SZENT ISTVÁN UNIVERSITY

ÉLELMISZERTUDOMÁNYI KAR
BUDAPEST

ABSTRACT BOOK

FOODCONF

SCIENCE, TECHNOLOGY & INNOVATION

Third International Conference on Food Science and Technology

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2018

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the [Faculty of Food Science, Szent Istvan University](#)
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the [National Food Chain Safety Office](#)

the Scientific Committee on Food Science, Section of Chemical Sciences, [Hungarian Academy of Sciences](#)

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November 30 (Friday)	8:00 am – 5:00 pm	Arrival and registration *(Building K)*
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	2:00 pm – 3:00 pm	Lunch

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Thursday, November 29th

Great Hall, Building K

15:00 – 18:00 Registration

18:00 – 21:00 Welcome party

Friday, November 30th

08:00 – 16:00 Registration

Building K

Plenary session

Great Hall, Building K

09:15 – 09:55	Brief introduction and opening/welcome ***Livia Simon Sarkadi*** conference chair, SZIU (in English) ***László Palkovics*** Rector, SZIU: 165 years of Buda Campus (in Hungarian) ***László Ferenc Friedrich*** Dean, SZIU, FFS (in Hungarian) ***Róbert Zsigó*** State Secretariat for Food Chain, Ministry of Agriculture (in Hungarian)
09:55 – 10:20	Industry 4.0 – Food Sector (in Hungarian) ***László György*** State Secretariat, Ministry of Innovation and Technology
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10:45 – 11:00	**Coffee break**
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11:20 – 11:40	Challenges of regulation in Food sector – international outlooks (in Hungarian) ***Gyula Kasza,*** Deputy Chair, National Food Chain Safety Office
11:40 – 12:00	Automatization in Food Industry (in Hungarian) ***Ernő Győri***, Siemens Hungary
12:00 – 12:30	Robotization in Food Industry (in Hungarian) ***Péter Bán*** and ***András Somos***, Energotest – SKC Holding
12:30 – 12:50	Industry 4.0 in the quality management (in Hungarian) ***György Laczkó***, header of business development, Bureau Veritas
12:50 – 13:40	**Lunch**

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Session Industry 4.0 in Food Sector (in Hungarian)
Chaipersons: József Felföldi & István Szabó
Room A1, Building A

13:40 – 14:00	**Biztonságos villamosenergia-ellátás** ***Fodor József*, Ügyvezető, ELMŰ-ÉMÁSZ**
14:00 – 14:20	Automatizálás - adatelemzés – hatékonyságnövelés ***Kun László***, Bizerba
14:20 – 14:40	Tej = High Quality & High Margin ***Cseh Gellért***, Medifood Hungary Innovation
14:40 – 15:00	Látórendszerek szerepe az automatizálásban ***Felföldi József***, Szent István Egyetem
15:00 – 15:20	**Coffee break**
15:20 – 15:40	Élelmiszeripari folyamatok optimalizálása ***Horváth Zoltán***, Dékán, Informatikai Kar, ELTE
15:40 – 16:00	Ipar 4.0 célok és hatások az élelmiszeriparban: Digitalizációs megvalósítások a termelők és gyártók számára ***Viniczay Zsolt***, Seacon Europe Kft
16:00 – 16:20	Vízfelhasználási hatékonyság növelése ***Nagy Zsuzsanna***, DHI Magyarország

Session International Food Safety (in Hungarian)
Chairperson: Csilla Mohácsi Farkas
Room K2, Building K

13:40 – 14:00	**Auditori tapasztalatok az IFS élelmiszer hamisítási követelményeivel kapcsolatban** ***Győrfi László*, SGS**
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14:20 – 14:40	Termékfejlesztés ***Cselényi Tibor***, McDonald's
14:40 – 15:00	Application of Metagenomics Data-Pool in structured problem solving. A case study in collaboration with Industry, Regulators and Academia (in English) ***Kalliopi Chalkou*** és ***Syposs Zoltán***, Coca-Cola HBC
15:00 – 15:20	**Coffee break**
15:20 – 15:40	Különböző korú személyek speciális étrend igényei ***Lelbach Ádám***, Vezető belgyógyász, gasztroenterológus, Dr. Rose Medical Center
15:40 – 16:00	Élelmiszerjogi aktualitások ***Deák Ferenc***, Agrárminisztérium
16:00 – 16:20	Theoretical and practical aspects of emerging risk identification from Hungarian point of view (in English) ***Zsuzsa Farkas***, National Food Chain Safety Office

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Session Hungaricum (in Hungarian)
Chairpersons: Péter Ondré & Zoltán Lakner

Room K5, K building, This section is dedicated to the Hungarian Scientific Festival

13:40 – 14:10	**Hungarikum piaci jelentősége** ***Ondré Péter*, Elnök, Agrármarketing Centrum**
14:10 – 14:40	Húsipari Hungarikumok az Ipar 4.0 tükrében ***Bajkai Tibor***, Pick Szeged
14:40 – 15:10	Prémium magyar élelmiszerek ***Gyaraky Zoltán***, Élelmiszertudományi szakértő
15:10 – 15:30	**Coffee break**
15:30 – 16:00	Hungaricum analitikai háttere ***Szigeti Tamás***, Wessling
16:00 – 16:30	A pálinka minősége a jogszabályi követelmények függvényében ***Nagygyörgy László***, Wessling

Section Food Analysis & Quality (in English)
Chairpersons: Livia Simon Sarkadi & Blaž Cigić

Room K7, K building

13:40 – 14:10	**Keynote: Measurement of antioxidant content in food: simple yet problematic** ***Blaž Cigić*, Biotechnical Faculty, Department of Food Science and Technology, University of Ljubljana, Slovenia**
14:10 – 14:30	Untargeted mass spectrometric analysis of polyphenols – potential and challenges ***László Abrankó***, Szent István University, Faculty of Food Science, Department of Applied Chemistry, Hungary
14:30 – 14:50	Sea-buckthorn in gluten free biscuits: aspects of quality and safety ***Zuzana Ciesarová***, Food Research Institute, National Agricultural and Food Centre, Slovakia
14:50 – 15:10	Detection of soybean oil as a potential adulterant of argan oil based on a novel DNA approach ***Joana Amaral,*** REQUIMTE-LAQV, Faculdade de Farmácia, Universidade do Porto, Portugal
15:10 – 15:30	**Coffee break**
15:30 – 15:50	Method of combine electrophysical disinfection of eggs with nanosecond electron beam and plasma radiation ***Krivonogova Anna S.***, Federal State Budgetary Educational Institution of Higher Education" Ural State Agrarian University", Russia
15:50 – 16:10	Stabilization of apo α-lactalbumin by binding of epi-gallocatechin-3-gallate ***Tanja Cirkovic Velickovic*** Center of Excellence for Molecular Food Sciences & Department of Biochemistry, University of Belgrade - Faculty of Chemistry, Belgrade, Serbia
16:10 – 16:30	Can the PESTEL tool answer what is the future of food chain safety? Situation analysis and environmental impacts ***Tekla Engelhardt,*** National Food Chain Safety Office, Hungary

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Session Food Compounds (in English)
Chairpersons: Isabel Belo & Éva Gelencsér
Room K4, K building

13:40 – 14:10	**Keynote: Application of the yeast *Yarrowia lipolytica* for food additives production** ***Isabel Belo*, Centre of Biological Engineering, University of Minho, Portugal**
14:10 – 14:30	Influence of ingredients and technology on antioxidant capacity during the brewing process ***Dániel Koren***, Department of Brewing and Distilling, Szent István University, Hungary
14:30 – 14:50	Effects of solvent and pre-treatment on the extraction kinetics of anthocyanins from blackcurrant peel residue ***Dezső András Csaba*** and ***Éva Molnos***, Sapientia Hungarian University of Transylvania, Romania
14:50 – 15:10	An adsorptive approach to enhance the 2-phenylethanol (2-PE) production from L-phenylalanine (L-Phe) biotransformation ***Braga Adelaide***, Centre of Biological Engineering, University of Minho, Portugal
15:10 – 15:30	**Coffee break**
15:30 – 15:50	Comparative studies on the prebiotic effect of distinct ganoderma extracts with the aim of underpinning prospective functional food application ***Attila Kiss***, Food Science Innovation Centre, Kaposvár University, Hungary
15:50 – 16:10	Multi-step valorization of sweet whey by enzymatic conversion to galacto-oligosaccharides and lactic acid fermentation ***Melinda Pázmándi,*** Department of Microbiology and Biotechnology, Faculty of Food Science, Szent István University, Hungary
16:10 – 16:30	Food industry ethanol batch fermentation modelling and simulation challenge ***Sándor Gombos***, Department of Food Science, Sapientia University
16:30 – 16:50	Role of diverse probiotics in reinforcement of prebiotic feature of versatile carbohydrates with food additive potential ***Erzsébet Némedi***, Expedit Nodum Ltd, Budapest, Hungary

16:40 Poster Session in Hall of Building A

19:30 Banquet

Saturday, December 1st

Plenary session

Great Hall, Building K

09:00 – 09:05	Opening ***Livia Simon Sarkadi***, Szent István University, Hungary
09:05 – 09:35	**Development trends in the food industry** ***Tamás Éder*, Bonafarm, Hungary**
09:35 – 10:05	**Using advanced data science in food chain safety decision making. Current status and future trends** ***Ákos Józwiak*, National Food Chain Safety Office, Hungary**
10:05 – 10:15	**Technical break**

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Session Food Science
Chairpersons: Doris Marko & Michael Murkovic
Room K2, Building K

10:15 – 10:45	**Keynote: Formation of furfurfyl alcohol during roasting of coffee** ***Michael Murkovic*, Institute of Biochemistry and Food Chemistry, Graz University of Technology, Austria**
10:45 – 11:05	Acrylamide forming in heat treated food products and LC-MS/MS analysis of this Maillard reaction compound ***Tamás Szigeti***, Wessling Hungary, Hungary
11:05 – 11:25	Technogenic contamination of agrobiocenosis as a risk factor in manufacturing of animal products ***Albina Isaeva G.,*** Federal State Budgetary Educational Institution of Higher Education, "Ural State Agrarian University", Russia
11:25 – 11:45	**Coffee break**
11:45 – 12:15	**Keynote: The influence of co-occurrence on the toxicological profile of *Fusarium* and *Alternaria* toxins in complex mixtures** ***Doris Marko*, Department of Food Chemistry and Toxicology, University of Vienna, Austria**
12:15 – 12:35	Radiation inactivation of bio-hazards ***Renáta Homlok***, Institute for Energy Security and Environmental Safety, Centre for Energy Research, Hungarian Academy of Sciences, Hungary
12:35 – 12:55	Formation of antibiotic resistance of microflora in commercial dairy farms in the regions with technogenic contamination of environment ***Donnik I.M.***, Federal State Budgetary Educational Institution of Higher Education, "Ural State Agrarian University", Russia
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Session Food Technology
Chairpersons: Marco Arlorio & Gyula Kasza
Room K3, Building K

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11:25 – 11:45	**Coffee break**
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Session Food Biotechnology
Chairpersons: Vladimir Mrsa & Vijai Kumar Gupta
Room K4, Building K

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11:25 – 11:45	**Coffee break**
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13:15	Best Poster Award *(Great Hall, Building K)* ***Livia Simon Sarkadi***, Szent István University, Hungary
13:45	Closing *(Great Hall, Building K)* ***László Ferenc Friedrich***, Szent István University, Hungary

14:00 **Lunch**

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P167	Impact of HHP on quality and rippering of Hungarian fermented meat products **A. Tóth**, Cs. Németh, J. Surányi, Á. Vadja, L. Frierich
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INVITED SPEAKERS

Marco ARLORIO

Marco Arlorio, with 28 years of activity in the field of the Food Chemistry, is currently Full Professor of Food Chemistry at Dipartimento di Scienze del Farmaco, Università del Piemonte Orientale (UPO, Novara, Italy), covering the position of Chair of the Food Chemistry Inter-Divisional Group within the Italian Chemical Society (GICA-SCI, Rome, Italy); Chair of the Food Chemistry Division, EuChemS (Brussels, Belgium), since 2015; member of the Executive Board of EuChemS (since 2018). In the recent past, he was active as Member of the Executive Board of the SAFE Consortium (Brussels, Belgium). He is active on teaching at Academic level (Food chemistry; Food biotechnology; Food analysis; Chemistry of functional foods and nutraceutical products); visiting Professor at Food Quality and Design Department, WUR (Wageningen University and Research, The Netherlands) as well as involved in Continue Medical Education in Food Sciences and Nutrition area in Italy. Principal Investigator of many National and International Projects; to date he leads the WP18 "INTELLItrace" (EU Food Integrity Project: https://secure.fera.defra.gov.uk/foodintegrity/), a Project devoted to the food authenticity and traceability. Chairperson or member of Scientific Committees of many International Congresses in food area (EuroFoodChem; CoCoTea series; Pigments in Food; In vino Analytica Scientia and others). Beside the academic activity, he works as Consultant for Companies in agro-food and technological areas.

Main research interests are focused on food quality and food safety assessment, particularly regarding the developing of new analytical methods and new strategic approaches dedicated to the food profiling and food chemical characterization.

Principal fields of interests (research): food authenticity and analytical traceability; detection/tracking of hidden ingredients in food (mainly allergens); bioactive compounds in food/food ingredients (particularly antioxidant polyphenols and biogenic amines); ingredient design (particularly regarding the valorisation of by-products and food wastes); stability of food ingredients and shelf life; thermal impact and neo-formed compounds in foods.

The outcome from the research is supported by more than 350 scientific contributions (papers published on peer reviewed International Journals in Food Science area, Proceedings, Oral and Poster communications Abstracts, Chapters in books).

Keynote presentation: "Food products from hemp (Cannabis sativa): nutritional value, chemical profiling and technological perspectives"

József BARANYI

József Baranyi is a Hungarian-British mathematician, who worked for the Institute of Food Research, UK, for 26 years, leading the Computational Microbiology Research Group there. Currently he is a Scientific Advisor at the University of Debrecen, Hungary, and a Visiting Professor at the Physics Department of Imperial College, London, UK.

He has held more than 150 international workshops on mathematical modelling and statistics for life sciences. He was the Statistical Advisor of the Journal of Applied Microbiology for 14 years and a member of the Editorial Board of Applied and Environmental Microbiology for 15 years; currently he is a member of the Editorial Board of the International Journal of Food Microbiology. Developer and founding member of the ComBase system (www.combase.cc); authored or co-authored nearly 100 research papers, book chapters and other scientific communications, with a total citation of >5000. The Baranyi-model on bacterial growth is one of the most frequently quoted models in predictive microbiology.

He has been member of the scientific / organizing committee in numerous international conferences; has given several invited/keynote talks on international conferences. He is a Doctor Honoris Causa of the Szent-István University of Hungary, a recipient of the “Distinguished Service Award” of the American Society for Microbiology and an elected member of the International Academy of Food Science and Technology, the prime advisory body of the International Union of Food Science and Technology.

Keynote presentation: "Network and big data systems in food industry"

Isabel BELO

Isabel Belo, PhD in Chemical and Biological Engineering from University of Minho, Braga, Portugal. She is Assistant Professor at the Biological Engineering Department of Engineering School of University of Minho where she collaborates in several Graduation and Master Degrees in Biological and Biomedical Engineering and in Biotechnology. She is the Director of the Doctoral Program of Chemical and Biological Engineering of University of Minho. Isabel Belo is a staff researcher of the Centre of Biological Engineering (CEB), leading projects on the topic of Bioprocess development and optimization within the Biosystems group (https://www.ceb.uminho.pt/biosystems). Isabel Belo is the Director of the Bioprocess and Biosystems Laboratory of CEB. Her main research activities are related to Bioprocess Engineering, with the main purpose of developing and optimizing biotechnological applications of non-conventional yeast and filamentous fungi. Under this goal different microbial cell cultivation strategies are studied, such as the use of high pressure bioreactors, airlift bioreactors, submerged and solid-state fermentation, with the aim of developing competitive solutions to biotechnological industry using wastes and renewable resources as feedstock and greener technologies.

She supervised 8 Post-Doc researchers, 12 PhD thesis and more than 40 Master students. She participated and coordinated several scientific projects with external financial support. She has published 3 book chapters and 70 articles in scientific international journals with peer reviewing and she is associate editor of scientific journals.

Keynote presentation: "Application of the yeast Yarrowia lipolytica for food additives production"

Blaž CIGIĆ

Blaž Cigić is Professor at the Biotechnical Faculty, University of Ljubljana. He earned his master degree of chemistry (1995) at Faculty of Chemistry and Chemical Technology, University of Ljubljana: He did his PhD in Biochemistry (1999) related to structural basis of activity and inhibition of cathepsin C in the laboratory of Prof. Vito Turk at Institute Jozef Stefan. From 2000 on, he is employed at the Department of Food Science and Technology-Chair of Biochemistry and Food Chemistry, Biotechnical Faculty and is involved in teaching Biochemistry and Food Chemistry subjects. His current research interests are related to stability and analytics of redox active compounds in foods.

He is the Coordinator of the Educational Committee of the Slovenian Biochemical Society and actively involved in the work of Slovenian Nutrition Society.

Keynote presentation: "Measurement of antioxidant content in food: simple yet problematic"

Doris MARKO

Doris Marko is full Professor for Food Chemistry and Head of the Department of Food Chemistry and Toxicology at the University of Vienna, Austria. She studied Food Chemistry at the University of Kaiserslautern, Germany. After PhD and Ass. Professorship for Molecular Nutrition Sciences, in 2005, she was appointed as Full Professor in Food Toxicology at the Karlsruhe Institute of Technology, Germany. In 2009 she accepted an offer for a full professorship for Food Chemistry at the University of Vienna. Since 2017, she is furthermore Visiting Professor at the University of Parma, Italy. As a Registered European Toxicologist (EUROTOX) and vicechair of the Austrian Society of Toxicology (ASTOX), she is member of several national and international commissions on food safety.

D. Marko is known for innovative studies on molecular mechanisms of food constituents. Main research interests comprise cellular responses to Nrf2 modulators (natural constituents versus contaminants) and the impact of genetic polymorphisms, molecular mechanisms of emerging mycotoxins and chemical mixtures. Mechanistic studies address issues on application-limiting toxicity of bioactive food constituents with special emphasis on the interference with topoisomerases, DNA repair and potential mutagenicity. DM is known for innovative studies on molecular mechanisms of food constituents. She published >130 manuscripts including ground-breaking studies on genotoxic mechanisms of emerging mycotoxins. In interdisciplinary approaches combining food science, state-of-the art analytics and systems toxicology strategies, current studies aim to unravel combinatory effects of naturally occurring contaminant mixtures and their interplay with “bioactive” food constituents.

Keynote presentation: "The influence of co-occurrence on the toxicological profile of Fusarium and Alternaria toxins in complex mixtures"

Michael MURKOVIC

Michael Murkovic was born in Graz in 1959 and was studying Technical Chemistry at Graz University of Technology with a focus on Biotechnology. He finished his Diploma and PhD in the field of Biotechnology in 1989. As a postdoc he stayed for one year in Switzerland at ETH Zürich and continued his professional career in the pharmaceutical company Biochemie-Kundl (now Sandoz) in Austria. In 1993 he moved back to Graz and started working as a food chemist at the Institute of Biochemistry and Food Chemistry at Graz University of Technology.

His research focus is in the formation of carcinogenic compounds that are formed during cooking and the influence of antioxidants on the formation of these compounds. He is specialized in liquid chromatography and mass spectrometry and habilitated in 2002 and became associate professor in the field of food chemistry.

He has published ca. 100 manuscripts in reviewed scientific journals.

He is teaching food chemistry and food biotechnology at Graz University of Technology, Medical University of Graz, and University of Applied Sciences.

Besides his university affiliation at TU Graz he is active in the Food Chemistry Division of EuCheMS (European Chemical Society) and is currently chairman of the Austrian food chemists.

Keynote presentation: "Formation of furfurfyl alcohol during roasting of coffee"

Zsolt VINICZAY

Zsolt Viniczay worked for several years as a director of R&D at Seacon Europe. He is owner and founding member in the company that was founded in 2005.

He studied at Faculty of Electrical Engineering and Informatics at the Budapest Unversity of Technology and Economics and he earned his master degree in 1987.

Already at the beginning he has worked in the field of information technology, first as a software designer, later as project manager and project director. This time he is responsible for research and development and partner search to complete different projects in the industry. Thanks to his work, Seacon Europe has been active in national innovation and international cooperation for many years.

His current specific area is the Industry 4.0 related activity.

Keynote presentation: “ Ipar 4.0 célok és hatások az élelmiszeriparban: Digitalizációs megvalósítások a termelők és gyártók számára"

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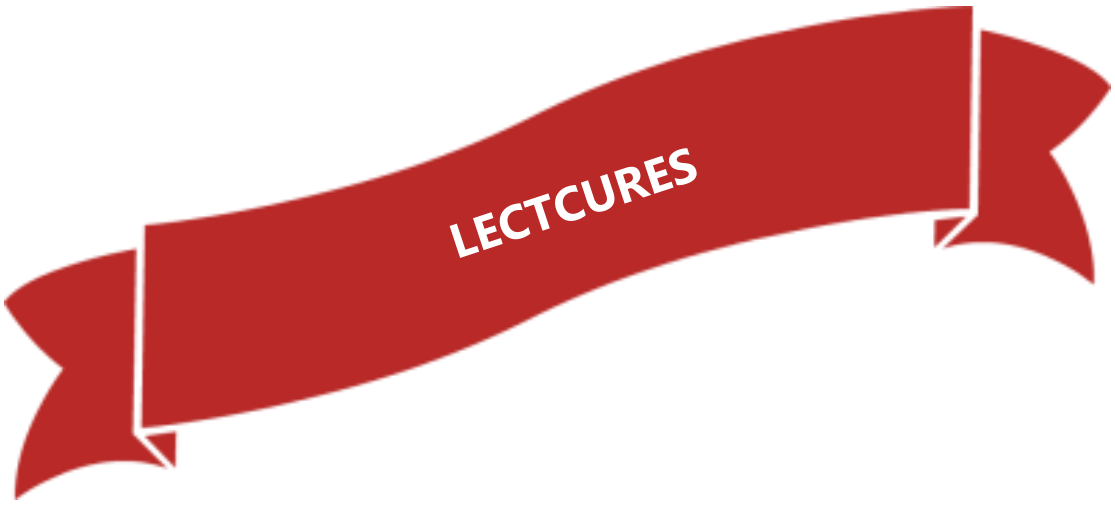
LECTCURES

Big data and food-related complexities

József Baranyi[a,b,1]

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Introduction

Since the turn of the century, technological and IT-advances have made "big data" reality also in food-related areas, from food design and safety, distribution network and security to food safety and patterns in consumer habits. The resultant data deluge has turned the attention of food professionals to computational methods, who need to understand not only the difference that LOTS OF DATA make but also the mathematical concept of COMPLEXITY. It is not simply "complicatedness" but an emerging property of an evolving system, let it be the network of food ingredients or the global food trade, where the LINKS between the constituents of a system are more numerous and, in some way, more important than the constituents themselves.

Application of network science is a good example for this development. Long gone the time when quantitative methods of food science were identified with statistical description of large amount of observations. Very few attempts were made for the sake of mathematical modelling, which however is a must for converting any discipline from descriptive to predictive science.

Changing consumer demands and food safety issues (such as that of minimally processed and Ready-to-Eat / convenience foods), generated a need to develop new laboratory techniques, among them the various "-omics" technologies. In the meantime, the originally simple models became more complex, with disparate variables, data sources and emerging patterns that could not be predicted from the parts – a typical property of complex systems, with difficult-to-predict, highly non-linear and stochastic behaviour; with high sensitivity (i) to input data; (ii) to changes in the external environment; and (iii) to the structure of the network on which they operate.

Here we demonstrate that understanding food-related complexities, from micro to macro level, is one of the major topics that food professionals need to pick up, to satisfy consumer demand, to solve global food security, distribution and safety problems, to reduce food waste and to contribute to the health of an aging population.

Theoretical and practical aspects of emerging risk identification from Hungarian point of view

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Keywords: emerging risk, food chain safety, early warning, risk identification

Introduction:
According to the EFSA definition, 'an emerging risk to human, animal and/or plant health is understood as a risk resulting from a newly identified hazard to which a significant exposure may occur or from an unexpected new or increased significant exposure and/or susceptibility to a known hazard'. A methodology for emerging risks of food chain safety was elaborated for emerging risks affecting Hungary regarding human, animal, plant health and economy.
Materials and Methods:
Previously elaborated emerging risk identification methods were studied and adjusted for Hungarian circumstances. The method was validated with formerly identified emerging risk cases that were determined by EFSA Emerging Risks Exchange Network.
Results and Discussion:
The elaborated emerging risk identification methodology seemed to be properly adjusted and its continuous implementation makes one able to determine risks that need further measures in order to prevent the emergence of the risk and penetration of adverse effects of the hazard.
Conclusion:
The aim of early identification of emerging risks complex. In addition to help to protect human, animal and plant health, timely recognizing of emerging risks provides input to decision making processes, strategic planning and analysis, risk assessment and designing appropriate risk management and mitigation measures. Therefore practical implementation and further refinement of emerging risk identification methodology is strongly encouraged.

Measurement of antioxidant content in food: simple yet problematic

Blaž Cigić[b,1]

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Keywords: antioxidant assays, methodology, DPPH, ABTS, Folin-Ciocalteu

Oxidation of organic compounds in foods have an influence on functional, sensorial and nutritional properties. Accordingly, there is a large interest to slow down oxidation during processing and storage of food. Compounds that protect food components from oxidation are antioxidants and many of them are reducing agents and compounds that stabilize free radicals. Antioxidants are not important only in relation to food stabilization but also as micronutrients with supposed health benefits. Therefore, determination of the content of antioxidants in food is of great importance. Under in vitro conditions antioxidant potential (AOP) is typically evaluated by DPPH•, ABTS• or Folin Ciocalteu assays that are all based on redox reactions, where reducing agent (antioxidant) donate electron to the probe (radical/ oxidant). This research area is lively as ever. In the year 2017 0.17 % of all manuscripts published in SCI journal (based on Web of Science database) contained DPPH, ABTS or Folin in the abstracts.

Widespread analytics is nevertheless not a guarantee for systematic approach to the field as methods are poorly standardized. Determinations of AOP are performed in different solvents, at different temperatures and for different periods of time. Comparison of slightly modified experimental protocols reveals that small differences in experimental conditions can results in large differences in determined AOP of model antioxidants and food samples. Synergistic effects and secondary reactions of partially oxidized antioxidants can contribute significantly to the number of exchanged electrons. Due to inconsistency of published results, the adequacy of in vitro antioxidant assays is becoming questionable. Literature survey reveals that differences in published AOPs for particular foods could hardly be explained solely by their antioxidant content.

Despite all drawbacks of AOPs assays, they are still efficient tools for (i) the estimation of reactivity of antioxidants under chosen conditions, (ii) quantification of antioxidant that is predominant in a particular matrix and (iii) evaluation in the shift of the composition of antioxidants in the sample.

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Untargeted mass spectrometric analysis of polyphenols – potential and challenges

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Keywords: polyphenol, untargeted, mass spectrometry, profiling

Various polyphenols are consumed with plant-based foods as a part of our diet. Several epidemiological studies as well as clinical trials provided evidence about their contribution for instance in the prevention of cardiovascular diseases, type 2 diabetes and some cancers. Untargeted metabolomics based on liquid chromatography and high-resolution mass spectrometry (LC-HRMS) is the primarily applied analytical tool for profiling polyphenols and their metabolites at the molecular level in complex matrices, including plant food materials and biofluids. Namely, untargeted LC-HRMS has key role in the discovery, provisional identification and monitoring of polyphenol forms present in our diet and also in the analysis of polyphenol-derived components, originating from the human endogenous metabolism of consumed polyphenols and from the activity of gut microbiota. Obtained detailed molecular information on polyphenol forms present in diet is necessary among others to assess the true exposure of consumers to polyphenols, and to understand the effects of processing, whereas information on polyphenol metabolites in biofluids is important to improve our knowledge about the effects and mechanisms of action of these compounds. This presentation aims to briefly overview of the state-of-the art of untargeted LC-HRMS analysis of polyphenols and related compounds and also to give some practical examples on the use of this analytical approach. In addition, some relevant challenges associated to this methodology will also be highlighted.

*

Acknowledgements:
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Sea-buckthorn in gluten free biscuits: aspects of quality and safety

Zuzana Ciesarová[b,1], Kristína Kukurová[1], Blanka Tobolková[1], Elena Belajová[1], Viera Jelemenská[1] Karel Cejpek[2], Michael Murkovic[3]

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Keywords: sea-buckthorn, gluten-free, acrylamide, asparaginase, food safety

Sea-buckthorn is an exceptionally valuable plant with many positive compounds present in berries and leaves. Fresh berries are used for production of juice and oil (pulp and seed ones respectively). Dried pulp pomace and dried seeds as by-products of this technology are still high in polyphenols, flavonoids, especially rutin and quercetin, beta-carotene and antioxidative properties. They can be used in human nutrition for fortification of some food products. This study deals with their application in gluten-free biscuits made from buckwheat, maize, beans and chickpea flours. Aspects of their quality and acceptability by consumers are evaluated. Addition of sea-buckthorn dried pomace which has high content of amino acid asparagine content resulted in promotion of undesirable acrylamide formation. This negative aspect was eliminated by enzyme treatment applied prior baking. More than 80 % reduction of acrylamide has been achieved, which meets a benchmark level even for a special category “biscuits for young children”.

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Acknowledgements:
This contribution was supported by the projects APVV-17-0212 “Bioactive compounds of sea-buckthorn and its application in functional foods” and APVV-16-0088 “Complex utilization of plant biomass in biofoods with added value”. The international cooperation was supported by the project APVV-DS-2016-0020 “Cooperation in research and development of sea-buckthorn enriched foods”. The infrastructure of the Centre of Excellence for Contaminants and Microorganisms in Foods (ITMS 26240120042) was used for associated research conducted in the frame of the project “Strategy of acrylamide elimination in food processing” (ITMS 26240220091).

Detection of soybean oil as a potential adulterant of argan oil based on a novel DNA approach

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Keywords: argan oil; adulteration, real-time PCR

Introduction:
Argan oil is a non-refined vegetable oil obtained from the fruits of the argan tree (*Argania spinosa* L.) and produced almost exclusively in the southwestern Morocco, where the argan forest is found. Different grades of argan oil are available, namely edible/food and cosmetic grades, depending on the use of roasted or raw kernels, respectively. Argan oil is considered one of the most prized oils in the world, with its demand growing worldwide mainly due to its success as an ingredient in cosmetic products. In Europe, the price of the edible grade oil is also very high as it is perceived as a luxury product [1]. Being a premium product, argan oil is highly prone to adulteration by admixing with cheaper vegetable oils or even its total substitution. Therefore, it is important to develop methodologies that can be used in the control of the authenticity of pure argan oil. Considering that several factors can affect the chemical composition of the oil, in this work novel approaches based on DNA markers are proposed to detect the presence of soybean oil as adulterant of argan oil.

Materials and Methods:
Samples of authentic argan oil were acquired from cooperatives in Morocco, while soybean oil was purchased from local stores in Portugal. *In silico* analysis was performed for the design of *A. spinosa* L. specific primers, while previously reported primers were used for the specific identification of soybean [1]. Binary model mixtures were prepared with the addition of known amounts of soybean oil in argan oil in the proportions of 40, 25, 5, 1% (w/w), followed by concentration by centrifugation. DNA was extracted using the Nucleospin Plant kit, protocol B (Macherey-Nagel), according to the manufacturer instructions. Specificity and sensitivity of the designed primers for argan were assessed by qualitative PCR, followed by the development of a real-time PCR assay with EvaGreen dye to quantify soybean using the normalised ΔCq method.

Results and Discussion:
Species-specific PCR assays was successfully developed, allowing the specific detection down to 0.01 pg of *A. spinosa* DNA. The application of the soybean-specific PCR assay to DNA extracts of binary mixtures enabled the clear detection of 2%. Subsequently, a real-time PCR assay was developed to estimate soybean addition in argan oil, which confirmed the limit of detection of 2% of soybean oil, with a dynamic range of 2-25%. The correlation coefficient (0.965) and PCR efficiency (73.5%), although being low, can be considered acceptable for this type of food matrix.

Conclusion:

This work evidenced the possibility of using DNA-based approaches as a simple, fast and high-throughput tools to detect the presence of adulterant oils in argan oil.

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Acknowledgements:

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Method of combine electrophysical disinfection of eggs with nanosecond electron beam and plasma radiation

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Keywords: disinfection, eggs, microorganisms, nanosecond electron beam, plasma radiation

We have done the research on combination of two electrophysical methods of disinfection of the surface of unfertilized egg. Processing with nanosecond electron beam was combined with discharge plasma radiation in high pressure gas. The experiment was done in the unit with continuous supply of eggs packed in plastic containers. The absorbed dose of nanosecond electron beam was from 1 to 5 kGy, and plasma exposure time was from 1 to 5 minutes. We have done the research on the survival of standard agents of opportunistic pathogenic and pathogenic microflora on the surface of eggs (microorganisms of types Escherichia, Enterococcus, Staphylococcus, Proteus, Pseudomonas, mould and others). It was stated that processing of eggs in plastic packing with nanosecond electron beam reduced the growth of microflora on eggs' surface by absorbed dose of 5 kGy and more. Processing with plasma for 1 minute insignificantly reduced general microbial content. Processing with nanosecond electron beam with the dose of 1 kGy resulted in suppression of life activity of mould of the type of Aspergillius. Combined influence of nanosecond electron beam with the absorbed dose of 1 kGy and plasma radiation for 1 minute did not show any significant cidal effect regarding Proteus, Staphylococcus, Enterococcus, Pseudomonas and Escherichia, so it was not enough for disinfection. Combined influence of nanosecond electron beam with the absorbed dose 5 kGy and plasma radiation for 5 minutes resulted in significant suppression of life activity of all the miscroorganisms, except of St. aureus. E.coli and P. Aeruginosa showed the highest sensitivity, and St. Aureus showed the highest resistance.

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Stabilization of apo α-lactalbumin by binding of epi-gallocatechin-3-gallate

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Keywords: apo α-lactalbumin, epigallocatechin-3-gallate, noncovalent interactions, protein stability, fluorescence quenching, molecular dynamics simulation

α-Lactalbumin (ALA) is a Ca^{2+}-binding protein which constitutes up to 20% of whey protein. At acidic pH, and in the apo-state at elevated temperatures, ALA is the classic 'molten globule' (MG). This study examined epigallo-catechin-3-gallate (EGCG) binding to ALA in its apo form (apoALA) and stabilizing effect on protein structure thereof.
EGCG binds to apoALA in both native and MG state. The complex of EGCG and ALA is more stable to thermal denaturation. The docking analysis and molecular dynamic simulation (MDS) showed that Ca^{2+} removal decreased conformational stability of ALA, because of the local destabilization of Ca^{2+}-binding region. EGCG binding to apoALA increases its stability by reverting of conformation and stability of Ca^{2+}-binding region. Therefore, EGCG-induced thermal stability of apoALA is based on increased apoALA conformational rigidity. This study implies that during gastric digestion of tea with milk EGCG would remain bound to ALA, albeit in the Ca^{2+}-free form.

Can the PESTEL tool answer what is the future of food chain safety? Situation analysis and environmental impacts

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Introduction:
The issue of food chain safety continues to be the focus of interest worldwide. The WHO estimates that the number of food-related illnesses worldwide is rising steadily. In response to the food chain safety challenges, the Hungarian Food Chain Safety Strategy (FCSS) 2013-2022 was established.
As a part of the midterm review process, the aim of our strategic situation analysis was to look at the new strategic interventions needed in the forthcoming period in the viewpoint of FCSS.
Materials and Methods:
During the PESTEL analysis the political, economic, social, technological, environmental and legal aspects on the FCSS were examined. The purpose of the current analysis is to provide a strategic overview of the global and national factors in 2018-19, but the impact of these factors could be long-term also.
Results and Discussion:
The important consequence of the global and domestic political situation in the view of FCSS there is more uncertainty than ever before, and this could have an impact on many target areas. It is necessary to continue with the ongoing globalization process and its implications for follow-up and the food fraud cases will also be important.
Technological development is an accelerating and intensifying pressure on food chain supervision, which has a major effect on the National Food Chain Safety Office (NÉBIH) tasks, regarding the regulatory, research and monitoring activities. This will be more challenging on the laboratory diagnostic side.
To predict and diagnose the risks in the early phase has a consequence to the investigation capacities at laboratory, monitoring and (data) analysis domains.
The social challenges show that the NÉBIH have to improve the food safety situation among elderly and deprived subpopulations.
NÉBIH is facing changes in communication tasks, communication needs to be raised to a new level, to a more powerful communication with consumers. NÉBIH should strengthen its understanding and use of social sciences.
Conclusion:
It would be necessary to increase the analysis capacity at technological (data mining, network analysis, artificial intelligence, blockchain), and interpretation (explanation of the results, support the decision-making process) levels as well.

Application of the yeast *Yarrowia lipolytica* for food additives production

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Introduction:

Yarrowia lipolytica is a nonconventional, aerobic and dimorphic yeast with many biotechnological applications due to the wide range of substrates that can use as carbon source and the ability to produce a large variety of metabolites with industrial interest. It can usually be found in environments containing hydrophobic substrates, such as alkanes and fats. It can also be isolated from cheeses, yoghurts, kefir, soy sauce, meat and shrimp salads. *Y. lipolytica* has been proved to be a robust cell for the biotechnological production of compounds that can be used as additives in food industry, such as organic acids (citric acid), enzymes (such as proteases and lipases), biosurfactants, sweeteners (such as erythritol and mannitol), and aroma and fragrances compounds.

Materials and Methods

Most of the work performed to optimize biotechnological processes with *Y. lipolytica* was carried with the strain W29 (ATCC 20460). Stirred tank bioreactors were used for batch and fed-batch cultures, as well as airlift type bioreactors. Cells were grown on different culture medium containing low-cost and renewable substrates, such as crude glycerol, waste cooking oils, castor oil, among others. Besides cellular growth and morphology characterization, intracellular compounds accumulation and extracellular metabolites production were monitored. Bioprocesses were optimized to maximize the productivity of the target products.

Results and Discussion:

Lipase production (12000 $U \cdot L^{-1}$) and lipid-rich biomass (48 % of lipids mass per dry cellular mass) enriched in unsaturated fatty acids (oleic and linoleic acids) was obtained with *Y. lipolytica* W29 from waste frying oils based medium. Biotransformation of castor oil into lactones (fruity aromatic compounds) have been extensivly studied either by comparing the reactors type and operation strategies, either using genetic modified strains derived from W29 strain. Results lead to an improvement in □-decalactone (peach-like aroma) accumulation in the medium (up to 7 $g \cdot L^{-1}$) reducing the side products formation.

Using crude glycerol, a by-product of biodiesel industry, citric acid, erytritol and microbial lipids were produced. Besides those substrates, also volatile fatty acids, such as acetic, propionic and butiric acid were sucessfully converted to lipids by *Y. lipolytica.* Oxygen transfer rate to the aerobic cultures of the yeast has been a major factor of process optimization strategies.

Conclusion:

Y. lipolytica W29 has been proven to be a workhorse cell for the development of biobased industry, mainly for the improvement of the sustainability of industrial biotechnology for the production of food additives. Its GRAS status, ability to use wastes and subproducts as feedstocks, and the high titers of interesting compounds obtained by *Y. lipolytica*, turns this yeast into an emerging microrganism for the implementation of circular economy on Food industry.

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Influence of ingredients and technology on antioxidant capacity during the brewing process

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Keywords: malts, beer, malting, brewing, antioxidant

Introduction:
Nowadays various ingredients are available for brewers as raw materials. These raw materials are valuable sources of vitamins and other biologically active substances eg. antioxidants. The combination of the ingredients and technological processes has influence on the composition of the final product. This study focuses on the main factors having major influence on antioxidant capacity and on its variation during the whole process.

Materials and Methods:
Malting:
Malting was carried out on a Schmidt-Seeger micro-malting plant. Three spring barley cultivars (Quench, Malz, Kangoo) and 3 winter barley cultivars (Wintmalt, Casanova, Vanessa) were malted.
Malts:
13 barley malts (Pilsner, Cara Pilsner, Vienna, Munich, Cara Hell, Cara Red, Melanoid, Cara Munich, Cara Crystal, Cara Bohemian, Cateau Special B, Carafa I., Carafa III.), 2 rye malts (Rye, Cara Rye) and 2 wheat malts (Wheat, Dark Wheat) were investigated.
Brewing:
Under laboratory circumstances two types of beers were produced, a Pilsner and a Vienna Lager. In a pilot brewery an Imperial Stout and a Barley Wine were brewed. Samples were taken during the whole process at defined points.
Antioxidant capacity:
This parameter was determined with the five most popular spectrophotometric methods (TEAC, FRAP, TPC, DPPH, CUPRAC).
Extract content:
The extract content of wort was determined with an Anton Paar DMA 4500 Density Meter.

Results and Discussion:
Malting:
During malting, the antioxidant capacity increased. The biggest increase was observed during steeping and kilning. During malting enzymes are activated and synthetized, which helps to free antioxidants from the kernels. In the course of kilning Maillard reaction products (MRPs) are synthetized which have antioxidant-activity. Between spring and winter cultivars no significant differences were observed.

Malts:
Basic malts, which are rich in enzymes (Pilsner, Cara Pilsner, Vienna, Munich) showed low results. Rye, Wheat and Dark Wheat showed the lowest values. Special malts (Cara Hell, Cara Red, Melanoid, Cara Munich, Cara Crystal, Cara Bohemian, Cateau Special B, Cara Rye) had higher antioxidant capacity than the previous two groups. Carafa I. and Carafa III. showed the highest values. It is because special malts are kilned at higher temperatures, at these temperatures Maillard reaction and caramelization takes place resulting in MRPs and reductons which contribute to the antioxidant capacity.
Brewing:
In case of all the beers after the first enzyme rest (protease and/or β-glucanase) the antioxidant capacity reached a relatively high level. This is because polyphenols in the barley kernels are located near the husk, in the aleuron layer, bound to proteins. During this rest these antioxidants are released. Antioxidant capacity slightly increased until the end of mashing. During laboratory filtration (carried out with MN-615 filter paper) the TPC values decreased notably. The filter paper may bound some polyphenols. The hop boiling of Pilsner and Vienna Lager worts increased the antioxidant capacity notably (calculated to 12 °P). Hops are remarkable sources of polyphenols and during hop boiling MRPs are also arose. In case of Barley Wine and Imperial Stout sparging was carried out, this process did not influence the antioxidant capacity. During hop boiling of these worts, brewed in the pilot brewery, the antioxidant capacity did not increase. It is due to the different circumstances, eg. more intensive boiling, better polyphenol-protein aggregation and better hot break separation.

Conclusion:

The raw materials of brewing are potential sources of health promoting components, but during the brewing process the amount of these components can be highly influenced by technology. With the right combination of ingredients and technology there is a possibility to produce a product that has higher value from the nutritional point of view.

Effects of solvent and pretreatment on the extraction kinetics of anthocyanins from blackcurrant peel residue

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Keywords: anthocyanin, blackcurrant, extraction, Hansen parameter

Introduction:
Today, there is an increasing demand for foods with natural additives (pigments and antioxidants), so the optimization of the extraction technology of natural products from plant matrices becomes more and more important. Taking into account the environmentally friendly aspects and consumer awareness, we considered that all issues can be solved by the integrated processing of plants and the use of environmentally friendly solvents. An important class of both natural colorants and strong antioxidants are anthocyanins from fruits, which also have cancer preventive and bactericidal effects. The cultivation of blackcurrant in our region is increasing, the fruit is processed mainly for obtaining fruit juice, which generates a very large amount of by-product: the waste is approx. 35-40% from raw material quantity even in case of pressing after enzymatic pretreatment. However, by efficient extraction of anthocyanins with GRAS (Generally Regarded as Safe) solvents and green technology, the wastes amount could be significantly reduced, besides obtaining valuable products. Thus, the economic efficiency of the processing is also higher, bringing them closer to consumer expectations. Although in the acidic medium (pH 3-3.5), the extraction yield would be higher, from environmental reasons we deliberately not attend to add acidifier to the technology.

Materials and Methods:
The anthocyanins from peel waste were extracted in a modified laboratory Soxhlet apparatus, where sampling was possible. The concentration of samples was determined spectrophotometrically (Agilent Cary 50). Methanol and ethanol-water (50-96% V/V) mixtures were used as extraction solvents, and the samples were prepared by drying and/or by milling (or cutting). The Hansen solubility parameters of the solvents were calculated for different temperature and composition of the solvent mixtures.

Results and Discussion:
Based on the results, it can be concluded that for the extraction of anthocyanins from blackcurrant peel waste, the ethanol-water mixture is more suitable than the water or pure ethanol. It was determined that the 52% V/V ethanol-water mixture possess identical polar Hansen parameter as the methanol, which is the best solvent for the polar bioactive substances from biomass. As the use of methanol in the food industry (due to toxicity hazard) is banned, it's green (and GRAS) replacer was found, having very similar solvation power. The water added to the ethanol increases the boiling point of the mixture, and the higher temperature has increased the diffusion rate, as well as the extraction yields of anthocyanins as long as the thermal decomposition is neglected.

Studying the effect of raw material pretreatment, it has been found that the drying of the raw material and the comminution degree significantly influences the extraction kinetics. This proves that the rate-determining step of extraction is the internal diffusion. Examination of the extraction kinetics for moist and comminuted samples also revealed that the moisture content of the sample improved the efficiency of recovery when 96% ethanol was used as a solvent. This can be explained, in part, by an increase in the boiling point and on the other hand by the increase in solvent polarity.

Conclusion:

The results suggest that the operation of drying the fruit peel waste, due to excessive energy demands, is not justified when the extraction is performed immediately after juice pressing. In contrast, the extraction of anthocyanins from the comminuted samples proved to be more effective, which could be further enhanced by pressurized solvent extraction and ultrasound assisted extraction.

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An adsorptive approach to enhance the 2-phenylethanol (2-PE) production from L-phenylalanine (L-Phe) biotransformation

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Keywords: 2-phenylethanol (2-PE); Bioconversion; *in situ* product removal (ISPR); L-phenylalanine (L-Phe); *Yarrowia lipolytica*; XAD4

Introduction:
The consumers demand for flavors produced by natural means has led to a decrease of natural resources and, in this scenario the use of microorganisms as biotechnological platforms for its production is becoming a promising alternative. 2-PE is an aromatic alcohol with a delicate fragrance of rose petals. In fact, product inhibition during biotransformation limits the final 2-PE concentrations in conventional biotransformation. In order to improve 2-PE production a strategy applying *in situ* product removal by adsorption was investigated.

Materials and Methods:
This study described the 2-PE production from L-Phe biotransformation (7 g L^{-1}) in a medium containing crude glycerol as carbon source, using two *Y. lipolytica* strains (W29 and CH1/5). The experiments were performed in batch mode at shake flask scale, in two different scenarios: without product removal and with *in situ* product removal by adsorption.

Results and Discussion:
The affinities of three resins (XAD4, XAD7-HP and XAD16) for 2-PE and L-Phe adsorption were first studied, and the resin XAD4 was chosen, since it adsorbed the most 2-PE and the least L-Phe. Biotransformation of L-Phe to 2-PE without addition of the adsorbent resin was carried out and it was observed that both strains were able to produce 2-PE with a maximum concentration of 1.57 and 1.19 g L^{-1}, for the strain W29 and CH1/5, respectively. The addition of 7% (w/v) resin to the biotransformation system allowed a 1.4-fold and 2.1-fold increase in 2-PE production, for the W29 and CH1/5 strain, respectively, compared to the biotransformation without addition of the adsorbent resin.

Conclusion:

Y. lipolytica W29 and CH1/5 show a greater potential for 2-PE production, with a titer of around 1.5 g L^{-1} produced from 7 g L^{-1} of L-Phe, which are competitive with the concentrations obtained by other species. The proposed *in situ* removal strategy demonstrated the potential of increasing the 2-PE production and may not only lead to a simpler downstream process design, but also to the avoidance of potential problems with the toxicity of 2-PE to the cells, especially when larger titers are obtained.

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Comparative studies on the prebiotic effect of distinct Ganoderma extracts with the aim of underpinning prospective functional food application

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Keywords: Ganoderma, Reishi, Prebiotic, Functional food

Introduction:
Health promoting effect of Ganoderma Lucidum has already been documented via implementation of some scientific experiments. Its prebiotic feature has been verified by means of microbiological assays, in vitro and in vivo experiments. In spite of these former studies, Ganoderma mushroom has not gained extensive use in food industry so far, mostly due to the actual inconvenience in flavor and behindnesses of the relevant processing technologies.
Crucial components of Ganoderma mushroom with regard to its prebiotic effect are known to be beta glucans, however the exact mechanism of action has not been revealed yet. As a consequence it is of high interest to conduct research on Ganoderma's prebiotic feature, to map the details of the action with special regard to its food industrial application perspectives.
Methods:
Two types of commercial Ganoderma extracts along with an extract obtained from the fruiting body of dried Ganoderma were investigated in terms of prebiotic feature by microbiological assay. Both extracts and their combination with natural honey were exposed to the examinations.
Different combinations of Ganoderma extracts (liquid and powder) and honey have been prepared. Their stability and physical characteristics along with representative bioactivity properties (e.g. antioxidant power) were monitored periodically for 6 months.
Different strains of probiotic (Lactobacillus casei, Lactobacillus acidophilus, Bifidobacterium animalis subsp. Lactis) and pathogenic (E. coli, Staphylococcus aureus, Salmonella enteritidis) bacteria have been tested for their growth on agar plates. The culture mediums were supplemented with different concentration (0.5, 1, 2 and 5%) of each extract alone and in combination with natural honey extract (5 and 50%). The bacterial cultures were plated on agar once right after addition of each extract/s and once after incubation of liquid culture with extracts for 24 h. The emerging colonies were counted after certain times for each strain and the results have been expressed as CFU/ml where prebiotic indices were also calculated.
Results:
Comparative studies on the application of different extraction solvents resulted in pointing out an optimized method. The highest extraction yield (9.1%) was gained when using 50% ethanol as extraction solvent. All the prepared combinations exhibited significant inhibitory effect towards E. coli, S. aureus, S. enteritidis when compared with the control. Although the natural honey samples itself (50% extract) showed antibacterial effect against the selected pathogenic strains, the supplementation of honey with the Ganoderma extract enhanced this feature significantly. There was a significant difference in the observed growth of the studied probiotic strains. It could be established that the Ganoderma displays more significant prebiotic impact

for lactobacillus strains than for bifidobacterium species. We have also observed a significantly higher growth for L. acidophilus then L. casei in samples supplemented with 5% Ganoderma extracts comparing to their counterpart controls.

Discussion:

The observed synergistic inhibition of pathogenic bacterial growth of Ganoderma extract containing honey is a considerably beneficial property that can be considered for functional foodstuffs development. Likewise, the experienced prebiotic trait makes Ganoderma an excellent candidate as a health-promoting component of foodstuffs stimulating the human microbiota.

Multi-step valorization of sweet whey by enzymatic conversion to galacto-oligosaccharides and lactic acid fermentation

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Keywords: sweet whey, galacto-oligosaccharide, lactic acid fermentation

Introduction:
Sweet whey, the main by-product of cheese making is the aquous solution of lactose, whey proteins and small amounts of other milk-derived components. Its environmentally conscious and profitable management is of great scientific and economic interest. Today whey is usually fractionated and its components are utilized separately. Purified whey proteins have beneficial nutritional value and they are marketed as dietary supplements with a great profit. Valorization of the whey-derived lactose is more difficult and complex. This study focuses on the possibilities of valorizing deproteinized whey by enzyme-catalized galacto-oligosaccharide (GOS) synthesis and lactic acid fermentation.

Materials and Methods:
Whey was deproteinized by ultra- and diafiltration, then concentrated to high lactose content by nanofiltration. The concentrated deproteinized whey (DPW) was then used as a substrate for GOS synthesis by Biolacta N5, a *Bacillus circulans*-derived ß-galactosidase. The possibility of lactic acid fermentation of DPW was studied as well. Nine lactic acid bacteria (LAB) strains belonging to the *Lactobacillus* and *Lactococcus* genera were screened for their ability to ferment diluted DPW. Fermentation experiments were conducted with and without the addition of various organic nitrogen sources (whey proteins, soy- and casein peptones). Growth, lactose and protein utilization of the LAB strains as well as acidification of the culture media were monitored during lab-scale experiments.

Results and Discussion:
High lactose content DPW was produced by a series of membrane filtration steps. The DPW concentrate was a suitable substrate for GOS synthesis. Optimal conditions for batch GOS production were determined as 200 gL^{-1} substrate concentration, 50°C, pH=7.5 and 240 min conversion time. Experimental results of lactic acid fermentation indicate that all the LAB strains require supplementation of the diluted DPW with a nitrogen source for sufficient growth and lactose utilization. Growth of strains was most supported by the addition of whey proteins, whereas lactose utilization was significant when DPW was supplemented with soy- or casein peptones.

Conclusion:

Our results indicate that the proposed valorization process of sweet whey is applicable for whey-fractionation and GOS synthesis. For fermentation of DPW with LAB strains addition of organic nitrogen to the medium is neccesary. Growth and lactose utilization of LAB strains varied depending on the supplementing nitrogen sources. It is assumed that differences in the fermentation characteristics are related to the differences in the protease activities of the strains.

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Formation of Furfurfyl Alcohol During Roasting of Coffee

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Keywords: furfuryl alcohol, coffee, formation, roasting

Introduction:
Furfuryl alcohol is a compound that is not commonly found in foods in higher concentrations, except in roasted coffee. The reason for this single occurrence is not clearly solved but it is definitely related to the high temperatures of roasting. The temperature at which furfuryl alcohol is formed at higher concentrations is in the range of the roasting temperature which can be up to 270 °C.

Materials and Methods:
HPLC analysis:
Zorbax Eclipse (XBD-C8 4.6×150 mm, 5 µm). The separation was done using a gradient mobile phase of 0.1% acetic acid and methanol at 25 °C. Detection was done at 217 nm for FFA.
Roasting experiments:
Two techniques were used, either at microscale where 100 mg of ground green coffee were heated in a 1.5 ml glass vial or at lab-scale were ca. 80 g of coffee were roasted in a Probat laboratory roaster; normal roasting was finished when the second crack was observed. The roasting conditions were optimized so that the second crack occurred at ca. 8 min.

Results and Discussion:
The limits of detection (LOD) was determined as 0.12 µg/ml and the limit of quantification (LOQ) was 0.41 µg/ml. The intra-day precision was ≤ 4.2% and inter-day precision was ≤ 4.5%. In the coffee brews the concentration of furfuryl alcohol was 55 ± 14 µg/ml (filter brew) and 68 ± 15 µg/ml (espresso brew). The profile of furfuryl alcohol formation kinetics shows a peak produced quickly after onset of roasting and then decreasing concentrations, which can be attributed to evaporation and polymerisation. The furfuryl alcohol emission during roasting, is high (up to 57%) leading to a lower amount of furfuryl alcohol determined in samples roasted under these conditions.
The maximum concentration of furfuryl alcohol is reached faster with higher roasting temperatures. It has to be pointed out that the highest amount of furfuryl alcohol observed was at 240 °C (512 µg/g) and that the amount of furfuryl alcohol produced at 180 °C was the lowest in the experiments described here (92 µg/g). The trend of furfuryl alcohol formation kinetics is very similar to that of other furan derivatives produced in coffee, such as hydroxymethyl-furfural and hydroxymethyl-furoic acid. Furfuryl alcohol has been found to polymerise during the roasting process forming dimers and higher oligomers and this (in addition to evaporation and other possible conversions of furfuryl alcohol) can be the reason leading to the furfuryl alcohol decline observed at later stages of roasting.

Acrylamide forming in heat treated food products and LC-MS/MS analysis of this Maillard reaction compound

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Introduction

Who would have been thought about a definitely occupational-like health risk, it may be general food safety problem in the XXI. century… This like is the case of the toxicological story of acrylamide. Until the end of XX. century, the acrylamide was a well-known compound as a raw material of different industrial product, like hydrophilic gels, contact lens, several soil conditioning products etc. Because the acrylamide is a volatile compound, during the production of this chemical, the inhalation of it's vapour may be harm the health of workers. According to the literature, acrylamide may initiate carcinogenic processes in the human body. The Maillard reaction and the process of acrylamide formation and the biochemical significance of acrylamide will be discussed briefly in the presentation. In 2017, manufacturers' measures aimed at decreasing acrylamide levels in heat treated, mainly baked, foods, as well as mandatory laboratory testing were regulated by a European Union Commission decree, and maximum permissible acrylamide levels in the foods in question were also set. The regulation to be applied from 11. April 2018.

Materials and Methods

Prior to the publication of the EU Commission decree, between 2006 and November 2017, the acrylamide contents of 250 drinking water samples, 715 potato chip samples and 67 other food samples (for a total of 1033 samples) were tested at the request of our partners using LC/MS/MS tandem analytical system without derivatisation applying acrylamide-D_3 internal standard. The limit of quantification (LOQ) of our analytical tests was 1.0 µg/L for drinking waters and 10 µg/kg for solid foods. One of our result series shown in Figure 1.

Results and conclusion

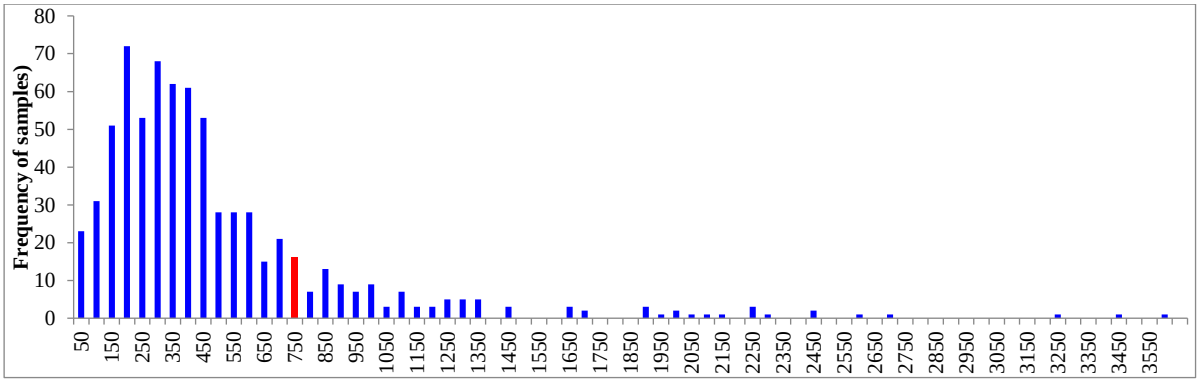

Figure 1. Histogram of 715 potato chips samples (on the X axis: acrylamide results in µg/kg. the red column is indicating the EU reference limit for potato chips, 750 µg/kg).

As our results the most exposed processed food group are the several types of potato chips.

Technogenic contamination of agrobiocenosis as a risk factor in manufacturing of animal products

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Keywords: technogenic contamination**,** forage plants, quality of milk, quality of meat

In the industrial regions with intense technogenic contamination the research was done on the content of radionuclides ^{90}Sr, ^{137}Cs, ^{210}Pb and metal pollutants Cd, Pb, Cu, Zn, Fe in different elements of agrarian biocenose in forage plants, animals' bodies, and meat and milk for processing. Inhomogenous dynamics of accumulation of pollutants in various groups of plant stuff was detected. Silage was mostly contaminated with radiostrontium, Zn and Pb; hay – with radiocesium and Cd; concentrates – with Cd; haylage - with ^{137}Cs, ^{90}Sr, ^{210}Pb and Fe; grain mixture – with Zn and Pb. Quality of milk of the cows from the regions with technogenic contamination was worse as compared with the intact regions, according to a number of parameters. Concentration of Cu, Cd, Zn in milk differed more than by two times. The meat of the cows from the regions with technogenic contamination generally contained more pollutants than in uncontaminated regions: the content of ^{137}Cs and Cd was twice as much, and of Zn and Cu was 2,5 times as much. Beef liver had excess accumulation of Zn, Cu, Pb, Cd and Fe, the difference as compared with the parameters of intact regions was 2,5-5 times as much. The tendency of the most accumulation of Fe and Cd in cows' kidneys was detected. The results obtained proves the change in quality of meat for processing and meat by-products produced by the animals from the regions with technogenic contamination and speak for high risk of migration of technogenic contaminants along agrarian trophic chains to the final consumer, that is a human.

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The influence of co-occurrence on the toxicological profile of Fusarium and Alternaria toxins in complex mixtures.

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Introduction:
Mould contamination of agricultural products is a growing concern worldwide, as toxic metabolites – the mycotoxins – can stay in food even after processing. Among the responsible fungi, the families of *Fusarium* and *Alternaria spp.* stand out with their ability to form metabolites that are able to interact with estrogen receptors -. acting as mycoestrogens. Zearalenone (ZEN) and α-zearalenol (α-ZEL), two mycotoxins frequently found in food after *Fusarium* contaminations, are well-described endocrine disruptors and thus controlled respectively. On the other hand, no regulation exists for *Alternaria* toxins whose toxic profiles are much more complex due to the usual co-occurrence of a divers spectrum of secondary metabolites with different effects such as cytotoxicity, genotoxicity, but also estrogenicity. Those compounds not only differ in activity, but are also produced in varying relative quantities depending on fungal strain and growth conditions, and also differ in chemical stability. Additionally, the frequent co-occurrence with *Fusarium* toxins, but also with other bioactive food constituents, like polyphenols, might alter biological outcomes. To shed some light on this complex situation, we performed *in vitro* studies which addressed some pending questions on the interaction of co-occurring compounds, the contribution of some single compounds to the toxicity of mould extracts and the fate of reactive metabolites in food matrices.

Materials and Methods:
In Ishikawa cells, known to express the estrogen receptor α and β, estrogenic effects were determined photometrically as expression of alkaline phosphatase.

Results and Discussion:
We found alternariol (AOH), one of the predominantly formed *Alternaria* metabolites that possesses estrogenic properties, to synergistically enhance the estrogenic effects of ZEN, α-ZEL and genistein, a phytoestrogen found in soy-based foods. In the complex mixture of an extract of *Alternaria alternata* grown on rice, the concentration of AOH and related compounds was seemingly not sufficient to cause similar effects, as here the potential estrogenicity was overlapped by the strong genotoxic effects of other present metabolites of the perylene quinone family. However, the extract was found to impair the activity of the endogenous estrogen 17β-estradiol, an activity whose mechanism remains to be enlightened. Furthermore, we demonstrated the reactivity of these genotoxic compounds with food constituents out of the class of polyphenols, which might subsequently allow the re-occurrence of estrogenic effects.

Conclusion:
Taken together, our findings represent the first steps towards a more holistic contemplation of the effects of mycotoxins in naturally occurring complex mixtures, considering the interaction with “bioactive” food constituents.

Radiation Inactivation of Bio-Hazards

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Keywords: AOP, Staphylococcus, wastewater matrix

In this study, we are looking for answers to the following question: Is it possible to reduce or eliminate the impact of antibiotics on the microorganisms in wastewater using radiolylsis methods, in order to prevent antibiotic resistance development?
We have introduced a microbiological assay, to assess the applicability of an AOP for eliminating the subinhibitory effects of antibiotics on selected resistant bacteria.
The test is based on the population dynamics of a resistant and sensitive mixed bacterial culture in response to the presence of antibiotics in a concentration range well below the minimum inhibitory concentration (MIC) in a synthetic wastewater matrix. We added sensitive and resistant subtypes of Staphylococcus aureus in a 1:1 ratio to the test medium, and we determined the fraction of resistant mutants after incubation for 24 hours by simple colony counting.
Using this method we plan two series of experiments, in one of them wastewater matrix with antibiotics will be used, in the other wastewater-matrix with bacterium. In this case, we will add bacteria to the samples prior to irradiation. The comparison will be based on samples with irradiated wastewater matrix without antibiotic and wastewater matrix with both antibiotic and bacterium.
So the aim of the proposed research is developing scientific and technical background to provide reliable data about irradiation inactivation of pathogenic microorganisms (mainly in treated wastewater) under varying physical conditions.
Elaborating methods for measuring the concentration of the bacteria in the wastewater effluent, and for measuring both the concentration and the antimicrobial activity of the antibiotics. Establish the dose required to eliminate specific bio-contaminants and develop appropriate methodologies for treatment of bio-hazards in irradiated wastewater using electron beam accelerators.

Formation of antibiotic resistance of microflora in commercial dairy farms in the regions with technogenic contamination of environment

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Keywords: microflora, antibiotic resistance, industrial pollutants, immune system

The article describes the results of the research done on the pathogenic agents of microbiome in commercial dairy farms located in the regions polluted with industrial pollutants, such as heavy metals and radionuclides. The research detected the interaction between the level of technogenic contamination of environment, immune status of animals and prevalence rate of strains of pathogenic and opportunistic pathogenic microflora with reduced sensitivity to various groups of antibiotics. Continuous excess supply of Cd, Zn, Fe, Cu and cesium-137 into the bodies of the cattle stock resulted in chronic suppression of cell and humoral components of the immune system and reduction of animals' organism resistance to pathogenic and opportunistic pathogenic microflora, and, consequently, in development of the disease state, where the use of antibacterial medications was needed. In the farms located in the regions with technogenic contamination frequency of detection of strains E. coli, Ent. faecium, Ent. faecalis, P. aeruginosa, S. aureus, P. vulgaris, P. mirabilis with reduced sensitivity to 1-2 antibiotics was 11 times higher than in the uncontaminated zones. Frequency of detection of pathogens with the reduced sensitivity to 4 antibiotics of various groups was 6,5 times higher. The frequency of detection of resistant strains was 3 times higher.

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Food preference survey in school canteens – A pilot study

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Introduction:
In accordance with the European trend, more and more children have their meals in the canteen, so all the questions of food safety and nutrition biology related to school catering have come into the limelight. In Hungarian public educational institutions it is compulsory to provide food for schoolchildren at least by one meal per day. It is legally regulated what can be served for children in school. However careful nutritional calculations are behind this regulation, the regulations are moderately suitable to determine the real consumption, because pupils often consume partly or even reject the served food. To get closer to this phenomenon a method were elaborated to measure what amount of served food are consumed in school cafeterias.

Materials and Methods:
In this research, plate waste of the canteens was analyzed according to the main ingredients. A checklist was created to collect menu information, consumers count, the weight data of served food and weight data of returned food. By analyzing the served portions and the amount of plate waste, we estimated the real quantities of the consumed food. For testing the method, we launched a pilot study in five secondary schools in Budapest.

Results and Discussion:
Preliminary results show that pupils eating about 76% of the meal they get. This ratio is lower in case of soups (74%) and higher in case of main dishes (77%).
If produced and served meal is partly consumed, the following drawbacks raise:

- Significant part of food was produced for waste, leading to unnecessary CO_2 production and increased ecological footprint.
- Food waste must be processed.
- Although the nutritional value of the meal was accurately calculated, pupils will not get the necessary nutriments. They will supply from other sources that are often considered as unhealthy.

It should also be considered that parents pay the whole sum in any case even if their children do not even have a look at the ordered meal. Moreover, when children eat well in canteens and it is not necessary to spend money on other things, households can calculate with less food expenses.

Conclusion:
The collected data give us the possibility for detailed evaluation of the nutritional intake of school children. These finding also enables the development of more appealing school cafeterias. Healthy food consumed fully and regularly will positively affect the health of consumers and reducing the additional economic cost of health problems.

Food products from hemp (Cannabis sativa): nutritional value, chemical profiling and technological perspectives

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Introduction:
The seed of *Cannabis sativa* L. has been considered as important source of nutrition for thousands of years in Old World cultures. More recently, non-drug varieties of *Cannabis sativa* (hemp) have been extensively studied for their nutritional potential. Non-drug hemp cultivation has recently been reassessed in many Countries, including northern Italy, for different non-food uses (textiles, plastics and novel building materials), but also for the production of food (oil, flours, food supplements). Hemp seeds flour and the high valued cold pressed hemp seeds oil are particularly appreciated both for foods and nutraceuticals production. Hempseed typically contains over 30% oil (characterized by a high unsaturated/saturated fatty acid ratio, 2:1-3:1 omega-6/omega-3 essential fatty acids ratio) and about 25% protein, with considerable amounts of dietary fiber, vitamins and minerals. Hempseed oil is over 80% in polyunsaturated fatty acids (PUFAs), and it is an exceptionally rich source of alpha-linolenic acid (18:3 omega-3). Two main proteins in hempseed: edestin and albumin, high-quality storage proteins easily digestible and containing significant amounts of essential amino acids. Bioactive properties of proteins, peptides and other minor compounds are of great interest in nutraceutical area, as in the case of cannabidiol.
The purpose of this lecture will be addressed to the critical discussion of the chemical/nutritional value of oils and flours obtained from hempseeds, as well as to discuss the value of the slurry (obtained from decanting and filtering process during oil production), considered a by-product to be valorised, taking into account the concept of the *bioeconomy*.

Materials and Methods:
Analytical methods for authentication, traceability and integrity of hemp seeds and their contamination by mycotoxins were first explored. Moreover, the cold mechanical pressing of hulled hemp seeds and the chemical characterization of the resulting cold pressed virgin oil and by-products, such as sludge (residue recovered after natural sedimentation and filtration of crude oil) and hemp flours (obtained grinding and sieving the exhausted hemp pellet) was considered in this study.

Results and Discussion:
The hemp oil composition was coherent with recent literature data. The slurry showed an interesting high crude protein content (> 40% on dry weight), and a low content of total dietary fiber (7.5% d.w.). Conversely, the exhausted pellet (source of flours) was characterized by a 45% of total dietary fiber, 28% of proteins and 11% of residual lipids. Applying a dry fractionation to grinded hemp pellets and a decreasing mesh sieving, we obtained different flours with specific composition. The finest one (< 200 μm) is characterized by an interesting 6% of soluble dietary fiber. Total antioxidant activity (DPPH° assay), protein pattern by SDS and polyphenols pattern by HPLC were also evaluated in these samples.

Finally, the cannabinoids profile of hemp oils from different varieties (also enriched with the slurry, by mean of high pressure homogenization, ultrasounds and high shear homogenization) was evaluated in raw and preserved samples in different conditions and following accelerated thermal oxidation in oven, allowing new data about the cannabinoids presence and stability.

Conclusion:

All these findings allowed us to confirm that hemp derived products are useful functional foods for humans, even if more investigations regarding their safety are requested.

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Biologically Active Peptides from Ultra-heat Treated Milk by Membrane- and Enzymatic Routes

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Keywords: Biologically Active Peptides, Ultra-heat Treated Milk, Membrane separation, Triptic hydrolysis

1. Introduction

In present century, a prodigious attention is placed to develop the biologically active compounds for food fortification due to their unique biological activities. Therefore, in the present investigation, an attempt has been made to develop antioxidant-, angiotensin converting enzyme (ACE) inhibitory-, antimicrobial- and hypoallergenic- peptides from ultra-heat treated milk (UHT) by membrane- and enzymatic routes.

2. Materials and Methods:

2.1. Synthesis of Bioactive Peptides from Milk

Ultra-heat treated milk was filtered in a tubular ceramic ultrafiltration membrane (pore size 5 nm), fitted in an indigenous cross-flow membrane module. Membrane separation process was operated under trans-membrane pressures 3 bar and retention flow rate 100 L h^{-1}. Native- and ultrafiltered- milks were pre-incubated and subsequently, ultrafiltered- different concentrations of trypsin (0.007 g.L^{-1}, 0.016 g.L^{-1}, 0.032 g.L^{-1}, 0.064 g.L^{-1}) were added into separate milk samples. Enzymatic reaction was performed at fixed agitation speed of 100 rpm and operational temperature 40 ^{o}C for 10 min. After 10 min of enzymatic reaction, samples were immediately placed in a water bath at temperature 70 ^{o}C to stop enzymatic activity.

2.2. Analytical Methods

2.2.1. Antioxidant Activity

Antioxidant capacity of UHT milk and enzymatically hydrolysed milks were estimated with the Ferric Reducing Ability of Plasma (FRAP) assay method using a UV-Vis spectrophotometer.

2.2.2. Estimation of Angiotensin-Converting-Enzyme Inhibitory Activity

Angiotensin converting enzyme inhibitory activity was measured with substrate (Abz-FRK(Dnp)-P), recombinant ACE and milk samples (in a dilution range of 10-fold to 10^{6}-fold). Activities in the absence of milk samples (uninhibited samples) were used as controls and the level of inhibition was calculated as % of uninhibited activity on each plate.

22.3. Estimation of Allergenic Activity

SDS-PAGE experiment was performed according to the Laemmli method. Standard protein marker (molecular weight 200-14 kDa) were used. The separated protein fractions were transferred onto PVDF membrane and incubated overnight with clinically proved milk allergic anonym human sera. Peroxidase conjugated anti-human IgE was used as secondary antibody.

2.2.4. Estimation of Antimicrobial Activity

Antibacterial activity of the synthesized peptides against gram-positive *Bacillus cereus* (collected from CCDMB in SZIE, Budapest, Hungary) was investigated with the agar well method.

3. Results and Discussion

Antioxidant activity of enzyme-hydrolyzed milk was significantly higher than native UHT milk and the antioxidant activity was increased in dose-dependent manner. Trypsin cleaves the peptide bond associated with positively-charged lysine or arginine, having hydrophobic side chains. Low-molecular weight peptides with hydrophobic amino acids offer antioxidant activity. Application of trypsin increased the ACE inhibitory activity of ultrafiltered milk compared to native UHT milk. Tryptic hydrolysis of milk- and whey- proteins offer ACE inhibitory activity and inhibitory activity of peptides is amino acid sequence specific. However, native UHT milk did not offer antimicrobial activity, enzyme-treated milk showed antimicrobial activity against test microorganism. Hypoallergenic activity of peptides was dose-dependent manner due to deletion of disulfide bonds and epitopes in proteins.

Study of whey ultrafiltration using different types of ceramic membranes and process characteristics

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Introduction:
The main by-product of the dairy industry is whey, its clean disposal or utilization is not always a given option for the dairy plants. In recent years there has been an increasing trend for applications of filtration processes in the food industry, but still the use of filtration for potential valuable product recovery has been lagging behind in Eastern Europe, especially Harghita county (Romania).

Material and methods:
The aim of our research is to screen different membranes for the development of a multistage filtration line to retrieve valuable components, such as protein fractions, lactose and minerals in order to assist the use of sustainable food technology in underdeveloped regions.
With this study we determined the effectiveness of different membrane modules and process characteristics in regards to whey microfiltration. Ceramic membrane modules were used in crossflow filtration with 200 nm and 500 nm pore sizes at different process characteristics. Whey temperature varied between 20-40^{o}C; flow rate between 75-150 L/h; and pressure between 1 and 3 bars. The process characteristics were chosen based on 3^{p} factorial design. Samples were taken triplicate from the base whey, from the permeate and finally the retentate.

Results and discussion:
The samples were analyzed for protein concentration, fat content, dry matter content and lactose concentration.

Conclusion:
After evaluating the data, the optimal parameters for the 200 nm and 500 nm ceramic membranes were concluded.

Flow condition of new turbulence promoter geometry optimised for membrane filtration

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Keywords: membrane filtration, tube membrane, static mixer, turbulence promoter

Introduction:
There are several fields in food industry where filtration process can be intensifyed using turbulence promoter inside tubular membrane. In this work, development of a new turbulence promoter geometric configuration has been presented, which does not generate significant pressure drop along the membrane and it has positive effect on the component retention and initial permeate flux. In case of commercially available static mixers, simplifyed equations are provided for calculating Reynolds number and pressure drop along the tube, but since these equations has not been created yet for our new type of turbulence promoter, a modelling attempt was carried out to fulfill this task. In this work few main steps of this developing process and the equation for calculation of Reynolds number will be reported.

Materials and Methods:
At first, stable oil-in-water emulsion as modell fluid was prepared from a commercial cutting lubricant oil additive (Unisol, Mol, Hungary). The oil concentration in the emulsion was 5 mass%. Another test liquid was sweet whey, a by-product of cheese production with solid content of 7.55%. In these experiments basic cross-flow set-up membrane filtration unit were applied. The regulation of recirculation flow rate was adjusted with a by-pass pipe and valves before and after membrane module. As filter media Membralox (Pall, USA) ceramic tube membrane with pore sizes of 20, 50 and 200 nm, filtration area of 50 cm^2 and 6.8 mm inner diameter were tested in unit-operation laboratory circumstances. For computational fluid dynamics (CFD) an open source lattice Boltzmann algorithm was used.

Results and Discussion:
The CFD simulation and experiments confirmed that Kenics static mixer has positive effect on permeate flux and retention of membrane, but there are other geometric configurations more suitable for membrane filtration, where pressure drop along the membrane is not significantly increased. Spiral static mixer with thread pitch and diameter ratio (L/D_{SM}) =2, pitch angle: 32°, the twisted metal strip thickness: 1 mm has most optimal geometry for membrane filtration process where tubular membrane is used. After all, the equation for the Reynolds number was created in function of inner diameter, recirculation flow rate, density and viscosity.

Conclusion:
New, spiral-shaped turbulence promoter geometry has better performance in membrane filtration process compared to commercial static mixers. Presented equation can be used for calculation of Reynolds number to predict the flow nature and turbulency level inside tubular membrane equiped with new, spiralic, turbulence promoter.

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Clarification of Hopped Wort by Crossflow Microfiltration

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Introduction:
Removing hot and cold trub from hopped wort is important, because of yeast viability, beer filtration, beer quality and less fouling during fermentation in Membrane Bioreactor. Hot and cold trub can be removed by several methods, but Crossflow Microfiltration (CFMF) would be an alternative and novel technology.

Materials and Methods:
For the filtration experiment a pale wort (Original Extract 11.16±0.01 °P) was produced. The membrane filtration was performed with the following operating parameters: temperature (10±1°C), Transmembrane Pressure (0.4 bar) and Crossflow Velocity (0.4 m s^{-1}). 0.5 µm is the size of the smallest particle (cold trub) that has to be removed, thus membrane pore size of 0.2 µm was applied. The flux values of the filtration were determined. Particle size distributions of original wort and permeate were measured. Analytical parameters (β-glucan content, bitterness, colour, dynamic viscosity, extract content, free amino nitrogen content, pH, total polyphenol content, turbidity) of original wort and permeate samples were measured and retentions of different components were calculated.

Results and Discussion:
The initial and steady-state fluxes of the membrane filtration were 16.75 and 4.89 L m^{-2} h^{-1}, respectively. According to the particle size distribution hot and cold trub was completely removed. β-glucan content decreased dramatically what leads to less fouling during fermentation in MBR and the lower β-glucan content can improve clarification of rough beer. The bitterness decreased by approximately 5 unit, this difference can't be evaluated with sensory analysis. Colour became paler, supposedly due to notable retention of carbohydrates and Maillard reaction products. The dynamic viscosity and the extract content decreased by reason of retention of different compounds (e.g. carbohydrates). FAN content wasn't changed that is essential, because adequate level of FAN in wort ensures efficient yeast cell growth and desirable fermentation performance. The pH increased which negatively affects the microbiological stability of the permeate. TPC decreased by approximately 5.6 %, because hot and cold trub were completely removed. This decrease is beneficial in terms of colloidal stability, because polyphenols play a decisive role in haze formation. However, this decrease is not beneficial in terms of flavour stability, because polyphenols hinder and prevent the oxidation of other molecules present in beer. The turbidity decreased by nearly two orders of magnitude, because of removal of hot break and cold break. This results in less haze problems in the final product.

Conclusion:

Flux values of the membrane filtration experiment were quite low, but these values could be enhanced by the optimization of operating parameters and applications of permeate backflow techniques, enzymes, filtration aids, flow pulsation, gas sparging, Static Turbulence Promoter, Vibratory Shear Enhanced Processing etc. It has been proven that hot and cold trub can be completely removed by CFMF and the changing of the analytical parameters are appropriate.

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Occurance of deoxynivalenol in cereals and cereal products in Hungary

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Keywords: DON, cereals, Hungary

Introduction:
Among *Fusarium* mycotoxins, deoxynivalenol (DON) is the most common contaminant in case of cereals and cereal-based foods in Hungary.
Materials and Methods:
Hungarian wheat (n = 305), maize (n = 108), wheat flour (n = 179) and pasta (n = 226) samples were analysed (N = 818). The samples were collected during 2008–2015 in Hungary. Applied methods of analysis were enzyme-linked immunosorbent assay and liquid-chromatography coupled with a mass spectrometer. Results were compared and evaluated with Hungarian weather data.
Results and Discussion:
In this study, Among cereal samples, in 2011, wheat was contaminated with DON (overall average ± standard deviation was 2159 ± 2818 μg kg−1), which was above the maximum limit (ML). In case of wheat flour and pasta, no average values above ML were found during 2008–2015, but higher DON contamination could be observed in 2011 as well (wheat flour: 537 ± 573 μg kg−1; pasta: 511 ± 175 μg kg−1).
Conclusion:
Based on our survey not only the weather conditions like temperature and rainfall quantity, distribution, affect the level of DON toxin contamination of cereals and cereal products. A new risk factor - extremely dry weather, very low annual average rainfall quantity - was determined for wheat samples and very high yearly average temperature for maize samples. This highlights that the consideration of other extreme weather conditions is also necessary when planning the monitoring not only the previously determined weather conditions–matrix–DON toxin relation.

Fungal enzymes in biomass to bioproducts development

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Biofuels and related by/co products, produced entirely from waste, such as agricultural by-products, lignocellulosic waste biomass from forestry, agri waste, food waste and municipal solid waste. These renewable biological resources are abundant, inexpensive and potential feedstock for bioenergy production. Fungi are playing a key role in producing important enzymes for bioconversion of variety of biomasses for bioproduct developments. Selection of fungal candidates depends on their capacity to specifically or at the same time degrade lignocellulosic materials, the high redox capability of their enzymes, their building abilities and their thermal stability. There are a huge market and interest in the role of fungi, their extracellular enzymes associated with the enzymatic hydrolysis of the lignocellulosic components, in particular cellulose, hemicellulose, and lignin. Researches and applications of fungal enzymes in bio-fuel area have got much attention because of its cleaner technology and a potential substitute for non-renewable petroleum fuels and their derived petrochemicals. Many researches are currently under way to develop and screen the most suitable technological platform and efficient enzyme preparations for biomass to biorefrenery applications. The present talk will address an overview of the strategies and technological challeneges on the importance of fungal enzymes in bioproducts development from feedstocks/biomass and to generate electricity.

Study of the fermentation abilities of *Torulaspora delbrueckii* yeast in a brewing environment

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Keywords: non-Saccharomyces yeast, brewing, Torulaspora delbrueckii, fermentation ability

Introduction:
Brewing is one of the most traditional food industries. Although the use of pure brewer's yeast cultures started only in the late 19th century we can state that brewers had centuries to select the suitable yeast for their own beer, and thus they had plenty of time to adapt their technology. In the past few years, innovation pressure in brewing has reached a point when brewers turn towards the application of yeast species other than the traditional Saccharomyces cerevisiae and S. pastorianus. In this context we should mention the yeasts belonging to different Brettanomyces species and the strains of Torulaspora delbrueckii. The brewers of present time have no decades to get to know and make lengthy selection among these strains and adapt their technology. Thus, it is crucial to perform thorough examination of potential strains to provide information to brewers interested in the use of new yeasts. We have chosen four Torulaspora delbrueckii strains and examined the basic characteristics of them as well as their potentials in brewing.

Materials and Methods:
The four Torulaspora delbrueckii strains were kindly provided by the National Collection of Agricultural and Industrial Microorganisms, Budapest: NCAIM 543, 931, 982 and 1593. For the fermentation experiments we have used all malt wort (extract content 12%) made in the pilot brewery of the Department of Brewing and Distilling at Szent Istvan University. Fermentation trials was performed in all malt wort to study fermentation abilities of the strains through measuring extract content change and alcohol production (by beer analyzer) as well as production of aromatic compounds relevant in beer composition (by GC), and phenolic compounds typical for yeast related to wine production (by HPLC).

Results and Discussion:
Fermentation trials were performed using a primary and a secondary stage. The former one at 20°C, based on information found in literature, while the latter at 5°C.

Conclusion:
Based on our investigations we can conclude that Torulaspora delbrueckii strains did not show any major deviant characteristics thus it is worthy to further investigate the possible use of these or other strains belonging to this species in brewing.

The antimicrobial and resistance modifying activities of *Nigella sativa* oil

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Keywords: Nigella sativa, antimicrobial, resistance

Introduction:
Nigella sativa L. (Black cumin) is well known for its benefits in the field of traditional medicine. The aim of this study was to investigate the antimicrobial activity of crude oil and essential oil of *Nigella sativa* L. on food spoilage and pathogenic bacteria, and the resistance modifying activity of *N. sativa* essential oil, thymoquinone, carvacrol, and p-cymene against *S. aureus* and *L. monocytogenes* strains.
Materials and Methods:
N. sativa essential oil, thymoquinone, carvacrol, and p-cymene were assessed for antimicrobial activity, modulation of antimicrobial resistance, inhibition of antimicrobial efflux, membrane disrupting effect and anti-biofilm activity by broth microdilution, ethidium bromide accumulation and LIVE/DEAD BacLight™ assays.
Results and Discussion:
N. sativa crude oil and essential oils were active against food-borne spoilage and pathogenic bacteria. The essential oil was 10 times more active than the crude oil. Crude oil inhibited only Gram positive strains. Combination of antibiotics with half MIC concentration of essential oil or its active compounds modulated (decreased) the antimicrobial resistance to each investigated antibiotic. *N. sativa* essential oil and its active compounds increased the EtBr accumulation in *Listeria monocytogenes* and *Staphylococcus aureus*. The increase was comparable to the chemical efflux pump inhibitors. 1/2 MIC of *N. sativa* essential oil, thymoquinone, carvacrol or p-cymene disrupted the membrane integrity of *L. monocytogenes* and *Staphylococcus aureus*. *N. sativa* essential oil, thymoquinone, and carvacrol could reduce effectively the development of biofilm formation of *Staphylococcus aureus*. Based on these results *N. sativa* essential oil has a great potential to use it as a food preservative. Furthermore, *N. sativa* essential oil and its bioactive compounds are promising modifiers of antimicrobial resistance, and could be applied as potent efflux pump inhibitors in *L. monocytogenes* and *Staphylococcus aureus* MRSA strains. Influencing efflux pumps, the resistant isolates can lose their virulence which can provide better perspectives to treat MRSA related infections. In addition, essential oil, thymoquinone, and carvacrol might be used as adjuvants in combination with antibiotics enabling a better therapeutic efficacy in *S. aureus* related infections.

Conclusion:

These findings prove that *Nigella sativa* oils represent a potential source of bioactive compounds to use it as a food preservative and as a medical commodity.

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Fungal cell wall biosynthesis: from basic research to biotechnology application

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Keywords: yeast cell wall, genetic immobilization, surface display, xylose reductase

Introduction:
Studies of microbial cell envelopes and particularly mechanisms for localization of cell surface proteins brought about new biotechnological applications of surface display of homologous and heterologous proteins. By fusing surface proteins, or their anchoring domains with different proteins of interest their so called *genetic immobilization* is achieved. In this way chemical immobilization is avoided by letting the cells do the whole procedure. Both bacterial and yeast cells have been used for this purpose and a number of potential biotechnological applications of surface displayed proteins have been reported. When surface immobilized enzymes are used, substrates do not need to cross membrane barriers, i.e. enzymes are freely accessed by any externally added substrate creating new biotechnological tools. In recent years particular attention has been paid to yeast systems since most yeasts are generally regarded as safe (GRAS), and cell walls are capable of binding more proteins. In this talk our current knowledge on molecular mechanisms for yeast cell wall biosynthesis will be summarized and the application of knowledge gained through basic molecular research on surface display of xylose reductase will be discussed.

Materials and Methods:
Generally, surface display of proteins in yeasts require standard genetic techniques for creating recombinant proteins. The first step is the construction of genetic cassettes in which a gene coding for the protein of interest is inserted. Such a cassette may typically contain a regulated promoter, a gene coding for a cell wall protein or a part that directs the protein in the wall, followed by one or several restriction sites for the insertion of the gene of interest. Usually a tag is added to the protein at an appropriate position to allow easier following the protein. Such cassettes can then be used for surface display of different proteins, the proper localization of the produced protein is determined by western blots, and its activity is assayed using whole cells as the enzyme preparation.

Results and Discussion:
In the talk an example of surface display of the enzyme xylose reductase (XR) will be presented. XR is an enzyme that reduces xylose to xylitol, a widely used sweetener. Xylitol is mostly produced biotechnologically, using yeasts that uptake xylose and reduce it in the cytoplasm to xylitol that is then secreted back into the external medium. Thus reaction relocation to outside the cells would avoid transport and a rather low availability of NADPH within the cells. XR is therefore displayed on yeasts in two different ways. In the first strategy XR is fused with Pir4 to achieve its incorporation in the wall through the N-terminus, while in the second the GPI-anchoring signal is added to the protein thus allowing its incorporation in the wall through the C-terminus by the GPI – beta glucan interaction.

In both cases XR was properly localized in the cell wall and both immobilized XR forms retained enzymatic activity. The immobilization by either method increased the thermal, as well as the pH, and organic solvent stability of the XR. This is particularly important since XRs are known to have low stability which largely limits their biotechnological applications.

Conclusion:

The importance of the surface display technology in biotechnology production and the comparison with the classic immobilization techniques are discussed in this talk.

Utilization of different prebiotics by probiotic Lactobacillus strains

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Keywords: Lactobacillus, prebiotics

Introduction:
Oligosaccharides have been increasingly used in the food industry (beverages, sweets) for modifying viscosity, emulsification capacity, gel formation, freezing point and colour of foods. Some oligosaccharides show nutrition- and health-relevant properties too. Definitely, prebiotics are food compounds that stimulate the growth of one or a limited number of the potentially health-promoting endogenous microorganisms, thus modulating the composition of the natural ecosystem of humans. Furthermore, prebiotics reduce the prevalence and duration of infectious and antibiotic-associated diarrhea, reduce the risk and severity of gastrointestinal infection and inflammation, exert protective effects to prevent colon cancer, enhance the bioavailability and uptake of minerals (Ca, Mg, Fe), lower some risk factors for cardiovascular disease. The prebiotics may also have protective effect on the viability and activity of probiotic bacteria during fermentation, through gastrointestinal tract and storage. This work focused on the utilization of prebiotics by some commercial probiotic bacteria.

Materials and Methods:
Thirteen commercial probiotic strains of different Lactobacillus species (L. brevis, L. crispatus, L. fermentum, L. helveticus, L. plantarum, L. reuteri, L. rhamnosus, L. salivarius) were used to investigate the utilization of various prebiotics (inulins, xylo-oligosaccharides, lactulose, galacto-oligosaccharides). The strains were inoculated in modified MRS medium (containing 1% each of the prebiotics or glucose) and grown at 37°C for 24 h. Utilization of prebiotics and glucose was evaluated by measuring the optical density at 600 nm. The cell density on glucose was considered as 100% and other results on prebiotics were compared to this value.

Results and Discussion:
Modified MRS medium without glucose were successfully developed to minimize the growth of probiotic bacteria. This medium contains only yeast extract, meat extract and peptone in concentration of 25%. All tested strains grew well on modified MRS medium contained 1 % of different prebiotics, but the consumption dynamics of each probiotic Lactobacilli were different comparing with glucose as main carbohydrate. Lactulose was the best prebiotic which enhances the growth of all investigated probiotic bacteria. Utilization rates of fructo-oligosaccharide and inulins were two times higher than of glucose in the case of the L. reuteri HA-188 strain. Galacto-oligosaccharide syrup was fermented at the lowest rate (about 50% of glucose on average), and only 2 strains (L. helveticus R-52 and L. fermentum LF08) were able to use it (80% of glucose). Also, only three strains (L. reuteri HA-188, L. helveticus R-52 and L. fermentum LF08) consumed xylo-oligosaccharide at higher rate than glucose. Fortunately, the pathogenic microorganisms were not able to consume prebiotic lactulose very well, meaning less than 50 % rate comparing with one of glucose.

Conclusion:

Utilization of prebiotics by probiotics should be a pre-requisite for synbiotic selection, in order to get synergic and maximum beneficial effects. Lactulose was very promising nutritional supplement for this purpose.

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The biochemical properties of different l-asparaginase types to minimize acrylamide formation in baked foods

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Keywords: Asparaginase, acrylamide, baked foods, Millard reaction

Introduction:
L-asparaginase is considered as a potential agent in reducing the formation of acrylamide, due to its ability to convert l-asparagine to l-aspartic acid and ammonia, thereby reducing the precursors for Millard reaction in baked foods. Nevertheless, it is necessary to determine and assess the biochemical activities of different l-asparaginases since variation and drawbacks in the food industry are being increasingly reported. This study offers a framework with recent developments on asparaginases biochemistry revealing their properties, the conditions and their activity to reduce acrylamide levels without altering the appearance and taste of the final baked food products.

Materials and Methods:
In this study a rich combination of extensive literature review was carried out in order to ensure that the important aspects in the field of different types of l-asparaginases and their biochemistry properties and activities were covered. This integrated review also presents data on the structure of l-asparaginase, its classification, applications, its activity under different conditions, and its use in the food industry.

Results and Discussion:
L-asparaginases are classified based on their amino acid sequences and biochemical properties. The enzymes are divided into three major groups: bacterial-type l-asparaginases, plant-type l-asparaginases, and Rhizobial-type l-asparaginases. Asparaginase activity is affected by enzyme dose, reaction time, temperature, pH chemical composition and contact with the substrate at which the reaction occurs. There are different methods to determine the activity of the enzyme based on measuring the ammonia that is generated from the asparagine hydrolysis.

Conclusions:
To quantify the effect of different l-asparaginases in food applications, their activity needs to be determined under different conditions setting up a standard activity determination method. These differences in activity should be considered prior to the application of the enzyme to food products.

Lipolytic activity of yeast isolates originated from farm cheeses

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Keywords: lipase, yeast, spectrophotometry

Introduction:
Enzyme production of microorganisms can have beneficial or deteriorative impacts. Several enzymes are produced industrially by microbes and are used in different industrial applications. Microorganisms are present in foods too which will produce at appropriate environmental conditions enzymes that can lead to food spoilage. Because food matrixes are often good substrates for microbial growth they represent a source for new or better (e.g. higher yield, activity at special condition, etc.) enzyme producing microbes.

Materials and Methods:
Yeast strains from farm cheese samples (from cow and sheep milk) were isolated using RBC media. Lipolytic activity of strains was tested on Tween-80, oilve oil contaning Rhodamine B and Gorodkowa agar plates. Extracellular enzyme activity was tested by agar well diffusion and spectrophotometric assays. For spectrophotometric detection of esterase and lipolytic acitivity tributyrin and Tween-80 were used as substrates, respectivelly. Induction of lipase enzyme production was tested using tributyrin and olive oil.

Results and Discussion:
36 yeast isolates were selected according to colony morphology from RBC plates (17-19 from cow and sheep farm chesses). From the strains 8 showed significant lipolytic activity during screening. Esterase activity was higher when strains were cultured in Minimal medium than in YEPD. The extracellular and intracellular acitivity values differed usually only slightly. In case of lipolytic activity half of the strains failed to produce lipase in Minimal Medium, the remainig four strains showed activity, however only intracellular. In YEPD all strains showed both extracellular and intracellular activities. The use of inductor in culture media enhanced the lipase activity, especially in case of olive oil. Dispite the enhancement no extracellular activity was detected in Minimal medium, moreover the extracellular activities in YEPD rapidly decreased or even disapeared with longer incubation time.

Conclusion:
Analysis of farm cheese samples revealed potential lipase producing yeast isolates with high activity. Usage of olive oil as inductor lead to increase (in one case tenfold) in intracellular lipolytic activity. Further optimization of environmental factors of fermentation (e.g. temperature, pH, aeration, etc.) could result even in higher activity values.


POSTERS

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Proximate and functional properties of starches obtained from two cultivars of cocoyam

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Keywords: Cocoyam, starch

The proximate and functional properties of cocoyam cormels were investigated to reveal their suitability for food and industrial applications. Two cultivals of cocoyam cormels were processed into starch and the resultant starches were investigated for their proximate and functional properties. The colocasia esculenta had crude protein content of 1.81% and the Xanthosoma sagittifolium had 1.67%, Fat content of 1.00% to 0.51%, Fibre 0.52% to 0.505%, Ash 0.63% to 0.715%, Moisture 13.50% to 14.00% and carbohydrate 82.54% to 82.61. The functional properties shows that the bulk densities ranges from 0.604g/ml of Colocasia to 0.72g/ml of Xanthosoma, water absorption capacities of 224g/100g to 211g/100g, oil absorption capacity of 190.3g/100g to 196.2g/100g, swelling power of 15.8g/g to 17.2g/g, solubility of 0.13g to 0.123g and dispersibility of 70.8% to 72.3% with appropriate processing, cocoyam could be a rich source of starch for food and industrial application and corms have potential for new product development. Stabilizing cocoyam crops and adding value could greatly improve its utilization in cocoyam producing countries.

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Smart vision system for quality control of cocoa flavored swirl bun

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Keywords: machine vision, image processing, smart sensor, bakery

Color pictures of 24 bits per pixel color depth has been captured about cocoa flavored swirl buns. Bakery products were made in the laboratory with known recipe. Amount of cocoa was changed ±50% compared to standard. Images of prepared dough and baked swirl buns were both acquired. Robust color segmentation was applied on normalized image data. The software of Octave was used for image processing and R for data analysis.
Ten pieces of cocoa flavored swirl buns were evaluated for each group. The illumination system was optimized in order to support segmentation of cocoa and dough (or swirl bun). It was revealed that image normalization increased color difference between baked swirl bun surface and cocoa filling, supporting segmentation. Image processing was able to distinguish groups based on cocoa filling quantity. Single image evaluation took approximately 0,3 sec, what makes this technique suitable for online monitoring.
According to acquired images and extracted information, image processing can be suitable smart sensor for quality assessment of bakery products such as cocoa flavored swirl buns. In this case the quantity of cocoa filling was estimated successfully, what was able to distinguish classes of low (-50%), standard and high (+50%) cocoa content. Despite promising results, proposed method needs further confirmation on large sample set and model development to reach better estimation accuracy.

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Comparative analysis of commercial apple juices

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Keywords: apple juice, patulin, hydroxymethylfurfural, sensory analysis, antioxidant, phenolic compounds

Introduction:
Pure fruit juices have an increasing popularity among health-conscious consumers. Both the raw materials and the technology have an essential impact on final product quality, therefore directly pressed and ecological products are especially valuable. The aim of the research was to compare some apple juices with 100% fruit content, available on the domestic market and produced by different technologies.
Materials and Methods:
Twelve products were examined. Patulin content was measured in cooperation with the National Food Chain Safety Office using HPLC-UV method, following special sample preparation. We measured hydroxymethylfurfural (HMF) content, antioxidant capacity by FRAP and CUPRAC methods and total phenolic compounds by Folin-Ciocalteau method. Sensory profile analysis was performed with trained panel, according to relevant ISO standards. Data evaluation was implemented by Principal Component Analysis, ANOVA and Spearman correlation ($P<0.05$).
Results and Discussion:
Patulin contamination was detected in one product, however, its amount was under the upper legal limit. In general, HMF content was higher in juices made from concentrates, still, the highest value was measured in a directly pressed product. Antioxidant capacity and phenolic compound content were higher for the directly pressed products, the difference between the product groups was significant. The attributes in which the products differ were identified by the sensory profile analysis.
Conclusion:
The juices analysed were safe, i.e. patulin contamination is practically absent. All juices differ in terms of every measured parameter. Lower HMF contents confirmed a lower heat exposure in case of the directly pressed products. Both antioxidant capacity and sensory properties showed significant differences for the two product groups. Statistical analysis based on the parameters measured revealed clear differentiation of the groups, this raising the possibility to further develop this method combination to serve as a simple tool for product authentication.

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Consumer acceptance of insect-based foods

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However, entomophagy was typical in the prehistoric times, and is still an integral part of the gastronomy of more than a hundred countries, it isn't a food alternative for the western cultures. In the last years, many researcheswere published in the field of edible insects, and their possible role in human nutrition. More than 2000 edible species are known: bugs, ants, wasps, bees among others, in nearly every stage of their development.
From the nutritional point of view, edible insects are favorable. Their energy content is variable and they are significant protein sources. The majority of their amino acid composition is essential for humans, the lipid composition is comparable to fish: the main fatty acids are unsaturated. The main representation of carbohydrates is chitin, which functionate as an insoluble fibre in the human body. Edible insects are also good sources of micronutrients [1].
However, the biggest hurdle of introducing insects into the human nutrition is their acceptance. The current consumer researches about edible insects focus on *willingness to eat*, *e.g.* knowledge of entomophagy, and the *openness to try* insects as food. Knowledge, previous taste experiences, curiosity among others seem to be increasing willingness to eat [2].
The main reasons of low acceptance are neophobia and disgust [3]. Neophobia is the fear of new food products, which has been observed worldwide, in Central Europe and Hungary as well [4]. In the case of whole insects, it becomes more pronounced [5]. Influence of disgust shows cultural differences between Western and Eastern populations. Easterners are more accepting than Westerners [3], but there are also significant differences between European countries [2]. Sensory appeal also has an important role in acceptance [6].
In order to draw attention and increase the acceptance of entomophagy, curiosity should be taken as an advantage. Adequate education and information for consumers could also help in promoting and removing the barriers [7].

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Formation of 2-MCPD-ester beyond 3-MCPD-esters during thermal treatments of oils

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Introduction:
Monochloro-propanediol (MCPD) fatty acid esters are a new group of food-borne contaminants. MCPD-esters are formed in vegetable oils during the deodorization step, especially in palm oil. However formation of MCPD-esters may occur in every fat containing food and food ingredients during high temperature thermal treatment. Free 3-MCPD (3-monochloro-1,2-propanediol) is considered as possibly carcinogen to humans [1], and the tolerable daily intake (TDI) is 0.8 µg/kg body weight/day [2]. Currently, 2-MCPD and 2-MCPD-esters are not yet classified in terms of carcinogenicity, there is a limited amount of data available on their toxicity.

Materials and Methods:
Laboratory scale deodorization trials were carried out in 150 g batches of bleached sunflower oil at temperatures between 220-260 °C. The thermal experiments mimicking frying conditions were conducted in laboratory with refined high oleic sunflower oil (heating at 180°C for 8 hours). Five different salts were investigated: KCl, $CaCl_2$, NH_4Cl and $FeCl_3$ with analytical grade, and NaCl as table salt. The quantity of MCPD-esters was determined by Official AOCS Cd 29b-13 Method.

Results and Discussion:
The aim of current work was studying the formation of structural isomers of MCPD-esters during different thermal treatments of oils. During the laboratory scale deodorization the concentration of 2-MCPD-esters did not reach the limit of quantification (LOQ=0.1 mg/kg) at 220 and 230 °C. At higher temperatures the ratio of 3-MCPD/2-MCPD-esters decreased with increasing deodorization time. This observation was reported in other studies, as well [3]. Frying in presence of different chlorine sources generated similar results, especially the experiments with salts with higher catalytic effect ($FeCl_3$, NH_4Cl and $CaCl_2$). While the total MCPD-ester content did not change substantially after 4 hours of thermal treatments, an increase in the proportion of 2-MCPD-esters was observed. During the reference experiment without any added salt the concentration of 2-MCPD-esters was under the LOQ.

Conclusion:
Present study shows that the formation of 2-MCPD-esters during high temperatures treatment of oils differs from the formation of 3-MCPD-esters. 3-MCPD-esters formation is preferred in the first part of the treatments, both in case of deodorization and frying. However the concentration of 2-MCPD-esters increases during the whole processes.

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P106

Effect of fructo-oligosaccharide on survival of probiotic strain under gastrointestinal conditions and storage

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Keywords: fermented fruit juice, prebiotic, storage

Introduction:
Functional foods do not have only the traditional nutritional effects, but they also have some additional beneficial effects such as improve health status, prevent and/or reduce the nutrition-related diseases, promote a state of physical and mental well-being. One important criterion of probiotic foods is that it must contain at least 106 cfu/mL of the living probiotic strain(s) at the time of consumption. Probiotic products are mainly base on dairy, thus they cannot be consumed by those who are lactose intolerants. Fruit drinks may also be good carrier for probiotics. However, very few data are available to understand the viability and survival ability of probiotic strains in fermented fruit juices during storage. Additionally, the effects of prebiotics on stability of probiotics in fruit juice are still not clear. Therefore, this study focused on the effect of fructo-oligosaccharide as prebiotic on growth of probiotics as well as on its protective effect during storage and simulated gastro-intestinal conditions.
Materials and Methods:
Pineapple juice was purchased from supermarket. Three commercial probiotic strains (Lactobacillus acidophilus La5, Lactobacillus plantarum 299V and Bifidobacterium lactis Bb12) were applied. Plate counts of living cells were determined during storage (2 month at 4°C) and in simulated gastro-intestinal conditions (135 minutes in gastric fluid – pH 2.0 followed 2.5 hour in presence of 0.6% bile salt). Pineapple juices were supplemented with prebiotic (Raftiline) in 1 % concentration during the fermentation at 0 h, 16 h and 24 h.
Results and Discussion:
Two Lactobacilli grew well on pineapple juices with or without supplementation of prebiotics and the cell concentration reached level of more than 109 cfu/mL after 24 h fermentation. However, in the case of B. lactis Bb12, the growth rate was much higher in pineapple juice with Raftiline than without. The highest cell was detected when prebiotic was added at 16-hours of fermentation.
The effects of prebiotic on the stability of bacteria during storage at 4°C were different. While addition of fructo-oligosaccharide after fermentation exhibited protective effect on L. acidophilus La5, and 60% of the viable cells remained after 2 months of storage, whereas in the case of L. plantarum 299V and B. lactis Bb12, the prebiotic should be added at the start of the fermentation.
In simulated gastrointestinal conditions, B. lactis Bb12 was the most resistant strain. After the procedure the cell number remained higher than 108 cfu/mL. L. acidophilus La5 exhibite good survival ability (more than 106 cfu/mL remained) after growth in the pineapple juice with supplementation of fructo-oligosaccharide at the begining of fermentation. At the same time the L. plantarum 299V prefered the addition of prebiotic at the end of fermentation. The bile acid has no significant effect on the viability of the examined strains.
Conclusion:

Pineapple juice was shown to be a suitable substrate for L. acidophilus La5, L. plantarum 299V and B. lactis Bb12 cultivation and for the development of an alternative non-dairy probiotic beverage. To prove the protective effect of prebiotic necessary to examine besides fructo-oligosaccharide another prebiotic also.

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P107

Non-destructive measurement of carbohydrate content using NIR spectroscopy – the snack example

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Introduction

The consumption of snacks has become part of our everyday life, that's why it is important to examine their quality. Usually they are made from high-starch ingredients such as potatoes, maize, wheat, rice etc. These give most of the carbohydrate content of the products, but the distinct flavorings, anticaking agents and bulking agents also contribute. The values in the nutrition facts table on the packaging of a product may be determined by analytical measurements of the concerned component, or with the application of databases to predict it. The aim of this study was to predict the carbohydrate content in different snacks using FT-NIR spectroscopy.

Materials and Methods

Samples and determination of carbohydrate content

In our study 155 different snacks were analyzed. For the measurement the samples were grinded. The carbohydrate content of the samples was determined with using the modified Schoorl method and due to the different compound of the products, the results were calculated for invert sugar.

FT-NIR analysis and chemometric methods

The spectra of samples were collected with Bruker MPA FT-NIR (Bruker, Ettlingen, Germany) spectrometer over the 12500 – 3800 cm^{-1} wavenumber region. For each sample nine spectra were made in diffuse reflectance mode. The spectra were analysed using the software of the spectrometer, OPUS 7.2 (Bruker, Ettlingen, Germany).

To determine the spectral outlier principal component analysis (PCA) was used. The average NIR spectra were modelled against reference values for carbohydrate. For model building partial least squares (PLS) regression was used and the regression model was evaluated with full cross-validation.

Results and Discussion

After evaluating the data of carbohydrate determination, the number of samples decreased to 145. The carbohydrate content of the samples ranged from 20.51 – 69.7 g/100 g product, however the results had not even distribution.

After using PCA the results had shown five spectral outliers. These samples were not used to PLS regression. For data pre-treatment the combination of FD and MSC was applied. First derivative is usually used to remove any offset from the sample and de-emphasizing lower-frequency signals [1]. Multiplicative scatter correction (MSC) transformation of the NIR spectra removed both additive and multiplicative noise effects in reflectance spectroscopy [2]. The statistical parameters of the selected model are shown in Table 1. The root mean square error of cross-validation (RMSECV) and the ratio of prediction to validation (RPD), can be used to describe the prediction performance of a model [3].

Calibration			Cross-validation			PLS	Evaluation range [cm^{-1}]
R^2	RMSEE [m/m%]	RPD	Q^2	RMSECV [m/m%]	RPD		
95.27	1.51	4.6	92.38	1.8	3.62	10	9403 – 6094, 5454 – 4597

Conclusion

A FT-NIR spectroscopy method was searched and developed for prediction of carbohydrate content in different snack products. So that can be a great alternative to the Schoorl method, which is time-consuming and has a high demand of reagents.

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P108

Amino Acid Composition of Milk Proteins of Busha Breed Cattle of Kosovo

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Keywords: Busha breed, Milk, Amino acids, food

Busha is an autochthonous cattle breed of Kosovo. This breed in Kosovo is present with two types known as Busha of Sharri and Busha of Dukagjini. Busha breed is characterised with low production rate but is known for high resistance against different diseases and good adoption to extensive breeding and production conditions. So far, in Kosovo Busha's milk has been studied very little in quality parameters. The objective of this study was to determine the amino acid composition of milk of Busha breed. Determination of amino acid composition of milk was done by automatic amino acid analyser. Our study result showed that glutamic acid is the major amino acid in the milk of Busha breed, glycine the minor amino acid. Leucine and lysine were in the highest amount among the essential amino acids, while glutamic acid and proline were the major amino acids in the group of non-essential amino acids. The amino acid content of essential and non-essential amino acids is higher in the milk of Dukagjin Busha compared to Sharri Busha.

P109

Concentration of oregano extract by nanofiltration and reverse osmosis

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Keywords: oregano, extract, concentration, nanofiltration, reverse osmosis

Introduction:
Origanum vulgare L. (oregano) is a medium-sized perennial aromatic herb in the mint family (Lamiaceae). In the majority of oregano essential oils, phenolic monoterpenoids constitute up to 70% of the total oil; these monoterpenoids mainly comprise polar phenolic compounds such as thymol and carvacrol. The volatile oils of oregano reportedly display anti-inflammatory, antispasmodic, antibacterial, diaphoretic, antioxidant, antifungal, analgesic, and carminative activity. The antimicrobial properties are mainly related to their high phenolic content. In fact, natural products rich in bioactive compounds, such as oregano, have received increasing attention in the chemical, food and pharmaceutical industries, because they can have a wide range of applications as well as could replace several synthetic compounds.

Materials and Methods:
The aim of this study was to concentrate of oregano extract by membrane filtration. To produce the oregano extract a semi-large scale extraction was achieved at 45 °C for 2.5 hours. The extraction solvent contained 50% of ethanol. Before concentration vacuum filtration was used to clarify the oregano extract. For the cross-flow concentration a Dow nanofiltration membrane and a TRISEP reverse osmosis membrane were used with 0.108 and 0.144 m^2 active area. The concentrations were achieved at 40 bar transmembrane pressure difference, at 30 °C temperature and 560 L/h recycle flow rate. During the concentrations 4 samples were taken from retentate and permeate. The membrane and fouling resistances were calculated using the resistance-in-series model.
To determine the content of carvacrol in the aqueous phase, the samples was analyzed by gas chromatography coupled with mass spectrometry (GC-MS). Hexane was added to the samples and the mixture were shaken vigorously for 1 minute. The organic phase was separated and placed in a vials in the presence of a small amount of sodium sulfate anhydrous. The analysis of the extracts was performed with a Focus-GC-DSQ gas chromatograph (Thermo Finnigan).

Results and Discussion:
The permeate flux in case of NF decreased from 22 to 7.9 L m^{-2} h^{-1} . Using RO membrane it decreased from 5.5 to 2.3 L m^{-2} h^{-1} . During the concentration process, a concentration polarization forms on the membrane surface. This leads to an increase in osmotic pressure near the membrane-solution interface and thereby, decreases the available driving force. The decreases in permeate fluxes at the end of two concentration were similar with 64% at NF and 58% at RO. Indeed, the percentage carvacrol retention ranges from 91% to almost 95% in the case of the tight RO membranes, while the NF membrane displays lesser retention, from 83% to 88%.

This might have been expected since the size of the NF membrane pores is larger than those of the other RO membranes. The membrane resistence of RO membrane was two times higher than the NF membranes. However the fouling resistance of NF membrane was less by 89% because of the larger membrane pores.

Conclusion:

Concentration of oregano extract was successfully carried out by membrane separation. The choice of the membrane for concentration is crucial. The RO permeate flux is less than NF permeate flux because of the smaller membrane pore size, however the retention of carvacrol was higher using the RO membrane.

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P110

Monitoring of Lactobacillus bacteria growth by physical parameters

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Keywords: yoghurt, lactobacilli,

Introduction:
Lactobacillus bacteria are lactic acid bacteria (LABs) which are anaerobic or facultative anaerobic microbes. Their major end metabolite product is lactic acid. Fermentational activity and nutritional benefits gives the industrial importance of LABs. Some of these strains have probiotic activity, that impacts on the diet and health of consumers. The aim of our study was to monitor the structural changes during the fermation process of yogurt samples prepared with different *Lactobacillus* bacteria strains of different probiotic strength .

Materials and Methods:
Different kinds of *Lactobacillus* strains (n=15) were studied. Based on their probiotic strength, the strains were cathegorized into three main groups: probiotic, moderate probiotic and non-probiotic. For milk production, fatty milk powder was diluted with sterilized distilled water and inoculated with bacteria wich were in freeze-dried form until the inoculation. This strain suspension was cultivated for 20 hours at 37 °C. The milk was inoculated with the activated bacteria culture. The fermentation of yoghurt was monitored during 20 hours at 37 °C with pH, rotational viscosimetry and optical density measuring tools. Microbial count was done with light microscope by the Breed Staining Method after the cultivation of bacteria and at the end of the formation of yoghurt. Statistical evaluation of data was performed in R-project and Excel.

Results and Discussion:
Two main peaks were detected during the viscosity measurement at different time points of fermentation depending on the strain of bacteria. The different strains presented different pH curves during the fermentation process. Some characteristic parameters showed significant difference according to the probiotic activity.

Conclusion:
The tested physical and chemical properties of the yogurt samples prepared presented high variability which can be useful in the product development of probiotic yogurt.

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P111

Effect of sweetener and storage on formation of sensory properties of jams

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Keywords: jams, sensory analysis, sweetener

Introduction:
Due to modern nutritional trends, the use of sugar substitutes gain an increasing popularity both in food industry and among consumers. Natural sweeteners or sweeteners originating from natural substances, such as different sugar alcohols, are in the center of the interest. Our aim was to investigate the effect of different sugars and sugar alcohols on the sensory properties of blackberry and apricot jams during the storage period.

Materials and Methods:
In this study apricot and blackberry jams were prepared using four different sweeteners: sucrose, fructose, xylitol and erythritol. Jams were stored at room temperature in a dark place through nine months. Measurements were performed in the 0, 1st, 3rd, 6th, 9th month after the production. Colorimetric measurement was accomplished in CIE L*a*b* trisimulus coordinate system. The determination of sensory profile was done with a sensory panel of 12 members, according to standard requirements. Electronical sensory attributes were determined by electronic tongue and electronic nose. Descriptive statistics, principal component analysis (PCA), discriminant analysis (LDA) and ANOVA test were used for the statistical evaluation of data in R-project and Microsoft Excel software.

Results and Discussion:
Jams sweetened with erythritol significantly differred in taste and odour parameters from the others in case of classical sensory measurement, while jams sweetened with xylitol and fructose reached similar results comapred to jams sweetened with sucrose. LDA results of electronic tongue showed separational tendency according to the storage time and clear separation according to the type of sweetener, especially in the case of blackberry jams.

Conclusion:

The effect of sweeteners on the formation of sensory attributes is appreciable and storage time also has a measurable effect on the sensory properties of jams, which depends onon the type of sweetener as well.

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P112

Investigation on Quality of Enzyme-treated yogurt

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Yogurt is a functional food, accepted by all communities around the world. However, it offers several nutritional activities, its quality improvement is prerequisite. In this study, combination of membrane filtration and enzyme treatment was adopted to improve the quality of yogurt. To concentrate the milk protein, ultrafiltration of milk was performed with 5 nm membrane, fitted in a cross-flow membrane separation unit. The filtration process was performed with trans-membrane pressure 3 bar and retention flow rate 100 L/h under the operating temperature 25oC. To enhance the permeate flux, static turbulance promoter was adopted inside the tubular ceramic membrane. It was found that permeate flux was decreased with time progress due to formation of concentration polarization on membrane surface. Concentrated milk was treated with papain for 10 min at temperature 50oC and subsequently, papain activity was stopped by heat treatment (70oC for 20 min). Papain-modified concentrated milk was treated with trans-glutaminase and used for fermentation. Fermentation was performed with commercial lypholized stater culture (Thermophilic YoFlex® culture) under the temperature 43oC for 6 hr. In fermentation process, effect of different carbohydrates, such as glucose and sucrose were tested. Antioxidant capacities of yogurts were analyzed after maturation of yogurts. It was found that antioxidant capacity of yogurt was increased due to addition of sucrose compare to glucose. Furthermore, it was found that antioxidant capacity of yogurt was increased due to application of papain and trans-glutaminase compare to application of alone papain.

P113

Development and production of seasoned beet root chips by microwave vacuum drying

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Introduction:
Nowadays it is becoming increasingly important to follow healthy lifestyle, with among others low carbohydrate consumption, so there is a growing demand for healthy, vegetable-based products. The aim of our research is to develop a vegetable snack that gives a healthier product due to its less salt and carbohydrate content. Red beetroot (*Beta vulgaris* L. subsp. *vulgaris*) contain high biological activity components which compounds are known to have potential antioxidant properties. It is a good source of vitamins, phenolic acids and betalains. The aim of this work was to study the valuable components of our developed flavoured beetroot snacks which were produced by microwave vacuum drying combined with direct hot air drying.

Materials and Methods:
Beetroots (Alto F1 variety) were washed and cut into cubes (2*2*0.3cm). It was dehydrated by convective pre-drying in hot air at 60 °C until moisture content 25 (m/m) % and vacuum-microwave finish drying at 300W microwave power for 15 mins, then 600W for 5 mins. This drying combination creates a large vapour pressure in the material, allowing rapid transfer of moisture thereby it results a porous texture of the food and facilitates obtaining a crispy and delicate texture. Due to the specific taste of beet, 2 types of flavouring (cumin-balsamic vinegar -B1, apple-mint-lemon-B2) were used on beet cubes, which were soaked for 1 day before the drying operation. The extraction of samples were carried out (with solvent containing 60% distilled water, 39.9% ethanol and 0.1% hydrochloric acid) to measure colour and antioxidant parameters. The spectrophotometric measurements were performed, which included the ferric reducing antioxidant capacity method, total polyphenol and betalains content. Colour of dried samples was evaluated by a Konica Minolta Chroma Meter.

Results and Discussion:
The beetroot cubes were dried to the required 4-5% moisture content, in the case of natural (without flavouring-BC) samples the drying step took 3 hours, while the sample B1 was 150 minutes and in case of B2 this time was 77 minutes. The drying kinetics of the B2 sample was much more intense than the other samples. This is due to the fact that during the flavoring, some of the beetroot moisture content was removed by the addition of sugar (from the apple juice), so that the atmospheric drying was faster, in one hour the moisture content was reduced to 15% and in the other cases at least 2 hours. The results of colour measurements, the parameters a* and b* were reduced due to the colour content (betacyanins and betaxanthins content) of the samples varies proportionally. The difference between the antioxidant capacity (and total polyphenol content) of samples were no significant. According to the sensory analysis, apart from that the best consistency of beetroot cube had natural sample, the most popular beetroot chips were flavoured with cumin-balsamic vinegar.

Conclusion:

The microwave vacuum dryer is perfectly suited for the production of beetroot chips, by this method the beetroot cubes were puffed so reach crunchy feelings. Delicious and good consistency beetroot snack had successfully produced, which contain a prominent antioxidant components and it can become healthy crackers and can be used to replace salty and high carbohydrate chips.

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P114

Possibilities of the on-line quantification of saccharides via spectroscopy during enzymatic oligosaccharides synthesis

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The increasing demand for commercially available oligosaccharides (OS) to be used in food products drives the advancement of production technologies ranging from the characterization of enzyme kinetics to bioreactor configurations. The complex biocatalytic routes of the OS synthesis necessitate a strict supervision to allow for an economically favorable operation. Despite the advancement of various aspects of the OS synthesis, current process monitoring is still based on discontinuous analysis of saccharides composition with traditional off-line analytical methods. A rapid saccharides quantification method is needed to provide better control over the operation as well as to satisfy regulatory requirements.
We propose spectroscopic analysis in the UV and near-infrared ranges coupled with chemometric modeling as an alternative method for saccharides quantification in an on-line manner. A large number of experimental samples was generated by enzymatic conversion carried out in lab-scale stirred tank reactors. The samples were analyzed with regards to their saccharides composition and spectra profile. Subsequently, chemometric models, such as PLSR and neural networks were used to establish the relation between the measured chemical properties. Following rigorous statistical validation of the models, they may be used to produce estimation of the saccharides compositions on-line. Our results imply that the proposed techniques could be implemented in the manufacturing process to provide real-time monitoring of the OS synthesis, and thus, to improve efficiency and quality control.

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P115

Effects of new thermophilic fungal isolates on bioconversion and saccharification of some lignocellulosic biomasses

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Keywords: lignocellulosic biomass, solid state pretreatment, thermophilic fungal strains, CMCase, xylanase

Introduction:
Lignocellulosic biomass has an enormous potential as a renewable carbon and energy resource for the industrial biorefineries, including second generation biofuel production. Biological pre-treatment of these organic materials have gained such attention in recent years because of drawbacks of other pretreament methods as well as sustainable green chemistry. Many cell-decomposing microbes can degrade the heterogenous polymeric structure and convert the polysaccharides, mainly cellulose and hemicellulose into reducing sugars (glucose and xylose) by their hydrolytic and/or oxidative enzymes. In this light, our research work was focusing on the selection of cellulase- and xylanase-producing strains as well as explored the best producers' saccharification capacity.

Materials and Methods:
12 thermophilic fungal strains isolated from mature composts, namely *Chaetonium thermophilus* TK25 and TK35, *Malbranchea cinnamomea* TK26 and TK36, *Thermoascus aurantiacus* TK31 and TK42, *Thermomyces lanuginousus* TK32 and TK43, *Thermothelomyces thermophila* TK27 and TK38, *Thermomyces thermophilus* TK33 and TK44, were obtained from Gödöllő, Szent Istvan University, and primarily screened for cellulase production on caboxymethyl cellulose (1 %, m/w CMC) agar and xylanase production on xylan agar (1 %, m/w, beerchwood xylan) at 47°C for 3-5 days. Biological pretreatment was carried out in 250-ml flasks containing 10 g dry wheat bran, wheat straw and wood chips, as test substrates. The solid medium was inoculated with 10^7 conidium per gram dry substrate (gds) and was grown at 60 °C, pH 6 for 14 days. Soluble carbohydrates and enzymes were extracted by mixing the biologically treated substrate with 50 ml 0,01 % (v/v) Triton-X solution and shaked on a rotary shaker at 180 rpm for an hour. Enzyme activities were assayed by the Somogyi-Nelson method, determining the liberated reducing end products using glucose and xylose as standards.

Results and Discussion:

All investigated fungal strains were able to produce xylanase and only one strain, *Thermoascus aurantiacus* TK42 did not have highly positive hydrolyzing zone on agar plates. Both strains of *Chaetonium thermophilus*, *Malbranchea cinnamomea*, *Thermoascus aurantiacus*, *Thermothelomyces thermophila* were found to degrade CMC, while *Thermomyces thermophilus* and *Thermomyces lanuginousus* strains did not show measurable activity zones. Among the agro-industrial substrates tested, wheat bran gave the maximum enzyme activities and reducing sugars compared to wheat straw and wood chips. CMCases, β-glucosidases and xylanases exhibited their maximum production during 5-10 days of incubation. The highest xylanase activities were 152 U/gds and 176 U/gds of *Thermothelomyces thermophila* TK27 and TK38 on the 5th day, respectively. Thereafter the enzyme synthesis sharply decreased. These two isolates produced relatively lower CMCase enzymes (38 U/gds and 26 U/gds), while β-glucosidase synthesis was not detected at the same conditions. In this case, the degree of carbohydrate conversion was about 4.2 % and 5.6 % respectively.

Conclusion:

Our results were preliminary, but may provide a good possibility to exploit the thermophilic fungi in development of microbial pretreatment of lignocellulosic raw materials.

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P116

Comparison of different Fusarium selective media for identification of Fusarium species in the grains of spelt in Hungary

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Keywords: spelt, Fusarium, morphological identification

Introduction:
High quality grain-based products are important components of well-balanced diet and main food products. The consumption of spelt (Triticum spelta L.) containing food products has increased significantly in Hungary in recent years. Cultivation of spelt in the last 15 years became more attractive for farmers expecially in ecological farming. The Fusarium species are widespread fungal pathogens on small-grains including spelt in Europe. Fusarium species are known to potentially produce mycotoxins. The risk of these secondary metabolites is a crucial element in cereal production. Therefore detection, identification and control of Fusarium species on spelt is important component of IPM.

Materials and Methods:
In our studies we sampled spelt grains from fields and isolated Fusarium species from kernels. Fusarium infection of kernels were evaluated in 100 kernels/sample. Kernels of the selected sample were transferred onto 4 different Fusarium selective media, modified Nash-Snyder medium, Czapek-Dox agar, Rose bengal-glycerine-urea medium, Papavizas medium. Fusarium selectivity of these media has been observed in spelt. Therefore, fungal cultures which were seemed Fusarium were separated and transferred to PDA (Potato Dextrose Agar). Pure Fusarium cultures were the basis of the morphological identification.

Results and Discussion:
Symptoms of Fusarium infection were observed on spelt kernels on every tested medium. Differences were observed between tested media. Alternaria was a frequently isolated fungus on PDA. Several Fusarium species have been noticed in our study. In some cases macro- and microconidia were absent or only microconidia were noticed, therefore these cultures were not determined.

Conclusion:
Morphological identification of Fusarium species can be problematic because characteristics like mycelial pigmentation, formation, shape and size of conidia are unstable. These parameters highly depend on composition of media and environmental conditions. Not every mycelium, initially considered as Fusarium on Fusarium selective media proved to be Fusarium on PDA.

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P117

Dielectric Model of Soybean of Various Moisture Content

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Keywords: soybean, moisture content, electrical impedance, dielectric model

Introduction:
In practice the exact knowledge of moisture content of various grains and oil seeds is very important. In our earlier work dielectric parameters of grains and oil seeds with various moisture content were determined from elecrical impedance spectrum at low (30 Hz – 100 MHz) frequency range. The dielectric constant and loss factor can be used for measurement of moisture content.
A question arises from this measurement whether the electric current passes through the grain seeds or only on the surface of seeds?
In this work we try to answer this question with approaching the measured electrical impedance spectra with model circuit.

Materials and Methods:
The moisture content – 22.9, 20.3, 17.5, 16.7, 12.7 and 10.6 % (on wet bases) - of soybeans was determined with air oven method. The electrical impedance spectra were measured with an Agilent 4294A impedance analyzer in frequency range from 100 Hz up to 100 MHz. The parallel capacitance and inductance were determined in a test cell with parallel-plate in transmission line, the volume of cell was 430.16 ml.
The measured spectra were approached with a model circuit consisting of serial connection of three elements. The first and the second element were two single distributed elements representing the impedance of bulk seeds and the skin of seeds. The distributed element contains three parameters: a resistance, a relaxation time and a power parameter. The third element was a model circuit of biological tissue inside the seeds. This model is a parallel connection of a resistance – resistance of inter cellular space – and a distributed element in a serial connection with an other resistance. The latter can be considered as the impedance of cell wall and the resistance of intra cellular part.

Results and Discussion:

The shape of impedance spectra of soy-beans referred at least three different relaxing structures were in the investigated system. Therefore the spectra were modelled with three different distributed elements. The distributed element is practically a modified parallel RC circuit. Generally the living tissues show both conductance and polarization in electric field, that is they can be described by RC or modified RC circuits.

The obtained parameters were in the range that we got in our earlier impedance measurements on single soy-bean seeds. Each of all resistance parameters is increased drastically as moisture content decreased. Similarly the relaxation times also showed sharp increase with moisture content decrease. The power parameters were not sensitive for the change of moisture content. These observations can suggest the electrical current passes through the seeds.

Conclusion:

Our findings support the idea, that electrical impedance measurement of grains and oil seeds can give information about the inside moisture content of seeds, but for more accurate results are needed further experiments.

P118

Applicability of membrane emulsification in food industry

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Introduction:
We can encounter emulsions in a significant area of the food industry. Examining their manufacturing technology, we can find many different industrial processes, depending on product and economic requirements. The membrane emulsification (ME) is relatively a new, simple method for generating emulsions. A drop by drop emulsification method is carried out with the use of microporous membrane. Beside the classic membrane technologies, after the patent filed in 1988(Nakajima and Shimizu, Japan), the ME method received increasing attention on scientific and technological areas.

Materials and Methods:
There are many benefits to traditional turbulence-based emulsion production methods. The most commonly mentioned are: lower energy requirements, simple design, easy expandability, and lower the shearing stress effects of end product. Due to localized shear and geometrically controlled drop formation, we can better control the evolving microstructure. The size of the droplets can be precisely controlled in a wide range, with a narrow droplet size distribution that allows the use of less surfactant.
A kind of vegetable oil was used, especially sunflower oil, as dispersed phase. The most commonly used continuous phase was distilled water. During the preparation of emulsions two theoretical parameters were changed: DF-driving force and the shear stress at the membrane wall, which is in practice the disperse phase pressure and the flow rate. During emulsion preparation the dispersed phase flux was measured, and finally the particle size and distribution of the prepared emulsion samples were analyzed.

Results and Discussion:
During our research work we carried out experiments along several streams. We focused on the application of this process especially in the food industry.
Our investigation emphasizes on 3 following routes:
1. Process development (with application of static mixers changing the flow parameters with baffles),
2. Product development of different types (O/W and (W/O) of food emulsions produced by ME. Two specific products: a hypoallergenic cream liqueur made from an O/W type emulsion, the other is a W/O type salad dressing, produced by dispersion of vinegar to oil (vinaigrette).
3. Basic research of microencapsulation based on membrane technology.

Conclusion:

The investigations do not make it clear that the baffles placed inside the tubular membrane have had a significant effect on the productivity of the process or on the properties of the resulting emulsion. However, the required shear force was provided at a lower flow rate while the shear stresses decreased in the circulated portion. The mechanical impact sensitive components, for example, starch, proteins, flavors, this property of the method can be utilized.

From the point of view of product development, the membrane emulsification deserves a great deal of attention when homogeneity and well-reproducible droplet distribution are important in our final product. By using membrane technology, better homogenization can be achieved, making it easier to digest and produce more bodied flavors. In the course of further researches, microcapsule extraction methods may be useful in extending the microcapsule extraction methods by other methods, for example: by spray drying. An interesting aspect may be to investigate the effect of static mixers on microencapsulation during further studies.

P119

Food industry ethanol batch fermentation modeling and simulation challenges

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Keywords: food industry, ethanol, fermentation, kinetic model, model parameters

Batch ethanol fermentation in food industry represents an opportunity, with increasing number of processing plants. In order to be able to improve product quality and entire production process, to find implicit more correlations, the aim of this research was to re-evaluate fermentation kinetic models, studying kinetic parameters influence, improving modeling the kinetics of production of ethanol solving ordinary differential equation systems.
To obtain better approach, was considered a more precise stoichiometry, generating improved mass balance, later improved heat balance. Using earlier fermentation kinetic models, were achieved more sensitive and realistic simulations. During the experimental fermentation processes with selected Saccharomyces cerevisiae strains the more sensitive model parameters were identified, these are useful in industrial fermentation processes control.

P120

Combination of active compounds of essential oil and HHP technology in chicken meat

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Keywords: chicken meat, HHP, alylisotiocianate

Introduction:
Chicken meat belongs to a category of naturally high perishable foods. It is susceptible to quality deterioration by various sources during the preparation, storage and distribution. Microbial contamination, lipid oxidation and sensorial changes in meat are major concerns causing the quality defects and food safety issues in meat industry. To stop or inhibit the changes antioxidants/antimicrobials or physical preservation methods can be used. High hydrostatic pressure (HHP) extends shelf life while retaining the original flavour and characteristics of food. Application of natural essential oils (EOs) or active compounds of EOs can improve the inhibition of microbes in HHP treated meat products and can result better oxidation stability. To combine ACs with HHP technology, ACs should be selected which fit to the character of meat. Allyl isothiocyanate (AITC) is a colourless, volatile and aliphatic organosulfur compound found in horseradish, cabbage, wasabi, brussels sprouts, broccoli. AITC possess strong effectiveness in causing cell membrane damage, leakage of intracellular components and inhibiting bacteria at all growth stages. The aim of this study to examine the effect of combination of AITC and HHP on the properties of raw chicken meat.

Materials and Methods:
Fresh chicken breast meat were obtained from a local abattoir. Meat was cut (free from bone, connective tissue, skin and visible fat) minced using a meat grinder. The meat was then homogenized and divided into groups. Amounts of meat were mixed with 500 and 1000 ppm AITC (dissolved in 5% sunflower oil); and control (only oil). The samples then placed in polyethylene bags and heat sealed. The high hydrostatic pressure treatment was carried out at 300 or 600 MPa for 5 minutes at room temperature using the RESATO FPU-100-2000 apparatus. After treatments samples were stored at 4 ± 0.5 °C for up to 28 days. The samples were then taken at different time intervals for different analysis on day 0, 14 and 28. Later, pH, colour parameters, thiobarbituric acid reactive substances (TBARS), sensory attributes (E-nose), total aerobic cell counts were monitored.

Results and Discussion:

For almost all of the parameters studied, a significant effect was demonstrated with respect to the AC concentration used and the pressure treatment level taking into account the storage time. The increasing concentration of AITC was becoming lighter ($p < 0.001$), becoming redder ($p = 0.008$) and producing a smaller number of microbes ($p < 0.001$). AITC did not change the pH of the meat ($p = 0.051$) and the TBA number did not change either ($p = 0.485$). Pressure treatment also made the samples brighter ($p < 0.001$), decreased a * ($p < 0.001$) and significantly reduced the number of microbes ($p < 0.001$). The TBA number was not influenced by pressure treatment ($p = 0.184$). All the factors except for the TBA number were significantly different. Electronic nose results have shown that all of the parameters studied had a detectable effect on the volatile components of the samples.

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P121

Differential scanning calorimetric study of stability of liquid egg products frozen in liquid nitrogen

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Keywords: liquid egg products, differential scanning calorimetry, liquid nitrogen, frozen storage

Introduction:
Eggs are usually marketed to consumers as shelled eggs, but liquid egg products are generally preferred for industrial usage. Their shelf life can be enhanced by adding preservatives up to 30 days. Freezing can be a potential solution to any emerging crisis situations or to the fluctuation of the price and quality of eggs.

Materials and Methods:
In our study, we examined the effect of freezing in liquid nitrogen and frozen storage on the calorimetric properties of pasteurized liquid egg products including liquid whole egg (LWE), liquid egg yolk (LEY) and liquid egg white (LEW). First, we froze liquid egg products dropwise in liquid nitrogen, then we stored them frozen at -18 °C. The initial, 1-day, 10-day and 4-month samples were released at room temperature, after that, we recorded the heat flow curves of samples with Differential Scanning Calorimetry. We compared the denaturation temperature and the enthalpy of denaturation of the samples and we used one-way ANOVA to analyze data.

Results and Discussion:
It was found that the enthalpy of denaturation changed significantly for LWE and LEY due to both freezing and frozen storage. We can see that frozen storage caused significant changes in the denaturation enthalpy of LEW. The denaturation temperature of LWE and LEW changed significantly due to the long storage, but no significant change in the denaturation temperature of LEY was detected. Results were considered statistically significant at $P < 0.05$.

Conclusion:
Based on the denaturation enthalpy and denaturation temperature results, we can conclude that freezing in liquid nitrogen and subsequent frozen storage have a strong influence on the calorimetric properties of LWE and LEY, probably due to fats and egg yolk proteins. For these phenomena, denaturation or aggregation is responsible during the freezing process. To reduce these effects, various cryoprotectors such as sodium chloride, sucrose and glycerol may be applied. Additionally, temperature fluctuation may cause water loss of the proteins, which may result in denaturation during storage. Therefore, in our next study, the ratio of bound and free water of samples is examined.

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P122

Evaluation of Linalool and Piperine in controlling water holding capacity and microbiological properties of fresh chicken meat in chilling condition

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Keywords: Linalool, Piperine, Fresh refrigerated meat, Antimicrobial, water holding capacity

This study was conducted to evaluate the effect of active compounds (ACs); Linalool (LIN) and Piperine (PIP) as natural additives in preserving the quality attributes of fresh minced chicken meat. For this aim chicken meat was treated with 500, 1000 ppm of ACs packaged and stored at 4 ºC for 8 days. Changes in pH, water holding capacity and microbiological status were evaluated. The activity of LIN was pronounced in maintaining pH, increasing water holding capacity in meat compared to higher drip loss in untreated meat. LIN with various dilution ratio particularly 1:10 (v:v) showed *in vitro* growth inhibition against *Escherichia coli*, *Staphylococcus aureus*, *Salmonella* Typhimurium and *Bacillus cereus*. While *Listeria monocytogenes* required 1:80 (v:v) to be inhibited, concomitantly no inhibition was detected for *Pseudomonas lundensis*. In contrast, PIP at different dilutions did not exhibit inhibitory activity against the studied bacteria. Regarding aerobic mesophilic bacteria, less than 7 log log^{10}CFU/g were recorded except for LIN-500 ppm shown higher log. Both ACs have potential to increase the shelf life of meat and meat products.

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P123

Effect of Allyl-isothiocyanate and carvacrol on water holding capacity and e-nose based characteristics of fresh chicken breast meat

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Keywords: Allyl-Isothiocyanate, Carvacrol, Chicken Meat, water holding capacity, electronic nose

Allyl-isothiocyanate (AITC) and carvacrol (CARV) are legalized to be applied as food preservative in different food systems including frozen or chilled meat products, and considered as generally recognised as safe (GRAS) flavouring agent in some countries. Addiotnaly they are gaining a wide interest as alternatives to synthetic food additives. In the currents study, the effect of these active components on pH, sensorial properties (electronic nose) and water holding capacity (WHC) of fresh chicken breast meat were monitored. Chicken meat was homogenized and divided into treatment groups: groups separately mixed with 500 and 1000-ppm with AITC and CARV (dissolved in 5% sunflower oil); and control (only oil), packaged and stored at 4 ºC for 8 days. AITC, particularly 1000-ppm, showed greater effectiveness than CARV and resulted in accumulative odour production. Concomitantly, 500-ppm CARV showed greater activity than AITC in producing higher level of WHC. The knowledge of properties of AITC and CARV, may contribute the great potential of these natural preservatives to extend the shelf life of chicken meat. However, future studies are warranted to determine the effect and to enhance the postprandial health benefits of these active components in human consumption of fresh chicken meat.

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Microbiological quality of some spices and antibiotic resistance of bacterial isolates

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Keywords: microbiological quality, spices, antibiotic resistance

Spices may be exposed to a wide range of microbial contamination during pre- and post-harvest and they can present high microbial counts. Contaminated spices can be cause food-borne illnesses and food spoilage. In our study, we have analyzed the microbial quality of 30 samples of commercially available dry spices. Samples were evaluated for the presence of aerobic spore-forming bacteria, Bacillus cereus, Escherichia coli, Salmonella sp., Clostridium perfringens, Pseudomonas sp., microscopic fungi. The antibiotic resistance of some pathogenic and spoilage bacteria isolated from different spices has been determined using the disk diffusion method.

P125

Xylo-oligosaccharides: a recently authorized novelfood in the European Union

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Keywords: Xylo-oligosaccharides, novel food

Xylo-oligosaccharides (XOS) are oligomers of two to ten β-1,4 linked xylose monomers and are hydrolysis products of xylan found in lignocellulosic material obtained from corncob a common agricultural waste. XOS are non-digestible oligosaccharides and are prebiotics that effectively stimulate growth and fermentation of beneficial bacteria in gut and also improve intestinal mineral absorption. In Europe XOS is a novel food ingredient recently authorized by European Food Safety Authority (EFSA) based on suggestions of regulation (EC) No 258/97 of the European Parliament. XOS is the first novel food ingredient authorized from Hungary and application process required proof of safety, stability and technological convenience of XOS in several food products such as dairy products, bakery and cereal products, milk substitues and fruit products. Aim of presentation is to introduce the authorization process, its main results and utilization potential of XOS as a new water soluble, prebiotic dietary fiber.

P126

Development of a new animal feed supplement based on spent brewing yeast

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The main scientific goal of ZINCOPPYEAST industrial research project is to obtain innovative products, i.e., animal feed supplements based on blended (1) spent brewing yeast from the beer industry and (2) new yeast biomass enriched with zinc. The resulted fodder supplement will contain polyphenols, vitamins and new bioingredients based on the yeast biomass enriched with zinc, and the brewing yeast rich in proteins and cell wall derived polysaccharides. In the first stage of the research, different cultivation conditions (carbon sources, yeast extract, concentrations of K^+, NH_4^+, Mg^{2+} salts, and $ZnSO_4$, oxygen flow rate, stirring rate, pH, temperature, dry matter) were applied and controlled on Zn enriched yeast biomasses, spent brewing yeast biomasses, and on blended yeast biomasses. Dried biomasses obtained after downstream process were analyzed in terms of concentration of dry cell weight, total zinc, organic zinc and total polyphenol content, using ICP-OES, SEC-ICPMS and the Folin-Ciocalteau method, respectively. Total zinc content of spent brewing yeast was found between 60-80 ppm, while for biomass enriched in Zn the concentration was in the range of 1100-2600 ppm. Total polyphenol content (expressed in gallic acid equivalent) found in different batches of spent brewing yeast was remarkably higher than in the yeast used in Zn enrichement experiments. This result highlights that endogenous polyphenol content of yeast may increase during brewing technology and can be considered as an appropriate vehicle for polyphenol enrichment of the planned feed supplement. The developed product (Zincoppyeast) is to be further tested in more detail to determine the influence of different industrial technological procedures on parameters such as homogenity, shelf life and stability of ingredient.

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P127

Development of DNA-based methods for the detection of soybean content in food

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Keywords: soybean, PCR, allergen

Introduction:
Food allergy is a growing problem affecting more and more people. Among food allergies, soy allergy cause one of the most serious food-safety risks. Accordingly patients suffering from soy-allergy should avoid the soy-containing food products against the allergic symptoms.
According to regulations concerning the food labelling mandatory – including the general labelling requirements of allergens – the presence/lack of soy is necessary to be checked regularly on the labels of products containing/exempted from soybeans. For the determination of soy content, different protein- and DNA- based methods are available. Point of our research was to develop sensitive, rapid DNA-method(s) for determination of the soy-content and for this purpose two types of DNA-based method (chloroplast AtpA gene-, and Lecl gene- specific, Zhang et al .; 2007, and Bauer et al.) were compared and characterized special regard to their sensitivity. So far, to verify the soy-free products, a method based on the detection of the so-called lectin gene was used successfully. Our research aim was to find a method even more sensible. Therefore, we compared two methods once based on the detection of lectin gene and once based on the AtpA genes.

Materials and Methods:
Optimization of the PCR reaction was carried out using the soybean called Pannónia Kincse (provided by the Cereal Research Non-Profit Ltd., Szeged,Hungary). DNA extraction was done by using the Wizard® DNA Clean-up System (Promega, Madison, Wisconsin, USA). PCR reactions were performed with Biometra TOne (Analytik Jena AG, Jena, Germany) with gradient PCR method. Two primer pairs: AtpA specific for the chloroplast AtpA gene, and Lecl specific for the lectin gene were applied. After the polymerase chain reaction, the results were evaluated by the means of FlashGel TM (Lonza Group Ltd.) electrophoresis apparatus.

Results and Discussion:
During the PCR optimization we identified the optimal primer annealing temperature (58°C), the adaptable DNA concentrate (20 µg/µl), the primer concentrate (1 µl 10 µM), and the optimal cycle number (34) in case of both specificities. Under these optimal parameters we searched for the smallest traceable copy number of DNA, which was about 3000 copies in case of Lecl specific – and 1copy in case of AtpA specific method. After the optimization we examined different food samples labelled with or without soy-content in order to confirm the statement of the manufacturer on the soy content.

Conclusion:

The optimal parameters for the PCR were determined and both of the methods could be suitable for the analysis of soy content in food matrices. Between the two primer pairs, the reactions with AtpA primers were more sensitive, so the detection with them was more effective. The explanation for this is the fact that in a plant only one lectin gene exists while there are thousands of chloroplast AtpA genes in the eukaryotic organism. To prove that the so-called "Soy-free" products do not actually contain soy, the PCR method based on the detection of the AtpA gene can be primarily recommended.

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P128

Effects of environmental factors on synthesis of hydrogen peroxide by some probiotic Lactobacillus strains

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Keywords: hydrogen peroxide, lactobacillus, enviromental factors, probiotic

Introduction:
Probiotic lactic acid bacteria are able to synthetize some metabolites such as organic acids, bacteriocins and hydrogen peroxide etc. that can exert inhibitory effects on activity and growth of pathogens. The aim of this study was focused on the production of hydrogen peroxide by some probiotic Lactobacillus strains.

Materials and Methods:
The strains were cultivated in MRS broth at 37°C for 16 hours. The growth was intiated by approx. 107 CFU/ml cell density, and was followed by monitoring changes of pH and viable cell counts. The cells were harvested by centrifugation and washed twice with cold saline solution. The quantity of produced hydrogen peroxide was followed by sampling at different incubation times (0, 2, 24, 48, 72 hour) at 5°C. The concentration of hydrogen peroxide was determined by spectrophotometer using peroxidase enzyme with ABTS as chromogenic reagent.

Results and Discussion:
During the 16-hour cultivation period, the Lactobacillus strains have shown growth with about two-order magnitude. The selection of Lactobacillus strains was performed in sodium-phosphate buffer (pH 6.5). Amounts of hydrogen peroxide were in the range of 0.2-6.26 µg H2O2/109 CFU. Five strains (L. fermentum HA-179, L. helveticus R-52, L. reuteri HA-188, L. salivarius HA-118, L. crispatus LCR01) were throughly analysed to determine the influence of the nutrient supply and the presence of lactic acid for the production of hydrogen peroxide. The addition of glucose to the medium used resulted increase in the productivity of hydrogen peroxide to the range of 14.6-26.2 µg H2O2/109 CFU. In this case, all the tested Lactobacillus strains have secreted at least three times higher quantity of hydrogen peroxide. In the mucin containing medium, the hydrogen peroxide concentration produced by Lactobacillus strains were in the range of 0.01-7.8 µg H2O2/109 CFU. While the L. crispatus LCR01 and the L. helveticus R-52 strains showed 1.2 times higher hydrogen peroxide synthesis whereas decrease tendency was observed in the cases of other three strains. Positive effect of supplementation of lactate to the medium was detected in the case of the L. crispatus LCR01 strain (36.2 H2O2/109 CFU), while it was inhibited the hydrogen peroxide synthesis by four rest Lactobacillus strains (0.03-2.0 µg H2O2/109 CFU).

Conclusion:

Our results shows that there are significant differences in the production of hydrogen peroxide in case of each Lactobacillus strains. This finding can be supported by the results of Zalán et al. 2005. Furthermore, it can be stated that enviromental parameters have important effects on hydrogen peroxide production. Villegas and Gilliland (1998) examined the hydrogen peroxide synthesis of Lactobacillus delbrueckii subsp. lactis I. and obtained similar results which were got in the case of the examination of L. crispatus LCR01 strain, where the lactate was better inducer than the glucose for the synthesis of hydrogen peroxide.

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P129

How pre-treatment refrigeration and frozen storage of the raw material influence some quality parameters of the Sous-vide cooked chicken breast

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Keywords: sous wide, chicken, refrigeration, freezing, weight loss

Sous-vide technology is a popular advanced heat treatment method, it gives exceptional organoleptic properties to the products. Using fresh, high quality ingredients is essential in the food industry. This cooking method amplifies both the high quality parameters and also the substandard raw material. Carefully chosen, good ingredients will be even better and substandard ingredients will be worse.
In our study we examined the color, the texture, the weight loss, and pH as quality parameters of the chicken breast meat. The effect of pre treatment storage was evaluated. Refrigerated (3 days and 10 days at 3°C) and frozen (10 days and 6 month at -25 °C) raw material was cooked sous vide (45 min at 65 °C). Meat samples were cooled to 10 °C and measurements were carried out right after the sous-vide treatment.
Weight loss was highly determined by the pre treatment storage period. It grew from 5,8 % (3 days at 3 °C) to 14,9 % (6 month frozen). Freezing increased weight loss and longer storage time (at both temperatures) had a slight effect as well. Lightness (L*) showed no difference between the samples. Yellowness values (b*) increased while redness (a*) decreased as longer storage period and freezing was was applied before heat treatment. An importand increase (+60%) in hardness was observed at the 6 month frozen sample compared to the refrigerated and 10 day frozen samples.
Evaluating all measured data CDA analisys points on the important difference between frozen and refrigerated samples. Storage time as awaited has more important role at the +3 °C stored samples.
Our work prooved that pre treatment storage method and time do have effect on the final product - freshness is decisive.

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P130

Mycotoxin producing fungi in small grain cereals (common millet, spelt, triticale)

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Keywords: mycotoxin, Fusarium, Aspergillus, small grain, millet, spelt, triticale

Introduction:
Several Fusarium and Aspergillus species are widespread pathogens and /or contaminants on cereals around the world, including all European cereal-growing areas. However we have limited information about the presence of these pathogens on small grain cereals, like common millet (Panicum miliaceum), spelt (Triticum spelta) and triticale (x Triticosecale wittmack), despite the fact that they are used in human diet and animal fodder as well. These pathogens can cause root, stem and ear rot on crops, resulting in severe reductions in crop yield and quality. Several Fusarium species may produce mycotoxins, which may lead to mycotoxicoses in livestock and in humans as well. Millet is traditionally grown cereal, especially in Asia. Nowadays it has become an alternative crop and used in diets of patients with celiac disease, because it does not contains gluten-forming proteins. Triticale is a minor cereal, a cross between wheat and rye, combining the quality and yield of wheat with the hardiness of rye. The modern hexaploid triticale are widely cultivated due to their tolerance to abiotic stresses and their ability to be productive with low input systems. Triticale can be milled into flour using standard wheat or rye flour-milling procedures, so it can be used as food. Spelt is well known traditional cereal, and is popular among farmers especially in ecological farming. In order to contribute to safe food and feed products from above crop grains we aimed at determining ear and grain infection level by mycotoxin producing fungi.

Materials and Methods:
We sampled millet, spelt and triticale grains from a range of fields and isolated mycotoxin producing fungi species (using Fusarium selective, modified Nash and Snyder's medium, surface sterilzed grain, 10 replicates). Plates were incubated at 25°C, and fungal mycelia were detected after 7 days.

Results and Discussion:
Because of the high number of samples, colonies were not always identified to species level but were classified as either Fusarium spp., Aspergillus spp., Alternaria spp. or other fungal species. Fusarium spp. were detected in all the samples. In case of millet Aspergillus spp. were dominant in the samples. Alternia spp. was a frequently isolated fungus on spelt. Triticale samples showed the lowest Fusarium infection.

Conclusion:

Mycotoxin producing fungi, like Fusarium and Aspergillus species are common on cereals, but their presenceand subsequent mycotoxin production is also a realistic source of contamination in small grain cereals.

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P131

Improved yield of tomato by combined biochar and bioeffector soil treatments

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Keywords: biochar, bioeffector bacteria, soil fertility

More than 100 type of abiotic and biotic bioeffector products are marketed in Hungary. The aim of their application is to restore soil fertility, improve absorption of macro- and microelements and accelerate decomposition of soil organic matter. Biochar technology is one of the efficient tool against soil degradation. The product have been made by a controlled industrial process from various biomass wastes of using reductive, oxygen-free technology, called pyrolysis.
Our aim was to study a plant-coal biochar and a plant growth promoting rhizobacteria (PGPR) strain and its combination in a low humidity sandy soil, to its physical-, chemical- and biological parameters. Pot and plot experiments were performed of using tomato (Solanum Lycopersicum L. var. Mobil) test-plant. In the field experiment, the biochar was incorporated into the upper 20 cm layer of the soil, of using 4- and 10 t-1 ha-1doses. The different doses were tested as single application and in combination with a bioeffector inoculum. In the pot experiements, the following biochar doses were applied: 0- (as control), 0.5-; 1-; 2.5-; 5- and 10 % of the soil (w/w %) in 8 replicates per treatment. Seeds of tomato was inoculated by 5 cm3 inoculums(1.5x108 cells/cm3) of a siderophor-producing, chelator bacteria. The total soil microbial enzymatic activity was measured by the Dehydrogenase- (DHA) and the Fluorescein diacetate (FDA) methods. Some groups of countable microorganisms were assessed by the Most Probable Number (MPN) method. Beside yields of tomato, the dissolved dry matter content (Brix) and the colour of the fruit extract was also estimated. The nutrient-uptake by plants was measured by atomic absorption spectrophotometer (AAS).
We found that plant coal biochar could improve the water retention ability of the low humidity sandy soil, thus positively correlating with the average fruit size of tomatoes. Considering the DHA and FDA assessment methods, the DHA activity was more effective, it had been in positive linear correlation with total aerobic and anaerobic bacteria, Pseudomonas genus, microscopic fungi and also with the potassium (P) and magnesium (Mg) nutrients in both of plant measurements.
Biochar increases the water content of the soil in general which is key-important of the plants and the soil biota, therefore yield of tomato might be increasing. Larger fruits and greater yield, however cannot be accomplished with some quality, food-tasty parameters. Further studies are needed, therefore to find the best beneficial bioeffective inoculum combinations with the biochar soil amendments.

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P132

Applying non-Saccharomyces strains for production of pálinka

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Keywords: non-Saccharomyces, pálinka

Introduction:
One of the most important technological advances in fruit spirit (Pálinka) production has been the inoculation of fruit mash with selected cultures of Saccharomyces cerevisiae. This has been based on the evidence that microbiological control of the fermentation process allows better management of this alcoholic fermentation. The use of non-Saccharomyces yeasts in pure cultures as fermentation starters has indicated that these have some beneficial fermentation characteristics. Many previous studies have investigated the influence of non-Saccharomyces yeasts on the final quality of alcoholic beverages, including wine and tequila. The researchers demonstrated that Kluyveromyces marxianus increased the concentrations of major and minor volatile compounds associated with the organoleptic quality of tequila, making it a more suitable biocatalyzer for the industrial production of tequila than the commonly used S. cerevisiae. The aim of this study was to investigate the fermentation activity of non-Saccharomyces strains in apple mash and to determine their effect on the quality of fruit spirit.
Materials and Methods:
In this study BiodivaTM Level2 (Torulaspora delbrueckii TD291), Viniflora ConcertoTM (Kluyveromyces thermotolerans), MelodyTM (mixed culture of Torulaspora delbrueckii, Kluyveromyces thermotolerans and Saccharomyces cerevisiae) and Uvaferm 228 starter cultures were applied. These starters were obtained from Kokoferm Limited and from Chr. Hansen A/S. During the mashing process LallzymeTM HC enzyme preparation were used for pectin degradation, phosphoric and lactic acid (in ratio 95:5%) for the acid protection and UvavitalTM complex nutrient as an additive for yeast strains. The starter cultures Biodiva and Concerto were used in sequential inoculation with Uvaferm 228. In the experiment Jonathan apple was used as a raw material. The fermentation was carried out at 16°C. Fermentation process was followed with traditional analytical methods and the quality of pálinkas was investigated by HPLC, GC methods and sensory test.
Results and Discussion:
Each yeast gradually utilized the available carbohydrate source, thus fermenting quickly and smoothly. There was no significant difference in yeast metabolic activity. The highest values of volatile acid (0.51 and 0.52 g/l) were measured in samples fermented with Concerto + Uvaferm 228, and Uvaferm 228 yeast. The alcoholic strength of fermented mash was between 2.8 V/V% and 5.2 V/V%. The recommendation was proven true that the yeast added in the second shift had an important role to achieve adequate alcohol content. In case the distillates that were gained from mash fermented with UVAFERM 228, Viniflora® Concerto™, MELODY™ and Viniflora® Concerto™ + UVAFERM 228 starter culture greater ester content was detected. Based on gas chromatography and sensory analysis the spirits obtained with Viniflora® Concerto™ + UVAFERM 228 starter cultures gave excellent results.

Conclusion:

Based on our investigations we can conclude that the use of mixed cultures positively influenced the sensory evaluation of the obtained pálinka. So non-Saccharomyces yeast can be a new perspective for enrichment of the aroma composition of a pálinka.

P133

Effect of drug treatment of fatty acid composition in adipose tissues

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Introduction
Fatty acids have biological activities that influence cell and tissue metabolism, and associated with diverse risk of diseases. Drug treatment has a significant effect on the fatty acid composition of adipose tissues (subcutaneous and visceral). Aim of this study was to investigate the fatty acid composition in adipose tissues of rats, according to sex, drug treatment and diets.
Methods:
Rats were fed with: 1. Standard diet (SD); 2. High Fat-High Sucrose diet (HFHSD); 3. HFHSD + Metformin (50 mg/kg/day); 4. HFHSD + Liraglutide (0.3 mg/kg/day). A micro extraction method was used to extract lipids from visceral and subcutaneous adipose tissues, and then fatty acids were converted to methyl esters (FAMEs). FAMEs were determined by Gas chromatography with Flame Ionization Detection (FID). Data were evaluated by statistical method (SPSS).
Results:
The main fatty acids in tissue samples were linoleic acid (C18:2, n-9), oleic acid (C18:1, n-9), and palmitic acid (C16:0), in decreasing order. Lauric acid (C12:0) and caprylic acid (C8:0) were present in less than 5 %. Erucic- (C22:1, n-9), capric- (C10:0), □-linolenic (C18:2, n-3), and □-linoleic (C18:3, n-6) acids were found in trace amounts.
Drug treatment caused significant differences in the fatty acid composition. Liraglutide caused bigger changes in fatty acid composition in the female rats, while Metformin treatment caused practically same effect independently of sex. Drug treatment caused changes in the mono/poly unsaturated fatty acid ratio in different adipose tissues too.
Conclusion:
Significant differences were found in fatty acid composition in visceral and subcutaneous adipose tissues depending on sex, diets and drug treatment.

Reference

Muranszky, G., Simon-Sarkadi, L. (2017): Determination of fatty acids in adipose tissues by gas chromatography. The Ukrainian Biochemical Journal, 89, Special Issue, RECOOP 12th Bridges in Life Sciences Annual Conference, 2017. April 7-8. Budapest, Hungary. pp. 27.

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P134

Escherichia coli contamination measurement of the cell phones and users' hands

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Keywords: Mobile phone; Hands; Bacteria contamination

Introduction:
This study aims to examine the presence of Escherichia coli bacteria on the surface of cell phones and the users' hands.
Method and Materials:
In this study, 201 mobile phones and 201 pair of hands were examined with normal standard microbiology methods. Association was supposed between the contamination level of the telephone parts and owners' hands. Computations were made by SPSS v.24 of IBM
Results:
Out of the 201 cell phone screens and backs investigated, 164 (81.5%) were contaminated with Escherichia coli or Coliform bacteria. More than 60% of the samples from the right and left hands were infected by Escherichia coli or Coliform bacteria.
Conclusion:
The overall percentage of positive cultures (Escherichia coli) from mobile phone was 18.76% (average percent), compared with 19.6% (average percent) for negative cultures. The overall percentage of Escherichia coli bacteria from right and left hands was higher than 25% (average percent), compared with 8.9% (average percent) for negative cultures.

P135

Separation of organic compounds from ABE mixtures by pervaporation

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Keywords: ABE fermentation, Pervaporation, Butanol recovery, Solution-diffusion model

Introduction:
The acetone-butanol-ethanol fermentation is a promising process to produce renewable energy sources. Usually distillation is used in order to recover fermentation products. However, the low end-product concentrations and massive energy consumption render this method uneconomical. Pervaporation is able to extract water-solved organic compounds using less energy than distillation since only a part of the mixture is evaporated in the membrane. The purposes of this research were to study the separation of the main product of acetone-butanol-ethanol fermentation process from different model solutions by vacuum pervaporation and modelling the process by solution-diffusion model.

Materials and Methods:
Model solutions were made of distilled water and organic compounds: acetone, butanol and ethanol. The experiments were carried out with binary (butanol-water), ternary (butanol-aceton-water and butanol-ethanol-water) and multicomponent (ABE model solution) aqueous mixtures. Feed concentrations of n-butanol were 1, 1.5 and 2 V/V% according to researches for ABE fermentation. The concentrations were set respectively to the biomass fermentation results. The measurements were performed at three different temperatures: 40, 50, 60 °C. The flow rate was set to 400 L/h. The separation of organic compounds was operated by an organophilic ceramic tube pervaporation membrane (Pervatech) using vacuum-pervaporation method. The commercial membrane with PDMS active layer has an effective membrane area of 0.011m^2. Feed side was under atmospheric pressure and on the permeate side of the membrane pressure was kept at around 20 mbar using a vacuum pump. Concentration of permeate was determined using gas chromatograph equipment.

Results and Discussion:
The experimental results showed that an increase in both temperature and concentration had favourable effect on flux. The separation factor was decreased by higher concentrations, which means that during the process the reduction of the concentration has preferential effect on the efficiency of the pervaporative separation. In the presence of the other components of ABE synthesis butanol had higher flux and higher separation factor in comparison with model solutions containing only butanol. The concentration of butanol were found in the range from 21 to 31 V/V % in case of separation of quaternary mixtures. Each component had the highest separation factor in the presence of all the other organic compounds. The mathematical modelling of pervaporation can be described with the solution-diffusion model. According to the modelling of pervaporation process the temperature dependence of the permeation rate was described by the Arrhenius-type relation.

Conclusion:

The results suggested that the applied pervaporation membrane was suitable for enrichment of product of ABE fermentation. Unfortunately, the aqueous solution of organic components cannot be condensed to an anhydrous organic solvent in a first-stage pervaporation setup. Distillation is still necessary to treat permeate obtained by pervaporation to produce anhydrous organic solvent. It is therefore preferential to have a higher concentration in permeate to reduce the cost of distillation.

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Effect of pretreatment on the nutritional values and functional properties of tomato powder

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Keywords: Tomato, Bulk density, Proximate, Dehydrated, Sodium chloride

The effects of pre-treatment methods on the nutrional value and functional properties of tomato were examined. The quality of dehydrated tomato is often poor as a result of: collapese of structure, discolouration and tough texture. Result revealed that sodium chloride (NaCl) increased water removal in tomato powder during drying and these pre-treatment influences the drying kinetics of tomato, while pretreatment with potassium metabisuphite (KMS) showed slightly more acidity and had the least vitamin C retention. The proximate composition showed that fresh tomato treated with sodium chloride (NaCl) contained 87.14% of Moisture, fat 4.76%,fibre, 0.05%, ash 5.16%, protein 1.48% and 1.41% carbohydrate. Fresh tomato treated with sodium metabisulphite (KMS) caontained 88.02% moisture, fat 5.01%, fibre 0.046%, ash 5.00%, protein 1.38% and 0.54% carbohydrate. The proximate composition showed that dried tomato powder treated with sodium chloride (NaCl) contain contained 6.41% moisture, fat 1.06%, fibre 0.18% ash 45.78%, protein 12.5% and 34.00% carbohydrate; while dried tomato powder treated with sodium metabisulphite (KMS) contained 6.92% moisture, fat 1.04%, fibre 0.16%, ash 45.74% 12.08% protein and 34.06% carbohyrdrate. The functional properties of tomato powder revealed that bulk density 0.59% water absorption 126.40% water solubiliy 8.40%, foaming capacity 66.75% and dispersability of 8.00%.

P137

Effects of combined treatments on the microbiological condition of white button mushroom (*Agaricus bisporus*)

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Introduction:
Mushrooms are very valuable raw materials. The traditional heat treatment can cause a great loss in the valuable components of the raw materials. That's why the minimal processing technologies become more important in the preservation of food. High hydrostatic pressure (HHP) technology is a non-thermal preserving technique, which applies 100-1000 MPa of pressure to inactivate pathogenic and food spoilage microorganisms, while retaining the valuable components of foods. Sous-vide is a method of cooking, when the food, sealed in airtight plastic bags , is placed into a water bath for longer period than normal cooking time at an accurately regulated temperature much lower than normally used for cooking.

Materials and Methods:
The raw matrial was white button mushroom. After washing, packaging and cutting the buttonmushrooms, we used sous-vide and high hidrostatic pressure treatments. The samples were made accordingly with two-level full factorial design. The level of the factors were 55°C, 75°C, 300MPa, 600MPa, and in the central point 65°C and 450MPa. The samples were stored for 14 days at 2°C, 8°C and room temperature.

Results and Discussion:
The linear response surface model was only significant ($p<0,05$) at room temperature storage for both treatment orders. However, the linear model of the sample made with Sous-vide/HHP treatment order at day 0 is not significant about the p value, but in this case the predicted cell counts plotted against the measured ones shows a quite good fit. In general, the sous-vide/HHP treatment order was better because the area of the lower cell count (the number of the mesophil aerob microbes) on the response surface was bigger. Based on the response surfaces, we can draw the inference that the pressure treatment gets a more appreciable role during the storage. But this is true if only we use the higher pressure values for treatment. On the whole, the cell count is influenced not only by the treatment levels and orders but also the storage temperature. Except for the HHP/sous-vide combination on the upper level, because these samples were stable irrespective of the treatment order and the storage temperature.

Conclusion:
We can give a mathematic model only for room temperature storage because the linear response surface model was significant in this case. With the mathematic model we can forecast the cell count for the examined interval. For exact accomplishments in the other cases, more measurements are needed.

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Storage stability of pineapple juice fermented by probiotic bacteria Lactobacillus sp.

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Keywords: probiotics, pineapple, lactic acid bacteria, refrigerator storage, probiotic drinks

Probiotic fruit juice has many benefits to human health, however, fermented fruit juices which have a low pH value (pH 4.5 or below) may influence the viability and activity of probiotic bacteria during the storage. This study focuses on the growth and survive of probiotic as well as the change of quality of lactic-fermented pineapple juice. Three probiotic lactobacilli strains Lb. acidophilus La-5, Lb. casei 01 and Lb. acidophilus 150 were applied. The fermented pineapple juice was stored at 4oC for 28 days. Total phenolic content (TPC) and ferric reducing ability of plasma (FRAP) were determined. The microbial population of three strains did not change significantly during storage for four weeks, cell number results approximately higher than 109 for Lb. acidophilus La-5, Lb. casei 01 and 108 for Lb. acidophilus 150, however, the pH value decreased in pH 0.5 at 28th storage. The lowest pH (3.49) was recorded in fermented fruit juice with Lb. casei 01. Results of carbohydrate analysis by HPLC showed that concentration of glucose reduced significantly. Lactic acid and acetic acid of the juice increase and reach at 1.43, 1.37, 1.73 and 0.4, 0.18, 0.18 %w/v for Lb. acidophilus 150, Lb. acidophilus La-5 and Lb. casei 01, respectively. The fermentation of juice by Lb. acidophilus La-5 did not affect concentration of TPC and FRAP, and these values remained above 0.4 mg/ml gallic and 2.66 mM FeSO4/ml, respectively. However, the trend of drop in TPC and FRAP was observed in the cases of the Lb. acidophilus 150 and Lb. casei 01 strains. None of the strains were significantly affected by the incubation in presence of 0.3% pepsin and 0.6% bile acid. It can be concluded that all investigated Lactobacillus sp. strains are able to survive in the stressful condition of low pH and high acidity of the fermented pineapple juice and also the relatively low temperature of the environment (4°C) til 28 day. These results provide good bases for development technology for probiotic fruit drink production with high antioxidant activity.

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Novel drink made from egg whites

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Keywords: egg white, product development, protein-dense drink

Introduction:
The scientist who would find optimal parameters for heat treatment is faced with a double task when it comes to determining a method of heat treatment for liquid egg. First, it must be considered that the level of liquid egg protein—and this means denaturing protein content—is already high when temperatures are low. Thus one cannot choose too high a temperature nor too long a treatment period. On the other hand, we cannot forget that liquid egg provides perfect food for microbes, and raising treatment temperature and time would reduce these harmful organisms. The situation is made worse when liquid egg (in the case of the present writers, liquid egg white) will be flavored with other microbiologically, or organically different materials, such as 100% fruit juices.

Materials and Methods:
For our experiment, we dosed liquid egg white in a 0-1000 ppm citric acid concentration, with 0, 300, 500, 1000, 2500, and 500 ppm concentrations of protein-splitting enzyme. Afterward, the samples were incubated at 50°C. for 2-24 hours. To these liquid egg white samples we added 20m/m% fruit juice concentrate (pineapple, apple, and orange), after which they were heat-treated at 70°C for 10 minutes.

Results and Discussion:
It can be stated that the samples treated in this alternative way exhibited great changes in their overall populations. In terms of microbiologic changes, there was a high degree of homogeneity after the 70°C heat treatment. By comparison, the control sample (0 ppm citric acid, 0 ppm enzyme, 0 h incubation) precipitated at 70°C after just 2-3 minutes, whereas the other various treatments yielded opaque (300, 300, 8), slightly viscous (1000, 300, 8), and milky white, watery products (500, 1000, 8). During the sensory tests, the tasters said the pineapple flavor was the best.

Conclusion:
Based on these results, it can be stated that choice of appropriate incubation time, together with correct citric acid and enzyme concentration, enabled us to produce a 20% fruit juice/80% liquid egg white that is acceptable both from the sensory the and microbiologic points of view.

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P140

Anthocyanin composition of innovative blue grape varieties

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Keywords: Anthocyanin diglycoside, resistive grape variety, wine colour

Introduction:
According to the current wine law, candidate species whose pigments exhibit anthocyanidyl diglycosides above certain concentrations are excluded from the authorization process since the presence of these diglycosides refers to American hybrid grape varieties. At the same time, it is worth considering the fact that many new breeds can be found at high concentrations of diglycosides which would be suitable for quality grape production and wine production on the basis of other parameters and organoleptic characteristics, and even on the basis of their resistive properties, these varieties could form the basis of alternative cultivation trends in the future.

Materials and Methods:
The new innovative varieties provided by the Research Institute of Viticulture and Oenology, Pécs are the results of Dr. Pál Kozma's work. Spectrophotometric measurements were made to determine total polyphenol content using Folin-Ciocalteau reagent calibrated for gallic acid; to determine the amount of leucoanthocyanins by heating with 40:60 hydrochloric acid and butanol, containing iron (II) sulphate; to determine the total anthocyanin content with a dilution of 96% ethanol containing 2 V/V% HCl at 550 nm wavelength; and to determine the catechin content in alcohol diluted with sulfuric acid vanillin at 500 nm wavelength. Malvidine-3,5-diglycoside and anthocyanin monoglycosides and their acylated derivatives were determined by high performance liquid chromatography (HPLC). The wines were directly injected into the HPLC after filtration. For screening samples, a Sartorius membrane filter of 0.80 μm pore size was used.

Results and Discussion:
Berry skin studies show that the polyphenol composition of the samples is similar to the literature data. Some species have a total polyphenol content of up to 8000 mg/kg or more. The amount of leucoanthocyanins and catechins (responsible for the tendency to browning and the tenderness of bitter taste) is typically between 1000-4000 mg/kg but is, however, very high in some varieties. In the case of the spectrophotometric determination of the anthocyanins in the berry skin, a variety of 2000-3000 mg/kg of skin was determined in several varieties, but in some cases also excellent results were obtained which exceeded the 5000 mg/kg skin concentration.
The results of the HPLC determination of anthocyanin monomers were similar to spectrophotometric measurements.

Conclusion:

Considering the investigation of malvidin-monoglucoside, of malvidin-diglycoside, and of total anthocyanin monomers, 5 samples have an outstanding amount of monomer anthocyanin. The diglycoside present in the American hybrids was found to be significant in several samples. On this basis, it should be considered for legislation that, in the process of licensing new grape varieties, it is necessary to examine their ability to produce anthocyanin-diglycosides.

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P141

Effect of ultrasound treatment on electro-chemical properties of orange juice

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Introduction: Ultrasonic treatment of different liquids, drinks and beverages has an increasing interest in the industrial and publishing fields, in recent years. Benefits of the sonication include increasing level of bioactive compounds, while keeping the quality parameters. The aim of this study was to evaluate the effect of the different parameters of the ultrasound treatment on electro-chemical properties of 100% orange juice.
Materials and Methods: 100% orange juice observed from a local store. Samples were treated in an HBM Ultrasound-cleaner equipment in glass bottles (100 ml) at different levels of the treatment factors: 20/40 kHz frequency, 180/300 W power for 15/30 minutes. After the treatment the samples were diluted to 50%. The electro-chemical properties were measured with electronic-tongue (Alpha Astree potetiometric Electronic Tongue). Other parameters were also measured, such as pH and electric conductivity.
Results and Discussion: Discriminant analysis of the data from electronic-tongue showed significant difference between the treated groups and the control group. The pH showed no difference between the groups, but the electric conductivity also showed perceptible difference. The dose of ultrasound treatment showed significant effect on the electro-chemical parameters of the juice.
Conclusion: The results show clearly, that the ultrasound treatment has a significant effect on the taste of the orange juice. Analysis of the factors highlighted the significant effect of all the three tested parameters (ultrasonic frequency, power and duration time).

P142

Role of diverse probiotics in reinforcement of prebiotic feature of versatile carbohydrates with food additive potential

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Keywords: Carbohydrates, controlled enzymatic semi-digestion, Oligosaccharides, Prebiotic

Introduction:
Carbohydrate molecules containing 10 or more monomeric units that are not hydrolyzed by the present enzymes in small intestine are considered as dietary fibers with potential prebiotic applications. Such oligosaccharides can be obtained from polysaccharide molecules of food industrial application perspectives, such as sodium alginate, chitosan, inulin and pectin. Degradation might be induced via different hydrolysis reactions such as controlled enzymatic semi-digestion. These obtained non-digestible oligosaccharides, selectively enhance the growth and/or activity of certain bacteria in the colon which ultimately stimulate the health and well-being. In order to ensure distinct, health-promoting feature, the application of probiotics being in compliance with the action of the concerned prebiotics is in forefront of research and development activities attached to food industry.
In this project, distinctive probiotics have been studied for their application as potential symbiotic agents by means of assessing their capabilities to interact with specific combinations of oligosaccharides having been yielded from carbohydrates' hydrolysis.
Methods:
Food grade pectinase, inulinase, cellulose, hemicellulae, protease, and a few commercially blended enzymes (BIO-CAT, USA) were applied to produce oligosaccharides with different degree of polymerization from, pectin, inulin, chitosan and sodium alginate.
Different bacterial strains (E. coli- gentamicin sensitive, Clostridium perfringens ATCC 13124, Lactobacillus casei 2756, Bifidobacterium adolescentis ATCC 15703, Bifidobacterium bifidum ATCC 11863, Bifidobacterium longum subsp. infantis B.01821, Streptococcus thermophiles, Lactobacillus delbrueckii subsp. Bulgaricus, Lactobacillus acidophilus La-5, Bifidobacterium animalis subsp. lactis BB-12, Faecalibacterium prausnitzii) have been cultured by supplementing sterilized carbohydrate-free Man-Rogosa-Sharp (MRS) medium with or without different concentration of distinctively treated, enzymatically hydrolyzed carbohydrate samples. To monitor the growth pattern, the bacterial cultures were plated once right after supplementation of oligosaccharides and once after incubation of liquid culture with oligosaccharides for 24 h. The emerging colonies were counted after certain times for each strain and the results have been expressed as CFU/ml where prebiotic index were also calculated.

Results:
Different pectin, chitosan and sodium alginate oligomers were obtained by termination of corresponding enzymatic decomposition after 1, 3, 6 and 12 h. Application of inulinase to different inulin variants led to the formation of fructo-oligosaccharides after 1, 5 and 10 minutes of the reactiom. The extent of degradation was analyzed chromatographically and the samples were categorized and utilized as carbohydrate sources in bacterial culture.
Most of the studied oligomer-combinations displayed pronounced prebiotic feature, the calculated prebiotic indices ranged from 0.2 to 2.4. There was a marked difference between prebiotic indices established for the distinct probiotic strains. Outstanding prebiotic activities were observed when Lactobacillus delbrueckii subsp. Bulgaricus and Lactobacillus acidophilus La-5 were applied in the reaction mixture.
Discussion:
The obtained degradates of high biological value comprising potential prebiotic components may beneficially be applied as key components of functional foodstuffs. It was found that mainly two probiotic strains can be regarded as proper candidates for food industrial use as components of symbiotic.

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Optimization of lipase production by *Yarrowia divulgata*

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Introduction

Lipase is a highly valuable compound which has a wide range of usability, for example in the food-, pharmaceutical- and beauty industries. *Yarrowia lipolytica* is one of the most extensively studied yeast species, known from its remarkably high lipolytic and proteolytic activity. In the last few years some novel species belonging to the *Yarrowia* clade were described, justifying the interest to study their ability to produce lipase and other valuable compounds.
The main aims of this research were to evaluate the lipase producing ability of some novel *Yarrowia* strains, and to enhance the production by optimizing the operational parameters.

Materials and Methods

Thirty-five strains, belonging to the species *Yarrowia divulgata, Y. porcina* and *Y. bubula* isolated from raw, grounded pork or beef were screened by streaking them on the surface of Gorodkowa medium, supplemented with olive oil.
Inoculum (5%, v/v) was transferred into 500 mL flasks, containing 200 mL of fermentation medium (2% glucose, 0.64% peptone, 1% yeast extract) and supplemented with 1% olive oil and/or 0.05% Tween 80. Experiments were carried out for 72 hours at 28°C in a shaker (160 rpm).
Samples were centrifuged and supernatants were used for measurement of extracellular lipase activity; additionally, yeast cells were disrupted before the quantification of intracellular lipase. 25mM p-nitrophenyl-laurate was used as substrate to determine the lipase activity and the reaction was performed at 37°C in phosphate buffer (pH 7.2) for 10 min. Lipase activity was determined spectrophotometrically at 405 nm. One unit (U) of lipase activity was defined as the amount of enzyme that releases 1 µM of p-nitrophenol per minute (pH 7.2, 37°C).
Optical density (λ=600 nm) to quantify cellular growth and pH were also measured.

Results and Discussion

Almost all strain showed lipolytic activity, but *Y. divulgata* 5257 and 2062 were selected for further experiments. During submerged fermentation pH decreased, while OD kept growing. Exponential growth started after 8 h of cultivation for both strains in YEPD medium. In experiments with *Y. divulgata* strains, 4.03 U/ml and 8.11 U/ml of extracellular enzyme activity was attained after 8 h and 48 h, respectively. Olive oil and Tween 80 have been published to enhance lipase activity and in our experiments this positive effect has also been proved: maximal lipase activity rised to 6.59 U/ml and 25.17 U/ml at 48 hours in the prescence of olive oil, and to 139 U/ml and 141.76 U/ml when both additives were added.

Optimal temperature and pH for enzyme activity assay were also determined. Lipase activity was highest at 37 °C and at pH 6.5, and probably these parameters were also the most adequate for yeast growth and lipase production.

Y. divulgata 5257 was used to determine intracellular lipase activity, which was also significant (396 U/ml without Tween 80).

Conclusion

Yeasts of the *Yarrowia* genus are able to produce high amount of valuable compounds, such as the enzyme lipase. *Y. divulgata* strains showed the best performance and the addition of olive oil and Tween 80 led to the increase of lipase production. Thus besides *Y. lipolytica* members of other species may have great industrial potential and should be studied.

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P144

Examination of different composition packaging folis

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Introduction:
In our research we are developing chilled and long shelf-life bakery product packaging. We have tested 20 different foils. We have worked with several test methods and selected the sample with the best properties.
Materials and Methods:
The BS-Plastic Invest Kft. provided the different foils. The following types of foils have been tested: HPDE, LDPE, PE / PA, COEX-PE, and PE-EVOH-PET. We measured the thickness,the water permeability coefficient, the oxygen permeability, elongation at rupture, oil and acid resistance, and aroma closing capability.
Results and Discussion:
We have concluded that HDPE folis are not suitable for long-term storage, because they are very thin, easily broken, got too high water permeability coefficient and oxigen permeability. They are sensitive to acid and oil. LDPE foils have better properties, but as its thickness decrease it deteriorates all properties. PE/PA foils have moderately good water permeapility coefficient, but the oxygen permeability was too high. The best properties were shown by PE-EVOH-PET foils. It has good gas and water permeability and less sensitive to acid and oil.
Conclusion:
Based on our measurements, PE-EVOH-PET foil is recommended for packaging chilled and long shelf-life bakery.

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Effect of performation modified atmosphere packaging on quality of fresh-cut mushroom during storage

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Keywords: mushroom, fresh-cut, MAP, storage

The aim of this work was to evaluate the effect of perforation modified atmosphere packaging on quality of mushroom slices during 12 days of storage at 5 °C. Polyethylene bags with different number of perforations (3, 4 and 6) were used in this experiment. Headspace oxygen concentration, respiration, weight loss, surface color, firmness, and solid content were examined throughout storage. It was observed, that all the investigated packages were equally effective in maintaining the quality of mushroom slices. There was no symptom of decay till the end of the experiment. In addition, firmness showed only minor change. Moreover, weight loss of mushroom slices was below 2 % after 12 days of storage. Thus, perforation modified atmosphere packaging (MAP) has been proved to be efficient in maintaining the quality of slice mushroom.

P146

Examination the effect of the high hydrostatic pressure treatment for the green color change of goose liver during the storage

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Introduction:
The poultry industry plays a leading role in the national food economy and food processing industry. The liver of ducks and geese deserve attention due to this is a premium food material and export-oriented products. Liver of geese and ducks are high quality and valuable product. Fattened liver (Foie gras) is a luxury food product made from duck or goose by a special fattening process. Foie gras is not only a gastronomic value it has also a major commercial and economic position in the Hungarian and international markets. The problem of vacuum-packed liver is the color changes on the surface. The green color appearance on the surface of the goose liver has long been a known phenomenon. Although the microbiological state of the product is optimal, the green color on the liver surface is a quality problem and consumers are often associated with the product's deterioration. Many studies and research focused on the cause and technological background of liver discoloration, but a soothing result so far has not been achieved to avoid or eliminate this phenomenon. The results of the literature also prove that it is a complex process.

Materials and Methods:
To ensure microbiological stability, high hydrostatic pressure (HHP) can be used, which is a gentle preservation process. Eliminate the green color of liver surface, the half of (goose liver) samples were solved in Soluprat (sodium pyrophosphate) solution (0.1% and 0.3%), while the other samples were treated with nitrite solution (0.0025% and 0.005%). Samples were treated at 600 MPa for 5 minutes with HHP treatment. The samples were stored for two weeks. The color measurements were made by using a Konica Minolta CR-400 measuring instrument.

Results and Discussion:
The results show that the HHP treatment increase the green color appearance and enhances it. In these cases the rate of change in green–red color components (a)* was faster and more pronounced than in the samples treated in the solutions.
In case of samples treated with Soluprat and nitrite solutions, the green color also appeared. The pH value of the nitrite treated samples did not show any significant difference from those treated with the Soluprat containing samples. However, according to my data, HHP treatment increases the pH value.

Conclusion:
The least amount of green color appeared in the samples which were treated with nitrite solution, but further experiments are required to find out whether the use of higher concetrations hinder the development of green color.

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The effect of adjuvants on degradation kinetics of captan

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Keywords: captan, pesticide, residues, THPI, LC-MS

Introduction

In Hungary, limit values for pesticide residues (MRL) are regulated by the European Parliaments and the Council 396/2005 EC. After plant protection treatment the concentration of pesticide residue is decreasing over time because of degradation of the active ingredients. Degradation can be occurred for several reasons. We assume, that adjuvants may influence this process by affecting the microbial life of the plant surface as well as affecting physical effects (such as the UV radiation energy) on the plant. Captan is a chemically unstable, nonpolar contact compound whose fungitoxic effect is caused by the attack of endogenous thiols, by inhibiting the activity of vital enzymes via substitution reaction. The US EPA lists it into the "most likely carcinogenic" group. The degradation of the active substance at ambient temperature and at alkaline pH is extremely fast, the primary degradation product is tetrahydrophtalimide (THPI). To quantify the amount of captan in plants we need validated analytical method. For quantification of captan residue in plant matrices generally GC-MS and GC-ECD methods are applied. However, during injection captan is immediately decomposed to THPI, making the method difficult to apply for residual analytical purposes. In order to avoid the above problem, we found it worthy to develop an HPLC-MS/MS method which is capable of measure captan in plant matrix. We used the developed method for the investigation of degradation kinetics of captan simultaneously using with different adjuvants on apple leaves and fruits.

Materials and methods

During LC-MS/MS method development, the ionization of captan was a critical point in ESI interface. We investigated the ionization of captan with various solvent compositions while keeping in mind that the solvent have to be compatible as mobile phase with ESI-MS detection. The component-dependent as well as source-dependent parameters were automatically optimized using Analyst software. For retention captan and separation from matrix constituent, Atlantis α C18 column was used at a flow rate of 0.4 ml/min, the column was heated to 40 °C. The eluent was methanol (A) and water (B), to which 5 mM ammonium-acetate and 0.5% acetic acid were added. For plant protection treatments, plots were treated with four different captan-containing plant protecting products (1. Table).

The plots were treated once. During sample preparation, the samples were kept frozen. Because of the alkalizing effect, PSA was not used during the citrate-buffered QuEChERS sample preparation process. Matrix-matched calibration was used for quantification.

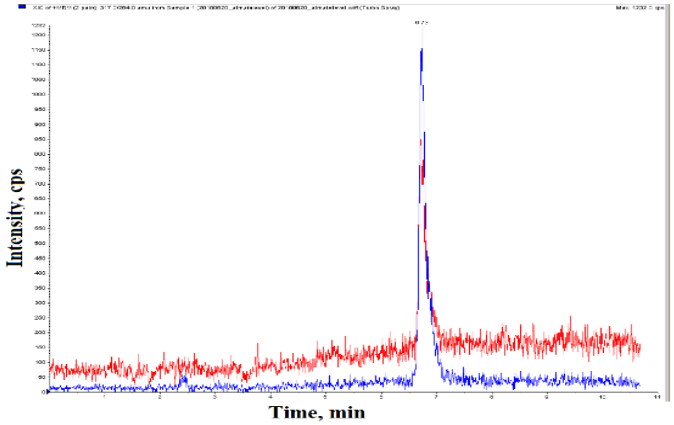
Results and discussion

For the determination of captan by HPLC-MS/MS method, 317.0/264.0, 317.0/300.1, and 317.0/79.1 mass transitions were used (DP = 31, EP = 3, CEP = 14). By this method LOQ were 8.39 mg/kg wet weight, which is below the MRL_{captan} = 10 mg/kg wet weight.

In each case Merpan treated samples had a greater incidence of decrease in captan concentration at 14 days than Buvicid K 370 SE treated samples. (1. Figure)

1. Table Captan-containing pesticide formulations used in this study

Name of product	Agent	Optionally added adjuvant	Dose
Buvicid K 370 SE	Captan		6.48 ml/plot
Merpan	Captan		4.32 ml/plot
Merpan	Captan	Designer	4.32+0.98 ml/plot
Merpan	Captan	Silwet Star	4.32+0.35 ml/plot



1. Figure Chromatogram of 507.75 ng/ml (39.46 mg/kg wet weight) captan-containing apple leaf sample

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P148

Combined, osmotic and temperature stress tolerance of wine-related strains of Starmerella bacillaris (syn. Candida zemplinina)

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Keywords: Starmerella bacillaris, Candida zemplinina, psychrotolerance, osmotolerance, wine fermentation

Introduction:
Wine yeasts are facing a wide range of different stress factors during the alcoholic fermentation. Some of them are related to the grape juice, e.g. the increasing initial sugar concentration due to the global climatic change, whilst others are technology-induced ones, e.g. the low fermentation temperature, which is beneficial to preserve volatile compounds. *Starmerella bacillaris* (syn. *Candida zemplinina*), a wine-related yeast species, is generally described as an osmotolerant and psychrotolerant organism apart from its fructophil character and high glycerol production. From oenological point of view, a more sophisticated description is needed to evaluate the applicability of wine yeasts as starter cultures. For example, there is a trend to ferment white wines at lower and lower temperatures, which is a considerable challenge on its own for the cells in the grape juice medium, though there are several other stressors present. Consequently, the detailed information about the performance of the employed yeast strain(s) could be valuable to choose the starter culture(s) even more consciously and to avoid fermentation failure.

Materials and Methods:
Three selected strains of *Starmerella bacillaris* (isolated from wine fermentations) were investigated in comparison with *Saccharomyces cerevisiae* and *Saccharomyces bayanus var. uvarum* as reference strains. Laboratory fermentations were carried out at three different temperatures, in an average grape juice medium to check the temperature tolerance itself. Combined stress tolerance (sugar x temperature) was tested with Drop-tests on solid YEPD agar surface, completed with gradually increasing sugar concentration from the normal to the extreme ones, incubated at different temperatures. After image recording with Sony Exmor RS IMX315 12 MP camera and ImageJ area analysis, the growth rate was evaluated with ANOVA, IBM SPSS.

Results and Discussion:
During fermentation trials in grape juice the *S. bacillaris* strains proved only a moderate psychortolerance: at 12°C the growth kinetics was between the growth of the two *Saccharomyces* species, while at 6°C the *Starmerella* performance was similar to that of *S. cerevisiae*. The psychrotolerant (criotolerant) character of *S. bayanus* was clearly confirmed. In the combined stressor experiment (sugar x temperature) the *Starmerella* strains showed extreme osmotolerance. In combination with 12 °C, surprisingly, their psychrotolerance seemed to be stronger with the increasing sugar concentrations, concluded from their growth rate.

Conclusion:

The results give a possible explanation for the dominance of *S. bacillaris* in cold fermentation environments combined with extremely high sugar content (e.g. botrytized wines). Currently, *S. bacillaris* has a rather underestimated importance in winemaking; this species could be a valuable contributor in wine fermentations. In the future, they could be a useful tool for the winemaker, either as a single or as an oligostarter, to cope with some of the extreme stress conditions during wine fermentation.

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P149

Radiation sensitivity of yeasts isolated from cottage cheese

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Keywords: food irradiation, food safety, radiation sensitivity of yeasts

Introduction:
Food irradiation could enhance the microbial safety of food products. Many research focused on the microbial safety of the irradiated foods, but only low numbers of publications concerned on surviving of fungal contaminants of products. In our previous study eight different yeasts species have been identified from irradiated cottage cheese, and it has been shown that the low dose gamma-irradiation treatment could reduce the fungal population of the food products, however, the radiation sensitivity of the microbes could be different.
The aim of the present study was the examination of radiation sensitivity of yeast species frequently occur in milk products.

Materials and methods:
Five yeast species, previously isolated from cottage cheese, were chosen for the study, namely Kluyveromyces marxianus, Galactomyces geotrichum, Pichia cactophyla (anamorf Candida inconspicua), Candida parapsilosis and Cryptococcus curvatus.
The food irradiation treatments were performed in sterilised skim milk by 60Co irradiator with doses of 1, 1,5, 2, 2,5 and 3 kGy at Hungarian Academy of Sciences, Centre for Energy Research, Budapest. The initial cell number of the samples was adjusted to 106 CFU/ml. The irradiated and non-irradiated control samples were diluted, and plated onto YEPD medium. The plates were incubated at 30ºC for 2 days and the developed colonies were counted. The experiments were performed in three parallels.On the basis of obtained data the survival curves were plotted.

Results and discussion:
The gamma irradiation could reduce the initial yeast population (106 CFU/g), but examined species showed marked difference in radiation sensitivity. The most sensitive species was K. marxianus, as 3 kGy irradiation treatments almost fully eliminated the yeast cells from the treated samples. In case of Galactomyces geotrichum and Cryptococcus curvatus 3 kGy irradiation resulted in 2-3 orders of magnitude reduction, while the opportunistic pathogen Candida inconspicua and C. paraspolisis showed high resistance against ionising radiation since more than ten percent of the populations could survive even the 3 kGy treatment.
This result suggest that higher irradiation dose is needed for effective reduction of populations in case of majority of yeast species.

Conclusion:
Irradiation treatment could be effective for reduction of the fungal community of dairy products, however, carefully performed studies are required to reveal the gamma radiation sensitivity of yeast species and to ensure microbiological safety and quality of a certain food product.

P150

Lifestyle and eating habits of self-defined ovo-lacto vegetarians, vegans, and omnivores

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Keywords: vegetarian, omnivore, lifestilye, eating habbits, sustainability

The problem of global climate change and the increasing environmental impact brought about new scientific disciplines interested not only in the nutritional impact of diets, but their environmental impact as well. Plant-based diets are in the focus of sustainable nutrition researches, due to their advantages in resource management and environmental impact. These diets contain less (or zero) animal-based products compared to average diet, and either way they tend to be rich in fresh or minimally processed plant-based ingredients. Vegetarian diets are plant-based diets that contain no meat or even no animal-based products at all.
Well-planned vegetarian diets are confirmed to be healthy by many nutritional and dietetic organisations worldwide, however, there is still no resolution in Hungary. As there seems to be an increasing tendency in the interest toward vegetarian diets, the health care system, the food industry, and the catering sector must adapt. According to several professionals, consumption of fortified foods and dietary supplements may be necessary to maintain normal nutrient balance in vegetarian diets, although scientific evidences have been missing to demonstrate this theory.
However, there is a lack of research about the Hungarian vegetarian population. Our investigation focuses on the lifestyle and eating habits of Hungarian self-defined ovo-lacto vegetarians and vegans.
We compare nutritional and environmental traits of diets among self-defined ovo-lacto vegetarian and vegan women with similarly health-conscious omnivore ones. In the first phase, we made a descriptive cross-sectional analysis with online questionnaire. We were interested in lifestyle, motivation, self-defined health state, eating habits, and food frequencies.
Vegetarian groups judged their actual health state to be better than omnivores, and they felt their health improving after going vegetarian. Vegans tend to cook for themselves the most and they visit the least catering units. As we expected, among ovo-lakto vegetarians and vegans the consuming frequency of pulses, soy products, mushrooms, nuts and seeds were higher compared to omnivores. The number of those taking regular medication was lowest among vegans, whereas the number of regular dietary supplement users was highest. The opposite was observed among omnivores. Both vegetarian groups based their diet mostly on internet information resources, e.g. websites, blogs, videos, Facebook groups; only a minority of them ask help from nutritionists or dietetitians.

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P151

Effect of the lactic acid fermentation by probiotic strains on the sour cherry raw material and its bioactive components

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Keywords: functional food, lactofermented, probiotic, sour cherry juice

Introduction:
Nowadays, demand for products which beyond the overall nutritional value have a feature that protects the consumers health, have increased. Several studies have proved fruit juices can become suitable carrier or medium for probiotic organisms. Therefore the aim of our study was to develop a fermented product that combines the beneficial effects of lactofermented juices and probiotics. By investigating the properties of different Lactobacillus strains and their effect on the bioactive components of raw material we wanted to find the most suitable probiotic strain(s) for fermentation to produce a high added value fermented sour cherry juice that help maintain the gut flora.

Materials and Methods:
In the fermentation 9 Lactobacillus strains were used and two types of sour cherry as raw material. The Újfehértói fürtös and Petri species were provided by NARIC - Fruitculture Research Institute. During the research, the properties of the strain - such as reproduction and metabolism (organic acid production) - and its effect on the raw material (carbohydrate and titratable acid content) were studied by microbiological and analytical methods. The lactic acid fermented sour cherry juices' antioxidant capacity was measured by FRAP and DPPH methods, while the anthocyanin and polyphenol content measurement was performed by HPLC-DAD analytical system.

Results and Discussion:
Our results showed the importance of ensuring an adequate environment for growth of Lactobacillus in sour cherry juices. Adjusting pH, added yeast extract and dilution of SCJ resulted in the highest (109 cfu mL-1) cell number and the pH decreasing to the optimal value after 24 hours. The ideal values of variables were optimized by central composite design with response surface methodology. Initial optimal pH is 5.8 and 3 g L-1 added yeast extract would be sufficient if the ratio of sour cherry juice to water is 6:4. Despite during the fermentation all investigated Lactobacillus strains reached the desired 109 cfu mL-1 cell density, a significant difference was observed between the number of viable cells of some Lactobacillus strains. It can be concluded from our results that there is no significant difference between the sour cherry species for all strains, but the type of sour cherry influences the fermentation, so it is important to select the starter culture for the given raw material. Nevertheless, in point of antioxidant capacity worthy select the Petri species could be suggested for fermentation, because in Petri sour cherry juice the antioxidant activity increased in the fermentation by all of the Lactobacillus strains used in strain selection.

At the same time the anthocyanin content of the fermented sour cherry juice was only the fifth-eighth of the original juice, but it increased compared to the initial, supplemeted juice to the end of the fermentation, as same as the rutin polyphenol content.

Conclusion:

By an appropriate strain selection, plant-based lactic acid fermented product can be developed, which contains the recommended viable probiotic cell count and preserves a significant amount of bioactive components also, which together could offer synergistic beneficial effect for the consumers.

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Examination of blueberry volatiles in fruit products

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Keywords: blueberry, volatiles, aroma, GC-MS

Introduction:
Blueberry (Vaccinium myrtillus) is a well-known and beloved fruit owing to its highly intensive colouring properties and specific flavour. During processing, this particular aroma can alter significantly, although the typical fragrance can usually remain recognizable. In this research work, the aroma composition of fresh blueberry and some fruit products prepared with heat treatment and fermentation were examined.

Materials and Methods:
The aroma constituents of fresh blueberry and its fruit products (freeze-dried blueberry, blueberry juice, syrup, jam, wine and fruit brandy) were investigated by gas-chromatography-mass-spectrometry (GC-MS). Initially, different aroma extraction methods – solid phase microextraction (SPME) and simultaneous distillation-extraction (SDE) – were compared in blueberry samples. During additional sample preparation procedures, the more efficient one was applied. For the examination of the effect of soaking on fruit bed some freeze-dried blueberry fruit was allowed to stand in brandy and in ethanol solution for 3 months. The odour components of the fruit beverages were extracted than with liquid-liquid extraction.

Results and Discussion:
The sample preparation was performed with the distillation method, since this process proved to be more efficient than SPME in preliminary experiments. In fresh blueberry 83 volatile compounds were detected. In blueberry brandy and in foodstuffs prepared with heat treatment less volatile compounds were identified than in fresh fruit, while in wine more fragrance constituents were referred. Nevertheless, the different fruit contents of the products have also influenced the appearance of the volatile constituents. In blueberry fruit, terpenes and compounds with benzene ring were the dominant component groups according to their peak area ratios. Some specific substances referring to the processing method were identified: oxygen heterocyclic constituents in heat-treated food products and esters, alcohols and acids in wine and brandy. Four common compounds were found in blueberry and in fruit products as well. These are mostly widespread plant odorants found in the volatile fractions of several plant species. Beyond common terpene compounds, p-cymen-8-ol, β-damascenone and dihydro-methyl-jasmonate can be characteristic blueberry aroma components, since they are present in fresh fruit and most of the products as well. The result of the soaking experiment is that excellent fruit brandy is essential for the production of “bedded” fruit brandy, since soaking alone do not result in pleasant smell. The fine fruity odour of the brandy with dried blueberry stems from the brandy itself, while the odour of the ethanol solution with dried fruit was weakly alcoholic, without any fruity notes. Soaking has the only favorable effect on the colour of the beverages.

Conclusion:

The aroma compositions of the blueberry products were highly different from those of the fresh fruits'. In spite of this result, the blueberry character was more or less perceptible in fruit products. Soaking of dried fruits in alcoholic beverages with poor qualities will not improve the fruity character of the spirit. For the determination of the characteristic blueberry volatiles, additional experiments – greater number of samples, different species and distinct provenances – are needed to gain information about the volatile fraction of this fruit species.

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Evaluation of gaseous 1-MCP treatment's effect on broccoli floret surface color and overall quality preservation

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Keywords: ethylene inhibition, 1-methyl-cyclo-propene, SmartFresh^{SM} Quality System, chlorophyll fluorescence, F_v/F_m

Introduction:
Consumers' demand is high for fresh broccoli. Its high sensitivity to ethylene represents a serious postharvest transport and retail quality risk. Fresh broccoli (*Brassica oleraceae cv. botrytis var. italica*) heads were 1-MCP and ethylene treated. Their effects on overall quality and color were evaluated during simulated cold and shelf-life storage.

Materials and Methods:
Fresh mature green broccolis were stored at 5 °C and 21 °C after separately treated with 1-MCP according to SmartFresh^{SM} Quality System (24 hours, 625 ppb), 24 hours with 2 ppm ethylene and 1-MCP followed by ethylene. The effects on color and quality maintenance of 1-MCP were evaluated by the use of nondestructive optical devices (Konica-Minolta CR-400 chroma meter, Walz MONI-PAM chlorophyll fluorometer) and digital image analysis.

Results and Discussion:
1-MCP treated and at 5 °C stored broccolis retained their initial fresh texture and green color significantly better and longer even after ethylene treatment than control and/or ethylene treated ones concerning chlorophyll fluoerescence data, hue angle, chroma and digital images. Clear difference was found between at low and high temperature storage combined effect with 1-MCP on florets' color. Based on L*, a* and b* data, chroma and hue angle values together with F_v/F_m or F_m/F_0 values showed the higly positive effect of 1-MCP and cold storage on keeping quality prolongation.

Conclusion:
1-MCP combined with cold storage could maintain the quality and color of fresh broccoli during 9 days of storage, minimizing the highly deteriorative effects of ethylene. Temperature and treatment dependent changes in quality and florets' color (represented well i.e. by F_v/F_m, F_m/F_0, C^*, hue angle) were found to characterize reliably the highly positive effect of 1-MCP.

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Increased yield and nutrient supply of basil by complex bioeffective soil treatments

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Keywords: basil, biofertiliser, arenosol, chernozem, alginite, *Bacillus megaterium*

There is a growing demand for organic nutrition of plants and healthy foods, nowadays. Possible solutions could be the use of microbial biofertilizers and natural clay minerals which can supply the plants with nutrients and can improve the soil conditions in one step. The combined biotic and abiotic treatments were tested by using a medicinal plant.
The test plant was basil (*Ocimum basilicum* L.), which was grown on 150 grams of soil per pots, with a low humus content (H=1,6%), calcareous, sandy soil (arenosol), and with a high humus content (H=2,8%), loose structure soil (chernozem). As a negative control we used soil, which was sterilized on 3 consecutive days in autoclave through 20 minutes with 121ºC to exclude the original microbal antagonists from soil. The mineral nutrition of plants was improved by 5% (m/m) alginite treatment of soil. Alginite is a natural mineral, rich in algal organic matter with significant amount of clay fraction. As a microbial fertilizer we used the *Bacillus megaterium* sporeforming bacteria, one day after planting. Simultaneously with the growth of test plants we tested the biological activity in the soil samples with measuring the dehydrogenase enzyme activity (DHA) and determining the numbers of bacteria, spore forming bacteria and fungi by using the Most Probable Number (MPN) method.
We found that the sterilization of soil could have a major influence to the biological soil-parameters. Surprisingly the count of bacteria and spore forming bacteria was higher than the unsterilized, control soil, although the DHA results in degradative metabolic processes show lower values for sterilization. Fungi count and DHA values were significantly higher on the Martonvásár soil than the Soroksár soil. The *B. megaterium* resulted only slightly rise of the spore forming bacteria. Other treatments did not have a significant effect on the microbial counts of soils. The alginite has improved the growth of the basil through the better soil-physical-chemical conditions. Complex biological treatments and bioeffective soil-solutions are concluded as basic requirements of achieveing good fertility of soils.

P156

Effect of different commercial yeast strains on physic-chemical characterizations and volatiles production in fermented apricot juice

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Keywords: Pálinka, spirit, Saccharomyces cerevisiae, volatile compound, apricot

Introduction:
Pálinka is a traditional Hungarian spirit produced exclusively by the alcoholic fermentation and distillation from native fruits. There are many kinds of pálinka-s with different distinct characters that are not only widely domestically consumed, but also be a favorite spirit in Europe and some countries worldwide. These characteristics were influenced by both primary aroma compounds coming from fruit and secondary ones produced by the yeast strain used in the fermentation process. The aim of this study was to evaluate fermentation efficacy of commercial yeast strains on alcohol production and aroma profile of fermented juices.
Materials and Methods:
Apricot juice was fermented by nine commercial yeast strains including Uvaferm SLO, Uvaferm PM, Uvaferm Danstil A, Fermiblanc Arom, Viniflora Melody, Vin-O-Ferm Roses, Fermicru AR2, Oenoferm x-treme F3 and Oenoferm x-thiol F3. The fermentation was conducted at 20^{o}C statically and sampling was carried out daily to determine pH, Brix, reducing sugar, alcohol content, organic acids content and volatile compounds.
Results and Discussion:
During 8 days of fermentation, the pH values ranged from pH 3.02 to pH 3.14. The concentration of citric, oxalic, malic, succinic and acetic acids decreased throughout fermentation. Glucose, fructose, and sucrose contents decreased to almost exhausted at the end of fermentation whereas ethanol content increased continuously till around 6.90 % vol. The ethanol production capacity of these strains was almost the same, however, there were differences in their rate of sugar consumption, especially strain Danstil A reaching maximum peak after 3 days of fermentation. The major components of volatiles comprising 2-pentanol, metyl etyl keton, linalool, and izo butyl alcohol etc. were similar in nine fermented apricot mashes, but at different concentration. Fermented juice of strain SLO were higher in aromas contents than that of others contributing the distinct fruity and floral flavor.

Conclusion:

The character of individual pálinka definitely depends not only on primary aroma compounds of fruit, it is strongly influenced by using yeast strain. These results provide the possibility to produce apricot pálinka with different characteristics when using different commercial yeast strains.

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P157

Effects of pH and heat treatment on some elderberry properties

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Keywords: elderberry, anthocyanin, pH, heat treatment, colour

Introduction:
Elderberry (Sambucus nigra L.) may be an excellent and preferred source of natural food colourant in food industry because of its high anthocyanin content. Colouring food production (into concentrate or juice form) including various physical and chemical factors such as enzymes, temperature and mechanical stress may have significant influence on different properties. Other important factor is the pH value of the final coloured product because if it is different than the original pH value of elderberry, it may result colour changing. The aim of this study was to evaluate the colouring potential and some properties of two elderberry varieties itself and in case of pH change and heat treatment.

Materials and Methods:
Two elderberry varieties were investigated, namely Finsam and Samdal were harvested in Nagyvenyim, Hungary (46°57'N, 18°51'E) the year of 2017. Elderberry juice was prepared under laboratory conditions. The original pH was changed to 4.0 and 4.5 pH value in case of both variety and the samples were treated by heat at 80°C for 30, 60 and 90 min. Samples were tested by various methods to determine the effects of pH change and heat treatment on total soluble solid content, total polyphenol concentration, total anthocyanin concentration, antioxidant capacity and colour parameters (L*, a*, b*).

Results and Discussion:
Evaluating the colouring potential of two varieties, Samdal seems more valuable because it had higher anthocyanin content (3756.14 mg/L) and higher total soluble solid content (15.1 %Brix), while Finsam showed lower value (1832.42 mg/L; 11.0 %Brix). In regard to other properties, Finsam (pH 4.7) has higher total polyphenol content (4076.54 mg/L) and higher a* value (10.16), however its antioxidant capacity is 57% lower than in case of Samdal (pH 5.2) variety at the original pH. Heat treatment influenced the different investigated properties of elderberry juice, especially the total anthocyanin concentration decreased after 90 min. In case of Samdal the degradation was 11.0% while in the samples of Finsam was 23.6% at the original pH value. The stability of anthocyanins was different at the different pH values, in most of cases higher pigment content was observed at the original or at pH 4.5 values during the heat treatment. The highest red-green value (a*) was measured in case of Finsam at pH 4 (12.64) and generally a* of the treated samples followed the tendency of anthocyanin degradation. Finsam variety had the highest total polyphenol values at the original pH, but there is no clear sequence between the lowered pH juices. During heat treatment polyphenols showed higher stability than anthocyanins, the concentration decreased less after 90 min.

Conclusion:

This study provides information about some elderberry properties after pH change and heat treatment. Comparing the two Danish varieties, Samdal has higher colouring potential than Finsam due to higher total anthocyanin, soluble solid content and lower L* value at the original pH. Generally concluded that the anthocyanin molecules were the most stable at the original pH values but its degradation after heat treatment was considerable. The pH and the heating had no effect on soluble solid content and influenced the total polyphenol content in less extend. Summary, using colouring food it should take into account the variety of elderberry due to different properties and the pH value of the final coloured food product.

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Valorization of *Salicornia ramosissima* halophyte plant: cookies new formulation and other biological studies

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Introduction:
The Portuguese coastline is rich in many halophytic and other maritime plants, whose physico-chemical and biological characteristics are still underexploited at the scientific level. This work seeks to fill this gap by examining the biological profile of fresh and/or dehydrated halophytes from extracts, allowing the use of these endogenous natural resources through the development of novel functional food ingredients. However, the shelf life is an essential aspect of product design since the food must be safe and have an acceptable quality.

Materials and Methods:
Salicornia ramosissima, collected in their natural habitat, (40.087980,-8.876943) was lyophilized and the powder was used (1) to obtain extracts for biological studies and (2) as table salt substitute in cookies formulations.
(1) The extraction of lyophilized samples was performed with methanol solutions. The extracts were evaluated in terms of antioxidant activity (phenolics quantification and DPPH method) and *in vitro* tests in HT 29 cell line human for quantification of cellular viabilitty and proliferation through, respectively, MTT and SRB assays.
(2) Two types of cookies were produced: a control and a cookie in which the salt was replaced by the lyophilised powder of *S. ramosissima*. The cookies nutritional value and sensory profiles were evaluated. Samples cookies were packaged in polyethylene bags and stored at controlled temperature of 25 ºC during six months using a reverse storage design. The shelf life of cookies was monitored by humidity content, peroxide value determinations and evaluation of sensory profiles. The sensory shelf life was performed by a triangle test, with non-trained assessors, to detect the differences.

Results and Discussion:
The amount of phenolic compounds of methanol extracts was 66.7 mg GAE/g extract and IC_{50} value, which refers to the smaller concentration of extracts needed to 50 % of scavenging of *S. ramosissima* extracts, was 0.12 mg/mL. The cellular viability and proliferation of salicornia extract revealed a decrease in cell viability for all times for the higher concentration (5 mg/mL) revealing an anti-cancer effect of salicornia extract, while for cellular proliferation a reduction was found for the concentrations of 2.5 and 5 mg/mL.
Comparing the control cookies with the cookies with salicornia powder was observed a similar nutritional profile in terms of moisture content, protein, crude fiber, total lipids and total carbohydrate content.
During the storage procedure the moisture content of the control and enriched cookies remain approximately constant at a value of 5 %. Furthermore, all the fresh cookies present a low peroxide value that is maintained almost constant along the six months of storage.

With respect to sensory analyses, the assesssors do not found differences between the fresh cookies and the cookies with three and six months´ storage.

Conclusion:

Extracts of *S. ramosissima* are a valuable source of natural antioxidants for different applications in food industry. In addition, *S. ramosissima* extract exhibit an anti-cancer effect. The shelf life study reveal that during the storage procedure of cookies (control and enriched with salicornia powder) the moisture content, the peroxide value and the sensory profile of samples remain constant during six months.

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Antimicrobial activity investigation og high polyphenol content apple pomace extracts

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Keywords: apple pomace, extraction, antimiicrobial activity

By-products of fruit processing could be a good source of biologically active components which are suitable to replace artificial food additives. Fruit phenolics have attracted great interest recently as potential natural antimicrobial agents that could be used to extend the shelf life of fruit and vegetable products. Apple pomace, a residue from apple juice production contains high amount of polyphenols which are known to have antioxidant effect. In this study extraction method of apple pomace was optimized to produce extracts rich in polyphenols. Application of 70% ethanol and 1:20 solvent ratio, extraction temperature 80°C proved to be the optimal solvent extraction method to produce extract rich in antioxidants. Apple pomace extracts showed inhibitory effect on the growth of 5 test microorganisms which were E. coli O157:H7, E. coli 8739, L. monocytogenes 4ab, Eb. cloacae and Ec. faecalis.
Our results showed that the apple pomace, an inedible waste product of juice manufacture, might be another potent source of antioxidants. Based on the results can be stated that apple pomace extract has good antimicrobial capacity, and has great potential as antimicrobial compounds against microorganisms.

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The Basics of Evaluation of a Food Supply Chain Model on the Functional Food Market

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Keywords: functional food, consumer acceptance, consumer survey

The rising number of consumers requiring a special diet because of health issues or lifestyle decisions have opened new opportunities for food chain operators. During last decades, a special focus was given to the health related functionality of food stuffs. This could designate the directions for food product development of the Hungarian food industry. Since functional food products can only achieve market success if they meet the consumers' expectations, our aim was to examine those main health problems that people are most worried about and to compare the possible ways of treating or preventing health problems. Results are based on quantitative consumer surveys conducted in 2015 and 2018 with same research methodology, so the two datasets are comparable.

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P162

Effect of blending on some thermal properties of fats

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Introduction:
One of the main role of fats in food industry to develop the required texture of foodstuffs. This need supposes special characteristic of the materials. To fulfil this requirement blending of pure fats seems to be simple and sufficient method. This physical method avoids the risk of producing undesirable by-products of the chemical modification. However miscibility as well as the interaction between the properties of the components must be studied in order to forecast the most important physical properties of the material.

Materials and Methods:
Blends of fully hydrogenated coconut oil and pure coconut oil as well as blend of pal kernel stearine and vegetable oil, furthermore blend of palm stearine and vegetable oil were investigated by means of differential scanning calorimetry (DSC). Thermograms of melting and solidification as well as the enthalpies of the phase transitions were recorded. Mixing ratios were 100:0, 50:50 and 25:75 pure fat: vegetable oil and fully hydrogenated coconut oil: pure coconut oil respectively.

Results and Discussion:
All fat mixtures explained unlimited miscibility. Regarding the blends of coconut fats, results showed decrease of enthalpies of melting and solidification according to the presence of pure coconut oil. Shape of the thermograms remained the same. In case of palm kernel stearin and vegetable oil mixtures shifting of phase transitions were clearly detectable. The relevant enthalpies decreased at melting and solidification. Same phenomenon was found at the blend of palm stearin and vegetable oil. Analysisi of thermograms explained a more simple structure of the blends comparing to the pure fats.

Conclusion:
From the results of the miscibility we may conclude that the components of the mixtures did not change the crystal structure of the fats. This study proved the softening effect of the non - hydrogenated coconut oil on the fully hydrogenated one. A most obvious softening effect was proved by the addition of vegetable oil to both palm kernel stearin and palm stearin. Vegetable oils did not modified the characteristic of melting and solidification. Results served sufficient information of product formulating of fat containing foodstuffs

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P164

Labeling satisfaction and food purchasing habits of consumers following gluten- and lactose-free diet

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Keywords: gluten-free, lactose-free, labeling satisfaction, food purchasing habits, suervey questionnaire

Introduction:
In addition to patients with allergie and intolerance, more and more consumers are turning to free-from foods for an array of reasons. In order to support consumers on diet regulation (EU) No 1169/2011 lays down producers' labelling obligations on substances and products causing allergies or intolerances.

Materials and Methods:
To recognize the labeling satisfaction and food purchasing habits of consumers following gluten- (N= 665) and lactose-free (N= 422) diet, a suervey questionnaire was conducted among Hungarian adults. For the data analysis IBM SPSS Statistics 24.0. (IBM, Armonk, New York, USA) was used.

Results and Discussion:
According to the self-assessment of the participants, they have sufficient product knowledge and can decide which food or ingredient have to be avoided. They are rather satisfied with the label information - especially consumers doing gluten-free diet -, easily understand it and trust in them. Although in spite of the "free" label, they brows the list of ingredients. The mandatory labelling got positive feedback. Since the regulation came into force, consumers' orient easier and makes them feel secure - mainly consumers doing lactose-free diet. Nevertheless, for gluten-free consumers the constant constraint orientation found to be burdensome. As a result, they prefer to purchase foodstuffs at the same place or in specialized shops. While lactose-free consumers are not stick to particular shops and prefer the foodstuffs having favourable price. Both adherence to the familiar foodstuffs, but they are open to trying new products, too.

Conclusion:
Mandatory labelling of substances and products causing allergies and intolerances have beneficial effect on purchasing habits of consumers following gluten- and lactose-free diet, thus further attention should be paid to the regularity and authenticity of them.

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Changes in liquid egg white caused by different combinations of heat and HHP treatment

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Keywords: HHP, egg white, emarging technologies,

Introduction:
Presercation of egg products means still a challenge for the food industry: on the one hand microbiolgocal safe products must be produced, on the other hand techno-functional characteristic should be preserved of egg. Develpoment of emarging technologies led to accomplish both aims. In our experimetn heat treatment and high hydrostatic pressure (HHP) are combined in several ways appliing a central composite design.

Materials and Methods:
Raw liquid egg white (LEW) was used from production of Capriovus Ltd. Samples were first heat treated, than HHP treated temparatures and pressure ranges were calculated according to a central composite design between 53 and 67°C and 330 and 470 MPa, holding time of heat treatment was 12 minutes and 5 minutes of HHP.
Colour of treated sampels was mesaured by Minolta Cr 400 colorimeter and protein denaturation was observed by differencial scanning calorimetry (Micro DSC III). Viscosity of samples were measured by Anton Paar MCR 92 rheometer appliing share rate between 10 and 1000 1/s.
Results were evaluated using the experiment design.

Results and Discussion:
The colour of samples were highly influenced by the temperature of hetat treatment, as long the pressure of HHP casued significant changes in viscosity of LEW. Ratio of denaturated proteins was mostly influneced by the temperature of heat treatment.

Conclusion:
Our results showes that LEW's functional properties are different influenced by HHP and heat treatment, but an appropiate combination of both treatments results LEW with great functional quality.

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P166

Change of naringin during the fermentation of grapefruit juice by some probiotic bacteria

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Introduction:
Citrus family fruits such as grapefruit, orange, limon, tangerine etc. are rich sources of bioactive compound. Nutritionally, these fruits are valuable due to rich in vitamin (especially vitamin C) and antioxidants, but unfortunately, they contain high amount of bitter compounds such as naringin (the most bitter compound), neohesperidin, limonin etc., thus debittering process should be done to make these juices to be acceptable by consumers. This process could be done by some probiotic bacteria which can synthesize naringinase used to debitterness in citrus fruit juices. Furthermore, fermented probiotic fruit juices are good alternative to milk product and can be consumed by groups of humans who are allergic to milk protein or have severe lactose intolerance. In this study, debitterness of grapefruit juice during fermentation by some probiotic bacteria was focused.

Materials and Methods:
Three probiotic lactobacilli strains *Lb. plantarum 01, Lb. rhamnosus B01725, Lb. fermentum D13* were selected to study the decrease of naringin concentration in grapefruit juice during fermentation. Grapefruit juice was fermented at 37°C in 24h. Naringin determination was performed by using a high-performance liquid chromatographic system (*I.A. Ribeiro, M.H.L Ribeiro*).

Results and discussion:
During fermentation, the growths of studied *Lactobacillus* sp. strains are different in grapefruit juice media. *Lb. plantarum 01* and *Lb. fermentum D13* reached the population of 10^9 cfu/ml after 12h of fermentation, while *Lb. rhamnosus B01725* obtained only the concentration of 10^8 at the 18th h of fermentation and stable in the rest of fermentation.
After 24h of fermentation, the highest decrease of naringin concentration (28,7%) in grapefruit juices was observed in the case of *Lb. plantarum 01* as the starter culture. Other lactic acid bacteria did not affect significantly naringin concentration of juices.

Conclusion: All the investigated strains are able to grow in grapefruit juice without any supplementation of nutrients. Although the fermentation of grapefruit juice by some lactobacilli strains cannot reduce the naringin concentration under the threshold of taste. Our results can serve the good basic for reduction naringin concentration in grapefruit juice as well as in the other citrus fruit juices.

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Impact of HHP on quality and rippering of Hungarian fermented meat products

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Introduction:
Raw fermented meat products may connected with food born diseases because of the lack of pasteuriziation with heat or chemical preservatives. Providing microbiological safe fermented products with original sensorial quality is a need of modern consumers. In our experiment Hungarian type raw fermented meatproducts are invastigated after HHP (high hydrostatic pressure) treatments.

Materials and Methods:
Raw fermented sauseges were produced at Dept. of of Refrigeration and Lifestock Product's Technologies after a special, vitamin-enriched formula for producing functional food product. After production procedure samples were treated with HHP at different pressure levels.
Sensorial attributes (as specially colour and texture) were analyzed and TBA was inspected for mesauring rancidity.

Results and Discussion:
Our results showed that TBA of HHP treated samples was lawer than expected, as long colour of samples was highly influenced by the pressure range of HHP. Texture became harder and differed highly in in the midle and surface of samples.

Conclusion:
Our results show that HHP treatment of raw fermented meat products may caose shlightly changes in texture, but the use of the technology leeds to a microbilogical safe and functional meat product.

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P168

The effect of ferric ion on electricity generated by immobilized Shewanella xiamenensis cells in microbial fuel cell

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Introduction:
Microbial fuel cell (MFC) is a bioelectrochemical device with converting the chemical energy in organic matter into electricity by living microorganisms. *Shewanella* species are reported to be able to produce extracellular electrons and transfer them onto electrode, thus these species can act as biocatalysts in MFC systems. In many recent studies, a number of bacteria have been isolated and characterized with a view to their ability to use ferric iron as electron acceptor. The terminal electron acceptors included insoluble metal oxides, soluble metal chelates, flavin and electrodes. It is well known that the *Shewanella oneisensis* MR-1 strain is a metal-reducing bacteria, and they can transfer electron from the cytoplasmic membrane to extracellular electron acceptors. In this study, the effect of ferric ion on electricity generated by immobilized *Shewanella xiamenensis* cell was investigated.
Materials and Methods:
Shewanella xiamenensis DSMZ 22215 was used in this study. A bio-anode containing gel-entrapped bacteria in alginate/polyaniline/TiO_2/graphite composites was constructed. Different concentration (0, 3, 6, 9, 12 mM) of Fe(III)-citrate were supplemented into Luria-Bertrani broth. The single-chamber MFCs (25 ml volume) was used in this study. The cell voltages (mV) was automatically recored using multimeter. The Fe(III)-citrate, protein concentration, pH in fermentation broth were also measured every day.
Results and Discussion:
The voltage output of MFC system increased with different concentrations of Fe(III) citrate after the inoculation. The maximum power density peaked 24.9 mW/m^2 with 12 mM Fe(III), compared with 3.61 mW/m^2 without Fe(III), and 11.56 mW/m^2 with 9 mM Fe(III) after 360 hours. In addition, the protein concentration in fermentation broth increased continuously.
Conclusion: Ferric iron affected the voltage production in MFC system and the higher voltage was observed with the higher Fe(III) citrate concentration.

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P169

Influence of different spectra on the metabolism of nitrogen-containing components of wheat

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Keywords: wheat, amino acids, polyamines, light

Introduction:
There is still a lack of detailed information on the lighting conditions required for optimal growth and blooming of different plant species and the effects of different light intensity and spectral composition on plant metabolism and nutritional quality. The aim of our research was to investigate the effect of light with different intensity and spectral composition on nitrogen-containing components of wheat.

Materials and Methods:
Wheat (*T. aestivum* ssp. *aestivum* cv. 'Mv Kikelet') samples were provided by the Martonvásár Cereal Gene Bank (Agricultural Institute, Centre for Agricultural Research, Hungarian Academy of Sciences, Martonvásár, Hungary) for the study. The plants were grown in plastic pots (volume 2.8 l) filled with 2:1:1 (v/v/v) mixture of garden soil, sand and humus for 16 weeks in a spring-summmer type chamber (PGV-36; Conviron Env. Ltd., Winnipeg, MB, Canada). Plants were illuminated with six various spectral composition (enriched with blue, red or far-red components). Free amino acid (FAA) and polyamine (PA) content of flag leaves were determined after extraction with 4 ml of 10% (v/v) trichloroacetic acid using a Laboshake (Ls 500i instrument, Gerhardt, Germany). Analysis of FAAs and PAs were performed using an AAA 400 amino acid analyser (Ingos, Czechia). Colorimetric detection was at 570 and 440 nm (for Pro) after post-column derivatization with ninhydrin reagent.

Results and Discussion:
The light quality and quantity affected both the amount and the ratio of the FAAs and PAs in flag leaves. Low amounts of FAAs were detected in leaves of plants grown under the blue and red LI (common intensity) spectra, while the highest amounts of FAA were found in plants grown under high intensity red light (Red HI). Gamma-aminobutyric acid, serine, aspartic acid and alanine were the main amino acids in leaves, accounted for 60% of total free amino acid content (TFAA). Based on hierarchical cluster analyses, FAA concentrations of flag leaves were significantly different under the blue spectrum. Under fluorescent white, pink and red (HI) light treatments the amount of valine, leucine, threonine, lysine, serine and gamma-aminobutyric acid in flag leaves were greater than those of the other three different light spectra. In the glutamate family (35% of TFAA) the concentration of proline was the highest under the blue light, while glutamic acid, glutamine and arginine content were the lowest. While in case of far-red light, high amounts of glutamic acid, glutamine and low amounts of proline were detected. In case of PAs, amount of agmatine reduced more than 25% under red (LI) light but other spectral composition did not have significant changes in PA content.

Conclusion: This study demonstrated the dominant light factors affecting on nitrogen-containing components of wheat. Light quality and quantity changed the metabolism of flag leaves. The amount and ratio of FAAs and PAs changed due to different spectra. The modification of radiation conditions during development makes it possible to optimize growth conditions for wheat and to obtain desired traits and products.

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Changes of amino acids, biogenic amines and volatile components in Trappist cheese during ripening

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Introduction:
The Trappist cheese one of the most common types of cheeses usually produced from cow milk by fermentation. The nutritional quality of cheese is affected by chemical, biochemical and structural changes during ripening and storage. The aim was to investigate the changes of amino acids and biogenic amines as well as the volatile components in Hungarian Trappist cheese.
Materials and Methods:
Hungarian Trappist cheese was provided by a local cheese manufacture. The cheese was stored in 14 °C for 12 weeks, sampling and measurements were performed in every third week. Total amino acid content was determined after hydrolyzation (6 N HCl, 24 h, 110 °C), free amino acids and biogenic amines were measured after extraction (10% TCA, 1 h, 25 °C). All three components were analysed by an Automatic Amino acid Analyzer (INGOS AAA400). Volatile substances of samples were extracted with HS-SPME (Carboxen-PDMS 75) and measured by GC-MS (Hewlett Packard 5890 series II.- GC – 5971/A MSD). The colour measurements were performed by a colorimeter (Minolta CR-100).
Results and Discussion:
Total amino acid content has decreased from 28% to 21% during 12 weeks storage due to proteolysis. The essential amino acid content decreased as well, from 10,6% to 7,9% in consequence of formation of biogenic amines and volatile components. Protein degradation has important share in the formation of taste, by the way of the emergence of small peptides and free amino acids. The free amino acid content increased (0,7 g/kg – 17,3 g/kg), the main components were proline, glutamic acid, asparagic acid, valine, leucine, phenylalanine, lysine and gamma-amino butyric acid (GABA) representing 55% of the total free amino acid content. The amount of free amino acids affecting taste has increased until the end of ripening, with particular regard to bitter-tasted ones like valine (0,03 g/kg–1,30 g/kg) and leucine (0,07 g/kg – 2,30 g/kg). The total biogenic amine content was 13,06 mg/kg at the end of he storage. Histamine (Him), tyramine (Tym), putrescine and cadaverine were the major biogenic amines detected. Their formation correlates with the accumulation of the precursors histidine (19,5 – 329,9 mg/kg), tyrosine (34,1 – 824,0 mg/kg), lysine (83,5 – 11417,6 mg/kg) and ornitine (35,4 – 435,4 mg/kg) during cheese ripening. The amount of biogenic amines, especially histamine and tyramine do not exceed the legal limits (100 Him mg/kg , 800 Tym mg/kg). The main aroma components of Trappist cheese were acetic acid (32,9%), butanoic acid (12,8%), ethanol (4,4%), acetoin (20,9%) and 2,3-butanediol (6,2%), but ethyl butyrate and some alcohols and aldehydes bear important part in forming cheese aroma. The composition of the volatile fraction has also changed during ripening: the buttery and pungent characters become more specific, while fruity and sweet flavour. Yellowish colour of the cheese has deepend during ripening. The alteration of colour may be induced by the changes in the casein fraction.

Conclusion:

Cheese making involves various biochemical processes among them proteolysis gains more importance in the generation of free amino acids and flavour of cheese. Hungarian Trappist cheese is a good source of essential amino acids as well as GABA which is a non-protein amino acid with important health benefits. In addition, it has low biogenic amine content therefore consumption of Hungarian Trappist cheese has no risk for consumers with food intolerance.

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Comparison study between external and internal gelation through emulsification technique regarding their suitability to develop micro delivery system for probiotics

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Keywords: Microencapsulation, Probiotics, Emulsification, External gelation, Internal gelation, Simulated gastrointestinal conditions, Encapsulation efficiency, Morphology

Introduction:
Probiotics are microorganisms which occur as one of the common components in functional foods, since they offer several beneficial effects on the human health, when they are ingested and make their way to the target site of the large intestine in sufficient viable quantity. However, by all accounts, major viability losses likely arise during food production, storage and gastrointestinal transit. Microencapsulation or designing a micro cell delivery system is one of the most potential approaches to ensure the protection for probiotics from various harsh factors. In this study, the probiotic bacteria of Lactobacillus casei 01 was microencapsulated into various calcium alginate-based gel capsules prepared by two different types of emulsifications, involving either the external or the internal gelation. Moreover, both these varieties of capsules were compared by evaluating their morphology, encapsulation efficiency and protective effect on the viability of L. casei 01 subjected to simulated gastrointestinal conditions.

Materials and Methods:
External gelation was based on the formulation of W/O emulsion, into which CaCl2 solution was added for the external gelation of alginate dissolved previously in the water phase. Internal gelation differs from it in that CaCO3, which is also present in the W/O system, disintegrates to calcium ions and carbonic acid by contacting with organic acid, leading to the internal gelation. Survival tests in gastric phase was carried out with separate runs of the same gel capsule type for 45, 90 and 135 min, while the intestinal phase was 150 min long in all cases. Both the phases were running under mesophilic condition at 37°± 0.5 °C. For statistical analysis the two-way ANOVA was used.

Results and Discussion:
The resulted gel capsules appeared as mostly irregular-shaped particles with non-uniform size in a wide range from µm to mm. More micron-sized particles were rather obtained with the internal method, which is more favourable as food component. The capsules prepared by internal gelation enclosed the bacterial cells to an extent of 91.54 %, which was only slightly higher than the efficiency of 89.88 % recorded for the ones made by external gelation. Significantly better tolerance ($p < 0.05$) of high acidic gastric environment was observed for cells encapsulated with external gelation in case of 45 and 90 min of treatment. However, there was a contrary occurred in the case of 135 min of digestion, after which no viable counts were detected for the externally prepared ones. No bacteria from either gel capsule variation survived the 150 min of digestion in bile salt-containing intestinal phase, even with the shortest term of prior gastric acidic contact (45 min). It was additionally apparent from this survival study that more viable counts than 106 CFU ml-1 were still found after 45 min of gastric treatment for

both gelations and after 90 min for external gelation case, which is required for the beneficial effect of probiotics.

Conclusion:

This study revealed that the external gelation of alginate would be by and large more preferable method for microencapsulation of the probiotic (L. casei 01) and for the application in probiotic food industry. However, future relevant works should aim to improve the tolerance of intestinal digestion by, inter alia, modifying the alginate-based emulsification with the incorporation of other polymers into their matrix.

P172

Effect of active ultrasound, brine concentration, brine temperature and meat sample-brine solution ratio on pork meat

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Keywords: ultrasound, brine concentration, brine temperature, meat-brine solution

Introduction:
Diffusion of salt into meat is a time-consuming process and has been studied by many researchers. However, there are limited information about the effect of active ultrasound treatment combined with concentration, temperature of brine solution and meat-brine solution ratio on salt content and diffusion.
Aim of this study was to investigate the combined effect of active ultrasound, brine concentration, brine temperature and meat sample-brine solution ratio.

Materials and Methods:
The meat samples cut from pork loin (longissimus dorsi), cylindrical shape (height 45 mm, diameter 18 mm). Ultrasonic waves were generated by Active Ultrasound Laboratory equipment (intensity 70 %, frequency 20 kHz). Salt uptake was measured with Mohr method. Diffusion coefficient (D [m2/s]) was calculated the following equation (Telis et al. 2004):

$$\frac{C_{0,M} - C_{t,M}}{C_{0,M} - C_{eq}} = 1 - \sum_{n=0}^{\infty} \frac{8}{(2n+1)^2\pi^2} e^{\frac{-D(2n+1)^2\pi^2 t}{L^2}}$$

where Ct,M corresponds to concentration of NaCl in the meat (g 100 g1) at given time t (s), C0,M is the initial NaCl concentration in the meat, Ceq corresponds to the concentration at equilibrium, D represents the diffusion coefficient (m2/s), L the thickness of the raw material (m). The equilibrium NaCl concentration (Ceq) was calculated as described by Körmendy and Gantner, 1960.

Results and Discussion:
Results of NaCl content measurement show that by increasing the temperature of the brine to 15°C resulted in getting more NaCl into the meat. If the temperature of the brine is increased to 20°C, no further increase in NaCl content was observed. Regarding the effect of the concentration of brine it can be seen that by increasing the NaCl content of the brine significantly more NaCl was getting into the meat treated with active ultrasound.
Based on the calculated diffusion coefficient it can be seen that by increasing the temperature of the brine accelerated the penetration of NaCl into the meat. By increasing the concentration of the brine the diffusion of the NaCl showed small but exponentially increasing tendency.
By increasing the meat sample-brine solution ratio the NaCl content of the meat sample showed an increasing tendency. At 1:40 ratio, 1.4x more NaCl was measured in the meat sample than 1:20 ratio.

Conclusion:

Increasing of brine temperature, NaCl concentration and meat – brine solution ratio accelerated the NaCl penetration into meat in case of active ultrasound treatment.

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P173

Capabilities of the electronic tongue for the authentication of wine, fish and honey

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Keywords: electronic-tongue, adulteration, multivariate-statistics, quality-assurance

Food adulteration is a growing concern often investigated using advanced technologies. The electronic tongue (ET) is a high sensitivity tool with applications in the sea foods, beverage and confectionary industries. This study brings to focus, the recent applications of ET for fish, wine and honey authentication. Base wine and non-adulterated Aszú wines were artificially adulterated with must concentrate to mimic the sugar contents of non-adulterated Aszú wines: (98.9, 130.2, 168.2, 254.5) g/L. For complex forms of adulterations, wine adulterated with sucrose (238.8 g/L) before re-fermentation was included. Fish (Cyprinus carpio) from six locations in Hungary were sampled during Spring and Autumn. Liquid samples were prepared from them by boiling and extraction. Honey samples were heated at different temperatures (°C): 40, 50, 60 and time (minutes): 30, 60, 120 to assess the effect of heating on chemical properties. Three repeats each of the samples were prepared and analyzed with the potentiometric ET. Principal Component Analysis (PCA) showed separation of the pure wine samples from adulterated ones. Those adulterated with sucrose before re-fermentation were close to the non-adulterated. There was separation in the fish samples also, especially those extracted by boiling. Separation was again observed in the honey samples according to their heat treatment and time difference but, with an effect on some chemical formations. Discriminant Analysis (LDA) showed 100% classification for all experiments. Partial Least Square Regression (PLSR) models meant to predict adulteration levels showed a good accuracy. The ET can be applied for quality assurance purposes in wine, fish and honey.

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Effect of 1-MCP treatment on postharvest quality of tomato fruits in different maturity

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Keywords: LSL tomato, acoustic stiffness, impact firmness, 1-methyl-cyclo-propene, DA-index®, SmartFresh℠ Quality System

Introduction:
Freshly harvested tomatoes, even Long-Shelf-Life cultivars usually suffer quality changes during postharvest and retail period. LSL tomatoes are developed for effective long term postharvest life providing consumer desired maturity, but the initial (harvest) maturity and postharvest conditions play significant role in keeping quality.

Materials and Methods:
Quality changes of 20-20 pieces of freshly harvested tomatoes (*Lycopersicum esculentum x Pitenza*) in green/breaker, turning/pink and light red maturity stages were evaluated by nondestructive measuring methods (AWETA tabletop frimness sensor, Sintéleia FRM01-F Vis/NIR DA-meter®, Konica-Minolta CR-400 chroma meter) after gaseous 1-MCP treatment (SmartFresh℠, 625 ppb) for 12 hours at 10 °C followed by one week cold storage at 10 °C and one week subsequent shelf-life at 22 °C.

Results and Discussion:
1-MCP treated samples in all maturity stages retained in better overall quality concerning mass loss, fruit texture, surface color and chlorophyll content than untreated ones during cold storage and even during shelf-life. The chlorophyll content based DA-index® measurements were effective only until samples reaching light red maturity.

Conclusion:
The applied methods were found to be suitable for the measurement of quality related changes. 1-MCP application effectively partly inhibited, delayed and slowed down postharvest maturation process during cold storage and shelf-life in case of maturity stages between green/breaker and pink/light red in coincidence with literature.

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Nondestructive postharvest quality measurement of three different Capsicum annuum cultivars.

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Keywords: acoustic stiffness, DA-index®, chlorophyll fluorescence, mass loss

Introduction:
Hungarian sweet pepper consumption is significant throughout the year. Consumers can choose from a wide cultivar list based supply. Postharvest quality changes of three *Capsicum annuum* cultivars were investigated during simulated cold storage and shelf-life.

Materials and Methods:
10-10 pieces of fresh, yellowish-white sweet *Whitex*, 15-15 pieces of sweet, light green *Kaméleon* and dark green hot *Thunder* samples were stored at 10 °C and at room temperature of 25 °C. Quality changes were evaluated nondestructively based upon mass loss, acoustic stiffness (purpose built tabletop acoustic system), chlorophyll content related DA-index® (Sintéleia FRM01-F Vis/NIR DA-meter®), surface color CIE L*a*b* characteristics (Konica-Minolta CR-400 chroma meter) and chlorophyll fluorescence data (Walz MONI-PAM chlorophyll fluorometer).

Results and Discussion:
DA-meter® and chlorophyll fluorometer provided chlorophyll content related data referred to initially low values concerning yellowish-white *Whitex* samples due to their low chlorophyll content. DA-index®, chlorophyll fluorescence and surface color values of dark green *Thunder* and light green *Kaméleon* showed significantly the positive effect of cold storage on preserving quality including retained fresh look and texture. All cultivars lost rapidly their original freshness and texture during shelf-life. Faded waxy color, moderate degreening (or orange-like color formation) and mass loss increase referred to loss of initial marketability.

Conclusion:
All the applied methods were found to be suitable for the evaluation of selected *Capsicum annuum* cultivars's postharvest quality changes. Cold storage and high relative humidity provide keeping postharvest quality.

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Effect of irrigation water on antioxidant capacity and microbiological state of edible sprouts

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Keywords: sprouts, irrigation, microbiology, antioxidant capacity

Growing sprouts at home becomes more and more popular. The aim of this work was to investigate the effect of different irrigation waters (tapwater, water of different wells –tube well and ring well - and water of a spring) on some health protecting substances (ascorbic acid, phenolic compounds) of various sprouts (two varieties of raddish, mustard, ruccola and alfalfa). Due to food safety aspects total viable count, yeast and mould count and number of *Enterobacteriaceae* of sprouts was investigated.
Sprouts have been grown under home circumstances, in a sprouting jar. Antioxidant capacity of growing sprouts was determined by FRAP method, and by meassuring total phenolic content. The four types of irrigation water were analised by ICP-OS. Pour plating (total viable count, and *Enterobacteriaceae* count) and spread plating methods (yeast and mould count) were used for microbiological investigations.
Ascorbic acid concentration varied according to the different sprouts and watering. On one part ascorbic acid content of raddish (varietas Korai) varied between 1,8-4,72 µM/g sprouts, on the other part concentration of ascorbic acid of alfalfa sprouts were below 0,4 µM/g sprouts. Watering with tapwater and water of tube well resulted the highest concentrations. Results of meassurements of total phenolic compounds did not show any correlation regarding to the different types of irrigation water. Microbiological load of sprouts was high: total viable count of the sprouts were between 10^7 and 10^8 cfu/g, yeast and mould counts and *Enterobacteriaceae* count varied between 10^2 and 10^8 cfu/g irrespecitive of watering.