a very attractive method for the isolation of high added value compounds. The aim of this study was to apply SFE- CO₂ for the recovery of the highest yield of CO₂-soluble substances from the dried lingonberry pomace. For optimizing process central composite design (CCD) and response surface methodology (RSM) were applied. The following parameters were selected for optimization: pressure – 25, 40, 55 MPa, temperature – 50, 65, 80°C, extraction time – 60,120, 180 min. The CO₂ flow rate was kept constant, 2L/min. The maximum yield was obtained at 52.7 MPa, 111 min and 79 °C. The predicted by RSM yield was 13.28 %; however, the experimentally recovered amount of lipophilic extract was slightly lower, 11.87 %. Extraction pressure was the most important process parameter, although the temperature was also significant for the extraction yield. The extract was characterized by the in vitro antioxidant capacity assays and chromatographic methods. It may be concluded that SFE-CO₂ was proved as a promising method for the recovery of valuable constituents from lingonberry pomace. The products obtained will be tested as functional food ingredients in various food products.

Acknowledgments
This study was supported by Research Council of Lithuania, grant no. P-MIP-17-228.

Key Words: lingonberries, supercritical fluid extraction, optimization, response surface methodology.
Effects of different stabilizers on physicochemical and sensory properties of yogurt ice cream

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Yogurt ice cream is a milk product that; milk, flavorings, emulsifiers, stabilizers, prepared by mixing yogurt cultivars (Streptococcus thermophilus, Lactobasillus delbrueckii subsp. Bulgaricus) and then this mixture is produced according to ice cream technology.

In this study, different stabilizers were used in the production of yogurt ice cream and the effect of the stabilizer used on physicochemical and sensory properties of yogurt ice cream sample was investigated. Using pectin, guar gum, gum karaya, maltodextrin and as 5th using the gum combination prepared by mixing these four gum in equal proportions; pH, titratable acidity, viscosity and penetrometer values, initial dripping and complete melting times, volume increase rate, amount of acetaldehyde and sensory properties of the yogurt ice cream samples were determined.

It has been determined that the stabilizer types used are important at pH value and % titration acidity value of 0.05% and affect high viscosity value and the degree of penetrometer, there are large differences between the samples (p<0.05). It was determined that the same acetaldehyde amount values could be obtained in the samples where different stabilizers were used and the differences between the samples were significant when the results were examined at p = 0.05 level. The stabilizer type used also significantly affected the volume expansion (p<0.05) and the values varied between 15-24%. Sensory qualities, especially when total acceptability is considered, have been found to be collected in the case of yogurt ice cream, where the combination of the highest scores is used.

As a result, it was determined that the stabilizer used was an important ingredient that affected the properties of yogurt cryopreservation. It has been concluded that this gum combination can be used in the production of yogurt ice cream as the average best results are seen in yogurt ice cream samples where gum combination is used.

Key Words: yogurt ice cream, stabilizer, physicochemical and sensory properties.
Obtaining the cheese in brine with the addition of marigold flowers

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The main purpose of this investigation is to get an innovative dairy product, cheese with added marigold flowers. The dried marigold flowers (Calendula officinalis), used for cheese processing, gives the product antioxidant properties and natural color due to the biologically active compounds of the flavonoid class present. For this study, the cheese with marigold flowers added was processed according to a technological scheme of operations, using marigold extract in the proportion of 2, 8, 12%, as well as marigold flowers in quantity of 1, 2, 3%. The obtained samples were analyzed sensorially (sensory method - scoring scale) and physico-chemical (acidity determination – Thorner method, moisture determination with thermobalance, moisture analyzer AND ML-50, determination of salt content - argentometric method) over a 21 days maturation period. In parallel, was determined the total flavonoid content from the marigold flowers as well as from the cheese with marigold flowers (the 6 samples obtained with extract and flowers of dried marigolds) using the spectrophotometric method, the reading being 430 nm. The following conclusions are drawn from this study: the marigold flowers contain flavonoids that show antioxidant properties, but at the same time they can be used as a natural dye. As a result of the physico-chemical analyzes, it can be noticed that both the marigold extract and the flowers, added in various proportions, have a beneficial influence on the characteristics of the cheese. In the sensory analysis, the team of tasters appreciated the new assortment of cheese with marigold flowers, so the samples with flower extract are much appreciated in terms of appearance, color and taste.

Key Words: cheese, active compounds, flavonoid, extract, innovative.
Classification of fresh and processed horseradish genotypes based on biologically active compounds using hierarchical cluster analysis

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Brief Introduction
Horseradish (Armoracia rusticana L.) leaves as well as roots contain phenolic compounds and other antioxidants, although the main culinary value has only the roots. Composition is influenced by both genetic background and technological processes applied. The aim of this research was to classify horseradish grown in Latvia based on genetic background, plants part and technological processes applied using the hierarchical cluster analysis.

Materials and Methods
Twelve genotypes of horseradish roots and leaves were analysed fresh, and for comparison of technological processes freezing and liophylization methods were used. For all samples total phenolic and total flavonoid content, antiradical activity (DPPH\(^\cdot\), ABTS\(^{\cdot}\)) and reducing power were determined. For hierarchial clustering method linkage between-groups was used and the distances between samples were calculated using square Euclidean distances.

Results
By analyzing an aggregate of data from 5 variables (analysed parameters) and 24 plant materials, hierarchical cluster analysis showed that samples can be divided into 6 clusters. One cluster contained only one sample with the highest content of phenolic compounds and antiradical activity (genotype GJ leaves), and it could be selected for further research as the most promising genotype. Roots with lower parameters were classified separately, meaning that they are not the source of analyzed bioactive compounds. Treated samples can be divided into 3 clusters and fresh and frozen horseradish leaves samples with the highest content of biologically active compounds are united in the one cluster, showing benefits of freezing as the method for the storage of plant material.

Conclusions
The results obtained have revealed that the hierarchical cluster analysis can be used to select the most promising horseradish genotypes and technological approaches based on bioactive compounds content.

Key Words: horseradish, biologically active compounds, hierarchical cluster analysis.
Free sulphhydryl groups, disulphide and amino groups content of wheat flour influenced by different climatic conditions

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Brief Introduction
The key issue of automatic processing in bakery industry is providing of wheat flour of uniform quality which is nowadays very difficult to achieve considering the altered climatic conditions. As a response to the unfavourable climatic conditions, the changes occur on different grain components and in different extent. From the aspect of wheat flour quality evaluation, it is very important to estimate the functionality of wheat proteins.

Materials and methods
Therefore, the aim of this work is evaluation of climate influence on the content of free sulphhydryl groups (SH), disulphide bonds (SS) and free amino groups (NH2) as indicators of gluten quality. The analysis included four bread wheat varieties grown in two production years with different climate conditions in different locations. To get additional insight on the kinetics of NH2 changes, the experiment was carried out at two different temperatures, which were selected to imitate the conditions for processing the dough (30 °C) and to provide optimal conditions for the activity of potentially present proteolytic enzymes (37 °C).

Results
The obtained results showed that variety, location, production year, and their interactions all had significant effects on all tested parameters. SH and SS content were mainly influenced by climatic conditions. For samples from the growing season characterized by higher average temperatures and the greatest number of days with daily temperatures above 30 °C, the content of SH groups was significantly higher. Regarding the SS content, the obtained results exhibited the opposite situation. Variations in NH2 content were dominantly caused by temperature treatment of tested samples where significantly higher amount of NH2 groups was obtained after gluten incubation at 37 °C.

Conclusions
The applied methodological approach could provide valuable information about complex changes in the gluten structure as a consequence of unfavourable climatic conditions.

Key Words: wheat flour, free sulphhydryl groups, disulphide bonds and free amino groups.
Creation of value added bread from whole grain wheat flour

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Brief introduction
Current trends in healthy diet and lifestyle include creation of sensory attractive value added products. One of the main nutrients originated from food waste are dietary fibre. Due to their technological functions such as water binding, gelling, structure building and use as a fat replacer, they are applicable as textural improvers. The aim of this study was creation of value added bread from whole grain wheat flour with addition of corn grits coextruded with brewer’s spent grain and apple pomace.

Materials and methods
Corn grits coextruded with brewer’s spent grain (BSG) and apple pomace (AP) in the ratio of 55:45 were used to replace 30%, 20%, and 10% of whole grain wheat flour (WGWF). Test baking procedure includes 120 min bulk-fermentation, 70 min of proofing, both at 30°C; baking at 220°C for 15 min). Control bread was produced from WGWF. All samples were evaluated 2 h and 24 h after baking regarding moisture content, volume, texture, color, while the sensory properties were assessed by an expert sensory panel using 7-point hedonic scale.

Results
After extensive experiments, substitution by 20% BSG and by 10% AP was found to yield the best technological quality of bread. The volume of 20% BSG bread was lower than the volume of 10% AP bread, which was close to the control sample. 10% AP bread had darker color than 20% BSG and control samples, which had very similar color parameters. Bread prepared with 20% BSG was harder than control bread and bread with 10% AP. Sensory scores for all evaluated parameters were higher than 4, indicated that both breads were acceptable, although the control sample received the highest sensory scores.

CONCLUSIONS: Those results are promising for food by-products valorization by including them as a raw material in bakery industry.

Key Words: food by-products, whole grain wheat flour, bread
Effect of apple-tree vegetative growth regulation on accumulation of fruit triterpenic and phenolic compounds

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Introduction
Tree growth regulation, such as spraying trees with growth regulator Regalis™ or summer pruning, is common practise in commercial orchards, but fruit quality is mostly determined by external quality parameters (fruit colour, size, firmness) and basic internal quality parameters, such as soluble solids, sugar content, acidity, etc. However, there is limited research data evaluating bioactive compounds, such as phenolics or triterpenes, in relation to tree growth regulation. In this work, we evaluated regulation methods of apple-tree vegetative growth and their impact on accumulation of bioactive compounds.

Materials and methods
This study was carried with apple cultivar ‘Rubin’ on rootstock P 60 planted at the distance 4 x 1,5 m. Four treatments of tree vegetative growth control were established: 1) Control; 2) Tree trunk incision before flowering by chain saw; 3) Application of growth regulator 'Regalis' (prohexadione-calcium) at the rate 2,5 kg ha⁻¹ immediately after the flowering; 4) Summer pruning performed in the middle of August. All measurements are conducted by appropriate HPLC methods.

Results
In control samples, apples accumulated 12,677 mg g⁻¹ DW of triterpenic compounds, whereas trunk incision significantly reduced triterpene concentration to 10,853 mg g⁻¹ DW, while summer pruning had the opposite effect – apples accumulated significantly higher content of triterpenes (13,727 mg g⁻¹ DW). Growth regulator Regalis™ did not had impact on triterpene concentration in apples.
Control apples accumulated 1,729 mg g⁻¹ DW of phenolic compounds. Trunk incision didn’t had impact on change in phenolics (1,878 mg g⁻¹ DW). Summer pruning significantly increased phenolics in apples (1,905 mg g⁻¹ DW), whereas the use of Regalis™ had drastic decrease of phenols to 1,307 mg g⁻¹ DW.

Conclusions
Summer pruning significantly increased both triterpenic and phenolic compound content in apples. Growth regulator Regalis™ significantly decreased phenolic compounds in apples, but didn’t influenced the content of triterpenes. Trunk incision significantly decreased triterpene content in apples, but didn’t influenced phenolic content.
Key Words: Malus x domestica Borkh, Regalis™, trunk incision, summer pruning.
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