

CASEE CONFERENCE 2023

“Smart Life Sciences and Technology
for Sustainable Development”

Book of abstracts



13th CASEE Conference
Technical University of Moldova,
Republic of Moldova

June 28-30, 2023

**Chişinău
2023**

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❖ FOREWORD

Dear Rector,

Dear colleagues,

Dear participants of the 13th CASEE conference,

Dear all good friends of CASEE network,

I am particularly glad to have this foreword addressing the Book of Abstracts from the 13th CASEE conference, which is hosted by the CASEE member in the Republic of Moldova for the first time. This year, our host is Technical University of Moldova. Former State Agrarian University of Moldova was the CASEE member for a long time. But after the merging in 2022 with Technical University of Moldova, the leadership of Technical University of Moldova decided to continue this important partnership by organizing this conference in Chisinau, which confirms its incredible support and commitment to CASEE network. The decision to select Technical University of Moldova as a host institution was not random. Facing the war in Ukraine, we want to prove all our support to the Republic of Moldova and Moldovan higher education institutions in their endeavour towards European Union. We were eager to organize the conference in Moldova even in 2022, but the unforeseen developments resulting from Russia's invasion of Ukraine required to change the venue to Prague. Nevertheless, we, as CASEE Board, were strongly committed to the idea of supporting Moldova and our CASEE member, the State Agrarian University of Moldova, which meanwhile has merged with Technical University of Moldova.

We expressed our support not only by our physical presence in Chisinau, but it also could be perceived in the conference topic "Smart Life Sciences and Technology for Sustainable Development". This topic is both important for the universities and faculties which joined CASEE and reflects the dominant discourses within the European Union. Out of many other challenging topics, two of them are now of high priority in the long-term vision: Green Deal and Digitalization. The word "Smart" in the conference title is close to Digitalization, and the word "Sustainability" goes hand in hand with Green Deal. Therefore, it is perfect to have CASEE as an international platform enabling us to discuss these issues together. As we could see from the conference abstracts, the discussions will be underpinned by national/local data or local/regional context. Nevertheless, due to the fact that CASEE is an international organization, it will enable to frame our national/local knowledge into international (in our case European) context. Herein lies the importance of such networks as as CASEE. Conference breakout sessions will be organized in several specific directions: (1) Sustainable agriculture (including landscape planning and forestry), (2) Current issues of the global agricultural economy, (3) Global trends and challenges in animal husbandry and veterinary medicine, (4) Climate-smart agriculture, (5) Digital agriculture, engineering and environment, (6) Food Engineering and Technology, (7) Food and nutritional security, (8) Applications in Gastronomy and Tourism Enterprises or Traditional Cuisines in Tourism Businesses, (9) Food Chemistry, Oenology and Biotechnologies in the Food Industry, (10) New healthy and sustainable food products and processes, (11) Climate change and food safety: effects of climate change on food safety across food systems, (12) Environmental sustainability and circularity for industrial bio-based systems.

The first CASEE conference was organized in May 2010 at BOKU in Vienna. During the years of CASEE conferences (the pandemic year 2020 was an exception, and the Conference was not held, only the on-line CASEE General Assembly was organized), more than 1,000 participants took part in the conference. It is a good example highlighting the important impact of CASEE. But such an impact would not be possible without the involvement of people in the organizations of this conference. I am very thankful to the local organizing committee consisting of Rector Prof. Viorel Bostan, Vice-Rector Daniela Pojar, Director of TUM Doctoral School Rodica Siminiuc, Head of Scientific Research Department Rodica Cujba, and Head of the International Relations Office from Technical University of Moldova Nina Putuntean. My special thanks also go to Lukáš Pospíšil from Czech University of Life Sciences Prague, who acts as CASEE secretary general and who represents an important source of energy for the conference.

I hope all participants will enjoy this conference, will keep networking and developing new innovative ideas on how to effectively promote professional growth using the experience of CASEE universities.

Prof. Michal Lošťák
CASEE President

❖ **FOREWORD**

***Dear Mr. CASEE President and Vice President,
Dear members of CASEE Board,
Distinguished guests,
Dear colleagues,
Dear students,***

Over the last few years, the world's higher education system is undergoing significant transformations in response to social, economic, technological, political and environmental transformations, therefore, in a couple of years, the education system will not be the same as it is today. Similarly, higher education in the Republic of Moldova is going through fundamental transformations in terms of its role in society, mode of operation, structure and economic value. Rethinking the current education model is needed to meet the demands of a changing world.

Technical University of Moldova (UTM) is one of the leading and largest higher education institutions in the country and is one of the main pillars of the educational progress of the Republic of Moldova nowadays. It is the most prestigious university in engineering, agricultural sciences and veterinary medicine in the country and offers a wide range of study-programmes in order that future students have the opportunity to make a good choice for their career path. With the support of the Ministry of Education and Research and our development partners, UTM has become one of the most performing and powerful institutions in the country, having a lot of laboratories and centers of excellence created especially for students, well-trained teaching staff, attractive theoretical and practical courses for students, lecture halls, meeting rooms, newly renovated library etc.

UTM strategic development priorities are established in strong connection with the priorities of the country in order to face the challenges attested in the higher education system worldwide and to successfully achieve University's mission as a catalyst for the development of the national and global society: increasing excellence in research, innovation and education; development and motivation of human resources; diversifying the educational offer, teaching-learning methods and funding sources; responsible and transparent university management; deeper integration with the business environment.

In the last decade, UTM grew both quantitatively and qualitatively, becoming a great educational, scientific and cultural center. At present UTM numbers over 11500 students, 973 teaching/academic staff, is Nr. 1 among universities in the country (The World University Ranking – Impact Ranking 2022), Nr. 1 among universities in the country and Romania („Round University Ranking (RUR) World University Rankings”), the only university in the Republic of Moldova included in the global times higher education impact ranking in 2023 (June 2023) and over 85% of graduates are employed within 3 months of graduation. UTM has a distinct presence locally and nationally, as well as internationally, as we prepare engineers, as well as specialists in agricultural sciences and veterinary medicine with a high professional qualification, able to respond quickly and efficiently to all engineering requirements. One of the most challenging developments in education is sustainable, genuine and inclusive digital transformation. Being influenced by the technological progress and the social trends of digitization, UTM aligns itself with revolutionary changes with impact and opts for intensive adaptation, development and adjustment to the digital transformation.

UTM expands and intensifies its collaborative relationships with higher education institutions globally in order to increase the possibilities for students and teaching staff to participate in international academic mobility programs for knowledge and technology transfer, developing transnational/transdisciplinary study-programmes, as well as joint degrees, exchange of experience, establishing/intensifying collaboration with colleagues from other countries, developing professional, social and intercultural skills. That's why being a student of the Technical University of Moldova is both a great honour and a huge responsibility. We are very proud of our students, as they are among the most sought-after specialists by top companies, due to their high level of professional training, the ability to take non-standard approaches to solving product design problems, which makes them perfectly competitive in the labor market. UTM graduates are employed by large manufacturing enterprises, government and commercial structures, international companies, educational institutions and research institutes. We encourage students to be active and curious in order to profit from all the opportunities we offer. Regardless of the faculty they choose, all students have a lot of opportunities to follow their passion and to develop lifelong skills, as we focus on improving student learning outcomes, creating a collaborative environment and cultivating a growth mindset for long-term success.

Last year, according to the Government Decision no. 485 of July 13, 2022 on the reorganization through merger (absorption) of some institutions in the fields of education, research and innovation, Technical University of Moldova was restructured by absorbing State Agrarian University of Moldova, the Institute of Electronic Engineering and Nanotechnologies "D. Ghițu", the Institute of Energy and the Institute of Microbiology and Biotechnology.

Due to this reform, we are extremely proud to continue the partnership with CASEE - "ICA Regional Network for Central and South Eastern Europe", which is a network of Central and South Eastern European Higher Education Institutions relating to the Life Science disciplines (agri-culture, food, biotechnology, natural resources, rural development and the environment) and develop it to a higher level.

We aim to encourage scientific cooperation and thereby serve the public interest by improving inter-university relations, including international ones, as well as developing a long-term perspective in the field of education, research and innovation. The organization of scientific events represents one of the key factors in the development of university science and it is a honour for us to host this year the 13th CASEE Conference focused on exchange, knowledge transfer, networking, as this is the best opportunity to get in touch with other members, but also to debate the main problems related to the research of the main directions in the field of Smart Life Sciences and Technology. The CASEE conference aims to make an exchange of constructive opinions and useful information, knowledge and experience accumulated by the academic staff and PhD students from different countries. Thus, CASEE Conference also meets one of the priorities of the scientific activity at UTM, and namely the involvement of bachelor's, master's and PhD students in scientific research, to encourage them participate with scientific communications in national and international scientific conferences.

Dear participants, I am confident that in the course of the conference the participants will be able to have interesting discussions, to exchange views and to develop practical recommendations that will stipulate all the important aspects of the development and innovation in this area.

I also take this opportunity to sincerely wish all the participants well-being, successful and fruitful work, good health, prosperity, good luck and success in implementing new ideas.

***Rector of the Technical University of Moldova
Professor Viorel BOSTAN***

ORAL PRESENTATIONS

❖ SUSTAINABLE AGRICULTURE (INCLUDING LANDSCAPE PLANNING AND FORESTRY)

Sustainable Drainage Systems as a water regime protection: An Investigation through analyzing ponding time

Muhammad MEREI

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Abstract

Sustainable Drainage Systems (SuDS) are a key component of the circular economy. They mimic natural water management systems and are designed to slow down and clean water before it enters rivers and streams, which helps to reduce the risk of flooding and water pollution, while also improving the quality of the water for people and wildlife. SuDS are a perfect example of the circular economy principle in action, by mimicking natural systems, SuDS can help to reduce the need for costly and energy-intensive infrastructure, such as concrete drainage channels. They also help to reduce the amount of water that needs to be treated, which can save energy and reduce costs.

One of the main benefits of SuDS is their ability to slow down and clean water before it enters rivers and streams. By allowing water to infiltrate into the ground, rather than running off into drainage channels, SuDS can help to reduce the risk of flooding. This is especially important in urban areas, where the risk of flooding is often increased by the large amounts of impermeable surfaces such as concrete and tarmac. SuDS also help to improve the quality of water by removing pollutants such as oil and heavy metals. They can also help to reduce the amount of nutrients such as nitrogen and phosphorus that enter rivers and streams, which can cause problems such as eutrophication and algal blooms.

Another important aspect of SuDS is their ability to provide habitat for wildlife. They can help to create diverse ecosystems that can support a wide range of species, from insects to birds and mammals. This can help to improve the overall biodiversity of an area and can also provide valuable green space for people to enjoy.

Purpose: The main objective of this case study is to measure the effectiveness of SuDS in reducing flood risk by measuring ponding time.

Methodology and results: The study was conducted in an area with a history of flash flooding. The research methodology involved installing SuDS units in the selected area, and measuring the ponding time before and after the installation of SuDS. The findings of the study showed that the SuDS were effective in reducing the ponding time by an average of 20%, indicating a reduction in flood risk.

This case study shows that sustainable drainage systems are an effective way of reducing flood risk by slowing down and cleaning water before it enters rivers and streams. The study also highlights the importance of monitoring and measuring the effectiveness of SuDS in reducing flood risk, as well as the benefits of SuDS in terms of water quality and biodiversity.

In conclusion, sustainable drainage systems are an important component of the circular economy. They help to reduce the risk of flooding and water pollution, while also improving the quality of water for people and wildlife. They also provide habitat for wildlife, and can help to create diverse ecosystems that can support a wide range of species. SuDS can also help to reduce the need for costly and energy-intensive infrastructure, and can save energy and reduce costs. This study aims to provide a comprehensive analysis of the potential benefits of SuDS and their importance in the circular economy and urban areas.

This study is significant because it demonstrates the effectiveness of SuDS in reducing flood risk by slowing down and cleaning water before it enters rivers and streams. SuDS mimic natural water management systems and are designed to reduce the need for costly and energy-intensive infrastructure, such as concrete drainage channels. They also help to reduce the amount of water that needs to be treated, which can save energy and reduce costs. This study highlights the potential benefits of SuDS and their importance in the circular economy and urban areas.

Promoting Sustainable Intensification Technologies; What Drives Small Farm Households' Adoption Decisions?

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Abstract

Smallholder farmers' behavioural decisions to adopt a given technology are a source of debate among applied economists as to what influences farmers' choices in each geographical area, and it remains an active area of research. Sustainable intensification technologies (SITs) or practices, it is argued, provide opportunities to increase farm-level productivity and income while minimising human, social, economic and environmental costs, especially in the face of increasing human population, food malnutrition, and climate change. Over the last two decades, policymakers and scientists have advocated for sustainable intensification of production, which has resulted in the development and dissemination of sustainable intensification technologies (SIT) to small farms in developing countries. However, adoption rates continue to be low, and the factors influencing farmers' adoption decisions have not converged. The study used a multistage sampling technique and a structured questionnaire to collect data from 461 small farm households in northern Ghana. To investigate the factors influencing SIT adoption, the logistic regression model was used. Further, a test of difference in means of the covariates of the two groups was performed. In terms of age, educational level, access to credit, extension, cost of hired labor, on-farm income, group membership, and regional or geographical location, the study finds a statistically significant difference in means between SIT non-adopters and adopters. The adopters are 1.68 years older than non-adopters. More non-adopters are educated (26.23%) than adopters (15.62%). Non-adopters and adopters spend an average of 2.69 years and 1.56 years in school, respectively. Adopters, on the other hand, are more likely to be in a group or a member of Farmer Based Organisation (93.67%) than non-adopters (28.88%). Adopters have more (2.87) access to agricultural extension than non-adopters (1.60). The odds of SIT adoption increase with age (1.150, $p < 0.05$), educational level (2.273, $p < 0.05$), number of agricultural extension visits (1.373, $p < 0.01$), group or FBO membership (39.420, $p < 0.01$), and geographic location ($p < 0.05$). SIT adoption is significantly influenced by access to extension services, group membership, age, education, and geographical location. The study proposes interventions by state and non-state actors to improve the delivery of extension services and education, as well as to promote group formation for peer learning, information sharing, and networking while taking geographical dynamics into account when delivering new technologies to farmers.

Keywords: Adoption, Determinants, Smallholder farmers, Sustainable intensification technologies, Northern Ghana.

❖ **GLOBAL TRENDS AND CHALLENGES IN ANIMAL HUSBANDRY AND VETERINARY MEDICINE**

Sources of innervation and distribution of nerves in the coxofemoral region in dogs

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Technical University of Moldova, Chisinau, Republic of Moldova

Abstract

The purpose of work: In order to determine the anatomical- topographical contributions of the branches of the hip region nerves and their clinical involvement in the transmission of afferent and efferent nerve impulses, we performed a study that reflects the morpho functional organization of the anatomical formations, components of the coxofemoral joint in dogs, the origin and distribution of the nerves participating in the innervation of the regions of the canine pelvic limb, with the determination of the branches involved in the innervation of the joint capsule. The research was carried out on a corpse of a German Shepherd dog and three corpses of mixed dogs, respectively eight coxofemoral joints. The bodies of the dogs were taken from different veterinary clinics of the city of Chisinau. Results: The pelvic region and hind limbs were dissected using various morphological exploration techniques, to highlight the regional topography. The anatomical component parts were fixed in 10% formalin solution. To avoid inhalation of dangerous formalin vapors, a few days before the preparation, the preservation solution was changed according to B. Berne. The sources of innervation of the coxofemoral joint were highlighted by macroscopic and microscopic methods of fine anatomical dissection, according to V. P. Vorobyov. The research results demonstrate that the canine hip is innervated by the following nerves: N. femorales, N. obturatorius, N. gluteus cranialis, N. gluteus caudalis, N. ischiaticus, N. cutaneus femoris caudalis, and the joint capsule is innervated by the branches of the nerves: N femorales, N. obturatorius, N. gluteus cranialis and N. ischiaticus with the respective directions: cranioventral, caudoventral, cranio-lateral and dorso-lateral. Branches of the N. gluteus caudalis were not observed to be involved in the innervation of the coxofemoral joint capsule. Conclusions: The data obtained provide veterinarians with valuable information about the topography and distribution of the nerve trunks, whilst the morphological and structural interpretation of the sources of innervation is of essential anatomical and clinical interest, as well as therapeutic interest in the case of dogs with hip dysplasia and arthrosis. The translation of the information into practice provides an analysis of the possibilities of reducing pain and possible surgical interventions in the region of the hip joint.

Keywords: Innervation, Pelvic limb, Dog, Coxofemoral joint.

❖ **FOOD ENGINEERING AND TECHNOLOGY**

A comparative study on the in vitro and in vivo toxicity of Gadolinium on Stevia rebaudiana

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Abstract

Lately, there is growing interest towards the potential toxicity effects that different nanoparticles or chemicals extensively used in everyday life applications could exert on the environment and edible plants. Gadolinium (Gd)-based contrast agents are extensively used for diagnostic purposes in magnetic resonance imaging. After administration, these molecules are excreted unmetabolized and a significant amount is present in hospital effluents and, consequently, in wastewaters. Gd presence in surface and ground waters all over the world, as well as in tap water and tap water-based beverages has been documented [1,2]. Our research is focused on potential risks associated with plants exposure to Gd and aims at assessing the in vitro vs in vivo toxicity of gadobutrol.

In our study, we have assessed effects of Gd on Stevia rebaudiana plants grown in vitro and in soil, by quantifying the plant growth and relevant plant metabolites (steviosides, chlorophylls, carotenoids, ascorbic and dehydroascorbic acids). The plants were exposed to gadobutrol in concentrations up to 3 mM.

The results showed that root and plant length, also plant biomass had a statistically relevant decrease upon Gd exposure at high concentrations. The effects were much more pronounced for the in vitro grown plantlets.

The plant metabolites were quantified using high performance liquid chromatography (HPLC). The concentrations stevioside and Rebaudioside A, chlorophylls A and B, lutein, zeaxanthin, and beta-carotene showed the same trend upon exposure to increased Gd levels. Their concentrations increased up to 0.1 mM Gd doses, while for the highest exposure level of 1 mM and 3 mM, the concentrations of all investigated analytes were significantly decreased compared to controls.

In all cases, the in vitro grown plantlets were more severely affected. The variations in metabolites levels are clearly related to a stress response of the plant, which is more pronounced under in vitro growth.

Acknowledgements: This work was supported by a grant of the Ministry of Research and Innovation, CNCS - UEFISCDI, project number PN-III-P1-1.1-TE-2021-1585.

Keywords: Gadobutrol, Chlorophylls, Carotenoids, Vitamin C, Growth.

Development of sustainable hybrid hydrocolloid films with improved water vapor barrier

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Abstract

Research concerning hybrid hydrocolloid films (HHF) for increasing food shelf life has increased in recent years. HHF are produced from biopolymers (polysaccharides, proteins, and lipids) incorporated with active compounds (e.g. essential oils). Despite their advantages (e.g. biodegradability, non-toxicity, biocompatibility), HHF have some unsolved drawbacks such as low water vapor barrier and reduced mechanical properties.

Aims: The aim of this study was to develop sustainable HHF using pectin and rosemary oil-loaded solid lipid nanoparticles (SLN) for improving the moisture barrier. Physical, mechanical, thermal, and morphological properties were determined to characterize developed films.

Results: The water vapor permeability of pectin films decreased by over 90% upon SLN incorporation, thus improving the moisture barrier. This can be attributed to the SLN being nanoscale particles with platelet-like shapes that additionally are crystalline and hydrophobic. Together, these features reduce the hydrophilicity of pectin films and lead to the formation of tortuous paths slowing down the diffusion of water molecules through the films. All films with and without SLN were transparent with an immediate complete disintegration in water. Upon SLN addition, the visual aspect of the films changed from very smooth to more structured as seen in SEM images. However, heterogeneities were not observed indicating a complete integration of SLN into the pectin matrix. In terms of mechanical properties, all pectin films showed mainly elastic behavior.

Conclusion: Thus pectin/SLN films were successfully developed with tuned properties. Further studies for testing their bioactivity (e.g. antioxidant and antimicrobial) and sensory effects in food matrices should be further performed.

Keywords: Edible films, Citrus pectin, Rosemary essential oil, Nanoencapsulation, Solid lipid.

Peaberry Coffee Beans Roasting Uniformity Study Through Image Analysis

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Abstract

It was traditionally considered that coffee peaberries were a defect in the coffee production process. There are usually two plano-convex seeds inside the berry; however, a single ellipsoidal seed may form for biological reasons: The Peaberry. Due to this mutation, the peaberries were long considered a defect; further, their export was banned in many coffee-producing countries due to their significantly reduced shape and the worldwide demand for supreme beans. However, different sensory evaluations have revealed that the peaberry has a high cup quality. It is hypothesized that the bean shape accounts for these results. The roasting process occurs homogeneously throughout the bean's domain, and its shape makes it easy for it to roll inside the roaster enclosure. Nevertheless, the data shared in the literature regarding this topic are relatively scarce. Therefore, this study aimed to perform a set of image analyses on 3 samples of coffee beans: 120g of standard grain, 120g of peaberries and a mixture of 60g of standard and 60g of peaberries. The samples were then medium roasted at the same temperature and conditions to better observe the tonality and roast uniformity in 100 randomly selected beans from each sample, from which 50 were cut transversely and 50 longitudinally. Afterwards, a high-resolution picture was taken with a stereoscope, normally located on the flat face. The pictures were processed through image analysis to identify colour mapping, intensity, discontinuities and anomalies in all the grains. The tonality was less variable in both individual and mixed samples of peaberries. Standard berries displayed anomalies in their inner structure generated during the roasting process in both individual and mixed samples. During the roasting process, air chambers formed inside the bean, which resulted in heat accumulation and overroasting, resulting in undesirable flavours and reducing the cup profile and quality.

❖ **FOOD AND NUTRITIONAL SECURITY**

Specific criteria and risks associated with food consumption

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The defining features of the world economic picture include: diversification and rapid renewal of the supply of goods; the globalization of markets; increasing the demands of customers, of society; organization of trade in food products in supermarkets (additional requirements regarding the shelf life of products). They involve a modification of the classic picture of the risks associated with food:

- risks associated with environmental pollution;
- risks associated with intensive agriculture (residues of pesticides, residues of veterinary drugs, promoters of growth, anabolics, etc.);
- risks associated with processing technologies (food additives, man-made contaminants, etc.);
- risks associated with packaging and materials that come into contact with food (phthalates, bisphenols, heavy metals, etc.).

Thus, there are multiple toxicological risks related to various man-made contaminants: biological, chemical risks, risks of falsification and counterfeiting of food.

The paper analyzes the main groups of risks and challenges faced by the food industry and which can intervene along the food chain, as well as methods to reduce their impact.

❖ **FOOD CHEMISTRY, OENOLOGY AND BIOTECHNOLOGIES IN THE FOOD INDUSTRY**

Novel integrated bioprocess system for producing organic acids from food by-products

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Abstract

The transition from a linear to a circular economy implies a shift in the population's mentality and requires the adoption of an eco-friendly economy. The utilization of bio-based materials and products has imperative importance. The aim of the current work proposed to utilize food by-products through an integrated process of solid-state (SsF) and submerged fermentation (SmF) with the purpose of obtaining the target compound itaconic acid (IA). Initially, this process was applied to glucose as substrate, which was also considered a control experiment. Through SsF with *Aspergillus awamori*, the production of hydrolytic enzymes (cellulase and glucoamylase) was obtained, and these were applied in SmF with *A. terreus* to produce IA. IA is a 5-C unsaturated organic acid highly used in producing biopolymers and with several positive qualities. After glucose, apple pomace was used as a food by-product in SsF. After the fermentation optimisations were performed, the whole process was upscaled into bioreactors, and with the help of enzymes, substrate hydrolysis was obtained. After this step through SmF with *A. terreus*, IA was quantified with the help of HPLC. The obtained solution is proposed to be applied in downstream processing to obtain an economically feasible method for IA extraction and purification.

Keywords: Solid-state fermentation, Submerged fermentation, *Aspergillus*, Itaconic acid, Enzymes

Funding: This research was funded by two projects from the Ministry of Research and Innovation (no. PN-III-P1-1.1-PD-2021-0672 and PN-III-P1-1.1-TE-2021-1052).

Probiotics carry iron oxide nanoparticles for iron absorption

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Abstract

One-third of the world's population has anemia, contributing to higher morbidity and death and impaired neurological development. Conventional anemia treatment raises concern about iron bioavailability and gastrointestinal (GI) adverse effects. This research aims to establish how iron oxide nanoparticles (IONPs) interact with probiotic cells and how they affect iron absorption, bioavailability, and microbiota variation.

Pointing to the study of the literature and developing a review and critical synthesis, the authors utilized a robust search methodology. The literature search was performed in the PubMed, Scopus, and Web of Science databases. Information was collected between January 2017 and June 2022 using the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) protocols for systematic reviews and meta-analysis.

The research profile of the selected scientific articles revealed the efficacy of IONPs treatment carried by probiotics versus conventional treatment. Therefore, the authors employed content assessment on four topics to synthesize previous studies. The key subjects of the reviewed reports are the characteristics of the IONPs synthesis method, the evaluation of cell absorption and cytotoxicity of IONPs, and the transport of IONPs with probiotics in treating anemia. To ensure a sufficient iron level in the enterocyte, probiotics with the capacity to attach to the gut wall transport IONPs into the enterocyte, where the magnetite nanoparticles are released.

Study of the kinetics of biomass fermentation processes resulting from the alcohol industry

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Abstract

A new-generation intensive ecological technology and integrated bioreactor for biogas production were developed, based on the valorisation of agro-industrial wastes, hazardous for the natural environment. An easily manageable technology proposed is environmentally friendly and an acceptable method beneficial for the population. This technology bears a breakthrough character and is based on the use of natural phyto-catalysts introduced into the digested biomass in micro-concentrations. Biomethane contents in biogas is thus increased from 62% with a caloric value of 5 232 kcal/m³ to 85-92% with a caloric value of 8 010 kcal/m³. In addition, the stabilized biomass residues can be used as organic fertilizers, whereas the treated water meets the requirements for irrigation scopes. The technology ensures the generation of a renewable “green” heat and electric energy, and contributes to the improvement of energy and environmental security in accordance with the existing national and international standards.

Secondary Metabolites in Food Digestion

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Abstract

Probiotics are viable cultures of bacteria or yeasts that benefit human health when ingested in adequate amounts. Their administration is recommended for the prevention or (in some cases) treatment of certain diseases or dysfunctions, such as diarrhoea, irritable bowel syndrome, ulcerative colitis, etc. Recent studies indicate that probiotics have received particular attention due to their ability to modulate nutrient absorption and act as a barrier against pathogenic bacteria in the intestinal mucosa, influencing the gut-brain axis. Although the use of probiotic microorganisms in dietary supplements has increased considerably in recent years, their mode of action has yet to be fully known.

Previous research indicates that the level of minerals in the human body is mainly associated with their amounts in the diet. At the same time, the optimal functioning of the human body is related not only to the amount of minerals but also to their proportion and the percentage of their absorption. In this context, our research aims to investigate the mode of action of probiotic microorganisms regarding their influence on the bioaccessibility and absorption of minerals from various food matrices.

In this direction, the literature points to the possible beneficial effects of probiotic microorganisms on the bioaccessibility of minerals, highlighting that they are involved in the metabolism of minerals (calcium, magnesium, selenium, zinc, etc.), facilitating their absorption.

Keywords: Bioaccessibility, Gut Microbiota, Mineral Metabolism, Probiotics.

Modulation of the gut-brain axis using psychobiotics in neurodegenerative diseases

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Abstract

One of microbiome research's most challenging and divisive issues is the link between gut microbial metabolism and mental health. Understanding the therapeutic impact of gut bacteria on mental health is of utmost importance for increasing the well-being state of the world's population. Psychobiotics are a type of probiotic that influence central nervous system processes and human behaviors via neural, immune, and metabolic pathways regulated by the gut-brain axis. They increase not only gastrointestinal function but also antidepressant and anxiolytic ability. Moreover, psychobiotics can effectively treat neurodegenerative and neurodevelopmental diseases, such as depression, anxiety, autism, Attention-Deficit Hyperactivity Disorder, Alzheimer's disease, Parkinson's disease, schizophrenia, Huntington's disease, anorexia nervosa, and multiple sclerosis. Even though the mechanism of interaction between psychobiotics and these diseases is not fully elucidated.

On this basis, we focus on understanding the relationship between gut microbiota and its impact on neurological and neurodegenerative illnesses. In addition, we aim to highlight the potential activity of probiotics as a therapeutic approach for the prevention and/or treatment of the abovementioned diseases. Our study reviews recent research on the gut-brain axis and the possible beneficial effects of psychobiotics in neurological disorders. To develop and significantly improve future studies, we have evaluated the scientific literature and presented the accumulated data on this topic. Therefore, the therapeutic use of psychobiotics opens potential future directions for investigation.

Keywords: Dysbiosis, Gut-brain axis, Gut microbiota, Psychobiotics, Psychiatric disorders.

Cereal Bran Acid Pretreatment for Enhanced Bioactive Compound Production through Solid-State Fermentation

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Abstract

Solid-state fermentation (SSF) is a promising technique for producing bioactive compounds from cereal bran. However, the low concentration of bioactive compounds and the presence of lignocellulose hinder the efficient utilization of cereal bran for bioactive compound production. In this study, we investigated the effectiveness of cereal bran acid pretreatment for enhancing bioactive compound production through SSF. Cereal bran samples were pretreated with 3% sulfuric acid (H₂SO₄) and incubated for 2 hours at room temperature. The pretreated bran was inoculated with *Aspergillus niger* and incubated at 30°C for 7 days. The bioactive compounds, including phenolic compounds, and antioxidants, were analyzed using high-performance liquid chromatography (HPLC) and spectrophotometry. The results showed that acid pretreatment significantly increased the concentration of bioactive compounds compared to the control. The highest concentration of total phenolic compounds (20.9 mg gallic acid equivalents /100 g DW) was obtained on day 7 of fermentation and antioxidants (11.05 μmol TE/g DW) were obtained on day 2 followed by day 7 with a concentration of 10.2 μmol TE/g DW. The acid pretreatment also decreased the lignocellulosic content of cereal bran, resulting in increased accessibility of the microorganisms to the substrate. In conclusion, cereal bran acid pretreatment is an effective strategy to enhance bioactive compound production through SSF. This study provides valuable insights into the development of sustainable approaches for the utilization of cereal bran for the production of bioactive compounds with potential health benefits.

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❖ **NEW HEALTHY AND SUSTAINABLE FOOD PRODUCTS AND PROCESSES**

Possibilities to improve the functionality of fermented beverages based on bee honey

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Abstract

Fermented drinks based on honey bees are among the oldest products consumed worldwide. In recent years, especially after the COVID pandemic, consumers are looking for "miracle" foods and drinks to maintain or improve their health. Currently, honey represents one of the imperial products of the Republic of Moldova. The beekeeping sector is dynamic, and the marketing of beekeeping products is quite difficult. The prospect of producing drinks with bee honey offers an effective way to diversify the range of healthy drinks. This review highlights the functional potential of alcoholic and non-alcoholic beverages fermented from bee honey in terms of nutritional and chemical profile that have a positive impact on human health, given their natural provenance and rich in mineral and pro/prebiotic compounds. The health benefits of bee-based beverages resulting from alcoholic fermentation and the specific recommended daily intakes of each claimed bioactive compound were also highlighted. Optimized fermentation processes and post-fermentation operations, reviewed in an industrial scale, can extend the shelf life and quality of honey-fermented beverages.

Strategies for intelligent utilization of residual yeasts from winemaking to obtain new products

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Abstract

Agriculture is one of the key sectors of the economy of the Republic of Moldova. According to the International Organization of Vine and Wine (OIVV), Moldova has a vineyard area of 140,000 ha of the country's total area, which represents 1.9% of the world's total vineyard area. In 2021, Moldova contributed 2 million hectoliters of wine to the world production. At the same time, as a result of the activity, 20 to 30% residual products resulting from winemaking are obtained (OIVV, 2021). On the one hand, the storage of these wastes creates environmental problems, such as the pollution of underground and surface water, and represents a risk of spreading diseases, leads to excessive consumption of oxygen in the soil and groundwater. The biodegradation of these co-products is slow due to the acidic pH and the presence of compounds with antibacterial properties, etc. On the other hand, these viticultural co-products contain significant amounts of molecules of interest that can be used as multifunctional agents in various fields aimed at the formulation of new products, both in the food industry and in other fields, such as the cosmetic industry. A big challenge for these two competitive poles is to be able to offer innovative technologies and new inexpensive multifunctional ingredients to be in tune with the problems and challenges of today's society. The targeted research refers to the possibility of capitalizing the residual yeasts obtained in winemaking with the aim of capitalizing on the physico-chemical qualities of their in the formulation of new products, both feeding and non-feeding.

❖ **ENVIRONMENTAL SUSTAINABILITY AND CIRCULARITY FOR INDUSTRIAL BIO-BASED SYSTEMS**

Soil physical properties, infiltration and CO₂ emissions across different land use in an urban area of Zagreb, Croatia

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Abstract

Urbanization unstopably affects land use diversity in cities. Land use changes increase soil degradation and modify land use characteristics, negatively affecting the soil ecosystem services. These changes are associated with soil quality deterioration, which is often visible through elevated flood risks, and the poor capability of soils to act as CO₂ sinks, which threaten human wellbeing and social and economic development. The objective of this work was to assess the effect of land use and soil management practices on urban and peri-urban soils in Zagreb (Croatia). The soil properties studied were bulk density (BD), soil water content (SWC), mean weight diameter (MWD), water-stable aggregates (WSA), infiltration, and CO₂ emissions. Eight samples were collected at depths of 0–10 cm in winter, spring, summer, and autumn in 5 different land uses: forests – natural *Quercus robur* (FOR), grasslands – semi managed (GRASS), abandoned agricultural land – afforested (AFFOR), cropland (CROP) and a grass-covered apple orchard (ORCH). Land-use and season effects differed significantly ($p < 0.05$) at all studied soil properties. The results showed that SWC was significantly higher in GRASS than in other land uses. Cropland land use had significantly higher compaction (BD) than other land uses, whereas FOR had significantly lower compaction. Significantly higher compaction was noted during the summer than during other seasons. The MWD has the next trend: ORCH>GRASS=AFFOR>CROP>FOR. MWD was significantly higher during the winter due to freezing and thawing processes than in other seasons. FOR showed significantly higher WSA values, while CROP showed significantly lower WSA values than the other land uses. GRASS and FOR land obtained a significantly higher infiltration than CROP, AFFOR, and ORCH. Soil CO₂ emissions registered significantly higher values during autumn and spring than in winter. The results show significantly lower CO₂ values in CROP land use than in the other areas. Finally, CO₂ emissions were significantly higher in GRASS than in other land uses. Such results indicate that land uses with intensive agricultural practices decline soil quality and flood retention capacity in peri-urban areas.

Phytoremediation of particulate matter pollution urban vegetation

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Abstract

One of the most dangerous pollutant created by traffic is particular matter – PM. They can be suspended in the air even for weeks as aerosols, and when inhaled can have carcinogenic, allergic and mutagenic effects. If pollutants have been emitted to the atmosphere only possible method to clean the air is via environmental technology - phytoremediation. It involves growing plants on the surface of which PM are deposited. Nevertheless, air pollution has also negative effects on efficiency of photosynthetic apparatus but still there is little data towards such effects of PM.

In this work we focused on the potential of PM accumulation on leaves of trees growing in Polish cities with different level of particulate matter in air. We also studied the reduction of urban particulate matter concentration by trees and shrubs and meadows growing in roadside vegetation barriers and the impact of PM on plants health.

Amount of PM was measured in two categories (surface-PM – deposited on the leaf surface and in wax-PM – phytostabilized in waxes) and three size fractions (10-100 μ m, 2.5-10 μ m and 0.2-2.5 μ m). For the same plants we also measured the concentration of heavy metals. To define the impact of PM on plants vitality we used efficiency of photosynthetic apparatus and a chlorophyll fluorescence. We found significant differences in PM amount between plants growing in different cities corresponding with amount of PM in atmosphere. The highest amount of PM was measured on trees growing in Cracow – which have one of the highest levels of PM in air in Europe. We also found that green barriers can significantly reduce the spread of traffic PM, heavy metals pollution. Moreover, flowering meadows can also be more efficient in pollution reduction than regular lawns. However, for almost all tested species parameters describing photosynthesis and chlorophyll a fluorescence was reduced in comparison with the control plants.

At the present time, phytoremediation technology is becoming more and more popular around the world. In this work we want also present new trends and research plans on the ability of plants to phytoremediate various types of pollutants from the air.

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The use of larvae meal in the feeding of broiler chickens

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Abstract

In raising broiler chickens, the biggest part of the expenses is the feed, especially the protein source. From this consideration, non-traditional sources of protein can become an alternative source of protein food for their growth, without decreasing their genetic potential.

Europe is leading the way in terms of start-ups focused on raising insects, having included insects on the list of sustainable foods. European authorities have allocated funds for research and production facilities, and the EU block already allows the use of insects for feeding fish, dogs and cats.

Biodegradable waste processing provides systems for insect reproduction. Worm-shaped worm does not look appetizing. But insect larvae must taste good only to fish, chickens or pigs. Their larvae are high in protein and are intended to replace fishmeal and soybeans as animal feed. Both protein sources are not only becoming more expensive, which is a financial burden for farmers and ranchers.

Insects transform waste into protein and reduce total nitrogen excretion, odors and methane emissions, thus contributing to environmental protection. The black soldier fly (BSF, *Hermetia illucens*) is one of the main species considered for large-scale insect farming, given their ability to convert low-value agro-industrial by-products into protein-rich biomass.

Insects could be used without negative effects on animal performance, health or quality of animal products. Since, at present, the increase of antibiotic resistance is of great concern, there is interest in the use of black soldier fly larvae (BSFL) (*Hermetia illucens*) as an antimicrobial product. They have the potential to control pathogens due to their naturally occurring antimicrobial properties. Also, the addition of BSFL meal to animal feed can modify the intestinal microbiota, improving animal productivity and meat quality.

The defatted insect meal can be incorporated in a proportion of 5% in the combined feed intended for birds and pigs, being able to partially replace the soybean meal and partially or totally the fish meal, as the case may be.

BSFL is found to be high in relevant macroelements (Ca, P, K, Mg) and microelements (Mn, Fe, Zn), with a Ca/P ratio of 4.2. The level of Ca, the major mineral of BSFL, is substrate dependent and tends to increase in the pre-pupa and pupa stages.

Larvae eat almost everything, are a bit picky and robust. In addition to its high protein content on the one hand, it has proven a natural antibiotic effect, which protects animals fed with it. On the other hand, the larvae meal corresponds to the natural feed intake of the birds. This also reduces behavioral disorders such as tail biting in pigs or feather plucking in chickens.

Finally, we need to get rid of fishmeal as animal feed. Across the EU, there are 40 million tonnes of cereal waste every year. The circular economy is advantageous from an ecological and bioeconomy point of view.

Conclusions: Larvae meal can be used as a protein source in the diet of broiler chickens, without diminishing their genetic potential.

Keywords: Larvae meal, Feeding, Broiler chickens.

POSTER PRESENTATIONS

❖ SUSTAINABLE AGRICULTURE (INCLUDING LANDSCAPE PLANNING AND FORESTRY)

Oryzalin induced polyploids demonstrated superior morphology and enhanced levels of essential oil production in *Melissa officinalis*.

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Abstract

Melissa officinalis L. is a widely utilized aromatic herb belonging to the lamiaceae family. It is grown across the globe for its wide range of pharmacological uses. Traditionally, it has been used to treat various respiratory and gastrointestinal conditions. Consequently, researches has been done on the breeding of *M. officinalis*. using traditional methods, although none of the previous studies have explored the scope of synthetic polyploidization in *M. officinalis*. Hence, the aim of the current study was to obtain polyploids of *M. officinalis* using oryzalin via in vitro somatic polyploidization. Nodal segments were cultured under in vitro conditions on Murashige and Skoog (MS) for 48 hours prior to oryzalin treatment. Thereafter, nodal segments were treated with three oryzalin concentrations (20, 40, and 60 μ M) for 24 and 48 hours. Flow cytometry and direct chromosome counting were then used to confirm the ploidy of the treated plant. Obtained polyploids were micro-propagated and transferred to be grown under field conditions. Thereafter, morphological, anatomical, and biochemical data were collected for further statistical analysis. Oryzalin treatment yielded a total of 8 polyploids across all treatments. The obtained morphological, anatomical, and biochemical data exhibited a significant difference between diploid and tetraploid plants. For instance, the leaf area, and thickness increased by almost 50 percent, and a higher trichome density was achieved in tetraploid plants compared to the mother diploid plant. Additionally, larger stomata size and higher chlorophyll content indicate a higher photosynthetic capacity in polyploids. The results obtained provide valuable insights into the breeding possibilities in *M. officinalis* and related species.

Local cherry varieties in sustainable production, biodiversity preservation and rural development

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Abstract

The increasing importance of local varieties of horticultural crops is imposing as the answer to growing awareness of biodiversity importance for sustainable agricultural production and rural development. This importance is reflected in two segments. The first segment is the biological, genetic, and technological, as a source for traits in breeding new varieties adaptable for marginal growing areas and potential robustness in the case of biotic and abiotic stresses, but also in their value to be grown just in their original form as a local variety. The second segment is their socio-economic value for rural communities where they might be of use just for their intrinsic value in traditional (and organic), but in any case, sustainable agricultural systems. Local varieties have specific importance because they are a sort of “trademark” for their producing regions, as they are unique and limited only for these regions. There are several such regions in Croatia, including Mediterranean part and continental part of the country, with their differences in environments.

In the context of their uniqueness, they have potential for rural development of specific producing areas, either for their limited availability for general market, or for their exceptional quality that is a result of specific environmental conditions such as climate, soil and relief, or just production methods. Therefore, local fruit varieties and the products made from these varieties may be of high socio-economic importance for rural communities as a part of offer “on the farm” or local green markets, but also as an integral part of the activities in rural tourism of their area of production. In this paper we give the brief history of local sweet and sour cherry production in the territory of Croatia. We provide the overview of nine local varieties (two of them are sour cherry), including their pomological description and producing specificities, their importance as “local trademarks” in socio-economic sense, their brief description with the focus on the traits that are of value for production and genetic pool for selection in the changing climate and growing requirements for biodiversity preservation and sustainability.

Climate change a problem of the century, including food security

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Abstract

Climate changes are the biggest problem facing humanity. Human activities, especially the burning of fossil fuels, increasing the amount of greenhouse gas emissions in the atmosphere, accelerate the rate of climate change. The effects of climate change are already being felt, and the damage is likely to be enormous worldwide. During the research, several materials were studied, maps regarding the current situation of the study object, satellite images, such as agroclimatic maps, biological diversity, soil cover and others currently used. The relevance of the research lies in increasing the awareness of the imminence of the integration of climate change into concrete actions aimed at food security at all levels.

In the Republic of Moldova, the sum of temperatures above +10°C is used as an indicator of the availability of thermal resources, based on which the territory is divided into agroclimatic zones, where the thermal risk index varies from 2750°C in the Northern zone to 3350°C in the Southern zone. According to some sources and models, including the three SRES scenarios regarding the increase in temperatures on the territory of Moldova, an increase of +1.2-1.4°C is expected in the near future, until 2050. The temperature will increase by +5.1 -5.2°C in the Southern and Central Zone, and for the Northern Zone an increase of +4.5°C is expected in the Northern ZAE until the year 2100. Currently, it is mentioned that the thermal state of the air and soil is one of the main factors which affect the development of plants, including strategic ones.

According to Dr. Jean-François Soussana who mentioned, that the food system causes between 1/5 and 1/3 of the total greenhouse gas emissions from humans, but at the same time, climate change affects food security. This is highlighted by the reduction in the production of corn and wheat, being more sensitive to heat and vulnerable for this reason, because at the increase of 2°C, wheat harvests will decrease by 2% per decade, "severe, extensive and irreversible" consequences and within the forecasts with on the demand for food which will increase by up to 70% in the coming decades. If the temperatures will increase by more ~ 3.4°C, not only the crops in the drier and more arid areas will be affected, but also the other areas, that is why a durable and sustainable agriculture adapted to the current conditions is required.

Keywords: Climate changes, Vulnerability, Food security.

❖ **CURRENT ISSUES OF THE GLOBAL AGRICULTURAL ECONOMY**

Measuring the progress towards sustainability in the wine sector of the Republic of Moldova

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Abstract

At present, Moldova's economy is largely linear. Although public institutions draw the boundaries of new regulations with a strong focus on sustainability, considerable efforts, significant reforms, accompanied by political and financial support, are still needed to align Moldova's legislation with the EU environmental and climate policy acquis. Therefore, the concept of sustainability has prompted many industries to reconfigure their production model in order to reduce their impact on the environment. In recent years, the popularity of wine sustainability has grown significantly. The growing pressure to adopt sustainable consumption and production practices and to report progress in this direction has led to the identification of relevant indicators in the sector.

Therefore, this research reviews the existing literature on circularity indicators in the wine industry with a particular focus on Life Cycle Assessment, carbon footprint, water footprint at different stages of the wine production life cycle.

Keywords: Wine, LCA, Carbon footprint, Water footprint, Circular indicators, Environment.

❖ **GLOBAL TRENDS AND CHALLENGES IN ANIMAL HUSBANDRY AND VETERINARY MEDICINE**

Impact of pesticide residues in raw milk

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Abstract

Foreign substances, usually with a toxic effect, may be present in the contents of milk, and therefore in dairy products, which when added intentionally constitute adulteration of milk. Toxic substances that are accidentally introduced into milk and change its properties and composition are considered to be pollutants, or simply pollutants.

Organochlorine pesticides, in particular, enter the cows' bodies through the consumption of concentrated feed (cereals, sprouts) and roots contaminated with such substances. As a rule, they are deposited as such in the fat tissue and milk fat. For this reason, skimmed milk and buttermilk will contain small amounts of pesticides.

The assessment of exposure of milk to pesticide residues depends on the presence of the pesticide residue in food and the availability/consumption rate of that food, which is compared with health-based toxic reference values such as the acceptable daily intake (ADI) and reference dose (RfD).

Following the study and assessment of the physico-chemical indices of milk samples, it was found that they meet the current requirements laid down in GOST 3625 - Milk and milk products. No pesticide residues such as aldrin, endosulfan, dieldrin, heptachlor, HCH, DDT were detected in any milk sample, which is probably due to the ban by the RM government on their use in the protection of grassland and agricultural crops for the last years.

The most effective way to minimize the action of various pesticide residues is the introduction of primary awareness-raising measures aimed at reducing environmental pollution with chemical compounds, as well as the introduction of environmentally friendly food processing technologies.

Keywords: Milk, Residues, Pesticides, Sample, Food.

Comparative analysis of the quality of local and imported sour milk

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Abstract

The role of acidic dairy products is particularly important in human life. Currently, the range of sour dairy products has become quite wide and varied, such as - yogurt, kefir, sour milk, cream and cumin, but unfortunately their quality does not always meet expectations, which negatively affects the health of consumers.

The research was carried out on domestic and imported sour milk, after assessing the quality of the local and imported product. Different qualitative criteria were evaluated - sensory properties, physico-chemical and microbiological parameters, the presence of toxic elements in the investigated product. In conclusion, the researched product demonstrated poor quality characteristics, with the exception of one sample, and the variation of fat content in sour milk does not correspond (% fat is lower) to the information indicated on the package, again with the exception of one sample, which affects the nutritional value and energy of the product. The acidity of the product in all samples coincides with the norms and standard requirements, the microbiological indices of the domestic sour milk as well as of the imported product correspond to the requirements in force.

Keywords: Sour milk, Quality, Fermentation, Acidity, Standard.

Mycotoxins in animal food

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Abstract

In the context of food security and population growth in geometric proportions, the problem of satisfying the population with quality food and in larger quantities as well as in reduced terms arises.

Mycotoxins are highly toxic substances that are produced by molds and can harm both animals and humans. These toxins can come either from animal products (milk, fermented cheeses, and so on) or from plants (cereals, herbs, legumes, fruits, spices, and so on). Contamination of animal products can occur when animals are fed feed contaminated with mycotoxins or when toxigenic molds are subsequently used.

There is a high probability that one or more mold species will develop and produce mycotoxins under favorable conditions throughout the food chain from the field to human consumption. Under stressful circumstances, such as excessive irrigation, exposure to pesticides, the presence of harmful insects, and other circumstances, fungi can attack plants.

Because grains are consumed by both humans and animals, they are crucial vectors of mycotoxins. Feeds showing an advanced degree of mold are usually excluded from the animal's diet. However, forages partially attacked by fungi are often used in animal nutrition. These chronic diseases, with little visible general signs or even no clinical manifestations, are always dangerous for animals.

Keywords: Animals, Mycotoxins, Food safety.

Effectiveness of some unused alternative feed in poultry feeding

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Abstract

A fundamentally new approach to the effective use of new additives in poultry farming is the development of bioconversion technologies based on the use of effective complexes and ensuring the conversion process of complex organic compounds that make up the waste.

The objective of the study was to determine the optimal level of introduction of the organic feed additive in the feed of broilers and to determine its effect on the productive performance, hematological parameters of farm birds.

Broiler-cross chicken hybrids "ROSS-308" were tested, which were distributed in five groups: the control group (LC) and four experimental groups (LE1 LE2, LE3 and LE4). In the control lot, where basic combined fodder was administered and for four experimental lots where used basic combined fodder supplemented with peat additive which administered at different levels.

The feeding conditions of the chicks were similar in all experimental groups. As raw materials that were included in the composition of the combined feed recipes intended for broiler chickens used to ensure the energy requirement are: corn grain, wheat and sunflower oil, to ensure the protein requirement soy meal, Smart fish, amino acids, calcium and Zoofort AF. Before performing the tests on birds, the determination of the quality and nutritional value of the feed ingredients according to the chemical composition and the formulation of the combined feed recipes for chicken broiler chicks with their manufacture, on experimental variants were carried out. The feeding conditions of the chickens were similar, with a difference only in the level of feed additive supplement introduced in the experimental groups.

The nutritional value of the feed corresponds to EMP 3150 Kcal/Kg, P.B. 22.5%, the ratio EMP/P.B. 140 and the ratios EMP/lysine, MDL / LDP, TRD/LDP, TIP/LDP are at optimal values, efficient for the digestion and bioconversion of feed.

The results of raising chickens with the use of peat additive made it possible to achieve high performance. During the experimental period of 7-14 days – body mass was higher in experimental groups 3 and 4 by 2.57; 2.81%; in the period of 14-21 days - with 7.97; 8.11%, during the growth period of 21-28 days the studied indicator was higher in the same experimental batches with 8.33; 8.15%, and in the last week of the experiment - in the period 35-42 days in experimental groups 3 and 4, the biggest difference was observed compared to the control group with 7.84 and 7.32% corresponding.

Physical-chemical indices of different types of bee honey from the Republic of Moldova

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Abstract

In this study (2020-2022), the physico-chemical parameters of different types of honey collected from different soil and climatic zones of the Republic of Moldova were studied. The physico-chemical indices of honey were determined in the Animal Products Testing Laboratory within the premises of the Republican Veterinary Diagnostic Center, the content of amino acids was determined in the accredited Laboratory of Psychosomatic Relationships of the Institute of Physiology and Sanocreatology, and micro- and macroelements and the presence of heavy metals in honey were determined by atomic absorption spectrometry at the Institute of Chemistry, State University of Moldova, Chisinau. It was revealed that the mass fraction of water in acacia honey averaged 16.93%, linden - 18.05% and sunflower - 17.05%, invert sugar, respectively - 77.18%, 78.8% and 77.65%. The content of sucrose in these types of honey was in the range of 1.71-2.5%, hydroxymethylfurfural 3.0-4.0 mg/kg. The largest value of the diastase number is 16.25 units. Gote was in sunflower honey, linden - 11.75 units. Goth and in acacia honey - 8.56 units. Gotha. It has been established that in acacia honey the total amount of microelements (manganese, zinc, copper, iron, chromium, nickel) averaged 18.0 mg/kg, lime - 9.92 mg/kg and sunflower - 9.49 mg/kg. The total amount of macroelements (calcium, magnesium, potassium, sodium, phosphates) in acacia honey was 483.81 mg/kg, linden - 1148.38 mg/kg and sunflower - 930.14 mg/kg. In the honey data, the amount of lead (Pb) was - <0.5 mg/kg, cadmium (Cd) - <0.06 mg/kg. The total amount of amino acids in acacia honey was on average 1.352 mg/g, linden honey 1.756 and sunflower 1.741 mg/g. Proline has the largest share - 17.9-23.65%, glutamic acid - 9.76-16.95%, taurine - 11.10-21.89% and aspartic acid - 9.89-11.39% of the total amount of amino acids.

The work was carried out within the project code 20.80009.5007.17 of the National Agency for Research and Development of Moldova (ANCD).

Qualitative analysis of autohton and imported classic butter

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Abstract

Butter is a product that belongs to the category of dairy products. In order to establish the safety and priorities of the consumer, the importance of the merceological evaluation of the organoleptic and sensory qualities, the verification of the correctness of the marking, labeling and the net mass of the butter produced both domestically and imported has been demonstrated through descriptive and differentiation research. The psychosensory value, respectively the organoleptic and aesthetic value, is that component of the nutritional value, which makes food products appetizing, determining their choice from those available at a given time. The quality of both autohton and imported butter has been established according to qualitative indices such as smell, color, appearance in section, consistency and taste, which will allow producers to draw conclusions about the importance of the market and the needs of end consumers regarding the safety and quality of the finished product. Following the examination of the correctness of the marking and labeling of 10 butter samples, several violations were found such as: none of the analyzed samples correspond, to a greater or lesser extent, to the quality requirements in terms of product labeling quality native or imported; some samples do not clearly indicate the manufacturer; no normative document or quality standard based on which the butter is produced is indicated on the packaging; the normative document is indicated very small and covered, being difficult to read; date of manufacture printed with easily washable ink hard to read. When analyzing the packaging of the imported butter samples, it was established that only the country of origin is indicated, without the precise determination of the manufacturer and the legal address; the normative document based on which they are produced is not indicated. Out of six samples of imported butter, only one does not indicate the presence of saturated fatty acids; being imported butter, neither the importer in our country nor the distributor is indicated on the packaging, nor are the ingredients from which they are produced as well as the trademark indicated; the text on the package is not indicated in Romanian. It was established that the discovered deviations are within the maximum upper limits of acceptability, the shortcomings are easily camouflaged so that the ordinary consumer without knowledge in the field cannot make correct conclusions about the quality and last but not least the safety of the product on the shelves of shopping centers. It is proposed to strengthen the legislative basis that provides for the analysis of the quality of food products, especially of imported ones, and to oblige the indication on the label of the presence of saturated fatty acids after their name, in order not to mislead the buyer; to organize information campaigns on the need to comply with the form of product labeling, so that the writing is legible and easily accessible to potential buyers.

Keywords: Butter, Sensory, Analysis, Taste, Quality, Smell, Consistency.

Evaluation of the physical and chemical indices of different ranges of honey

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Abstract

Honey - the main product of the beekeeping industry, is appreciated for its nutritional properties and therapeutic effects. Honey is one of the most biologically complex products, in the composition of which there are quite important substances for the human body. Currently, one of the tasks of the beekeeping branch is to create the necessary conditions to obtain competitive beekeeping products on the European Union market, absolutely natural and of a superior quality without any residues or falsifications. Bee products are quite valued as particularly valuable and are in high demand. The basic purpose of beekeeping products is for them to be obtained, conditioned and processed in such a way as to preserve the totality of the original natural properties for as long as possible. These conditions can be respected if they are thoroughly known. If these conditions are not respected, so-called defects can be registered that can affect bee products up to the destruction of valuable properties. Following the research carried out on three varieties of honey, it was concluded that they fell within the organoleptic indicators for honey, namely by appearance, color, consistency, taste and smell. Laboratory research indicated an average honey moisture of 16.66%, acacia and linden honey had the same water content, with a lower percentage observed in polyfloral honey. The content of toxic metals Pb in the studied honey indicates an average presence of less than <0.02 mg/kg, the acidity indices varied between 0.8 – 1.6 milliequivalents per 100 g of honey, the average being 1.30 milliequivalents per 100 g, the content of oxymethylfurfural varied depending on the variety, in polyflora honey - 2.0 mg/kg, in acacia honey - 9.4 mg/kg and in lime honey - 8.1 mg/kg, on average - 6.50 mg/kg, the sucrose content was 1.0% in polyflora honey, 2.2% in acacia honey and 0.7% in linden honey. These values fall within the limits of the normative requirements provided by the European Union requirements for bee honey.

Keywords: Bee honey, Oxymethylfurfural, Organoleptic indices, Physico-chemical indices.

Increasing the productivity of the poultry cross hybrid brown when using non-traditional feed additives in the diet

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Abstract

Industrial poultry production has entered a new phase of its qualitative development. The task of today is to give products in accordance with reasonable nutritional standards, with low cost and high nutritional quality. Full feeding of poultry is a fundamental condition for its high productivity, and special attention is paid to obtaining environmentally safe products that are not harmful to humans. That is why new cheap and environmentally safe feed additives, stimulating poultry productivity and positively affecting the health and safety of the livestock are sought and introduced into production.

One of the available and effective ways to improve the fullness of poultry diets, is the use of biologically active additives that serve as an alternative to feed antibiotics, hormones, antioxidants and other additives that accumulate in poultry products. These include organic acids that contribute, according to the literature, to increase productivity and improve the quality of poultry meat. In this regard, feed concentrate from peat and feed concentrate from feathers are of particular interest. The peat feed concentrate contains humic acids, one of which is fulvic acid. Feather feed concentrate can serve as a significant reserve in terms of protein content.

A good quality edible egg is a highly valuable dietary product. It contains all the nutrients and biologically active substances necessary for humans in a well-balanced form, which accounts for its high digestibility of 96-98%.

When obtaining marketable eggs in the poultry farm, it is important not only to obtain a large number of eggs, but also to obtain products of high quality. To determine the quality of eggs obtained from laying hens of experimental and control groups at the age of 34 weeks, when the egg production has reached a high level and the weight of laid eggs was equal to 58-62 grams to determine their quality, we selected 20 pieces of eggs in each of the experimental groups.

Based on the studies, a positive effect of peat and feather feed additive on the productivity of laying hens was established.

Keywords: Poultry production, Laying hens, Egg production, Peat feed, Feather feed concentrate.

❖ **DIGITAL AGRICULTURE, ENGINEERING AND ENVIRONMENT**

Artificial neural networks as a tool for monitoring woolly aphid in apple orchards

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Abstract

Apple is one of the most important fruit crops in the world. It is a host for numerous insect pests. One of the most economically important and widespread apple pests is the woolly aphid (*Eriosoma lanigerum*) (Hemiptera: Aphididae). It develops 10-15 generations per year and causes damage by feeding on roots, developed branches and young shoots, especially in mechanically damaged areas, where it favors the development of secondary diseases and pests. Its feeding weakens mature apple trees, resulting in loss of vitality and quantitative and qualitative yield losses. Chemical control measures are used when 5-8% of shoots are infested; in young orchards, the threshold may be lower. Before deciding to use chemical control measures, a visual inspection of the orchard is required to determine the extent of infestation, which is difficult and time-consuming, especially in large areas. This time-consuming monitoring can lead to late and ineffective chemical treatments. Recently, artificial neural networks (ANNs) have been used as a tool to develop automated monitoring techniques for many agricultural pests and phenomena. By using these techniques, users can respond in a timely manner and provide targeted and effective pest control with less human intervention. Therefore, the objective of this work was to develop an analytical model for the detection of woolly aphid in apple orchards using ANN. Photos of apple trees were collected from March to September 2022. The photos were taken manually from a distance of 50 cm with an RGB camera in five apple orchards in Zagreb County, Croatia. The images were annotated, and the target objects (woolly aphids and other objects) were labeled with bounding boxes and used for training ANN. Finally, there were 2750 labeled objects of the class "woollyaphid". The model was developed and showed high accuracy in detecting woolly aphids on test images and great potential for work in practice. This model will be further improved by using larger datasets. The contribution of this work is development of accurate techniques for monitoring important apple pests to enable economically and environmentally sustainable apple production.

Drought stress in winter wheat - physiological responses and detection using remote and proximal sensing techniques

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Abstract

Wheat (*Triticum aestivum*, L.) is one of the world's most important crops and sources of calories and protein, making it a critical factor in food security. The stability of entire food systems is threatened by climate change, which is the main cause of abiotic stress in crops, such as salinity, waterlogging, heat, frost, nutrient deficiency, and drought as the most studied and damaging stress factor. Drought results from an insufficient amount of rainfall and water in the soil during the growing season and is the most limiting factor for wheat production worldwide. The effects of drought stress on wheat grain yield depend on the severity and duration of the stress, and the response varies depending on the phenophase of the crop. Drought stress affects leaf area expansion, dry matter distribution, photosynthetic rate, and root growth. It is most damaging just before anthesis and during the grain-filling stages, where it causes direct yield losses in the form of lower grain number and lower grain weight. Under drought conditions, CO₂ uptake is reduced due to stomatal closure, which affects respiration, photosynthesis, and overall plant development. As a result, production of cell components such as carbohydrates and proteins is reduced. Severe drought stress in wheat also significantly reduces chlorophyll content in leaves and thus photosynthesis. In addition, the water potential of wheat leaves may be reduced, leading to a decrease in turgor. Remote and proximal sensing of vegetation (RS and PRS) provides a non-destructive method suitable for rapid and accurate assessment of plant physiological responses to stress factors including drought. Hyperspectral measurements using different RS and PRS systems can be used to detect changes in plant reflectance caused by variations in leaf structure, pigments, and water content. The study of spectral reflectance (as a main element of the RS and PRS systems) of plant material has contributed to the definition of vegetation indices (VI), which can be used to quantify numerous agronomic variables by relating the values of different combinations of wavelengths of the electromagnetic spectrum to plant properties. Based on VI calculated from ratios and differences between reflectance values of plant material in the visible (VIS), near infrared (NIR), and shortwave infrared (SWIR) range, various agronomic plant traits related to drought can be estimated. Water content can be estimated remotely by using water absorption bands in the NIR to SWIR range where there are strong water absorbing features, e.g., at 970 nm, 1200 nm, 1450 nm, 1930 nm, and 2500 nm. To improve the extraction of spectral information on water metrics (such as leaf water potential) in vegetation, scientists have proposed several hyperspectral VI, including water index (WI), normalized difference vegetation index (NDVI), simple ratio (SR), photochemical reflectance index (PRI), normalized difference water index (NDWI), water band index (WBI), brown pigment index (BPI), normalized difference infrared index (NDII), simple ratio water index (SRWI), moisture stress index (MSI), deep water index (DWI), normalized difference vegetation index (Red-edge NDVI), etc. Together with irrigation management, rapid assessment of water content in wheat plants would enable effective screening and identification of resistant varieties in plant breeding programs. Based on numerous studies of water stress in wheat plants and applications of RS and PRS, there are a large number of accurate, reproducible methods that can be applied under a wide range of climatic, soil, and growing conditions.

❖ **FOOD ENGINEERING AND TECHNOLOGY**

The impact of berries on the evolution of yoghurt acidity

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Abstract

Yogurt is a leading dairy product with a high consumption level and numerous nutritional benefits, with a history spanning over 100 years. In recent times, yogurt supplemented with fruits or berries has a higher antioxidant activity, the acid taste is mitigated, it has a richer nutritional value. Aronia (malic acid predominant), raspberry and strawberry (citric acid predominant) contain valuable organic acids that act as protective agents capable of reducing post-acidification process. According to the normative documents (GD No. 158 of 07.03.2019) the titratable acidity value for yogurt must be in the range of 75-140 oT.

The yogurt was obtained by the thermostat method in the laboratory of the Food Products Technology Department of the Technical University of Moldova, from cow's milk ("Ferma cu Origini" SRL, Horăști v., Ialoveni r.), goat's milk ("Vilador" SRL, Slobozia-Măgura v., Sângerei r.), starter culture (Lyofast YAB 205, consisting of *Streptococcus thermophilus*, *Lactobacillus delb. Bulgaricus*), aronia berries (collected from plantations in Cuizauca v., Rezina r.), or raspberry berries (collected from plantations in Elizavetovca v., Dondușeni r.), or strawberry berries (collected from plantations in Sadova v., Calarasi r.) and sugar ("Suedzucker Moldova").

In this context, the present study represents an important step in the assessment of yogurt quality, as it reflects the possibility of inhibiting the post-acidification process of yogurt thanks to the addition of berries. The results obtained for the samples titratable acidity after 15 days of storage showed increasing values, but remained within the maximum permissible value of 140^oT, as it was influenced by the berries lower acidity. Thus, for raspberry yogurt a maximum titratable acidity of 105 ^oT was obtained, for strawberry yogurt 100 ^oT and for aronia yogurt 92 ^oT, compared to the classic yogurt 82 ^oT. After yogurt storage during 20 days, the recorded values were the following: raspberry yogurt 119 ^oT, strawberry yogurt 112^oT and aronia yogurt 108 ^oT, compared to classic yogurt 93 ^oT. After 25 days of yogurt storage the titratable acidity exceeded the maximum permissible value, with the following results: for raspberry yogurt 140 ^oT, for strawberry yogurt 143 ^oT and for aronia yogurt 142^oT, compared to classic yogurt 141 ^oT. These results support the hypothesis that the berries chemical composition and its biologically active substances have the ability to inhibit the increase of yogurt acidity.

Keywords: organic acids, preservative, supplements, titratable acidity, berries.

Acknowledgments: This work was supported by Moldova State project no. 20.80009.5107.09 "Improvement of food quality and safety by biotechnology and food engineering", running at Technical University of Moldova.

The action of some antioxidants on the stability of vegetable oils

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Abstract

The present study aimed to investigate the effectiveness of the use of some antioxidants as inhibitors on oxidation of oils from grape seeds, walnuts and corn germs. The oxidation was evaluated during 700 h, in forced conditions. The optimal conditions of the accelerated oxidation process in the analysed systems were established. The progress of lipid oxidation was evaluated by measuring the peroxide index and conjugated dienes and trienes. A series of secondary products of the lipid oxidation were identified: hexanal, octanal and hydroxy-nonadienal. The intensity of the formation of these compounds during oxidation was monitored. The results of this study show that the oil samples with the addition of antioxidants show considerably lower oxidation values compared to the control sample. More effective was the action of L-ascorbic acid and n-octyl gallate, the optimum concentrations - 0.1%. An inhibitory effect of the oxidation process was observed for α -tocopherol and matcha extract.

The effect of using wine by-products in obtaining sweet preparations

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Abstract

Grapes harvested worldwide are used in winemaking, and with the development of this industry, the volume of accompanied by-products increases, such as grape pomace, seeds, etc. These products are rich in polyphenols, tannins, and others and are of interest for their subsequent exploitation because. The paper explores the possibility of using grape skin powder as an addition to the production of sweet dishes.

Sweet dishes formulas with the addition of grape skin powder (0, 2.5, 5.0, 7.5 and 10.0% to total weight) have been developed.

Research has shown that the addition of grape skin powder reduces the rate of oxidative processes in sweet dishes samples, and significantly contributes to increasing the total polyphenol content (63.93 - 139.29 mg AG / mL extract) and antioxidant activity (33, 63% for sample 10.00 % PS). Also the fortification of the sweet dishes with powder from the grape skin significantly influences the color of the elaborate sweet dishes.

The addition of grape skin powder has been shown to slow down the oxidative processes in sweet dishes.

According to the accumulated score (23.43 out of 25) as a result of the sensory analysis, the most successful sample is the sweet dishes with 5% grape skin powder. However, the other samples did not accumulate a score lower than 20, thus leaving room for further research on the technology of sweet dishes preparation and the method of incorporation of grape skin powder.

Keywords: Sweet dishes, Grape skin, Color, Polyphenols, Antioxidant activity.

Goat milk yogurt with improved properties

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Abstract

Milk and dairy products are indispensable food products for human nutrition, as they are important suppliers of proteins, fats, vitamins and minerals (especially calcium).

In recent years, goat's milk has attracted the attention of dairy producers due to its balanced chemical composition and special functional properties. Also, goat's milk has therapeutic benefits for people with certain dietary problems, being traditionally recommended for infants and people allergic to cow's milk or being lactose intolerant. However, this group of consumers cannot omit dairy products from their daily diet, due to the rich intake of macro and micronutrients important for human nutrition.

In this context, also taking into account the benefits of goat's milk compared to cow's milk, the aim of the work was to diversify the dairy products variety as well as consumer groups by obtaining lactose-free fermented dairy products from goat's milk through different hydrolysis processes.

For the research, samples of classic yogurt and lactose-free yogurt (non-hydrolyzed yogurt, the yogurt that was hydrolyzed before fermentation, and the co-hydrolyzed yogurt) from local goat's milk with a fat content of 5.5%, protein 3.0% and lactose 4.45% were manufactured in the laboratory conditions. Yogurt starter cultures containing *Streptococcus thermophilus*, *Lactobacillus delsubrueckii* subsp. *bulgaricus*, *Lactobacillus acidophilus*, *Bifidobacterium* were used. Commercial enzymes β -galactosidase obtained from *Bacillus licheniformis*, activity 5500 BLU·g⁻¹ NOLA Fit 5500 were used for lactose hydrolysis.

The degree of lactose hydrolysis was determined in accordance with the method for the measurement of lactose in low-lactose and lactose-free products under Standard Method Performance Requirement (SMPRVR) 2018.009.

According to the obtained data, in the non-hydrolyzed yogurt sample, lactose hydrolysis was achieved only under the action of β -galactosidase synthesized by the lactic acid bacteria from the starter culture, the hydrolysis degree reaching the lowest values (up to 14%), and in the case of the yogurt samples obtained from pre-hydrolyzed and co-hydrolysis milk, at the end of the fermentation period, an advanced hydrolysis degree is reached (over 80%).

Both pre-hydrolysis and co-hydrolysis of milk accelerate the fermentation process in yogurt manufacturing, suggesting that the lactose hydrolysis process improves the fermentation process and the lactose-free yogurt quality attributes.

However, the process of obtaining yogurt by co-hydrolysis reduces the yogurt production time by excluding the lactose pre-hydrolysis technological stage and, respectively, the production costs. The optimal method from the economic, technological and quality index characteristics point of view is to obtain lactose-free yogurt through co-hydrolysis.

Keywords: goat's milk, free-lactose yogurt, lactose, lactase, intolerance, enzymes.

Acknowledgment: The research was funded by State Project 20.80009.5107.10, nr. PS-62 “Personalized nutrition and intelligent technologies for my well-being”, running at Technical University of Moldova.

The influence of thermal processing on the goat milk antioxidant properties

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Abstract

Milk and dairy products are an integral part of the human diet due to the content of important nutritional compounds, such as proteins, essential amino acids, fatty acids, calcium and biological compounds important for the consumer physiological functions.

In recent years in the Republic of Moldova, goat's milk has become a common raw material in the diversification of local dairy products, industrial production. Goat's milk is characterized by a well-balanced chemical composition, namely due to the ratio between casein fractions (β and α casein), the fat content and quality, respectively fat-soluble vitamins, the lactoferrin content that contributes to the formation of special functional properties.

In the context of the milk thermal processing, manufactured at industrial scale, the purpose of this scientific paper is to identify how thermal treatment methods affect the antioxidant properties of goat milk.

Goat milk samples were used for the research: whole, pasteurized, heat-treated UHT, powdered milk. The antioxidant activity was determined by the method based on the discoloration of the stable DPPH radical and the total content of polyphenols according to the Folin-Ciocalteu method.

The results obtained showed that the UHT milk has the highest antioxidant activity, followed by powdered milk and pasteurized milk. Whole milk showed the lowest antioxidant activity. Thermal treatment can increase the milk antioxidant capacity due to the proteins degradation and the exposure of thiol groups, which can act as hydrogen donors, as well as the formation of Maillard reactions compounds, especially melanoidins, which have a strong antioxidant activity.

Polyphenols are inorganic chemical compounds with a prominent antioxidant character, reduce oxidative stress, have anti-inflammatory, anti-cancer and immuno-protective qualities. The content of polyphenols largely depends on the milk fat content. Thus, the results obtained showed maximum values for whole and pasteurized milk, followed by UHT milk and powdered milk. Also, a thermal treatment at high and long-term temperatures will contribute to reducing the polyphenol content.

The obtained results show that heat treated goat milk, besides the fact that it keeps its chemical composition, obtains special functional properties, being fortified with natural biologically active compounds obtained as a result of protein degradation and from temperature-catalyzed reactions between milk components.

Keywords: goat milk, caseine, antioxidant activity, polyphenol

Acknowledgment: The research was funded by State Project 20.80009.5107.09 "Improving of food quality and safety through biotechnology and food engineering", running at Technical University of Moldova.

Diversification of the technology of juice making from black berry grape varieties with the utilization of increased biologically active substances

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Abstract

Juices obtained from grapes of black berry varieties, due to their high nutritional value, are increasing in demand, showing a trend of continuous growth in consumption. Grape juice assumes important nutritional and bioenergetic properties for the human body through the content of carbohydrates, organic acids, antioxidants, antioxidants. The food and hygienic values are due to the multiple components and properties with effects on the human body: alkalizing, mineralizing, vitaminizing and therapeutic-antioxidant with phenolic compounds, resveratrol and other biologically active substances. This research is focused on studying the processes of obtaining grape must through competitive achievements: the analysis of the intensive technological regime through thermal-processing in different regimes (for 10-20 minutes), the hydraulic (pneumatic) pressing of whole grapes and the separation of the pigmented red must in the production process. The technological results are presented, and the analysis of the influence factors: temperature, titratable acidity and the role of pH, dry substance content (% BRIX), polyphenols and chromatic parameters (CIELab) that ensure the improvement of the quality parameters and the production technology in the specific conditions for the region and the category given by the juices of the grapes with black berries. The perspective of applying the technology and optimal technological parameters paves the way for ensuring quality, diversifying the assortment, and ensuring juice stabilization during storage, bottling and preservation.

Keywords: Color indices, Processing technology, Quality parameters, Therapeutic properties.

Valorization of bioactive compounds in local plant agri-food waste materials for functional food products

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Abstract

In the last 20 years, there has been a resurgence of interest in hemp seed due to its nutritional and pharmaceutical value. Australia, Canada and most recently the United States have legalized the cultivation of hemp seeds with low levels of tetrahydrocannabinol (THC) (<0.2% w/w). The Republic of Moldova has favorable climatic conditions for the cultivation of hemp and annually over 700 kg of *Cannabis sativa* L. hemp seeds are harvested per hectare, 37 % being food waste (oil cake). In the food industry, hemp seeds are widely used as a means of enriching or fortifying food products. Derivatives as well as hemp seeds have been evaluated as an added ingredient in products consumed daily, such as bakery products (bread, biscuits), meat and meat products, yogurts. Regarding the nutritional quality of products enriched with hemp flour, the addition of hemp seeds or its derivatives has been found significantly in the nutritional quality, as it increases total protein and fat content, total soluble and insoluble dietary fiber, group B vitamin and mineral.

Cannabis sativa L. culture is cultivated for medicinal and industrial purposes. Hemp seeds contain 35-45% lipids with a unique, perfectly balanced composition of fatty acids. Depending on environmental factors and variety, the protein content of whole hemp seeds can vary from 25 to 30%. Total carbohydrate content from hemp seeds can vary between 20 and 30%. It should be mentioned that the *Cannabis sativa* L. seeds are of particular interest from the point of view of the content of B1, B2, B6 vitamins. At the same time, 100g of seeds contain the average daily rate of phosphorus, potassium, magnesium, manganese and zinc. Due to the chemical composition of the seeds, they have therapeutic effect. The amount of essential nutrients increases with the elimination of the fat fraction. After the hemp seeds oil extraction, the oil cake (meal), that is considered a food waste, in the fact is an important source of protein and constitutes 45-55%. It is not used in the food industry in the Republic of Moldova, but only as food for animals.

Effect of functional plant extract from grape seeds on the quality of boiled cream with milk

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Abstract

Cream semi-finished products usually limit the shelf life of cakes and pastries due to the susceptibility of the fat phase to oxidative processes and microbiological deterioration.

The aim of the work was to use grape seed extracts in custards to prevent and retard oxidative reactions and microbiological spoilage processes.

Grape seed extract is a by-product derived from grape (*Vitis vinifera*) seeds that is extracted, dried and purified to produce an extract rich in polyphenolic compounds. The antimicrobial properties of grape seed extract have been evaluated against *Listeria monocytogenes*, *Salmonella typhimurium*, *Staphylococcus aureus*, *Bacillus cereus*, and other foodborne pathogens, both in vitro and, to a limited extent, in food.

The effect of different concentrations of dry grape seed extracts (0.05-0.1%) as antioxidant and bioprotectant in custards has been investigated. Main physico-chemical parameters and microbiological indicators of custards are determined in accordance with standard procedures. The sensory quality of the cooked cream was evaluated using the 30-point scale method. The cream has a viscous and homogeneous consistency, light creamy colour, the smell and taste was defined as pleasant creamy, sweet, aromatic, with a pronounced buttery, balanced taste, the samples of cream with grape seed extract added had a light and pleasant nutty flavour, according to the results of the quality rating, corresponding to the highest quality. The amount of dry matter in the boiled milk cream samples does not change significantly and averages $38.80 \pm 0.03\%$ for all samples. This indicates that the additions of functional plant extracts do not influence the change in the amount of dry matter, i.e. they do not reduce the shelf life. Determination of titratable acidity showed that all samples of boiled cream with milk were within the permissible limits (1.84-2.15% depending on the amount of extract), but during storage for 24 hours the acidity decreased significantly (1.10-1.15% depending on the amount of extract). The peroxide value of the cream sample without added grape seed extract during storage increases in 3.2 hours, while the samples with the extract were more resistant to oxidation (1.5 times higher and within the permissible range).

In terms of antioxidant activity, all samples show increased antioxidant activity. The best result is shown by the sample with 0.1% dried grape seed extract - in 55 hours higher compared to the control sample.

The antibacterial potential of the functional plant extracts used against gram-positive and gram-negative bacteria showed that antimicrobial compounds are present in the extracts used. The functional plant extracts used are in close agreement in inhibiting bacterial growth.

Grape seed functional extracts were tested against fungi and bacteria and revealed significant antibacterial and antifungal potential. The plant functional extracts used are extracts with numerous innovative acts that increase the shelf life of the cream.

Keywords: Antioxidant activity, Antimicrobial properties, Boiled cream, Extract, Grape seed.

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Quality and storage stability of cream cheese enriched with microencapsulated rosemary extract

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Abstract

Polyphenolic compounds derived from rosemary (*Rosmarinus officinalis* L.) have numerous biological effects, including antioxidant and antimicrobial ones. However, their application is limited because they degrade under different environmental conditions. Consequently, rosemary extract was microencapsulated in alginate using the drop technique to alleviate this problem. Research results showed that rosemary extract has a high total polyphenolic content (38.63 ± 0.29 mg GAE/g DW), especially methyl-rosmarinate, rosmarinic acid, cirsimarin, carnosol, epigallocatechin, rosmadial. The extract shows important antioxidant activity - 1216.46 ± 2.42 mM Trolox/g DW and inhibitory effect against strains of *Staphylococcus aureus*, *Geobacillus stearothermophilus*, *Bacillus cereus*, *Candida albicans*, *Enterococcus faecalis*, *Escherichia coli* and *Salmonella* Abony. Microencapsulated rosemary extract was characterized by: moisture - $6.21 \pm 0.05\%$, swelling index - $85.5 \pm 0.1\%$ and solubility - $22.5 \pm 0.4\%$. The encapsulation efficiency of microencapsulated rosemary extract was $81.0 \pm 0.3\%$, demonstrating minimal losses of polyphenolic compounds. Microencapsulated rosemary extract was used to enriched cream cheese. In this study, the sensory, physicochemical and textural properties of cream cheese were evaluated during the storage period of 28 days at 4°C. It was determined that the addition of 0.6-0.9% microencapsulated rosemary extract in cream cheese inhibited the post-fermentation process, improved the degree of water retention and textural parameters of cream cheese, thus prolonging its shelf life by 7 days compared to plain cream cheese. Microcapsules based on alginate ensured the stability of the bioactive compounds of the rosemary extract and led to the controlled release of the polyphenolic compounds from the cream cheese during the storage period.

Keywords: Rosemary; Microencapsulation; Antioxidant activity, Polyphenolic compounds, Antimicrobial activity, Cream cheese.

Acknowledgments: This study was supported by Moldova State project 20.80009.5107.09 "Improvement of food quality and safety by biotechnology and food engineering", conducted at Technical University of Moldova.

The influence of thermal treatment on the chickpeas and lentils minerals content

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Abstract

Chickpeas and lentils have an important role in the traditional diet, as they fulfill the dietary guidelines recommended for a healthy diet. Legumes are the second most important group of plant crops after cereals in human nutrition. This fact is due to the low cost of cultivation, nutritional properties and beneficial physiological effects. Chickpeas and lentils constitute 13% and 5%, respectively, of the most widespread legume crops in the Republic of Moldova. Regular consumption of legumes has been reported to reduce people's susceptibility to chronic diseases such as cardiovascular disease, diabetes, cancer and excess body mass. This may be due to the high content of protein, dietary fiber, essential fatty acids, minerals and isoflavones. The aim of this study was to investigate the influence of heat treatment (boiling) on the content of minerals in chickpeas and lentils.

Two varieties of legumes - chickpea and lentil - were used for the research. The content of minerals in the dried legumes and in their boiling water was determined. Flame photometry (propane-butane-air) was applied to determine the sodium and potassium content. To determine the magnesium, calcium, manganese and iron content, atomic absorption spectrophotometry in flame (acetylene-air) was used.

The obtained results demonstrated that dry chickpea and lentil grains are important foods for the essential minerals ingestion necessary for human health. In general, among the minerals determined in the dry samples, potassium content was the highest, followed by magnesium and calcium content. The lowest content refers to manganese. The content of sodium, magnesium and calcium in the lentil samples was higher than in the chickpea samples. And in the case of the potassium, manganese and iron content, the chickpea samples had the highest values. Chickpeas and lentils have also been found to be excellent sources of iron.

The legumes boiling (heat treatment) process had a significant effect on the minerals transfer from the grains to the boiling water. It was found that in the lentils boiling water potassium has the highest content of minerals, followed by magnesium, calcium and manganese had the lowest content. In chickpea boiling water, the order of minerals is preserved as in the case of lentil boiling water, but their content is lower.

Analyzing the obtained results, it was found that in the elaborated process of obtaining the legumes boiling water, not only protein substances but also an essential amount of minerals pass from the boiled grains. This allow to fortify fasting food products with minerals when boiling water is used as a foaming agent.

Keywords: Chickpeas, Lentils, Boiling water, Mineral content, Food fortification.

Acknowledgment: The research was funded by State Project 20.80009.5107.09 “Improving of food quality and safety through biotechnology and food engineering”, running at Technical University of Moldova.

❖ **FOOD AND NUTRITIONAL SECURITY**

The consumption of salt, sugar and trans fats and the nutritional profile in the Republic of Moldova

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Abstract

The consumption of salt, sugar and trans fats and the nutritional profile in the Republic of Moldova. Currently, the food systems of the Republic of Moldova face numerous challenges. They directly influence the population, increasing the indicators of malnutrition and the spread of non-communicable diseases, caused by an unhealthy diet. One of the most influential problems is the presence on the market and in the production chain of intensively processed products with a high content of salt, sugar and trans fats, respectively their exaggerated consumption by the population. In the Republic of Moldova, several programs involving the education of the population were implemented and aimed at reducing the consumption of salt, sugar and trans fats, but despite this, the population continues to have unhealthy eating habits. The objective of this study is to highlight the attitude of consumers in the Republic of Moldova regarding the amount of salt, sugar and saturated fat. Data collection was carried out between January and June 2022. The questionnaire aimed at identifying the food preferences of the adult population, analyzing their practices, attitudes, behavior and knowledge. The results showed that salt consumption is high and 64% of respondents do not take measures to limit it. Among the most favorite products are: cheese, salty sheep's cheese, pickles and sausages. Also, 50% of respondents consume white bread, which is considered a significant source of salt. A positive aspect is that 87% use iodized salt. Products with a high sugar content are part of the respondents' diet often in the case of 31.90%, sometimes in the case of 33.50%, and 7.70% always consume them. Only 1.20% declare that they do not use these products in their diet. The most alarming is the fact that 38.80% of respondents would find it very difficult to give up these products, and 47.30% do not take measures to control sugar consumption. Products with a high sugar content are part of the respondents' diet often in the case of 31.90%, sometimes in the case of 33.50%, and 7.70% always consume them. Only 1.20% declare that they do not use these products in their diet. The most alarming is the fact that 38.80% of respondents would find it very difficult to give up these products, and 47.30% do not take any measures to control sugar consumption.

Keywords: Salt consumption, Sugar, Trans fats, Nutritional profile, Republic of Moldova.

The use of spread in human food

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Abstract

New technologies and a wide range of dairy products, balanced in food and biological value, contribute to the improvement of the nutrition system. In this regard, there is undoubted interest in the creation of functional food products based on the achievements of modern biotechnology and nutrition science, which are intended for a targeted impact on the human body. Promising in the creation of qualitatively new dairy products, balanced in nutritional and biological value, the direction of combining dairy and vegetable raw materials is presented. Not so long ago, a new product began to appear on the shelves of the stores, similar to butter, but also to margarine. It is, of course, about the spread. The spread is really similar to both butter and margarine, but in the end it is a completely separate product consisting of vegetable and dairy fats. Unlike the already mentioned oil, this product does not burn and does not emit harmful carcinogens. Thus, it turns out that the spread is not only cheaper than oil in most cases, but also cleaner as a food product.

Preliminary study regarding the anthocyanins figs ethanolic extract stability

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Abstract

Fig (*Ficus carica* L.) fruits represent a rich source of polyphenols. From the phenolic compounds, anthocyanins represent an important group of water-soluble pigments with important roles in development of plant organs, pollination and peel's and pulp's color. They also have antioxidant, anticancer, anti-inflammatory and antimicrobial properties, being used from food to pharmaceutical industries. Ten fig varieties (1 Mai, Ploiești, Săvârșin, Fântanele, Rot negru, Stork, Viscool, Negru Șvinița, Passulana nera, Cilento nero) with color starting from brownie-green to black were analyzed for their amount of anthocyanins. The objective of this preliminary study was to investigate the anthocyanins' figs ethanolic extracts stability, because they have a low stability, being influenced by many factors. To quantify the total anthocyanins content the pH differential method was used. The extracts were analyzed after 24 and 72 hours and the results were expressed as equivalents of cyanidin-3-glucoside mg/ 100 g of fresh fruit. It was found that anthocyanin stability varied both between varieties, and the period of time as follows: Viscool variety had an increase with 3.24 mg/100g after 72 h than initial moment, instead Passulana Nera variety had an increase only with 0.85 mg/100g than the initial moment. Even if the Stork variety was found to have the highest content of cyanidin-3-glucoside mg/100 g, he exhibited a medium to low increase after 72 h compared to the other varieties.

Keywords: Anthocyanins, Cyanidin-3-glucoside, Ethanolic Extract, Stability.

Nutraceutical advantages and limitations of *V. paradoxa* fruit pulp and Shea butter

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Abstract

The Shea tree is an indigenous fruit bearing plant distributed within the African Shea belt. Apart from its nutritiveness, it has been used for several decades as an ingredient in many pharmaceutical formulations. In this review, the fatty acid profile of Shea butter and the proximate analysis of Shea fruit pulp is analysed alongside similar products. Therein, attention is focused on how these chemical compositions differ and the significance of these variations from nutraceutical and economic points of view. Examining the literature showed that Shea fruit pulp has the best overall rating (28%) as far as meeting the recommended daily intake (RDI) is concerned. Additionally, the pulp of this fruit contains much more vitamin C than other commonly consumed fruits. Although the unsaturated fatty acid content of Shea butter is significantly lower than that of Macadamia, Olive and Sesame oil, the unsaponifiable matter (USM) in the former is extraordinarily higher than most vegetable oils. USM are believed to possess anti-inflammatory and cholesterol-lowering properties. As a recommendation for future research, chemical analyses for USM should also be done wholesomely for all the constituents as compared to selective analyses which is the current trend.

Application of unconventional methods for the extraction of pectin from apple pomage

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Abstract

In the Republic of Moldova, apples are one of the most cultivated fruits. Apple pomace, generated as a result of apple processing, is an important source of functional compounds (carbohydrates, dietary fibers, including pectin, phenolic compounds, etc.), used directly in food systems. The functional compounds extracted from pomage are applied in various fields: food industry, pharmaceutical, cosmetics, etc. Pectin extracted from apple pomace is the most important polysaccharide used in the food industry as an additive that promotes increased viscosity and acts as a protective colloid and stabilizer in foods and beverages.

The aim of the research was to elucidate the impact of non-conventional extraction methods assisted by ultrasound (UAE) and microwaves (MAE), on the yield and properties of pectin from the pomace of Golden delicious apples.

In this research, apple pomace obtained after squeezing the juice from Golden delicious apples, dried and shredded to a granularity of $120 \pm 15 \mu$, was used, which were mixed with the aqueous solution of citric acid at different liquid: solid ratios (LSR) 10, 15, 20 (v/w) and at pH 1.5, 2 and 2.5. Ultrasound-assisted extraction was performed at a frequency of 37 kHz, for 15 and 30 min, at a temperature of $60 \pm 1^\circ\text{C}$, and in the case of microwave extraction, the magnetron power of 450 W was applied, for 5 and 10 min. Extraction yield, equivalent weight (EW), methoxy group content (OMe), degree of esterification (DE) and anhydrogalacturonic acid content (AUA) were determined. The mutual information analysis was applied regarding the influence of the extraction conditions on the analyzed parameters.

It was established that the yield of pectin increases with the decrease of the pH, with the increase of the extraction time and the LSR ratio (v/w). By the MAE method, the yield of pectin was 2 times higher than in the case of UAE extraction. The equivalent mass of pectin extracted by UAE and MAE decreases with decreasing pH, increasing extraction time and increasing the LSR ratio. The content of OMe in the sonicated samples is more increased compared to MAE. It is also shown that the OMe content decreases with decreasing pH and extraction time, but it depends less on LSR. It was found that varying the extraction parameters allow obtaining pectin with different content of methoxyl groups. The purity of pectin, expressed by the concentration of galacturonic acid, increases with decreasing pH, increasing LSR and increasing extraction time. The degree of esterification was not essentially influenced by the extraction method. The analysis of the main information demonstrated the different influence of pH on the analyzed parameters.

Thus, the non-conventional extraction techniques increased the quality of pectin, led to the reduction of extraction time, energy and reagent consumption, compared to the traditional extraction method.

Keywords: Apple pectin, Ultrasound, Microwave, Extraction.

Acknowledgement: The research was funded by State Project 20.80009.5107.09 "Improving of food quality and safety through biotechnology and food engineering", running at Technical University of Moldova.

❖ **FOOD CHEMISTRY, OENOLOGY AND BIOTECHNOLOGIES IN THE FOOD INDUSTRY**

The effect of brewer's spent grain concentration on the degree of maturation of bread sourdough

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Abstract

Brewer's spent grain is a secondary product of brewing production, which accumulates in large quantities and needs further disposal. Due to the high moisture content (68-75%), brewer's spent grain has a short shelf life and emit toxic substances into the atmosphere at the time of spoilage. The purpose of this research work is to study the microflora of sourdough obtained from white wheat flour and brewer's spent grain, as well as to identify the optimal concentration of used raw materials for its further use in baking. Brewer's spent grain can be offered in the production of healthy foods to enrich their nutritional value. It is known that brewer's spent grain are rich in B vitamins (B1, B2, B5), minerals (P, K, Mg) and essential amino acids (arginine, leucine, valine).

Dried brewer's spent grain, white wheat flour and distilled water were used to produce sourdough starter. Five types of white wheat flour and brewer's spent grain sourdough starter were studied: a reference sample of 100% wheat flour, 75/25%, 50/50%, 25/75% respectively and 100% of brewer's spent grain. The fermentation process took place at 27±1 °C for 168 hours. Every 24 hours the starter was renewed with nutrient medium consisting of the used ingredients.

Microbiological analysis of the flour mixture was done before fermentation - 0 hours and every 24 hours of fermentation. As a result, a significant growth of microorganisms consisting of *Streptococcus lactis*, *Lactobacillus casei*, *Lactobacillus acidophilus* and especially a significant number of *Saccharomyces cerevisiae*, typical for the microbiota of used wheat flour, was observed. With increasing the concentration of added brewer's spent grain in the starter a decrease in growth and activity of microorganisms, as well as a marked decrease in the number of *Saccharomyces cerevisiae* was observed. Thus, sourdough made of 100% brewer's spent grain is characterized by low content of microorganisms and lack of yeast. For sourdough made only on brewer's spent grain flour and water the presence of *Streptococcus lastis* and *Lactobacillus casei* is characteristic. The percentage of development of the microorganisms in this sample is 70 %. The most successful sourdough by its microbiological composition stands out 75/25% sample, which has 95% of microorganisms, most of which are *Saccharomyces* species yeast at the stage of multiplication. This sourdough is also characterized by the presence of *Streptococcus lactis*, *Lactobacillus casei* and a small amount of *Lactobacillus acidophilus*. The presence of yeast in the sourdough facilitates fermentation of carbohydrates and produces carbon dioxide, which loosens the dough, and the presence of lactic acid bacteria contributes to the rich flavor and aroma of the finished product. Baking trials showed that the optimum concentration of a mixture of wheat wallpaper flour and brewer's spent grain to obtain starter is a concentration of 75/25%, respectively. The resulting products have a pleasant aroma of cereal products, with a well-developed porosity, with a sour taste and have a long shelf life of freshness.

Keywords: Brewer's spent grain, White wheat flour, Barley malt, Sourdough microbiota, Spontaneous fermentation.

Acknowledgment: The research was funded by State Project 20.80009.5107.09 "Improving of food quality and safety through biotechnology and food engineering", running at Technical University of Moldova.

Role of enzymes in Enhancing Wine Aroma

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Abstract

The aromatic potential of grapes is characterized by the existence in berries of two types of flavors: free (odorous) and related to sugars (non-odorous), also known as "flavor precursors" because they have the ability to turn into volatile compounds, participating in the formation of the aromatic complex in wines after processing the grapes. This characteristic of the wine is essentially determined by the composition of the varietal aroma. Concentrations of precursors are usually higher than their free volatile forms, thereby indicating the potential for increased aroma upon release.

Addition of β -glucosidases can enhance the aromatic profiles of some wines by hydrolyzing the β -1,4 bond, liberating the free volatile component from its conjugate. Most pectolytic enzymes have some β -glucosidase activity, therefore can catalyze hydrolysis. These have the greatest impact on high-terpene white grape varieties.

Flavor enhancing enzymes act on the skin of white grapes and are used for two reasons. The first would be to increase both the amount of quality grape must, as well as the total amount of juice per ton of crushed grapes. The second reason is to extract more varietal aromas from the grape skin and thus increase the aromatic potential of the wine.

Pectic enzymes release the bindings and thus increase the aromatic potential of monoterpenes. These enzymes work best with grape varieties having high monoterpene levels. Glycosidases release aromatic compounds linked to sugars and intensifies cell lysis and increases the extraction of aromatic precursors from the berry. Nowadays in many commercial enzyme preparations, glycosidase activities occur as side activities along with pectinase and glucanase activities.

The use of enzymes during maceration leads to the optimization of the varietal flavors increasing process, resulting in wines with superior sensorial characteristics, the values of terpene compounds increasing by about 40%. Moreover, the use of enzymatic preparations leads not only to significant increases in terpenes in wine, but they also are richer in esters, have very low values of acetaldehyde and volatile phenolic compounds.

In conclusion, use of enzymes during maceration leads to increased efficiency due to increased content of compounds responsible for the profile and aromatic typicality of wines, which is reflected through a value increase of the wine quality.

Redox processes in wines - measures to reduce the effects of oxidation

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Abstract

The quality of the wine reaching the consumer is decisively determined by the redox processes, carried out in the fermentation processes and in the evolution of the wine. The redox potential of wine reflects the state of balance between the concentrations of oxidized and reduced substances and, through it, sensory expression, stability, evolutionary pathways. Redox potential refers to a concrete redox couple. As many redox couples are present in wines that intervene with its input, the measured redox potential of the wine represents a mixed potential. In wines, between the redox partners of the couples, reversible and irreversible equilibria are found. With the platinum (inert) electrode, the redox potentials of the reversible and not the irreversible equilibria are determined. Therefore, the measurement result refers to a mixed redox potential. Although it was considered that the reduction potential of wines indicates their redox state, this fact is not eloquent, since it should reflect the degree of oxidation of polyphenols, the most easily oxidized constituents. However, there is evidence that polyphenols and quinones do not contribute to the redox potential, which is generated by the oxidation of ethanol at platinum electrodes and largely depends on the oxygen concentration at the time of measurement. In turn, the concentration of dissolved oxygen is a function of the matrix, in which it is dissolved, and the temperature. At 20°C, approximately 8.4 mg/L is solubilized in wine, 6.9 mg/L in must and 15 mg/L in ethyl alcohol (66%). Since the solubility of oxygen is higher in water and alcohol, it follows that the other components of the must and wine have some impact on the O₂ concentration. Thus, the redox potential is not decisive for the redox state of the wines, but the redox potentials of the likely reactant couples provide useful information on the possible mechanisms involved in wine oxidation. The reaction of polyphenols with oxygen is mediated by iron and copper and accelerated by sulfite, which then reduces the quinones that are produced back to the polyphenol. The objective of this paper is to elucidate the redox processes that occur throughout the winemaking process, their role on wine quality.

Optimization of the sulfuration process of wine products with potassium metabisulfite at all technological steps

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Abstract

Sulfitation of wine products is a routine process widely used in the wine industry at various stages of production and regulated by normative and technological documents of wine products production. Disposing of the needs and technological possibilities of industrial enterprises, sulfitation process of wine is carried out using sulfur dioxide as sulfur source: sulfuric acid, native sulfur, liquefied sulfur dioxide and salts of sulfuric acid (meta - and sulfites). The sulfitation process of wine products with the use of salts of sulfites - potassium sulfite ($K_2S_2O_5$, E 224) has gained a large spread not only in craft winemaking but also in large wineries. At the same time, the basic disadvantage of this process is the exogenous enrichment of wine products with potassium ions, and the reduction of mass concentration of total titratable acids, which leads to the risk of crystalline instability resulting from the precipitation of tartaric salts, limiting the range of use of this process at the first stages of the manufacture of the wine products.

Under laboratory conditions, a process for the sulfitation of wine products has been developed by reducing the risks of crystalline instability at all stages of their production, with the use of potassium sulfite solutions. The process provides a prior preparation of a mixture of 100 g/dm³ potassium sulfite solution and tartaric acid of 300 g/dm³ solution at rapport 2:1 (by volume) with intense stirring. The prepared solution, based on potassium sulfite and tartaric acid, is used for the sulfitation into wine products, after the pre-separation of the formed precipitate, at all stages of their production.

Keywords: Crystalline instability, Potassium sulfite, Wines, Sulfitation.

❖ **NEW HEALTHY AND SUSTAINABLE FOOD PRODUCTS AND PROCESSES**

The active biological potential of triticales in the production of a functional beverage

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Abstract

Global and regional climatic, energy and food crises impose on the current scientific society the task of acquiring new fundamental and applicative knowledge in highlighting, evaluating and directing the genetic and physiological mechanisms of the production process and the ecological resistance of plants. One of these examples is the triticale species - it has a relatively short evolution constituting a species of synthesis by the amphiploidisation a hybrid between wheat (*Triticum* sp.) and rye (*Secale cereals*) for the first time by scientist Wilson in 1875. Optimized characteristics described by: increased production capacity, rapid adaptation to environmental conditions, considerable agricultural potential and high protein content with a balanced amino acid level, agronomic parameters and enhanced quality attributes, etc. have enabled tritium crops to be harnessed in human food, industry and animal feed.

Triticale species homologated in the Republic of Moldova Inger 35 cultivated on the experimental field of the Institute of Genetics, Plant Physiology and Plant Protection was studied in the Biochemistry Laboratory of the Genetic-Vegetable Resources Center and Bioalimnet Platform of the University of Dunarea de Jos, Galati. Research aimed to obtaining a functional drink based on triticale species, with the optimization of its biological potential by controlled germination. The fermentation process of functional drink was carried out by the *Lactobacillus plantarum* species (concentration $3,2 \cdot 10^9$ UFC/ml) for 4 hours by administering 5 g honey per 100 ml. The obtained beverage was kept for 40 days at the temperature of 4°C and in the dynamics every 7 days the specific and technological parameters were determined. The experimental results described a growth dynamic of lactic acid (0,5 g/100 ml beverage), log UFC / ml (0,42) and the descendant content of reducing sugars, starch and pH. The high content of antioxidants, obtained by fermentation and maintained at high level during storage, has attributed to this drink the title of functional food quality with a benefic potential for human health. The number of viable *Lactobacillus plantarum* cells was maintained at high level during the conservation, thus giving the drink the quality of probiotic food and providing the human body with a quarter of the daily need for soluble and insoluble fiber at a consumption of 150-200 ml/day. The optimization of the functional beverage production process by mathematical treatment of the results made it possible to establish the technological scheme that keeps the highest content of polyphenols, reducing sugars, fibers and NTG for 35 days of conservation.

Keywords: Functional drink, Germination, Triticale, Technological process.

New trends in food industry - plant based meat substitutes

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Abstract

According to the last results based on social questionnaires, the popularity of alternative meat is growing. If a few years ago the consumers were prejudiced against plant-based meat, now the consumers are ready to include it in their diet. This trend opens up new opportunities for manufacturers to create interesting, promising products. The consumer's tendencies are connected to a large spectrum of factors. The consumers firstly are interested in new products, desire to diversify nutrition, fashion for light, healthy products. Nowadays people are ready to consume plant analogues. A "non-meat" is a product not for vegans, but also for anyone who wants to expand their diet. The other tendency is connected to a new request for healthy lifestyle products - healthy, but the products must remain tasty. Nutritionists recommend consuming meat products in moderation, since meat takes longer to digest than other products in the human body. The experience of European companies has shown that it is possible not only to produce semi-finished products based on plant raw materials, but also to make them as similar in taste, smell, appearance and consistency as meat products. Active contribution to climate protection is the other factor that determines the consumers to become Eco-friendly and have a very sensible attitude to the environment and ecology. Due to this tendency businesses in the world are becoming more humane and open and are contributing to the fight against ecologically global problems of the planet.

As it is mentioned in the articles different plant substitutes may be used in plant-based meat products. These products must be of excellent quality, increase the nutritional value of the final product and completely imitate meat fiber. Only in this case it will be possible to create products that compete in quality. For this reason, the SUSPLANT project partners from Sweden, Poland, Lithuania, Ukraine and Republic of Moldova had created a public questionnaire to identify the needs of their country's consumers in the new plant-based meat products. The questionnaire was based mainly on questions concerning the food culture of the consumers in different countries and if their society is ready to change the nutrition habits towards plant-based meat products.

Keywords: Consumer, Meat, Plant, Protein, Substitute.

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❖ **CLIMATE CHANGE AND FOOD SAFETY: EFFECTS OF CLIMATE CHANGE ON FOOD SAFETY
ACROSS FOOD SYSTEMS**

Phenology of the native species Fetească Neagră in Moldova under the background of climate change

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Abstract

Climate change is one of the main challenges facing agricultural production, especially in the context of global temperature rise, some extreme weather (frost, drought and other disasters) will cause serious damage to agricultural production. Viticulture and winemaking are important industries in the Republic of Moldova, contributing significantly to the country's society and economy. Wine grapes are particularly sensitive to climate change because climate affects the character and quality of wine through changes in grape composition. The viticulture industry in Moldova also faces major challenges under conditions of climate change, where the adaptation of vines to climate change is of particular interest. The vines adapt to new climatic conditions through changes in phenological phases. In the Republic of Moldova, the distribution of vineyards is characterized by a high degree of dispersion, variability in topography and landforms, and diversity in climatic conditions.

This study observes the phenological phases of the local variety FN in three geographically protected production areas of Moldova in the last four years (2019-2022), and analyzes the main climate indicators such as temperature and rainfall and the multi-year averages to show that the grapevines are under short-term climate change conditions. Changes in phenological periods. The purpose of the study is expected to provide a reference for viticultural practices in Moldova and to mitigate the impact of climate change on viticulture.

❖ **ENVIRONMENTAL SUSTAINABILITY AND CIRCULARITY FOR INDUSTRIAL BIO-BASED SYSTEMS**

Impact of substrate adsorption behaviour for emerging pollutants in constructed wetlands

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Abstract

Emerging pollutants (EPs) have become a considerable concern for human health and all biota, thereby endangering the health and lives of the whole environmental system. For example, pharmaceutically active compounds, including over-the-counter medications, have more frequently been found throughout water bodies around the world. Moreover, a pandemic caused by the SARS-CoV-2 virus has entailed increasing the use of various chemicals and compounds, including Pharmaceuticals and Personal Care Products. Therefore, the risk of environmental damage has received extensive attention in recent years. This research aims to investigate, evaluate, and compare the role of two different substrates, sand and perlite, within the waste products removal process regarding the adsorption capability of EPs, including ibuprofen (IBU) and diclofenac (DCF) in constructed wetlands (CWs). The comparative results showed that perlite provides a superior condition for plant growth versus sand and indicates that the size difference of the plant shoots and roots length is 20% and 16%, respectively, in favor of perlite. In addition, the removal efficiencies of TOC, PO₄³⁻, and NH₄⁺ have shown the best sorption results using perlite increased treatment process by 5%, 25%, and 42%, respectively, compared to sand. Furthermore, the influence of perlite also contributed to higher IBU and DCF removal efficiency. It was 88.57% and 63.48% for perlite, which is higher than the adsorption ability of sand by 23 and 27%, respectively. Besides, the perlite significantly boosts the contents of IBU in the rhizosphere soil and raises the presence of DCF in plant roots. Moreover, the contents of IBU and DCF metabolites (2-OH IBU and 4-OH DCF) in the plant roots were also higher. It can be concluded that perlite may be contributing to the high removal efficiency of emerging pollutants, including pharmaceuticals. Thus, the characteristics of this substrate are promising due to its effectiveness in emerging pollutants removal. This paper considers the components, pathways, and impact of pollutants on the ecosystem. The presumed mutual influence and co-dependency of the elements of nature can shed new light on the existing problem and may contribute to solving it. Introduction Emerging pollutants have attracted increasing concern due to dramatic growth in population and rapid industrialization in the 20th century worldwide. Large-scale production and use of EPs as goods, services, personal care products, pharmaceuticals, and further discharge of their processed products into the environment are some of the crucial causes of ecosystem disturbance in the 21st century. Moreover, water and air pollutions create a high load on the human immune system. Consequently, they have an extremely negative effect on all body such as increased morbidity and mortality and different kinds of allergies (Manisalidis et al., 2020). Sources of EPs are agricultural, urban, and rural areas. The emerging contaminants, including personal care products, are known as (PPCPs), Non-steroidal anti-inflammatory drugs (NSAIDs), hormones, pesticides, plasticizers, industrial and household products, metals, food additives, solvents, flame retardants, and other organic compounds in the water generated mainly by human activities (WWW.UNESCO.ORG, 2019). For instance, PPCPs such as detergent for the washing machine may anticipate ensuring daily human life in terms of comfort: time saver and alleviate manual labor. While on the other hand, their usage has environmental harming by polluting and dwindling supply of resources and destructively altering the climate condition. Another significant negative contribution is that washing machines require high energy consumption from fossil fuels. Fossil fuels are burning for energy production, at the same time producing carbon dioxide and greenhouse gases. After the penetration into the air, they aggravate the global warming crisis. Furthermore, beyond the existing issues, the onset of the COVID-19 pandemic enhanced PPCPs production and medical consumables and caused an extremely high discharge of waste in the ecosystem. Hence, the consequences for the environment by releasing the debris, including non-biodegradable plastic syringes, pose additional challenges for ecologists. Wastewater treatment plants (WWTPs) focus on removing contaminants from wastewater and, by effluent,

discharge it into the water cycle. However, Corada-Fernández et al. (2017) have noted that most WWTPs were not designed to eliminate PPCPs, including NSAIDs. Therefore, in the world, especially in big cities, the overflow of the sewage system causes a significant content of EPs in the groundwater and surface water. So, the occurrence of EPs in the environment their detection in different combinations is constantly reported and accounted for worldwide. Once released into the environment, the degradation process begins. Unfortunately, the behaviour of many EPs is still insufficiently understood. Therefore, it can be out of control and cause or aggravate undesirable consequences (Llamas et al., 2020). Therefore, CWs have been identified as a sustainable wastewater management solution worldwide. The components of CWs included: substrates, emergent/submerged vegetation, and water. The substrate plays a pivotal role in the adsorption within the pollutant's removal process. But even here, there are still many unexplored gaps because of a lack of familiarity and experience with this methodology and availability (Nelson et al., 2007). Large-scale production and consumption create a heavy load on conventional WWTPs, which are not designed for many pollutants, including medicals that appear in large amounts in the water. Additionally, the COVID-19 pandemic raised the release of a considerable amount of medicine in the sewage system. Thus, an urgent need arose to use CWs in terms of efficiency, economy, and ecologically friendly application. As noted above, NSAIDs' removal method in CWs, including IBU and DCF and sorption efficiency of given absorbent, are still not thoroughly studied. Their further fate is still not well understood. Therefore, the primary purpose of this research was: - To investigate and compare the adsorption behaviour of the chosen substrate: sand, and perlite for selected EPs in VSSF CWs. -To analyze and estimate their role and purification ability in CWs for removing EPs, including pharmaceuticals IBU and DCF. The research may provide data and knowledge about the purification process. In addition, the obtained data can be helpful in improving methods of elimination of EPs in CWs and mitigating their impact on aquatic and human life. Conclusively, the study can shed light on issues related to the impact of EPs on the ecosystem to contribute to future research. Initially had planned to study both the adsorption and desorption capacity of sand and perlite. Unfortunately, due to the unpredictable situation of the COVID-19 epidemic in the Czech Republic, the desorption capacity of given substrates could not be achieved. Conclusion The five months of study have demonstrated by our results that the type of substrates may play a significant role and have a considerable influence on the biomass of plants. The analysis, which used small-scale experimental VFCWs, illustrates different results for each compound. The experiment has shown that perlite as an adsorptive substrate plays a critical function in CWs. Due to its porous structure, perlite contributed to the faster growth of wetland plants. It promoted the development of all plant tissue, thereby enhancing the surface area for the absorption of metabolites, which was beneficial by the plant nutrient uptake process. The given outcome has agreement with Stottmeister et al. (2003) that soil has a crucial aspect of the interaction taking place in the rhizosphere, such as interconnection and synergistic effect between rhizomes and the soil matrix. However, the overall picture is not yet clear enough since there are still multiple gaps in the study of the toxicology of pharmaceuticals, their transformation products, and their interaction with other inorganic contaminants in the environment. Furthermore, the shortcoming of our experiment was that it was carried out in a given climatic region limited by the climatic conditions of the current season, in particular temperature, lighting, and humidity. Moreover, the measurement error should be taken into account since perlite is only one of the chain elements in the removal process. Additionally, microbial interaction was not evaluated, and the synergistic/antagonistic effect of all participants involved in a given remediation process was also not considered. Thus, the study conducted above assists in getting an expanded practical knowledge concerning the aspect involved in the adsorption mechanism. It can be summarized that substrate plays a crucial role in the removal process. Our study has demonstrated that perlite coped better with issues and obstacles than the sandy filter. Therefore, it has the potential to expand its usage in the adsorption process. Unfortunately, perlite is a non-renewable resource since it naturally occurs. Nevertheless, due to its low cost and reuse ability, perlite is the most promising filter material for removing given emerging pollutants, including pharmaceuticals.

Keywords: Emerging pollutants, Pharmaceutical and personal care products, Constructed wetlands, Adsorption, Substrates.

Research on advanced 3D hybrid composite construction materials with the utilization of agro-waste fibers and biomass for thermal and acoustic insulation

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Abstract

The production, storage, efficient use, and prevention of waste related to energy are of great significance in today's world, considerably impacting the economies of countries and their relationships and even causing wars. Conservation of energy in general and preventing heat loss is a major concern. At the same time, noise pollution is one of the largest environmental problems in the modern industrial world. The use of novel composite materials showing advanced thermal and acoustic insulation for architectural and human design has become crucial, with the consumption of these materials serving as an indicator of progress in society. As composite materials are composed of a mixture of materials, their recyclability is also a key concern. Current research focuses on studying the thermal, acoustic, and mechanical properties of polymer-based composites reinforced with three-dimensional structures (spacer). The use of natural polymers, biomass, and agro-waste fibers in these structures can enhance the recyclability of the composites. The trapped air between the top and bottom layers in the composites leads to excellent heat insulation properties, and the sound transmission difference can turn them into powerful sound insulators. The deviation of fibrous structure from the center in the composites provides good cohesion properties. The hybridization of natural and synthetic fibers like glass in the fabric of three-dimensional structures can significantly improve their mechanical properties. We hypothesize that tests would indicate how it is possible to achieve desirable thermal, acoustic, and mechanical properties simultaneously by controlling the composition, thickness, and density, as well as the mixing ratio of the composites.