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CONFERENCE THEMES:

1. **Food Engineering and Technology**
2. **Food Safety and Nutrition**
3. **Food Chemistry, Oenology and Biotechnology in the Food Industry**

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Institutional Project, subprogram 020405 – *Optimization of food processing technologies in the context of the circular bioeconomy and climate change;*

23.70105.5107.05 – *Exploratory analysis of food security in the Republic of Moldova based on metrics of sustainable and nutritional quality (SNuQ) of food products, implemented at the Technical University of Moldova.*

Contents:

SECTION I:
Food Engineering and Technology

"GREEN" EXTRACTION, STABILIZATION AND VALORIZATION OF THE BIOACTIVE COMPONENTS OF JOSTA AND PUMPKIN

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The concern for the development of functional foods has generated the need for new food ingredients with the role of maintaining and improving health. The key areas identified are: creating new functional nutritional elements from traditional raw materials and reducing/replacing synthetic additives; optimization of functional nutritional elements from raw materials and foods; increasing the efficiency of the nutritional elements of raw materials and food. The extraction of natural colorants and antioxidants from plant raw materials for use in the food and pharmaceutical industries presents an extremely current topic. The major problem lies in the perishability of the raw materials and the need to preserve the functionality of the biocomponents during the extraction and purification of the extracts, as well as during the incorporation of the extracts into the food matrix. The aim of the research was the development of efficient "green" extraction processes of bioactive components - polyphenols, carotenoids of vegetable origin from josta (*Ribes nidrigolaria*) and pumpkin (*Cucurbita maxima*) for application in the food industry. To achieve this aim, the following actions were carried out.

Ultrasonic and microwave pretreatment processes were applied to optimize the extraction. The influence of the application duration of ultrasound and microwaves on the extraction yield of bioactive compounds was analyzed. Fractions of bioactive compounds were purified, concentrated and stabilized for further application in the food industry. The influence of technological processes (temperature, pH, ionic strength) on the stability of bioactive compounds was analyzed in terms of staining power and antioxidant activity. The analysis of the bioactive components was carried out according to international methodologies. The antioxidant and antimicrobial properties of the obtained extracts were analyzed in model systems, *in vitro* and *in situ*, on different food matrices.

It has been shown that plant extracts obtained under different conditions can be used in food production, offering a wide spectrum of colors.

Keywords: *Ribes nidrigolaria, Cucurbita maxima, ultrasound-assisted extraction, microwave-assisted extraction, bioactive compounds, color, food matrices*

Acknowledgments. This work was supported by a grant from the Francophone University Agency (AUF) ECO 2023 DRECO-7859, project "Extraction 'verte', stabilisation et valorisation des composants bioactifs de *Ribes nidrigolaria* et *Cucurbita maxima*".

ADVANCED TECHNOLOGIES FOR ENHANCING THE NUTRITIONAL POTENTIAL OF ROSE HIP IN FUNCTIONAL FOODS

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Rose hip *(Rosa canina)*, known for its potent bioactive compounds, including vitamins C, A, E, and diverse flavonoids, has gained significant attention in the functional food sector. This study examines the potential of rose hip extracts as functional ingredients in the food industry, aiming to enhance product nutritional value and extend shelf life.

Emerging methods such as enzyme-assisted extraction, supercritical CO_2 extraction, and freeze-drying are explored for their efficiency in preserving antioxidants and minimizing nutrient degradation and enhancing the bioavailability of key nutrients in rose hips, such as vitamins C, A, and E, flavonoids, and carotenoids. Incorporating rose hip into functional foods such as beverages, snacks, and supplements boosts health benefits, including antioxidant, anti-inflammatory, and immune-enhancing effects.

Research in the field also demonstrates that the synergistic effects of rose hip with other natural ingredients to create multifunctional foods that contribute to health benefits such as anti-inflammatory, antioxidant, and immune-boosting properties.

Keywords: *rose hip, functional food, nutritional value*

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ASPECTS OF PROTEIN AGGREGATION AT THE ELECTROACTIVATION OF WHEY

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The research on protein fractionation at the electroactivation of whey requires to understand the mechanisms of protein aggregation and the recovery of protein mineral concentrates (PMCs). The different and uneven extraction of protein fractions in PMC upon electroactivation of different whey types is conditioned by the properties of each individual fraction and their behavior at the electroactivation. Accumulation of hydrogen ions at the cathode surface as a result of water dissociation at the electroactivation of whey, leads to multiple aggregation reactions of whey proteins and their recovery in PMC. Whey proteins have amphoteric properties, and due to oscillatory motions in the electric field and activation of hydrophilic radicals of aminoacids, protein "unfolding" occurs. Simultaneously the deterioration of the hydrating film, due to the mineral content of whey and the migration of bivalent ions from the anode cell initiates the salinization of proteins and their extraction in the form of foam accompanied by ion flotation, generated by the release of hydrogen at the cathode surface.

These conditions leads to the formation of different protein aggregations and the extraction of protein fractions under certain technical and technological processing conditions.

Protein aggregation occurs upon the activation of sulfhydryl groups -SH, through the interaction of S-S bonds where proteins of different molecular weights are involved and contribute to the formation of high-molecular protein compounds as the sulfhydryl groups are activated from the surface of the globule to the interior of the globule, causing unfolding of the globules. Protein globules, which form the colloidal phase of whey, during electroactivation is deteriorated, characterized by the transition of aquacomplexes into hydrocomplexes, confirmed by the increase of the pH values and the decrease of the redox-potential.

The pH values increase in the cathode cell and the whey proteins respectively pass through the isoelectric point pI, causing their sedimentation.

The electroactivation of different types of whey, allows the electrofractionation of serum proteins, and the recovery of PMC with predetermined protein content depending on the processing regimes, geometrical and technical parameters of the electrolyzers. The extraction of the protein fractions is carried out simultaneously with the isomerization of lactose to lactulose.

Keywords: *aquacomplexes, electrofractionation, hydrocomplexes, isomerization, protein mineral concentrates*

Acknowledgments. The work was carried out within the framework of the subproject: 011203 ”Research and development of the advantages of electroconvection, electroactivation and magnetic fluidization at enhancing of heat transfer and processing”.

CALCULATION OF THE HEATING DEPTH OF A CAPIARY POROUS BODY DURING MICROWAVE DRYING

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Introduction

A fairly common method of dehydrating food products is drying, in which thermal energy is supplied to the surface through convection, conduction and radiation. One effective method is microwave drying.

Material and methods

The mechanism of microwave drying is quite complex - microwave energy is absorbed by two mechanisms: ionic conductivity and dipole relaxation. Dipole relaxation is the main mechanism for substances with high humidity. When a dielectric material is placed in an electric field, ions, atoms and molecules are excited and move under the influence of the electric field, causing them to collide and convert kinetic energy into thermal energy.

Results

A mathematical model of microwave heating for capillary porous bodies will make possible to obtain new approximate analytical solutions enabling to accurately determine the influence of various process parameters, such as the penetration depth of electromagnetic waves, the magnitude of the electric field strength, processing time, etc. on the drying intensity. One of the most important factors determining the uniformity and efficiency of microwave heating is the penetration depth [1, 2]. We modeled and calculated this parameter for a product with 40% moisture content, which is about 2-6 cm.

Conclusions

The resulting numerical solution for the penetration depth of microwave heating is an important parameter of the dehydration process of capillary porous materials and serves as a basis for evaluating the accuracy of the solutions of other models.

Keywords: *microwave heating, capillary porous body, dielectric constant, slope angle, penetration depth, humidity*

Acknowledgments. The described results were obtained thanks to the research carried out *within the project: 020405. Optimizing food processing technologies in the context of the circular economy and climate change.*

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DEVELOPMENT AND QUALITY ASSESSMENT OF A NOVEL PLANT-BASED ICE CREAM FROM WALNUT MILK USING RESPONSE SURFACE METHODOLOGY

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Introduction. Plant-based frozen desserts are gaining popularity in recent years with consumers. Beyond health reasons, plant-based alternatives address consumers' concerns about animal mistreatment and have a lower carbon footprint [1]. In this study, the effects of walnut oil, fibers and walnuts/water ratio were selected to develop plant based ice cream and to investigate their effects on the physicochemical, sensorial properties and antioxidant potential of plant-based ice cream samples in comparison to dairy ice cream.

Material and methods. Development and optimization of the formula and technology for a plant-based ice cream from walnut milk using STAT-EASE 360 software was performed [2]. This program allows to optimize the main technological process and to find the most appropriate ratio of independent variabilities. All ice cream formulations with different amount of fibers, walnut oil and ratio of walnuts/water were analysed for pH, acid value, texture parameters, color, total polyphenol content, DPPH antioxidant activity and sensory characteristics.

Results. In this research, fibers (1.32…4.68%), walnut oil (8.30…16.7%) and walnut/water ratio (1/2,5…1/13,5) were used in the formulation of plant-based ice cream and their effects on the physicochemical and sensory properties were investigated. The optimum levels of fibers, walnut oil and walnuts/water ratio were determined by response surface methodology. Incorporation of walnut oil and using high ratio of walnuts/water increased acidity, melting rate, antioxidant potential, but decreased melting rate of ice cream. Results showed that the incorporation of fibers at 3%, resulted into ice cream with suitable texture parameters and pleasant sensory characteristics.

Conclusions. This study provided a novel and efficient way to manufacture acceptable plant-based ice cream from walnuts. The incorporation of fibers, walnut oil and using of different walnuts/water ratio in ice cream formulations had an impact on sensory properties, resulting in a variation on physicochemical properties and antioxidant potential.

Keywords: *ice cream, response surface methodology, quality characteristics, sensory acceptance*

Acknowledgments. The research was supported by Institutional Project, subprogram 020405 “Optimizing food processing technologies in the context of the circular bioeconomy and climate change”, Bio-OpTehPAS, being implemented at the Technical University of Moldova.

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DEVELOPMENT OF THE PRODUCTION TECHNOLOGY OF DIVINE "SUCCES" FROM NEW SELECTION AND LOCAL VARIETIES

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The world wine market is characterized by great competition, and one of the solutions to remain competitive is to emphasize diversification and the creation of a unique product with authentic qualities of the production area.

In this context, it is important to review the traditional assortment of grapes and to include in the economic circuit the local varieties and those of new selection, an absolutely necessary fact in the conditions of the climate changes of recent years [1].

The purpose of the research was to study the technological potential of local and new selection grape varieties for the production of high-quality wine distillates.

The researches were carried out within the IP Scientific-Practical Institute of Horticulture and Food Technologies, during the years 2018-2023. The grapes of new selection (LuminiTa, Alb de OniTcani, Distil) and local (PlAvaie, Zghihara de HuSi) varieties were harvested from the institute's plantations and processed in the microvinification section. The Aligote grape variety served as a control.

The physic-chemical indices of the obtained wines and distillates were determined according to the standardized methods and the OIV methods (including using gas chromatography method). The distillations of the raw material wines were carried out at the distillation installation with periodic direct distillation operation.

The raw material wines obtained from the researched varieties were physic-chemically analyzed and then distilled. The obtained results demonstrate that all young wine distillates, according to the physic-chemical indicators, fall within the requirements of the SM-312 norms. The wine distillates were aged on Moldavian oak wood under laboratory conditions. After 4 years, a blend obtained from distillates of new selection and local varieties of 4-year-old was prepared.

As a result of the research carried out, the Technological Instruction for the manufacture of divine "Succes" of 4-year-old (IT MD 67-40582515-133: 2023) was developed.

Keywords: *distillates, oak wood, physic-chemical indicators, technological instruction, white wine*

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EFFECT OF COMPRESSION MODES ON STRENGTH AND ABRASION OF TABLETS

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Introduction. The aim of the research is to determine the impact of the number of compression cycles and turret rotation frequency on the strength and friability of tablets.

Materials and methods. Two tablet samples manufactured on an industrial rotary press with rotor rotation frequencies ranging from 30 to 80 rpm were investigated. Tablet strength was assessed by destructive stress in the diametrical direction, and wear resistance was measured by the percentage of mass lost during processing in a rotating turret.

Results. The decrease in tablet quality is attributed to product sticking to the press tool surface, increased surface roughness, friction coefficient, and adhesive strength. Consequently, the tablet's outer layer exhibits lower strength properties and is prone to rapid deterioration. The reduced strength at higher rotor rotation frequencies is explained by decreased dwell time in the die and higher ejection speed, which lowers the strength of its outer layers. Increased tablet wear affects subsequent manufacturing operations: dust accumulates in tablet feed channels for blister packaging, hindering their movement, and tablets lose mass during coating application in turret-type machines, among others. Decreased tablet strength leads to its fragmentation during various technological operations and storage.

As the rotor rotation frequency increased from 30 to 80 rpm, tablet strength decreased by up to 10%. The most significant reduction in strength was observed at rotor rotation frequencies of 60–80 rpm. Wear resistance in this range increased intensively from 0.2% to 1.2%, exceeding both pharmacopoeial (1%) and recommended (0.5%) standards. After 300,000 compression cycles, tablets lost up to 8% of their strength. This is because at high force of pushing out, the outer layer of the tablet is destroyed by the high friction forces of the tablet on the die surface. The outer layer of the tablet is then excessively abraded in the subsequent processing and finishing operations. This type of defect negatively affects the coating process in drum and fluidized bed machines, transportation between equipment, and during blister packaging.

Conclusion. For the tablets used in the study on the Korsch XL 400 tablet press, the optimal rotor rotation frequency was determined to be 50 rpm. Increasing the rotation frequency, and thus productivity, is achievable through more frequent polishing of die and punch surfaces.

Keywords: *tablet, compression, quality, strength, wear resistance*

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ESTIMATION OF NON-EQUILIBRIUM HEAT TRANSFER LOSSES IN A RECIPROCATING COMPRESSOR

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Introduction

The article addresses a key topic in mechanical and thermodynamic engineering, focusing on the energy losses generated by unbalanced heat transfer in piston compressors. This type of compressor is widely used in various industries, and a detailed understanding of heat transfer processes and associated losses is crucial for improving thermal efficiency. The study provides an in-depth analysis of the thermodynamic processes within the compressor, utilizing temperature-entropy (T-S) diagrams to illustrate heat losses and their impact on overall performance. Mathematical models and formulas are detailed for calculating energy and volumetric losses, as well as the coefficients of thermodynamic and mechanical efficiency. This article offers a solid theoretical foundation for optimizing the operation of piston compressors and can contribute to reducing energy costs and improving the performance of compression systems.

Materials and methods

In this study, mathematical and analytical models were used to estimate heat and energy losses in piston compressors under unbalanced heat transfer conditions. Thermodynamic equations and heat transfer laws were applied to assess the impact of these losses on compressor efficiency. Additionally, a temperature-entropy (T-S) diagram was utilized to analyze thermal variations and volumetric losses. The loss calculations were performed using the finite integral transformation method.

Results

The results of the study show that heat and volumetric losses in piston compressors significantly affect thermal and mechanical efficiency. Unbalanced heat transfer was identified as the primary cause of efficiency reduction, with volumetric and temperature coefficients being influenced by energy losses. The mathematical models provided an accurate estimation of these losses and offer directions for improving performance.

Conclusions.

The study demonstrated that unbalanced heat transfer in piston compressors leads to significant energy losses, affecting overall system performance. Optimizing heat transfer and reducing volumetric losses are viable solutions for improving compressor efficiency. The models and methods presented in this article provide a solid foundation for enhancing compression processes.

Keywords: *unbalanced heat transfer, energy losses, compressor, thermodynamic efficiency, volumetric losses*

Acknowledgments. The described results were obtained thanks to the research carried out within *the project: 020405. Optimizing food processing technologies in the context of the circular economy and climate change.*

INCREASING THE EFFICIENCY OF THERMAL AGENT DISTRIBUTION IN TUNNEL DRYING INSTALLATIONS

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Introduction

The food industry includes a wide spectrum of processes that are applied to the processing of raw materials. One of the basic technological processes for thermal processing of agro-food products is drying. The diversity of drying plant types is described by several criteria, such as: mode of operation, mode of heat transmission, nature of the drying agent, according to construction type, etc. However, the drying process involves increased expenditure of thermal energy. Tunnel-type drying installations are no exception in this sense, the efficiency of which directly depends on the technological parameters during the dehydration process (heat agent speed, temperature, air flow, etc.). In order to ensure these parameters, it is necessary to ensure the uniform distribution of the thermal agent over the entire section of the drying chamber, in order to uniform the drying of the product over the entire height of the cart with the product in the installation.

Materials and methods

For this purpose, a device was designed in 3D that ensures the uniform distribution of the thermal agent over the entire geometric volume of the tunnel. The SolidWorks 3D design software was used for its development. Initially, each element was designed separately using the "Part" design tool. The 3D assembly of the constructive elements was carried out with the help of the "Assembly" design tool. The mobility of the functioning of the assembled elements was elaborated by the "Motio Study" command.

Results

As a result, the given mechanism ensures the uniform distribution of the thermal agent in the cross-section of the drying chamber and regulates the dispersion of the air distribution according to its speed and flow passing between the corrugated vanes, due to the possibility of changing the position of the connecting rod with respect to the crank and vice versa, which leads to the uniform drying of the product and the reduction of energy consumption in the installation.

Conclusions

Drying food products is a rather energy-intensive process, therefore it is very important to take into account all the methods by which it is possible to reduce energy consumption. In this work, a device is presented, which ensures the uniform distribution of the air flow in the room of the drying installation, this positively influencing the work efficiency of the installation during the technological process

Keywords: *installation, drying, heating agent, air flow, efficiency*

Acknowledgments. The described results were obtained thanks to the research carried out within *the project: 23.70105.5107.03T Increasing the efficiency of the process of drying seeded fruits, by combining convection and microwaves.*

INFLUENCE OF HEAT TREATMENT ON INACTIVATION OF POLYPHENOL OXIDASE ENZYME

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One of the most studied processes in the food industry is enzymatic browning, considered the second most important cause of the appearance and quality of fruit puree. Enzymatic browning involves the oxidation of phenolics caused by polyphenol oxidase (PPO) and peroxidase (POD), forming dark pigments called melanins [1]. Thus, it is essential in fruit processing to use physical agents (thermal and non-thermal processing) to avoid or slow down enzymatic browning. The inhibition treatments of enzymatic browning in traditional and non-traditional processing of fruit purees were investigated. Nonconventional combination treatments can be used as promising treatments to prevent enzymatic browning in minimally processed fruit products.

The object of the study is fruit purees obtained from the raspberry (R), strawberry (S), and aronia (A) fruits. Raw materials were washed, shredded, and homogenized separately in an electric blender. A comparative assessment of the combination treatments was carried out. For this the fruit purees were divided into 4 replicates with obtaining the following samples: P-1 (ultrasonicated puree at 70˚C for 12 min. and sterilized at 105˚C, for 1.1 min.), P-2 (puree ultrasonicated at 70˚C, for 13 min. and sterilized at 105˚C, for 2.3 min.), P-3 (ultrasonicated puree at 70˚C, for 12 min. and sterilized at 105˚C, for 3.4 min.), P-4 (ultrasonicated puree at 70˚C, for 13 min. and sterilized at 105˚C for 4.5 min.) in comparison with P-0 sample (ultrasonicated puree at 70˚C). The enzyme activity of PPO was determined by a method based on the ability of PPO to oxidize pyrocatechol to quinone, which in turn oxidizes ascorbic acid. The result was calculated by the reaction rate in conventional units and expressed per 1 g of fruit puree (f.u.). The best results with a decrease of the PPO inactivation were shown by sample PA-1 where it presented a value of 30 f.u., PA-2- 25 f.u., PA-3- 14 f.u., and PA-4- 3 f.u., in comparison with sample PA-0 which presented a value of 37 f.u. Similarly, raspberry purees also showed corresponding values, with a decreasing trend, where sample PZ-1 showed a value of 37 f.u., sample PZ-2- 26 f.u., sample PZ-3- 19 f.u., and PZ-4- 6 f.u., compared to sample PZ-0 which showed a value of 42 f.u. Strawberry purees recorded values similar to aronia purees and raspberry purees, where PC-1 showed a value of 46 f.u., PC-2- 32 f.u., PC-3- 24 f.u., and PC-4- 13 f.u., compared to sample PC-0 with a value of 51 f.u. Thus, the inactivation rate of PPO enzyme on ultrasonication and sterilization of fruit purees constitutes 97% for aronia puree, 94% for raspberry puree, and 87% for strawberry puree.

Keywords: *enzymatic browning, PPO inhibitor, peroxidase, fruit puree, quality*

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INFLUENCE OF MACERATION TIME ON BIOACTIVE COMPOUNDS IN ORANGE WINES FROM LOCAL GRAPE VARIETIES IN 2023

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Introduction. The production of orange wines from indigenous grape varieties has gained attention in recent years due to their elevated content of bioactive compounds. This study continues research conducted in 2022 [1], focusing on the impact of maceration time on the concentration of phenolic substances and proanthocyanidins in wines made from Riton, Sauvignon, Floricica, and Viorica, harvested in 2023. These bioactive compounds are essential for the antioxidant capacity and overall quality of wines.

Material and methods. Grapes from the 2023 harvest were processed into orange wines, and the samples underwent maceration periods of 1, 2, 3, and 6 months. Physico-chemical analyses were performed using spectrophotometric methods to determine the concentrations of phenolic substances and proanthocyanidins. The control samples (without extended maceration) were also analyzed for comparison [2].

Results. The maceration process significantly influenced the bioactive compound content in all wine samples. In Riton wines, phenolic content increased from 435 mg/dm³ in the control sample to 1242 mg/dm³ after 3 months of maceration, with proanthocyanidin levels reaching 725 mg/dm³. Viorica wines showed a similar trend, with phenolic content rising from 454 mg/dm³ to 999 mg/dm³, and proanthocyanidins peaking at 535 mg/dm³. Sauvignon and Floricica wines also exhibited moderate increases in bioactive substances, with the highest phenolic content recorded at 2 months (Sauvignon: 890 mg/dm³, Floricica: 737 mg/dm³).

Conclusions. Extended maceration periods enhance the extraction of phenolic substances and proanthocyanidins in orange wines, particularly in the Riton and Viorica varieties. This study confirms findings from 2022, demonstrating that maceration time is a key factor in optimizing the bioactive composition of orange wines. Further research is recommended to refine the maceration process and explore its effects on different grape varieties.

Keywords: *bioactive substances, orange wine, maceration, phenolics, proanthocyanidins, Moldovan grape varieties*

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INFLUENCE OF STERILIZATION MODES ON MICROBIOLOGICAL INDICATORS OF CANNED FOOD

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The work investigated the microbiological composition of raw materials with use cold and hot soaking mode before adding it to canned goods.

It has been clarified the influence of sterilization regimes on the efficiency of the process and on quality and safety indicators. It is suggested the washing of raw materials in hot water.

Introduction. In modern realities, to provide the population with biologically valuable and nutritious food products in Ukraine, in particular in the front-line regions, various methods of food storage are used. Canning is one of the most common methods. It is necessary to use raw materials that have valuable nutritional properties according to biochemical and microbiological indicators for the production of high-quality and safe canned goods. Ensuring the sterility of canned goods is the main condition during their production. The correct mode of sterilization should affect the raw materials in such a way as not to change their structure and preserve the biological value as much as possible.

Material and methods: analysis, synthesis, generalization, organoleptic, microbiological.

Results. It was found that the effectiveness of sterilization of canned food depends on the microbiological composition of raw materials and spices and the method of its processing. If the raw material is soaked in cold water for 50 minutes, there is a decrease in QMAFAnM pollution by about 1.3-1.4 times. During soaking in hot water, a 12.2-12.3 times decrease in QMAFAnM was found. The first method of soaking practically did not reduce the content of spore forms of bacteria, and according to the second method, their number decreased by 5.7-5.8 times.

The raw material corresponded to the normative values according to biochemical parameters, namely: negative reaction with copper sulfate, positive reaction to peroxidase, the content of amino-ammonia nitrogen and volatile fatty acids within the permissible limits. Soaking beans at a temperature of up to 60 °C for 3.0 h affected asporogenic mesophilic microorganisms. Among the spices, the bay leaf had the highest content of mesophilic aerobic and facultative anaerobic microorganisms with a value of 56.8±4.2 thousand CFU/g. Ground black pepper and peas had results of 21.7±1.3 and 27.6±1.8 thousand CFU/g, respectively. Sowing coriander - 49.2±3.4 thousand CFU/g.

It was established that spices that were pre-soaked in cold water had the highest microbial contamination in canned food before sterilization. This indicates the fact that these spices can be a source of heat-resistant spore-forming microflora.

According to the evaluation of canned meat and vegetables, their spices differed in the amount of spore-forming microflora. Canned foods that were prepared with spices pre-soaked in cold water had single spores. Other cans were completely sterile.

Conclusions. The microbiological composition of spices, as components of canned goods, affects the effectiveness of the sterilization process. Based on the results of research, it is recommended to pre-wash spices in hot water.

Keywords: *soaking, microbiological composition, spices, spore-forming microflora*

INVESTIGATIONS INTO THE ANTIOXIDANT CAPACITY OF HONEY USED AS AN ADDITIVE IN SYNBIOTIC DAIRY PRODUCTS

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Introduction. This study aimed to assess the impact of honey (sourced from Comrat, UTA Gagauzia, Moldova) on the antioxidant activity of yogurt containing the probiotics *Streptococcus thermophilus* CNMN-LB-50, CNMN-LB-51, and *Lactobacillus bulgaricus* CNMN-LB-42. Four yogurt formulations were prepared, each with varying amounts of stingless bee honey [0%, 2%, 5%, and 8% (v/v)], and inoculated with the probiotic starter culture (20 g/L of cow milk). The addition of honey positively influenced several characteristics of the yogurt, including color, syneresis, viscosity, and sensory acceptance. The findings demonstrated the successful incorporation of both the probiotic starter and honey, resulting in a novel dairy product with enhanced nutritional value, antioxidant activity, and sensory quality, attributed to its functional properties.

Material and methods. The cultures used in this research study, *Streptococcus thermophilus* CNMN-LB-50, CNMN-LB-51, and *Lactobacillus bulgaricus* CNMN-LB-42, were obtained from the Branch Collection of Food Technology and Microbiology Department, 2 Scientific and Practical Institute of Horticulture and Food Technologies, Chisinau, Moldova. All the cultures were maintained by propagating in sterilized skim milk and stored at -18 ± 2 °C. Prior to use, cultures were activated in skim milk and incubating at 37 °C overnight. To determine the antioxidant activity, the direct reaction was performed: 1.95 ml of DPPH solution of concentration 60 μM dissolved in methanol and 0.05 ml of the sample to be analyzed were introduced. Methanol was used as a reference sample.

Results. The selected strain of *Lactobacillus bulgaricus* demonstrated a high degree of milk acidification on its own, when combined with *Streptococcus thermophilus* strains, it resulted in a moderate level of lactic acid concentration. Dairy product samples containing honey exhibited higher antioxidant activity compared to the control sample without honey. The DPPH radical scavenging activity of the control sample was 3.24%, while the antioxidant activity of thedairy with honey increased proportionally with the honey concentration. The variations observed were as follows: a 10.49% increase between the control and the 2% honey, a 45.81% increase between the 2% and 5% honey dairy, and a 53.64% increase between the 5% and 8% honey dairy product.

Conclusions. The study demonstrated that incorporating honey into fermented milk formulations significantly enhances antioxidant activity, with increases in DPPH radical scavenging ranging from 10.49% to 53.64% depending on the honey concentration. Despite the high acidification potential of starter cultures resulted in a balanced and moderate level of lactic acid, supporting its suitability for yogurt production with functional properties.

Keywords: *lactic acid bacteria, probiotic, fermented products, Streptococcus thermophilus, Lactobacillus delbrueckii subsp. bulgaricus*

METHODS OF RECOVERY OF WASTE FROM THE BEER INDUSTRY

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Introduction. The brewing industry, as part of the food and beverage sector, generates various types of waste during the production, packaging and distribution process. Current waste issues in this industry focus on efficient resource management, reduction of environmental impact and reuse or recovery of waste materials [1]. The most important types of waste in the brewing industry are: malt dregs, it is the largest type of solid waste produced during the brewing process [2]. The yeast that remains after beer fermentation is considered waste, but it can be reused or utilized in other fields. The brewing industry consumes significant amounts of water, and the wastewater from various stages of production contains organic and chemical substances that require treatment. Glass, aluminum and plastic packaging also contribute to waste, although many of these can be recycled. The carbon dioxide produced during fermentation can be considered a "waste gas", which can be recovered and reused in the production process [3].

Material and methods. bibliographic study, research of specialized articles and magazines.

Results. Methods of recovery of waste from beer manufacturing are: production of laccase and polyphenols from spent grains from beer production; production of pharmaceutical agents from used hops; production of fire retardants from used yeasts; production of new functional food products; production of dietary fibers; protein production; production as substrate material; bioethanol production; lactic acid production; production of xylitol; production of biobutanol; energy and biogas production; production as adsorbent, biosorbent; brick and paper making; production as sustainable, ecological, biodegradable packaging; production of emulsifying, stabilizing, binding and thickening agents; production as a flavoring agent; production as an encapsulating agent [4]; enzyme production; production as yeast extract; production of new materials from used kieselguhr; CO2 reproduction, etc.

Conclusions. The waste generated in the brewing industry represents a significant ecological problem, but there are also innovative solutions that are starting to be implemented. Investments in green technologies, the circular economy and efforts to reduce single-use packaging will be essential for minimizing environmental impact and the sustainable development of this sector.

Keywords: *beer, spent grains (hops, barley, wheat), brewer's yeast, valorification*

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OILS FROM KERNELS OF VARIOUS PEACH CULTIVARS FOR THE DEVELOPMENT OF A CRAFT TECHNOLOGY

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Abstract

Rapid development of the food market makes it necessary to study and structure it, in order to determine further ways of creating new products with improved quality (in particular, oils from kernels of peach cultivars) and thus to develop a craft technology.

Introduction. The peach (Prunus persica) yields 8–14 % of stones from its fruit. The stone is very hard. It is composed of the thick-walled shell-like coating, kernel, and film that covers it. The kernel only makes up 10–15 % of the stone's total weight and contains 35–46 % of oil.

Materials and methods. The quality characteristics have been studied in peach stones of the cultivars Cardinal, Nectarine, Flamingo, Moldavsky (harvested in 2020, 2021, and 2022), and of their mixture (25 % of each variety), which are prospective raw materials for fat-and-oil products. Stones from different peach cultivars and their mixtures and fat-and-oil products made from them differ in their quality indicators, depending on the cultivar and crop year. The research involved analysis of the physicochemical, functional, and technological parameters, as well as establishing technological conditions, determining the fatty acid composition.

Results and discussions. The study provides a basis for a craft technology of producing oils from the kernels of stones of various peach cultivars harvested in the Odesa region and Moldova in 2020, 2021, and 2022. The most suitable cold pressing modes (extra virgin) have been chosen for kernels obtained from different cultivars. Crushed peach kernels should be wet-treated and heat-treated at 40–50 °C for 15–20 min. During extraction by pressing, it is recommended that the crushed kernels (extraction mash) should not be heated above 50—60 °C for 5–7 min. The effectiveness of pressing has been established to be 33–47 % of oil. The thickness of an oilcake piece determines the effectiveness of pressing extraction. The thinner the oilcake piece, the more effective the pressing is: the load withstanding time, the compressive force, and the loading rate are significantly reduced, and the yield of oil increases. Thus, the most effective parameters of the pressing extraction stage for the kernels of all the peach cultivars are: residual oil content in the oilcake 5.0—6.0 %, oil yield 94.0 %, oilcake thickness 33.0 mm, load withstanding time 3.0 min, compressive force 10.0 kN, loading rate 5.0 kN/cm.

The sensory assessment has shown that, by the complex of parameters, the average score of the oil from Cardinal kernels was the highest (4.9), the second best was the oil from Nectarine kernels, with the average rating 4.8, and the oils from Flamingo and Moldavsky kernels received 4.76 and 4.75 respectively. The lowest sensory rating is that of the mixture of these cultivars – 4.7. Thus, it is highly topical to utilise stones from different peach cultivars and their mixture, as well as to apply the technology proposed, to manufacture craft oils.

Based on the findings of this research, the proposed technology of extra virgin oils from peach kernels of different varieties has been introduced into the production process at Odesa Factory of Kernel and Vegetable Oils *TOV AVA* and recommended for the manufacture of craft oils.

Conclusions. The proposed technological mode of producing oils allows retaining the original fatty acid composition of the raw material to the maximum extent. After determining the fatty acid composition of oils produced from the kernels of peach stones and their mixtures (harvested in 2020, 2021, and 2022), it was shown that the difference in ω-6 PUFA was 2.8 % and that in ω-9 MUFA was 1.9 %, depending on the cultivar.

Keywords: *kernels; oilcake; peach-kernel oil; peach stones*

OPTIMIZATION OF THE MICROWAVE APPLICATOR

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The optimization of the operation of a microwave (MW) applicator partially filled with an absorbing medium aims to ensure uniform temperature distribution throughout the material layer. This is achieved by determining the relationship between changes in the cross-sectional dimensions of the applicator's transmission line and the working wavelength λ. The dielectric properties of the medium (ε_2 and tan δ_2) depend on temperature, which can lead to possible uneven heat generation during energy absorption.

The analysis involves a system of equations describing the electric (E) and magnetic (H) fields:

1. The equation for the electric field component:

$$\Delta E - \mu_2 \frac{\partial}{\partial \tau}\left(\frac{\partial \varepsilon_2}{\partial \tau} E + \varepsilon_2 \frac{\partial E}{\partial \tau}\right) - \mu_2 \frac{\partial j}{\partial \tau} = 0$$

2. The equation for the magnetic field component:

$$\Delta H - \mu_2 \frac{\partial \varepsilon_2}{\partial \tau}\frac{\partial H}{\partial \tau} - \varepsilon_2 \mu_2 \frac{\partial^2 H}{\partial \tau^2} = 0$$

3. By separating the fields into spatial and temporal components (E=$E\kappa E\tau$ and H=$H\kappa H\tau$), the equations simplify to:

$$\Delta E_k + \omega^2 \varepsilon^2(0)\mu_2(0)E_k = 0$$
$$\Delta H_k + \omega^2 \varepsilon_2(0)\mu_2(0)H_k = 0$$

4. Assuming the process is quasi-harmonic over the time interval $\Delta\tau$, the condition can be written as:

$$\left|\frac{\omega - \omega_k}{\omega}\right| = \left|1 - \sqrt{\frac{\varepsilon_2'(0)}{\varepsilon_2'}}\right| < 0{,}01$$

Where $\varepsilon_2' = \varepsilon_2(0) + \Delta\varepsilon_2'$ and $\frac{\Delta\varepsilon_2'}{\varepsilon_2} < 0.02$. If this condition is met, the process can be considered quasi-static.

The optimization process follows these steps: determine the dependence of $\varepsilon_2(\tau)$ and tanδ(τ) over the working temperature range; select the waveguide dimensions based on the wavelength; set the generator power and calculate the temperature distribution over coordinates and time; verify that the condition $\frac{\delta\varepsilon_2'}{\varepsilon_2} < 0.02$; adjust the time interval δτ if necessary; repeat calculations until the desired temperature and processing time are reached; adjust the generator power to achieve optimal heating conditions.

Conclusions. This optimization process ensures uniform heating of the material, minimizes heat losses, and maintains the stability of the technological process.

Keywords: *thermal optimization, dielectric properties, temperature distribution, uniform heating, electromagnetic wave, waveguide dimensions, quasi-harmonic process*

Acknowledgments. The work was carried out within the of *the young researcher's project with number 24.80012.5107.04TC.*

PHYSICAL AND CHEMICAL PARAMETERS OF SEA-BUCKTHORN (*HIPPOPHAE RHAMNOIDES*) BERRIES POMACE

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Valorization of by-products is a viable solution that contributes to cost savings and reduces negative environmental impacts. Large amounts of by-products are generated daily during the fruit processing. Sea-buckthorn pomace obtained as a waste by extraction of juice can be used as a source of biologically active components. The aim of this study is to analyze the physical and chemical parameters of the pomace, obtained by pressing of sea-buckthorn berries.

The pomace from sea-buckthorn was obtained from the local manufacturer L.L.C. BIG KUKER through a juice pressing process. Initially, the pomace underwent convection drying, partial seed removal, grinding and sieving. Total solid content was measured by refraction. Mineral content (ash) was measured gravimetrically. The chemical composition of sea buckthorn pomace was analyzed using reversed phase C_{18}-HPLC/PDA with corresponding analytical standards. Water activity was measured by Water Activity Meter.

The results revealed that the sea buckthorn pomace has the following physical and chemical characteristics: total solid content – 9.8%, mineral content – 2.13%, pH – 3.53, titratable acidity – 4.48 ^{0}Brix, total carotenoid content – 73.02 mg/100 g, L-ascorbic acid content – 298.2 mg/100 g, phenolic content – 474,93 mg/100g and water activity – 0.228 u.c. Based on the data obtained, the pomace, as a secondary product, contains a significant amount of L-ascorbic acid, carotenoids, and flavanols such as rutin and its analogs, which all have high antioxidant properties. These bioactive substances enhance the nutritional value of the sea-buckthorn pomace and increase the pomace's value for the food industry.

The sea-buckthorn pomace can be used for functional foods production to enrich them with phenolic compounds (structural analogs of rutin), carotenoids and water-soluble vitamins, emphasizing nutritional enrichment and providing additional health benefits.

Keywords: *agro-food wastes, antioxidant content, carotenoids, pomace, valorization*

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PRETREATMENT OF SORIZ GRAINS BY SOAKING FOR USE IN THE FOOD INDUSTRY

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Soryz grains are a cereal crop adapted to the climatic conditions specific to the Republic of Moldova. In addition to high productivity even in drought conditions, soryz has an appreciable chemical composition, especially for the content of carbohydrates (especially starch), followed by proteins. In this context, taking into account the current trends of obtaining innovative food products by substituting proteins of animal origin with those of vegetable origin, the respective cereal could be an indicated raw material. The purpose of this work was to highlight the properties of the soryz starch and proteins through soaking processes in water, for their subsequent use in the manufacture of meat analogues.

The hydration of the grains was followed over time (0.5, 1, 2, 3, 6, 9, 12, 24 h) at different temperatures of the hydration medium (20, 30, 40, 45, 50, 60 ºC). The experimental data were adapted to the Peleg models and the diffusion coefficient values were calculated using Fick's second law.

The obtained results showed an evolution of the grains hydration degree as a function of time followed by temperature and have a complex character. During the hydration process, it was divided into three consecutive phases: the phase of very rapid increase in the hydration degree that lasts up to 2.0 hours, the stabilization phase, responsible for the hydration of proteins and the phase of linear growth, when the constant increasing rate of the soriz grains hydration degree is reached. The rate of water absorption over time is initially quite high, then decreases continuously and approaches equilibrium. The rate of hydration was obviously faster in the first 9 hours. The impact of temperature on the hydration process is obvious and quite defined, especially in the second phase of hydration, the increase in the hydration medium temperature is directly proportional to the hydration degree of soryz grains. The values of the Peleg model constants, the K1 and K2, were depending on the temperature, being inversely proportional to the temperature, results highlighted for the temperature of 40, 45 and 50 ºC. The results obtained for the water diffusion coefficient in the soryz grains showed a linear increase with the increase in temperature up to 50° C, and decreases with the subsequent increase in the temperature of the hydration medium. This decrease may be a consequence of the processes of starch granule gelatinization and protein denaturation, which modify the capillary structure of the grains and reduce the diffusion rate.

The pretreatment of soryz grains by hydration, implicitly knowing the optimal conditions of the respective process, predicts the transformation of this grain into a raw material of plant origin with the potential to define the characteristics of meat analogs, namely, their texture properties.

Keywords: *cereal, diffusion effect, hydration kinetics, meat analogues*

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PROCEDURE FOR ENRICHING WINES WITH BIOLOGICALLY ACTIVE SUBSTANCES

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Biologically active substances play an essential role for the nutritional capacity of wines and have a beneficial effect on the health of the human body.

In wine, the biologically active substances come from two main sources: the raw material and the alcoholic fermentation yeasts**.**

In order to enrich the wine with SBA from the raw material, different technological processes are used, such as skin maceration, maceration-fermentation, the use of enzymes from the class of hydrolases, thermo-maceration.

The main method is keeping the young wine for a long time on the yeast sediment during which the walls of the yeast cells break down through the autolysis process and the biologically active substances contained in the yeasts pass into the wine.

For the study, the must was taken from white grapes and circulated for fermentation. With the initiation of alcoholic fermentation, this process was directed and the solution of biologically active substances was added to the fermentation medium, which was prepared later. Dry yeasts in the amount of 20-40 g per 100 liters of fermentation medium were administered in concentrated must with a sugar content of 600-700 g/l, the proportion per 1 kg of dry yeasts is 2 liters of concentrated must with the temperature of the concentrated medium 20 ±36 ^{o}C and a duration of maintaining the mixture until administration in the fermentation medium from an hour to 24 hours. The concentrated must can be replaced with a solution of powdered sugar with a concentration of 700 g/l or other substances, the administration of which in wine is allowed by the normative acts.

Enrichment of wines with biologically active substances - amino acids, vitamins, enzymes, mannoproteins, fatty acid esters, reductones, nucleic acids, etc. it is carried out by administering in wine the solution of plasmolyzed yeasts by the osmotic pressure in conditions, in which the native properties of the biologically active substances are preserved. The given study was focused on the use of the osmosis process to break down the yeast cell wall.

Keywords: *white wine, biologically active substances, sugar, plasmolyzed yeast, tank liquor*

Acknowledgment. The research was funded by *Institutional Project 020405 Bio-OpTehPAS "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", running at Technical University of Moldova.*

RATIONAL CURRENT FREQUENCY FOR ELECTRIC CONTACT HEATING OF MINCED MEAT PRODUCTS

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Introduction. Of the known methods of heating, electric contact heating (ECH) is effective. Low-frequency (LF) ECH is preferred over high-frequency (HF) because the generators required to produce HF require significant power consumption.

Materials and methods. Standard methods of measuring electrical and thermometric indicators were used for the study of ECH. Test samples were made according to the collection of recipes for dishes and culinary products.

Results and discussion. In order to determine the most rational conditions of ECN, a study of heat treatment of samples of molded meat minced meat semi-finished products was conducted with a voltage of 20 V at frequency values of 0.5 Hz and 50 Hz and with direct current. The kinetic dependence of the temperature change was obtained.

The nature of the processes are the same, but they differ in duration, which is 115 s for a current of 0.5 Hz, and 130 s for a current of 50 Hz. The difference is insignificant and within the margin of error. Compared to direct current, the duration of the latter is 3 times longer. The yield of the products after processing was also determined, which was 85.1 % of the initial one at 0.5 Hz, 83.4 % at 50 Hz, and 76.0 % with direct current.

Conclusion. The research testified to the insignificant difference in the course of processes in the LF range, as well as low efficiency when applying direct current. A rational value of the frequency is 50 Hz, taking into account the ease of obtaining this current from the electrical network.

Keywords: *electric contact heating, minced meat products, current frequency, temperature*

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RESEARCH ON THE USE OF *PRUNUS* FRUITS IN BAKERY PRODUCTS

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Fruits and vegetables are among the foods that are wasted the most, with 12 million tonnes of fruit and 21 million tonnes of vegetables lost yearly, according to FAO (2015). According to national surveys carried out in EU member states, fruits and vegetables account for more than half of the food waste produced by families (21.1 kg per person annually). In terms of economics, the *Prunus* genus is currently the most widely grown tree crop globally. Tree fruits in the genus *Prunus* are widely consumed around the world. There are 430 species of it, found in temperate regions on every continent. Some of the species of commercial importance in the food industry include peaches (*Prunus persica*), nectarines (*Prunus persica* var. *nucipersica*), plane peach (*Prunus persica* var. *platycarpa)*, European plum (*Prunus domestica*), sour plum (*Prunus cerasus*) sweet cherry (*Prunus avium*) and apricot (*Prunus armeniaca*) [1]. These include both wild and cultivated variants. From a sustainability standpoint, using fruit by-products is essential (FAO, 2020*). Prunus* fruit processing by-products are abundant in bioactive and technologically significant compounds (polyphenols, unsaturated fatty acids, carotenoids, tocopherols, tocotrienols, squalene, sterols, peptides, and amino acids) that can be investigated for encapsulation, smart films, active ingredients, and healthier and functional foods in ingredient development. The application of *Prunus* fruit by-products to increase their value for the food industry has become a very interesting field of research in the last few years. Fruit components that are recovered have a positive impact on environmental pollution control while also improving nutrition and product quality. Numerous specialised publications have discussed the use of *Prunus* fruit by-products in the food sector to make doughs for extruded foods, creams, puddings, ice cream, and bakery and pastry goods (bread, muffins, and cookies). The examination of specialised literature on the application of *Prunus* fruit by-products in the bakery products is presented in this research.

Keywords: *by-products, functional products, sustainability, valorisation*

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SENSORY CHARACTERISTICS OF LIVER PATEES WITH AMARANTH FLAKES

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Introduction. Relatively recently, a new type of raw material appeared in the food industry of Ukraine – amaranth seeds and various products of its processing. It has a rich chemical composition, high nutritional value, high biological value, contains a wide range of biologically active substances, which determines the prospects of its processing for food use. The results of determining the qualitative and quantitative composition of amino acids prove the high biological importance of amaranth.

In many countries, plant raw materials are used in the production of complex food products, which allows not only to enrich with biologically active substances, but also to purposefully regulate the quality characteristics of the final product.

Material and methods. The subject of this research is amaranth flakes. The object of the research is the production technology of liver pastes with substitution of the main raw material in the recipe.

Results. Recipes of liver-vegetable pate with the addition of amaranth flakes were developed, and research was conducted to assess their quality. Four test samples of pastes were made: control and three with replacement of raw materials, respectively, in which 17%, 27%, 45% were replaced with hydrated (in a ratio of 1:3) amaranth flakes.

The liver plant pate samples had the following indicators: Sample 1 - control according to the recipe.

Sample 2 - The raw material for the production of liver-vegetable preserves has an insufficient content of plant components and a sufficiently dry and non-greasy consistency.

Sample 3 – The raw material for the production of liver-vegetable preserves has a distinct structure and organoleptic properties.

Sample 4 - The raw material for the production of liver-vegetable preserves has an insufficient content of meat raw materials, but has a pleasant taste and smell.

That is, the best indicators in the production of pastes were observed in example 2 and example 3, where the average content of amaranth flakes was 17 and 27%, respectively, according to the total amount of raw materials.

Conclusions. The scientific rationale for the production of liver pate using amaranth flakes is presented. The conducted studies indicate the expediency of using amaranth raw materials in the production of paste products.

Keywords: *raw amaranth, amaranth flakes, chicken liver, pate, processing of raw materials*

SPRAYING APPLE TREES WITH 1-MCP BEFORE HARVEST TO IMPROVE POST-HARVEST FRUIT QUALITY

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1-Methylcyclopropene (1-MCP) is an ethylene inhibitor applied to fruits during the post-harvest stage to prolong their storage capacity, either in a normal or controlled atmosphere and to extend shelf life. The application of 1-MCP (Harvista 1.3 SC) before harvest on apple trees is a novel treatment designed to delay ripening, maintain fruit quality during harvest, and reduce pre-harvest fruit drop. The mode of action of 1-MCP allows growers to exercise planned control over the ripening process, ensuring fruit quality and better management of weather-related challenges.

This study aims to determine the optimal parameters for the application of 1-MCP (Harvista 1.3 SC) before harvest, including starch iodine index, fruit coloration, pulp firmness, dry matter content, and titratable acidity.

The optimal parameters for harvesting Gala apples were established based on the degree of ripeness, starch iodine index, fruit coloration, pulp firmness, dry matter content, and titratable acidity. All determinations were carried out in laboratory conditions within the Food Technology Department.

The results of this study demonstrated that spraying Gala apple trees with the ethylene inhibitor Harvista 1.3 SC at a starch iodine index of 2-4 and a fruit coloration level greater than 30% of the surface had beneficial effects on fruit quality parameters. Ethylene, a plant hormone, plays a key role in the ripening of climacteric fruits, and 1-MCP in Harvista 1.3 SC blocks receptors, delaying the ripening process. The treatment delayed fruit ripening by 14 days, during which the fruits developed more intense coloration, covering more than 75% of the surface, and maintained a firmness of 7.8 kg/cm². The starch iodine index at the time of spraying and harvest was determined using the starch conversion chart for apples 1...10 (CTIFL), while the degree of fruit coloration was evaluated using the color code (CTIFL) for the Gala variety.

Keywords: *1-Methylcyclopropene (1-MCP), starch iodine index, firmness, dry matter content, apples, quality*

Acknowledgments. The research was supported by *the Institutional Project, subprogram 020407 "Development and implementation of good practices of sustainable agriculture and climate resilience" GREEN, implemented at the Technical University of Moldova.*

STUDY OF BRAKE SYSTEMS PERFORMANCE BY THE FINITE ELEMENT METHOD

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Optimizing friction braking systems is key to ensuring safety and increasing production efficiency. Computer simulation enables detailed analysis of brake system performance, justifying more reliable and durable lean solutions for a wide range of industrial applications, from individual components to robotic smart production lines. Modern production processes place high demands on the reliability and durability of equipment, including brake systems. Computer modeling, in particular, with the help of LS-DYNA software packages, provides a powerful tool for detailed analysis of the behavior of such systems under various loads and operating conditions. The purpose of this study was to develop a methodology for assessing the impact of material characteristics on the operation of pneumatic stoppers widely used in robotic systems of packaging lines. For this purpose, a detailed numerical analysis of the three-dimensional model of the stopper was carried out in the LS-DYNA environment. The model took into account the geometric features of the structure, material properties of the components, and characteristic loading modes. The modeling results showed a high sensitivity of the stopper behavior to changes in the materials of the friction pairs. The use of bronze as a material for the jaw resulted in significant plastic deformation and rapid wear due to cyclic loads. This leads to a decrease in the efficiency of stem fixation, an increase in backlash in the joint, and, as a result, to premature failure of the entire mechanism.

For a more detailed analysis of the processes occurring in the contact zone of friction pairs, a study of the distribution of stresses and strains was conducted. The results made it possible to identify critical zones subject to the highest loads and estimate the intensity of material wear.

The research led to the following conclusions: material characteristics have a significant impact on the durability and reliability of pneumatic brakes; bronze, as a material for friction jaws, has limited durability under cyclic loads. The modeling results confirm the hypothesis that cyclic loads on the crimping surface of the bronze sponge cause significant plastic deformations. This leads to a decrease in its geometric dimensions, a change in its original shape, and, as a result, a decrease in the efficiency of stem fixation. In parallel with the deformation, intensive wear of the sponge material occurs due to abrasive and adhesive effects on the surface of the stainless steel rod.

The results obtained can be used to develop new design solutions and select optimal materials for friction pairs.

Keywords: *pneumatic stops, ccomputer modeling, materials, wear and tear reliability*

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SURVEY OF PHARMACEUTICAL ENGINEERING SPECIALISTS ON TABLET QUALITY PARAMETERS

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Introduction. A survey of pharmaceutical company specialists was conducted to determine their experience of the influence of design operating parameters of equipment on the quality of tablets.

Materials and methods. Tablet makers, leading engineers and shift supervisors participated in the survey. The following questions were considered: What affects the quality of tablets? How and what can affect the appearance of the tablet? Why is the pressing tool polished? How to achieve a constant tablet weight? How to avoid tablet delamination?

Results and discussion. Processed answers to the questions:

1. The quality characteristics of the tablet are influenced by: pressing pressure, pressing speed, mass quality, flowability of the material, fractional composition, shape of the loading funnel and slope angle; properties of the tablet components.

2. The appearance of the tablet is influenced by timely and proper polishing of the press tool, fractional composition of the granules, excessively moistened granules; the presence of a collar is affected by the large size of the granules; displacement can contaminate the mass.

3. The pressing tool is polished to avoid sticking of the mass to the punch, to avoid the formation of a collar and to improve the appearance of the tablet.

4. Constant weight of the tablet is achieved by correct working stroke of the punch, absence of damage to the head, speed of the tablet press rotor, degree of compression, and composition of the bonding agents.

5. Tablet delamination can be avoided by adjusting (reducing) the degree of pressing, selecting the rotor speed, and adjusting the amount of binders.

Based on the survey, a table was compiled, the so-called "Trouble shooting" – the most common problems and suggestions for their quick elimination.

According to the survey, the main types of defects were identified: black specks on the tablet, inconsistent tablet weight, granule sticking to the punch. Possible causes of these issues could include problems with equipment, the machine, or the granulated mass. Black specks may occur due to damaged punch surfaces, improperly adjusted lubrication feed frames, or overly moist granules. Tablet weight depends on the heterogeneity of the granules, improper feeder operation, or uneven punch movement. Sticking occurs due to a damaged punch surface, excessive moisture in the granules, or uneven pressure on the tablet. To avoid these issues, it is recommended to: correctly adjust the feed frame, reduce lubrication on the upper punches, improve granule quality, reduce rotation speed, adjust the feed frame, increase pressure, and improve granulation quality.

Keywords: *tablet, compression, quality, strength, wear resistance*

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TECHNOLOGY FOR OBTAINING COLLAGEN-BASED STRUCTURING ADDITIVE

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Introduction. The constantly growing world population raises new important questions in the field of food security, forcing humanity to use the planet's food resources more rationally. Animal-based proteins are a significant element in human nutrition, as they contain essential nutrients, help regenerate tissues, support the immune system, and aid in hormone regulation. A potential additional source of animal protein could be by-products from meat processing, such as pig skins. Processing such raw materials through collagen extraction technology can provide high-quality and cost-effective animal protein. This protein can be applied in the food industry, adding value to livestock products. Collagen is the most common animal protein found in all animals, including humans. Collagen found in pig skins has a large molecular weight and is difficult to absorb and utilize directly, whereas low-molecular-weight collagen peptides, after hydrolysis, are more efficiently absorbed and exhibit stronger biological activity. To extend the shelf life of the resulting protein additive, it needs to be dried. Advanced low-temperature drying methods allow for the dehydration of the substance while preserving the native properties of the protein. Optimizing the methods and conditions of extraction and drying will improve the technology for obtaining the additive and produce a product with the best functional and technological properties.

Materials and research methods. The process of obtaining a collagen-containing additive includes several stages. The first stage is raw material preparation: washing and cutting the skin. Next, we carried out pre-treatment. The pre-treatment is designed to break the covalent intermolecular bonds between collagen molecules. These crosslinks break down very slowly, even in boiling water. For partial hydrolysis of collagen, we used solutions of organic acid with different molar concentrations. The acid penetrates the skin, causing it to swell to two to three times its original volume, and hydrolyzes the crosslinks. This method allows the breaking of crosslinks while leaving the collagen chains intact. For collagen extraction, we applied enzymatic hydrolysis using a solution of a proteolytic enzyme of animal origin with varying molar concentrations. Enzymatic hydrolysis acts only on the non-helical part of the collagen peptide chain (the ends) and leaves the structurally important helical part intact, thus ensuring better selectivity of the reaction and causing less damage to the collagen. Once the collagen was dissolved, it needed to be precipitated from the solution. For this, NaCl salt was used, and the appropriate amount of neutral salt was added to a certain volume of the collagen-containing solution. The solution was left for 12 hours. To preserve the native properties of the protein, dehydration was carried out in a low-temperature vacuum-microwave dryer. The resulting product was ground into powder.

Results. As a result of this work, we obtained a protein mixture of collagen proteins, which exhibits high functional and technological properties and is subject to further research.

Conclusions. At this stage of our work, we obtained animal-based protein. The next step is to determine the functional and technological properties of the obtained additive and conduct spectral analysis of the samples with the best properties.

Keywords: *animal protein, collagen extraction, pig skin, protein drying*

TEXTURE PROPERTIES OF PLANT-BASED YOGHURT ALTERNATIVIES FROM WALNUTS (*JUGLANS REGIA* L.)

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Introduction. Plant-based dairy alternatives have many benefits in terms of sustainability, animal welfare, and health, but they can only be successful in the market if consumers perceive them as suitable substitutes for conventional dairy [1]. The present study aims to reveal the texture properties and consumers' perception of plant-based yoghurt from walnut milk to gain insights into its potential as dairy yoghurt alternative.

Material and methods. Development and optimization of the formula and technology for a plant-based yoghurt from walnut milk using STAT-EASE 360 software was performed. All formulations with different amount of pectin, emulsifier and ratio of walnuts/water (used for walnut milk development) were inoculated with commercial cultures VIVO. Texture characteristics of yogurt samples after 24 h of storage at 4 ± 1 °C were determined using a texture analyzer TA.HDplusC coupled with probe P/5S and Ø = 5 mm. Sensory evaluation of yoghurt samples were performed according to the following criteria: appearance, color, flavor, taste, consistency, and an overall assessment.

Results. The texture analysis of all developed yoghurt samples included the following parameters: hardness, stickiness, elasticity, cohesiveness, strength, chewing ability and plasticity. The hardness of some samples is higher in comparison with the reference sample, being 22.92 g. Sample No. 2 had the highest hardness of 30.69 g, and the lowest hardness 13.51 g has sample No. 12. Thus, the hardness is influenced by the ratio of walnuts/water, used for the walnut milk. The elasticity, chewing ability, strength, plasticity were also influenced mainly by the ratio of walnuts/water used for walnut milk development. Three-dimensional plots were also used to analyze the overall assessment of walnut milk yogurt by visualizing studied factors. This approach allows visualizing the relationships between the formulation parameters and the overall assessment of walnut milk yogurt, which helps to improve the product development process and achieve the desired sensory characteristics. Sensory evaluation showed that samples 1, 2 and 5 get the highest overall assessment ratings of 4.61, 4.58 and 4.53 respectively.

Conclusions. The results of this work will help in understanding the role of different amounts of pectin, emulsifier and walnuts/water ratio in formulation of plant-based yoghurt from walnut milk with improved texture characteristics and the impact thereof on relevant sensory properties.

Keywords: *yoghurt, response surface methodology, texture characteristics, sensory acceptance*

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THE DEVELOPMENT OF THE ENCAPSULATION OF BIOACTIVE COMPOUNDS FROM FLAX AND MILK THISTLE SEEDS

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In the Republic of Moldova bioactive compound food supplements (BFS) are being used. These supplements are produced in the form of crushed flour or powder and are packaged in plastic containers. Consumers take these BFS throughout the day by the spoonful. To move to a more advanced level of BFS storage and consumption, a new technology has been developed to create concentrated extracts. These extracts are then encapsulated into soft gelatin capsules, creating a new product that is innovative in the Moldovan market. This product is made from bioactive compounds derived from flax and milk thistle seeds and has a high level of competitiveness.

Cold-pressed flax seeds oil and milk thistle oil are difficult to use because they require large quantities of consumption. Therefore, it is necessary to concentrate them by CO_2-extraction. In order to improve the extraction process, we investigated the raw material drying regime. Raw material with high water content prevents hydrophobic solvents (CO_2) from penetrating the seed structure and reduces extraction yield of desired compounds. Thus, we determined the required moisture content of raw materials and optimized the drying regime of raw materials supplied from manufacturers. We studied the technology of CO_2-extraction of biologically active substances from flax and milk thistle seeds. The most active forms of tocopherol can be found in these extracts. The amount of tocopherols in these extracts is 56.0mg per 100g of extract.

Raw material preparation and extraction process were developed. Optimal CO_2-extraction regimes were developed for flax seeds: P = 40-45 MPa, t = 35-40 °C, particle size 0.2-0.3 mm, humidity H = 5.3%. For milk thistle seeds, the following extraction regimes were selected: P = 35-40 MPa, t = 25-35 °C, particle size 0.2- 0.3, H = 5.2%. These extraction conditions were chosen based on the yield of lipid extract obtained from the process. The extraction yield for milk thistle seeds can reach up to 1.7% from the total lipid content. From the flax seeds, the process yield amounts to up to 87.7% of the initial lipid content in the raw material. The fatty acid composition of flax and milk thistle CO_2-extracts was determined, as well as their stability during storage. It has been established that the lipid composition of flax and milk thistle CO_2-extracts is determined by unsaturated fatty acids, such as linoleic (55.00% and 0.19%, ω-6) and linolenic (16.80% and 48.88%, ω-3), as well as oleic (17.50% and 31.94%, ω-3). CO2-extracts from flax seeds are a significant source of linoleic acid, making them an important component in various industries.

Thus, it was established for the first time that samples of extracts obtained from flax and milk thistle seeds have low acid and peroxide values, so the extracts are of high quality, and extraction parameters do not affect their quality.

The realized studies have demonstrated the potential of the technology for producing bioactive compound food supplements using modern technology for processing local agricultural raw materials.

Keywords: *biologically active substances, CO_2-extracts, local raw materials*

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THE IMPACT OF FOOD ADDITIVES ON THE FOAMING AND EMULSIFYING CAPACITY OF CHICKPEA BOILING WATER

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The water of chickpeas is a viscous liquid resulting from cooking chickpeas. This ingredient is an important source of soluble proteins, which can serve as foaming and emulsifying agents in the production of flour-based confectionery products. Replacing animal-based agents with plant-based ones allows to produce food suitable for vegetarian and vegan consumers or for consumption during fasting periods. The goal of this study was to investigate the impact of food additives on the foaming and emulsifying capacity of chickpea boiling water.

In the research, three native varieties of chickpeas were analyzed: Ichel, Botna, and Cogalnic. The food additives used were table salt (NaCl), sodium bicarbonate ($NaHCO_3$), and acetic acid (CH_3COOH). Solutions of the additives were prepared with the following concentrations: NaCl solution at 0.5%; 1.0%; 1.5%; 2.0%; 2.5%; $NaHCO_3$ solution at 0.5%; 1.0%; 1.5%; 2.0%; 2.5%; acetic acid solution at 0.25%; 0.5%; 0.75%; 1.0%. The chickpeas beans were hydrated in the additive solutions at various concentrations for 12 hours, then subjected to a boiling process in distilled water with a chickpea-to-water ratio of 1:4 for 4 hours. The foaming and emulsifying properties of the obtained chickpea boiling water were determined.

The results showed that the hydration capacity of the chickpea beans was higher for the samples hydrated in NaCl and $NaHCO_3$ solutions, particularly for the samples hydrated in 2.5% NaCl and 2.5% $NaHCO_3$ solutions, with the maximum hydration point of the beans being reached after 11 hours. The lowest hydration capacity was recorded for the chickpea samples hydrated in 1% CH_3COOH solution. The analysis of the foaming capacity of the beans hydrated in additive solutions showed high values for all analysed samples. The obtained foam was monitored to determine its stability over time. It was established that the foam obtained from chickpea boiling water is very stable, decreasing in volume by only 10% after 2 hours of rest. The chickpea boiling water of the samples that had been hydrated in CH_3COOH solution exhibited lower foaming capacity, with the best result being for the sample hydrated in 0.75% CH_3COOH solution. Emulsions were also prepared from the analysed samples, and all chickpea boiling water samples reported high emulsifying properties.

Hydrating the chickpea beans in food additives positively influenced the foaming and emulsifying capacity of the boiling water, but the best results were obtained for the chickpea samples hydrated in basic solutions compared to neutral or slightly acidic ones.

Keywords: *legumes, chickpea boiling water, food additives, foaming capacity, emulsifying capacity*

Acknowledgments. The authors would like to thank *the Institutional Project 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.*

THE INFLUENCE OF THE PRODUCT OBSTHORMON 24A, ON THE QUALITY INDEX OF THE FRUITS OF THE GALA MUST VARIETY

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Introduction

The product Obsthormon 24a is a synthetic auxin, which maintains the formation of the suber layer in the abscission zone, the connection between the fruit peduncle and the fruit formations is better, which allows the control of the apple drop before harvest. But in addition to the above-mentioned benefits, Obsthormon 24a also has the properties of accelerating the ripening of apple fruits and influencing the fruit quality indices. The aim of this study was to determine the optimal dose of the product, the frequency of treatment, which will finally maintain the fruit quality parameters of the Gala Must variety closer to the control variant where the growth regulator was not applied.

Material and methods

The research was carried out with the apple fruits of the variety "Gala Must" grown on the M9. To determine the effectiveness of the product Obsthormon 24a (NAA) on the degree of fruit ripening and quality indices, five different treatment doses and frequencies were studied in the pre-harvest period. In apples from the crown of the tree and fallen to the ground, the firmness of the pulp was studied with penetrometer FT 327, the soluble dry substance with the refractometer and titratable acidity by the titration method with subsequent calculation in malic acid

Results

Lower pulp firmness values were recorded in the control variant (8.3 kg/cm^2), compared to the variants treated with the product Obsthormon 24a (ANA) (7.8-8.1 kg/cm^2), the difference being 0. 3-0.5 kg/cm^2. A lower fruit firmness was recorded in the NAA variant 37.5 ppm (7.8 kg/cm^2) compared to the other treated variants (8.0-8.1 kg/cm^2). The higher amount of dry substance in the fruits was recorded in the variants NAA 30 ppm and NAA 37.5 ppm (14.6%) while in the other variants, the studied index was identical, or slightly higher than in the variant control. The titratable acidity of the fruits of the Gala Must variety varied between 0.26 and 0.30%. This legitimacy is also found in the case of fruits that have fallen on the ground, only the values obtained are much higher than the previous ones, constituting 0.24-0.26%. Increasing the dose of ANA treatment led to a more intense ripening of the fruit, a decrease in firmness and titratable acidity, as well as an increase in dry substance.

Conclusions

To prevent premature fruit drop, and maintain a favorable relationship between fruit ripening and quality indicators, the first treatment with the product Obsthormon 24a in a dose of 15 ppm to be applied in the first decade of July, when the differentiation of the fruit buds begins, and the next with the same concentration 15 days before harvesting.

Keywords: *firmness, fruit, NAA, dry substance, titratable acidity*

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THE POTENTIAL OF THE LOCAL GRAPE VARIETY NEGRU DE CAUSENI FOR PRODUCING DRY RED WINES WITH INCREASED BIOACTIVE SUBSTANCE CONTENT

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Introduction. In the competitive wine market, it is essential to focus on indigenous grape varieties, which must be valued across different market niches [1]. The Negru de auseni variety is increasingly recognized for its potential to produce dry red wines, but we aim to determine whether it has sufficient biologically active compounds given its high phenolic content.

Materials and methods. The technological reserve of the Negru de Causeni grape variety was assessed based on grapes harvested in 2023, along with comparative data from previous years. The analysis of phenolic substances, anthocyanins, and proanthocyanidins was conducted using spectrophotometric methods [2].

Results. The total content of phenolic substances in the wine ranged from 1860 to 2680 mg/dm³. Within this range, proanthocyanidins measured between 481 and 979 mg/dm³, indicating a significant variation influenced by the vinification process and the specific harvest conditions. The anthocyanin content was observed to range from 307 to 346 mg/dm³, contributing to the wine's color and flavor profile. Notably, proanthocyanidins constituted 30-37% of the total phenolic content, highlighting their substantial presence and potential health benefits. Organoleptic evaluation further confirms the potential of this variety to produce distinctive red wines characterized by rich flavors, complexity, and a well-balanced profile, all of which depend on the fermentation and maceration processes employed, as well as the specific conditions of the harvest year.

Conclusions. The Negru de Causeni variety shows significant promise for producing dry red wines rich in bioactive compounds. This study underscores the importance of utilizing indigenous grape varieties to enhance their value and appeal in the wine market.

Keywords: *bioactive substances, dry red wine, phenolics, proanthocyanidins*

Acknowledgments. This study was conducted as part of *the Institutional Program* ***200101*** *„Crearea soiurilor Si clonelor pomicole, viticole Si legumicole, perfecTionarea procedeelor agrotehnice de cultivare Si elaborarea tehnologiilor de producere a vinurilor din soiuri de struguri locale Si produselor alimentare de ultima generaTie”.*

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THE PREPARATION OF WHEAT GRAIN DURING MILLING

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According to regulatory documentation, Ukraine produces 3 grades of wheat flour and wholemeal flour. The classic domestic range of wheat flour today cannot meet the needs of modern consumers, who are mostly bakeries and confectionery enterprises, and even less can it compete on the world market. An analysis of existing technologies for processing grain into flour allows us to formulate three main directions for the production of flour for specific purposes and flour with specified technological properties:

obtaining wheat flour with specified properties through agricultural techniques of selection and cultivation of wheat varieties with the required properties;

carrying out a number of flour milling techniques, such as: forming milling batches, implementing special millings, mixing individual flour streams, etc.;

formation of the quality of wheat flour by biochemical methods through the use of technological additives of various purposes.

Within the framework of traditional technologies, the main structural differences in varietal milling of wheat grain mainly appear at the stage of grain milling, while at the preparation stage such differences are not so significant. Nevertheless, grain batches with different quality indicators require adjustment of the modes of the main preparation processes, especially the processes of forming milling batches and tempering process. At domestic flour mills, the grain quality indicators that determine the grain preparation modes for milling are its vitreousness and gluten content. However, in order to create milling batches of wheat grain for the production of targeted flour, these indicators are not enough: it is necessary to take into account other indicators that will allow more effectively predicting consumer quality indicators of finished products for specific groups of bakery products. Such indicators include: the alveograph test values, water absorption capacity, the starch damaged contents, the SRC test values, the protein content in laboratory-milled flour.

Formation of milling batches of wheat grain with specified quality indicators and application of appropriate water-heat treatment modes for production of finished products for a specific purpose at a flour mill will allow the manufacturer to:

rationally use all grain resources available at the enterprise; stabilize the quality and expand the range of special-purpose flour;

increase the competitiveness of domestic products.

The production of flour with specified quality indicators will not only expand the range of finished products at flour mills, but will also stabilize the quality of finished bakery products of different groups without the use of corrective technological additives, or with their minimum dosage.

Conclusions. Therefore, scientists are faced with a number of urgent tasks in organizing the preparation of wheat grain during milling in modern conditions: improvement of the processes of forming milling batches and tempering process in the production of special-purpose flour; development of requirements for the recipes of milling batches with specified quality indicators and corresponding tempering process modes for the production of finished products for a specific purpose at a flour mill.

A detailed study of the above tasks will contribute to the improvement of the process of forming specified indicators of flour quality depending on its intended use.

Keywords: *wheat flour, special-purpose flour, grain milling, quality indicators*

THE QUALITY PROPERTIES OF SUGAR DOUGH AND BISCUITS WITH LENTIL FLOUR

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Grain legumes are widely recognized as a staple source of dietary protein worldwide. Lentil proteins provide dietary amino acids and are also a source of bioactive peptides that provide health benefits. Lentils have a balanced nutritional profile due to their nutritional content of 22.7% protein (containing all essential amino acids), 51% carbohydrates, 13.8% dietary fiber, and 1% lipids. The lentil flour enhances the nutritional value of bakery products but also extends the freshness of the finished product.

The effect of lentil flour on the quality parameters of sand dough and biscuits was investigated. Lentil flour was added in the amount of up to 15% of the weight of wheat flour. An increase in dough moisture content by 1.2 times was observed, structural and mechanical properties improved, while cohesiveness and strength decreased in proportion to the increase in lentil flour content. Lentil flour addition also affected the textural properties of the dough - dough hardness increased from 12% to 42% with increasing lentil flour content. Cohesiveness and elasticity decreased proportionally with increasing red lentil flour content in the dough, by 19.5% and 15%, respectively. As in the case of hardness, the values of these two parameters were mainly affected by the decrease in the amount of gluten in the final product when wheat flour was replaced by lentil flour. Sensory analysis of the biscuits showed that the experimental samples with red lentil flour (1-10%) had a firm consistency, a pleasant and uniform appearance, and a significant improvement in taste, odor, and color. During storage (35 days), the softening index values decreased 1.2 times, which is due to the high content of proteins and fibers and the presence of hydroxyl groups, which provide an increase in bound water content, as confirmed by the decrease in water activity. The product confirmed its sensory (color values) and microbiological stability. Partial replacement of wheat flour with red lentil flour reduces the calorie content of the biscuits, providing an additional source of protein and fiber and significant nutritional benefits.

Keywords: *grain legumes, bakery, texture, sensory parameters, softening index, calorie content*

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THE USE OF PECTIN AS A BINDING AND COATING AGENT IN THE MANUFACTURE OF DRIED FRUIT BARS

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A wide range of dried fruits provides great health benefits and is a convenient snack option. They are considered a rich source of phytonutrients, dietary fiber and antioxidants. The aim of the study is to investigate the effect of using pectin suspension as a binding and coating agent in the production technology of dried fruit bars (plums, cherries, apples and rosehip powder) with a shelf life of 360 days. The pectin used in the production of vegetable bars was obtained under optimal microwave-assisted extraction (MAE) conditions at pH~2, solid:liquid ratio of 20 (*w/v*), microwave exposure time of 10 min and magnetron power of 450 W. The extracted pectin was characterized by the following physicochemical parameters: content of anhydrogalacturonic acid (65.68%), degree of esterification (47.74%), total polyphenol content (4.97 mg GAE/g d.w.) and antioxidant activity, DPPH (13.36 µmol TE/g d.w.). It was shown that the sensory quality of the bars did not change significantly, with the exception of the taste, which at the end of the shelf life had a predominantly cherry flavor. The moisture content during storage decreased by 1.4 times. The protective pectin film on the surface of the bars acted as a barrier in controlling moisture retention, reducing the interaction processes between food molecules and the environment and decreasing gas exchange. The evolution of the pH in the vegetable bars was influenced by the acidic environment formed by the plum and cherry fruits, the rosehip powder used for microbiological stability, as well as by the citric acid used in the formation of the pectin suspension. During the storage period, a slight increase in pH was demonstrated from 3.64 to 3.95, and titratable acidity decreased from 1.12% to 0.83% expressed in citric acid. Water activity changed from 0.571 to 0.496 c.u. indicating a decrease of 14%. In terms of microbiological stability, the reduction in moisture content of the dried fruits used, low pH values, and the use of pectin as a binding and coating agent stopped the growth of microorganisms, thereby ensuring microbiological stability throughout the entire storage period. An analysis of biologically active substances in the bars showed that the inclusion of dried fruits and rosehip powder in the bars, together with the use of pectin, has a positive effect on the change in antioxidant content during storage. The antioxidant activity (DPPH) in the vegetable bars decreased by 1.23 times, demonstrating minor changes throughout the period, which is due to the chemical composition of the plant material and the properties of the pectin used. The results of this study showed that pectin extracted by MAE, which is subsequently used as a binding and coating agent in the technological process of making bars, retains antioxidant activity and high functional value of the bars for 360 days of storage.

Keywords: *pectin, vegetable bars, physicochemical analysis, sensory quality, microbiological stability, biological value, shelf life*

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ULTRASOUND AND MICROWAVE ASSISTED EXTRACTION OF BIOACTIVE COMPOUNDS FROM SEA-BUCKTHORN POMACE

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Ultrasound-assisted extraction (UAE) and microwave-assisted extraction (MAE) are modern techniques that enhance the extraction of bioactive compounds (BAC) from fruits, plants, and other natural sources. Both methods are efficient and eco-friendly, providing purer extracts and protecting sensitive compounds compared with traditional methods.

The aim of the study is to establish the optimal conditions for BAC extraction using ultrasound and microwave-assisted methods, as well as to analyze and to determine the optimal yield of BAC extracts obtained from powdered sea-buckthorn pomace.

The powdered sea-buckthorn pomace used in our analysis was obtained by fine grinding with the PULVERISETTE 11 mill. For the extraction of lipo-soluble bioactive compounds, the following experimental parameters were established: the ratio of plant material to solvent, solvent concentration, extraction time, extraction technique, magnetron power, microwave pulse duration, as well as the power and frequency of ultrasound. Eight samples were analyzed at the same time, in duplicate, using different parameters and solvents. The qualitative and quantitative analysis of the bioactive compounds were performed using HPLC/PDA gradient method with C_{30}-column for carotenoids.

According to the HPLC data, the extracts obtained by UAE using ethyl alcohol and sunflower oil in a 1:1.5 ratio showed the highest yield of total carotenoids, with values of 73.02 ± 0.14 mg/100 g of extract. The lutein content ranged from 1.55 to 1.68 mg/100 g of extract, while the zeaxanthin content was between 3.99 and 4.32 mg/100 g of extract. The percentage of DPPH radical scavenging varied between 0.34 ± 0.01% and 0.85 ± 0.01%, and the total phenolic content ranged from 0.41 ± 0.02 to 1.30 ± 0.05 mg of gallic acid equivalent (GAE)/g of extract.

Results demonstrate that ultrasound extraction technologies for carotenoids from secondary vegetal sources, sea-buckthorn pomace powder have considerable potential and could find industrial applications in the food industry, where the demand for natural pigments is increasing.

Keywords: *optimal conditions, lipo-soluble extracts, ultrasound, sea-buckthorn pomace powder*

Acknowledgments. The research was supported by *the Institutional Project, subprogram 020405 "Optimization of Food Processing Technologies in the Context of Circular Bioeconomy and Climate Change," Bio-OpTehPAS, implemented at the Technical University of Moldova.*

USE OF NATURAL BROWN DYE FROM WALNUTS IN SWEETS WITH FUNCTIONAL PROPERTIES

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Sweets with synthetic dyes have a negative impact on a health, so, according to actual European policies, it is necessary to replace them with inoffensive natural dyes. A good source for obtaining of the natural brown dye can serve the walnut (*Juglans regia L*) pellicle and septum. R. Moldova produces 50…60 thousand tons of walnuts annually. The woody membrane that separates the cotyledons from the kernel, known as the *septum*, take for 3-5% of the total weight of the walnut seed. It is not exploited on an industrial scale. A small amount being used to prepare traditional home-made beverages. The *septum* contains 5-15% of polyphenols with expressed physiological properties, which also form brown dyes. The aim of this research is to replace synthetic additives in the composition of the recipe, in the manufacture of sweets by adding the natural brown dye obtained from the walnut's septum. To increase the biological value of the product and to offer functionality, toffee samples were prepared with the replacement of sugar with sweeteners and by addition of the natural brown dye from walnut. The HPLC method was used for the separation, identification and quantification of the chemical compounds from the experimental samples. The "Shimadzu LC-2030 3D-Plus" instrument, equipped with Photo-Diode Array detector, was used, also gradient elution method and reversed-phase C18-column. When determining the antioxidant activity by the DPPH method, the reaction between DPPH and the antioxidants in the extracts was monitored using a "BIOTEK Synergy HT" multi-detection spectrometer, at wavelength of 515 nm. The methanol solution was used as a blank, then 2800 μL DPPH and 400 μL sample were used for each determination, with absorbance recorded at T_{30} (after 30 minutes). The results of this study confirm the presence of several important biologically active compounds in the toffee, which provide potential physiological activity: Gallic Acid ($\lambda_{max.}$ = 271 nm, R_T ~ 10 min.), Catechin, Epicatechin ($\lambda_{max.}$ = 278 nm, R_T ~ 15 min., ~ 16 min.), Ellagic Acid ($\lambda_{max.}$ = 366nm, R_T ~ 20min), and their derivates, such as Casuarictin. When analyzing the toffee, an increase of the Ellagic Acid / Casuarictin ratio from 3/1 up to 9/1 is observed. This take place because at high temperatures, Casuarictin turns into Ellagic Acid, Gallic Acid and glucose by hydrolysis. The addition of the natural coloring from walnuts, contributes to the decrease of titratable acidity from 0.28 ± 0.08 in the control sample to 0.21 ± 0.06 degrees of acidity in the sample with 1.0% of the coloring matter being added. The CIE-Lab chromatic parameters L*, a*, b* of the toffee sample with 0.6% of the brown dye from walnuts are close to the classical toffees. So, the use of natural brown dye from walnut's septum or pellicle in production of toffee with reduced quantity of sugar, substituted by sweeteners, provide synergy of physiological properties. Use of brown natural color maintains the original appearance (for consumers) of the toffee at the same time.

Keywords: *brown dye, HPLC, pellicle, septum, toffee, walnut kernel*

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WATER TREATMENT IN THE FOOD INDUSTRY: MODERN TECHNOLOGIES AND PERSPECTIVES

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Introduction. Water plays a critical role in the food industry, serving as an ingredient, cleaning agent, and processing medium. It is essential that the water used meets specific standards to ensure the safety and quality of food products. In the food industry, water must be treated to remove impurities such as microorganisms, organic and inorganic substances, and other potential contaminants that could harm consumers or affect product quality. This article provides a generalized approach to water treatment processes, including filtration, softening, deionization, and disinfection, with attention to modern methods and equipment used in food manufacturing.

Materials and methods. The analysis includes research on modern water treatment technologies, industry standards, expert reviews, and data from water treatment equipment manufacturers. The following methods were explored:

- Knowledge clusters from scientific research on water treatment in food production.
- Manufacturer data and industry standards for water quality requirements in food production.
- Expert surveys on current challenges and innovations in water treatment technology.

Results. Water treatment in the food industry can be categorized into several key operations, each tailored to specific needs of the manufacturing process:

Filtration – Removes particles and organic contaminants.

Softening – Reduces water hardness, which prevents scale buildup in equipment.

Deionization – Eliminates dissolved salts and minerals, ensuring purified water.

Disinfection – Destroys microorganisms using methods like chlorination, UV treatment, and ozonation.

These processes are essential to maintaining food safety and product quality. For example, microbial contamination of water can compromise food hygiene, while improper treatment may affect product taste and shelf life.

Technological operations for water treatment in the food industry:

- **Pre-treatment** – Coarse filtration, sedimentation, and chemical treatments.
- **Filtration** – Membrane filtration, activated carbon filtration.
- **Disinfection** – UV, ozone, chlorination, or chemical-free methods like electrochemical treatment.
- **Post-treatment** – Polishing filters, final disinfection to ensure compliance with hygiene standards.

Conclusion. Water treatment is vital in the food industry for food safety, process optimization, and environmental sustainability. Advanced technologies reduce contamination risks, enhance product quality, and conserve resources, though more research is needed to improve efficiency and integrate renewable energy.

Keywords*: water treatment, filtration, food industry, disinfection*

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SECTION II:
Food Safety and Nutrition

ANALYSIS OF LACTIC ACID BACTERIA FROM MOLDOVAN CHEESE "BRYNZA" USING 16S RRNA

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Introduction. In our study, we examined the microflora of Moldovan type of cheese "Brynza" using molecular biology techniques. To confirm the genus classification, we employed genus-specific PCR, which revealed that all isolates belonged to the *Lactobacillus sp*. and *Streptococcus sp*. groups. Selected strains were analyzed using RAPD and Rep-PCR typing methods, which are more cost-effective alternatives to sequencing. However, these methods did not allow for proper classification of the strains according to their taxonomic hierarchy. Using sequencing techniques, we identified and confirmed the genus of the selected strains, which were then used for further analysis.

Material and methods. The research was conducted at the Food Research Institute, Bratislava, Slovakia. Was studied 6 strains. For all PCR techniques used, we employed a Veriti 96 cycler (Applied Biosystems, Foster City, California, USA) to amplify the PCR products. We analyzed the PCR products by electrophoretic separation in a 1.5% agarose gel as follows: 80 ml of TAE solution, 1.2 g of agarose, and 4 µl of GelRed visualization dye. We applied 8 µl of the sample, mixed with 2 µl of loading buffer, to the gel. To compare the size of the products, we used a standard ladder with sizes of n x 100 bp. Electrophoretic separation was performed in TAE buffer at a voltage of 400 V for 60 to 90 minutes, using a PowerPac Basic voltage source (BIORAD, Hercules, California, USA). After separation, we visualized the fragments with a transilluminator (UVP, Upland, California, USA). The specific composition of reaction mixtures and temperature conditions for each PCR technique are provided separately. We used the DNA isolated from the selected strains for typing using the RAPD method using the M13 primer and for the Rep-PCR method – primer $(GTG)_5$. The resulting concentrations of PCR components converted to one reaction with a volume of 25 µl.

Results. We found the differences between PCR results and previous identification of LAB strains based on biochemical phenotypic signs. The 4A strain was originally identified as *Lactobacillus bulgaricus* but sequencing revealed it to be a *Lactobacillus fermentum*. We identified strain ST144 and LB12 as Streptoccus thermophilus. Strains 10A and 6B were originally identified as Lactobacillus acidophilus, whereas based on PCR data, they are strains of Lactobacillus bulgaricus Lactobacillus plantarum. Strains 177 were originally assigned to the genus *Leuconostoc*, but by sequencing we found that it is a strain Leuconostoc mesenteroides. Conclusions

Conclusions. As a result of the research, several limitations were identified in the biochemical methods used for determining the species affiliation of lactic acid bacteria. Modern molecular techniques offer significantly greater accuracy in species identification, ensuring more reliable and precise classification.

Keywords: *cheese microflora, molecular technique, RAPD, Rep-PCR*

ANALYSIS OF THE FATTY ACID COMPOSITION OF BLACK LEVINA

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Introduction. The Black Levine (Hermetia illucens L.) is a dipteran insect belonging to the Stratiomyidae family, known for its unique feeding habits and ability to efficiently convert organic waste into nutrients. There are positive data on the use of H. illucens L. larvae in the diet of fish, pigs and poultry, as well as in the diets of cows and calves. Larvae of the Black Levine contain useful organic compounds that have commercial and industrial value. The purpose of the research is to investigate the fatty acid composition and to determine the nutritional value of Black lionfish larvae.

Material and methods. A modern analytical method was used to analyze the fatty acid composition of Black Levine larvae, in particular: gas chromatography-mass spectrometry. Fatty acid methyl esters were analyzed by gas chromatography-mass spectrometry for identification and quantification of individual fatty acids on a Shimadzu Chromatography-Mass Spectrometer (Japan). The fatty acid composition of fresh-frozen larvae and flour from dried larvae of the Black Levine obtained on different substrates was investigated.

Results. The results of the analysis of the fatty acid profile of Black Levine larvae show a high concentration of unsaturated fatty acids, in particular oleic (13.0…14.7%), linoleic (6.8…9.7%) and linolenic (0.1…0.39%). These acids are important for human and animal health because they are essential fatty acids. The detected high proportion of polyunsaturated acids, such as linoleic and linolenic, indicates the potential of Black Levine as a source of beneficial omega-3 and omega-6 fatty acids. Palmitic (C16:0) and stearic (C18:0) acids dominate among saturated fatty acids - 21.9 and 10.8%, respectively. When conducting experimental studies, it was found that the larvae of the Black Levine grown on organic waste contain: up to 9% protein (determined by the Lowry method), 27% fat (determined by the A. Levitskyi express method). It was established that the fat content in the larva significantly depends on the composition of the feed substrate on which it was grown, so in samples 1 and 2 the fat content was up to 30%, in sample 3 up to 40%, which is confirmed by previous studies. The fatty acid composition of fats in the dried larva shows the presence of a wide range of saturated and unsaturated fatty acids. Flour from larvae contains a relatively high content of lauric acid (C12) (up to 47%), which is characterized by antiviral and antibacterial properties and is a natural antibiotic, besides it is non-allergenic, able to prevent inflammatory processes of the digestive tract and improve metabolism and strengthen immunity. Taking into account the chemical composition of the larvae of the Black Levine, it is possible to propose its use in the production of complete combined feed for fish, domestic animals, pigs in the amount from 15% to 35% of the input, for fish - up to 50%, which will allow replacing expensive feed of animal origin (fish meal, meat and bone meal) and partially replace soybean meal (up to 12%), which will significantly reduce the cost of finished compound feed.

Conclusions. Based on the results of experimental studies, the high content of unsaturated fatty acids makes the larvae of the Black Levine an attractive alternative source of fat additives of animal and plant origin for use in the production of animal and fish feed. The study of the fatty acid composition of the larvae of the Black Levine revealed a high content of unsaturated fatty acids, in particular oleic, linoleic and linolenic. This confirms the high biological value of the lipids of this insect and its potential as a source of useful fats in the production of feed for pigs, fish, and domestic animals.

Keywords: *Black Levine, fatty acid composition, nutrition, compound feed*

ANTHOCIAN PROFILE OF RED WINES FROM NEW GRAPE VARIETY CODRINSKY

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Anthocyanins and their derivatives occupy a special place among polyphenols in red wines. They have dual role - affect the color, bitterness, astringency, and fullness of the taste and contribute to the antioxidant properties of red wines. The anthocyanin complex of the classic European red grape varieties has been studied quite thoroughly, the technology for producing high-quality wines from these varieties has been worked out. That is why many researchers have turned their attention to autochthonous grape varieties growing on their territory. Codrinsky is a grape variety approved and recommended for the production of high-quality red dry wines in the Republic of Moldova [1].

Analysis Method OIV-MA-AS315-11. Separation was carried out on HPLC system with UV/VIS detector on C18 column. Content of monomeric anthocyanins was determined using malvidol-3-glucoside chloride as internal standard. 34 samples of red dry wine produced in Republic of Moldova.

The main anthocyanins in red wines are delphinidol, cyanidol, petunidol, peonidol and malvidol with a total amount of 340-380 mg/md^3. They exist as monoglucosides esters (main compounds, around 78% from total amount) and as monoglucosides with acetyl and coumaroyl groups (22% from total amount). The main compounds present in red wines from Codrinsky grape variety are Malvidol-3-glucoside (59% from total), Malvidol-3-acetylglucoside (12 from total), Petunidol-3-glucoside (9% from total), Delphinidol-3-glucoside (7% from total) and Malvidol-3-coumaryl glucoside (6% from total) which represent 93% from total antocyaninins amount.

Conclusions

The anthocyanin profile of dry red wines from new grape variety Codrinsky was stable and almost the same in all analyzed samples, which can be considered as a marker for their identification. Malvidol derivatives present in high amount imparts color stability during production. New grape variety Codrinsky can be of high interest for the production of high quality dry red wines.

Keywords**:** *Codrinsky, monomeric anthocyanins, anthocyanin profile*

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ANTHOCYANIN COMPOSITION IN GRAPE SKIN: A COMPARATIVE ANALYSIS OF THE MOLDOVAN VARIETIES FETEASCA NEAGRA AND RARA NEAGRA

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This study focuses on the anthocyanin composition of grape skin powder (GSP) derived from two grape varieties native to the Republic of Moldova: FeteascA NeagrA and RarA NeagrA. The analysis aimed to quantify and compare the anthocyanin profiles of these grape skins, emphasizing their potential applications in functional foods and nutraceuticals due to their bioactive properties. Among the ten analyzed anthocyanins, malvidin-3-glucoside emerged as the predominant compound in both grape varieties, constituting 67.63% of total anthocyanins in FeteascA NeagrA and 63.84% in RarA NeagrA. This significant presence highlights the role of this compound in influencing the color and antioxidative properties of the grape skins. FeteascA NeagrA grape skin powder demonstrated higher concentrations of several anthocyanins, including petunidin-3-glucoside (12.06%), delphinidin-3-glucoside, malvidol diglucoside, and peonidin-3-glucoside, suggesting a richer anthocyanin profile that may contribute to stronger antioxidant potential and desirable color attributes in food applications. On the other hand, RarA NeagrA displayed higher levels of compounds such as peonidin-3-acetylglucoside, cyanidin-3-glucoside, malvidin-3-acetylglucoside, peonidin-3-coumarylglucoside, and malvidin-3-coumarylglucoside. These differences indicate unique anthocyanin compositions that can impart distinct sensory attributes and functional benefits, depending on their application. The abundance of specific anthocyanins in each variety underscores the potential for selective use based on desired product characteristics, such as color intensity and health benefits. Similar findings have been reported in the literature, where malvidin-3-O-glucoside is often the dominant anthocyanin in red grape varieties, highlighting its significance in the pigmentation and potential health benefits of grape-derived products. The diverse anthocyanin profile in these grape varieties suggests their promising use in developing functional foods that capitalize on their antioxidant properties while promoting the principles of a circular economy and sustainability by utilizing grape by-products as valuable ingredients.

Keywords: *grape skin powder, anthocyanin, Feteasca Neagra, Rara Neagra*

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APPLE POMACE, A NATURAL SOURCE OF COLOURINGS AND ANTIOXIDANTS FOR HEALTHY JELLY CANDIES

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The natural juice production generates a large volume of by-products, which represents a real problem for the food industry, as it involves additional costs and environmental damages. The apple pomace (AP) is the by-product issued from the technological process of apple juice production and its evaluation has shown that it represents a natural and cheap source of many bioactive compounds, including antioxidants and pigments, which can be reused in the food industry to create value-added products. The present study tested the use of apple pomace extract (APE) in the production of jelly candies, following a simplified recipe, with a reduced number of ingredients.

The phytochemical profile of the apple pomace extract, obtained in simple and environmentally friendly conditions, was analysed, including: total phenolic content, total carotenoid content, β-carotene, lycopene, antioxidant activity, etc. The individual phenolic compounds were quantified using a HPLC method. The jelly candies prepared with apple pomace extract were characterised compared to jellies without APE (control), in terms of physico-chemical parameters, colour parameters, organoleptic profile, biological activity (antidiabetic potential), storage stability, etc.

The main polyphenols found in the apple pomace extract were: gallic acid, 3,4-dihydroxybenzoic acid, 4-hydroxybenzoic acid, vanillic acid, catechin, chlorogenic acid, vanillin, coumaric acid, salicylic acid. The tested parameters of both types of jellies comply with the standard requirements set for such products, but the organoleptic score was higher for the jelly containing APE (4.88/5). Also, as expected, the antioxidant activity of jellies with APE was improved (142.03 ± 1.08 mmol TE/g DW), due to the antioxidant compounds from the apple pomace (polyphenols, carotenoids, etc.), which preserved an important part of their antioxidant potential during the processes of jelly preparation.

In conclusion, the present study recommends the use of apple pomace extract in the production of healthy jelly candies, without synthetic colourants/antioxidants/preservatives.

Keywords: *bioactive compounds, food waste, functional foods, polyphenols, recovery*

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ASSESSING FOOD SECURITY THROUGH NUTRITIONAL AND SUSTAINABLE QUALITY METRICS OF FOOD PRODUCTS

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Introduction. Global food security is a complex challenge that involves not only ensuring access to food but also considering the nutritional quality and environmental impact of food products. In the context of climate change, population growth, and declining natural resources, the evaluation of food products must include both their nutritional value and ecological sustainability.

The aim of this study is to assess food products from the perspective of nutritional quality and sustainability, using metrics such as nutritional density (content of macronutrients, vitamins, and minerals) and ecological impact (carbon footprint, water use, and land use).

The research methodology involved the analysis of a sample of 50 food products from diverse categories, including meat, vegetables, cereals, and dairy products. Nutritional data were gathered from reputable sources such as the USDA database, while ecological impact was assessed based on studies of carbon footprint and life cycle analysis. Each food product was evaluated using a composite score reflecting both nutritional quality and sustainability.

Results. The results show that plant-based foods, such as vegetables, fruits, and cereals, achieved the highest scores in terms of both nutritional density and reduced environmental impact. On the other hand, animal-based products, particularly red meat (beef), demonstrated a high ecological impact despite offering moderate nutritional value. Foods such as eggs and fish exhibited a better balance between high nutritional density and moderate ecological impact. Processed foods and those high in sugars and fats scored lower in both nutritional value and sustainability.

The conclusions of this study highlight the importance of promoting a diet that emphasizes plant-based products, complemented by sustainable animal protein sources, to ensure durable food security. Public policies are needed to support sustainable agricultural practices and balanced food consumption, optimizing both nutritional value and ecological sustainability. Such a holistic approach can help protect natural resources while improving global public health.

Keywords*: food security, nutritional density, food sustainability, carbon footprint, ecological impact, sustainability, diet*

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AUTHENTIC BREADS OF UKRAINE

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The hospitality industry encompasses various business sectors that provide tourism services, accommodation, food and entertainment, which has a significant impact on the economy and image of the country. The military invasion of Ukraine presented this sector with new and unpredictable challenges that require new strategic solutions to adapt to changes.

The most promising direction for the restoration and further development of the tourism industry of Ukraine is international cooperation and European integration, particularly, the creation of international tourist routes, which will contribute to hospitality industry as well as promote interest in Ukrainian history, culture and gastronomy.

Among the variety of modern food products, bread is one of the oldest and most common products and an important part of the cultural heritage of many nations, where agriculture and agricultural practices greatly influence the development of national traditions. For Ukrainians, culinary arts play a special, even sacred role. Ritual dishes are prepared during special holidays: the baking of Paska and Christmas breads is often accompanied by a prayer, and during their preparation the dough is covered with an embroidered towel. For Ukrainians, bread is not just a product, but a sign of prosperity and hospitality.

Bakery products are an important daily source of energy for almost the entire population, providing up to 30-40% of the necessary energy, vegetable proteins, digestible carbohydrates, dietary fibers, vitamins B1, B2, PP and some minerals. For this reason, nutritionists emphasize their importance for improving the quality of nutrition, as well as importance of using ingredients that have not only the necessary technological, but also valuable physiological properties.

In Ukrainian villages, ancient recipes for making dough are still followed, using hop leavens, acacia flowers, and other natural ingredients with useful nutritional properties. The variety of types of flour, including wheat, rye, whole grain, spelt, hemp, corn, etc., not only demonstrates the richness of flavors, but also reflects the cultural heritage and gastronomic traditions of the regions. Studies of Ukrainian gastronomy in general and bread-making in particular help improve the quality of products, their safety, and support a healthy lifestyle. The use of local resources has a positive effect on the health of the population and preserves the gastronomic heritage.

Today, for the preservation of traditional bread-making, initiatives are actively launched and events are held, such as the festival of local gastronomy “True&Local”, organized by the “Traditional Shop” and the “Slow Food” organizations in Ukraine, which presents a wide range of local breads from different regions of Ukraine. The “True&Local” also has a lecture hall, where anyone could learn about traditional baking and gastronomic heritage. Other important initiatives include the “Bread Atlas of Ukraine” project, the film “Dough”, which was released and was a success, and the Living Museum of Bread. These events contribute to the preservation of authentic recipes, the popularization of Ukrainian culture, demonstrating the diversity of Ukrainian breads and their authentic recipes.

Ukrainian bread products demonstrate the wealth of authentic recipes characteristic of each region. Local ingredients, special starters, and unique production technologies emphasize the diversity and traditional heritage of Ukrainian culinary arts. This preserves the cultural identity and respects the history that is passed down from generation to generation.

Keywords: *bakery products, hospitality, tourism, traditional baking*

AWARENESS AND KNOWLEDGE ABOUT CELIAC DISEASE AND THE GLUTEN-FREE DIET IN THE REPUBLIC OF MOLDOVA: AN OPINION SURVEY

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Objective. This study aims to assess the knowledge and awareness of the gluten-free diet (GFD) among consumers in the Republic of Moldova and to identify factors influencing this awareness. Gluten-related disorders (GRDs) such as celiac disease can only be managed through a strict GFD. Therefore, understanding public knowledge and perceptions about this diet is crucial for improving the quality of life of individuals affected by these conditions.

Methodology. A cross-sectional survey was conducted between April and June 2022, involving 778 respondents from various demographic backgrounds. The questionnaire was designed based on a validated model from the Syracuse University Institutional Review Board (IRB) and adapted for the Moldovan context. It included 15 questions focusing on respondents' knowledge about gluten, sources of information, attitudes toward GFD, and the perceived difficulty of adhering to the diet. Data were collected online and analyzed using descriptive statistics and correlation methods to determine the relationship between various factors such as education level, dietary habits, and knowledge about GFD.

Results. The survey revealed a moderate level of knowledge regarding gluten and gluten-free foods among the respondents. Although 77.3% of participants could correctly identify gluten, only 16.1% scored above 50% on overall knowledge, indicating gaps in understanding the complexities of a GFD. Notably, respondents with higher education levels, especially those with a master's degree, demonstrated a better understanding of gluten-related issues. The internet and social media were the primary sources of information on GFD for 61.7% of respondents, followed by healthcare professionals. However, the reliance on online sources raises concerns about the accuracy and quality of information being accessed. Additionally, the study found that almost half of the participants following a GFD perceived it as challenging, citing the high cost and limited availability of gluten-free products as significant barriers.

Conclusions. The findings highlight a need for improved public education and awareness campaigns about GFD, particularly focusing on the accurate identification of gluten-containing foods and the health implications of GRDs. The perceived difficulty in maintaining a GFD underscores the necessity for policy interventions to ensure the availability and affordability of gluten-free products. Furthermore, enhancing the role of healthcare professionals in providing reliable dietary guidance could facilitate better adherence to GFD and improve the overall health and well-being of individuals with GRDs. These results emphasize the importance of implementing educational and policy measures to address the knowledge gaps and support those affected by GRDs in the Republic of Moldova.

Keywords: *celiac disease, gluten-free diet, awareness, food security, gluten-related disorders, Republic of Moldova*

Acknowledgments. This work was supported by *National Agency for Research and Development (NARD), [grant numbers 23.70105.5107.05, Exploratory analysis of food security in the Republic of Moldova based on metrics of sustainable and nutritional quality (SNuQ) of food products, which runs within the Technical University of Moldova]*.

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BIOPOLYMERIC COMPOSITION ANALYSIS OF BUCKWHEAT HUSK

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Food waste is a pressing issue today, as it poses a threat to the environment through pollution. Buckwheat is an important food product that is rich in minerals and vitamins that have a positive impact on human health. However, during grain processing, about 5% of its weight is buckwheat hulls, which need to be disposed of or possibly reused.

The aim of this study is to investigate the chemical composition of buckwheat husk to determine its suitability for reuse as a compost additive in the form of biochar. An important role in the production of biochar is played by the chemical composition of the raw material, particularly the content of such components as lignin, cellulose and hemicellulose, which significantly affect the characteristics and properties of biochar.

To achieve the aim of the study, a biopolymer analysis of buckwheat husks was carried out. The nitrogen content was determined by the Kjeldahl method, pectin substances by spectrophotometry, and hemicellulose by hydrolysis of easily hydrolysed polysaccharides. Hydrolysis with concentrated H_2SO_4 was used to determine the cellulose content, and lignin was determined as a residual product after cellulose removal. Each experiment was performed in triplicate to obtain accurate data.

The results of the study showed that the protein content in buckwheat hulls is 4.8 % ± 0.1, pectin substances - 3.1 % ± 0.1. Among the lignocellulosic components, lignin accounts for the largest share - 36.3 % ± 0.1, while the cellulose content is 27.4 % ± 0.1, and hemicellulose - 15.5 % ± 0.2.

Based on the results obtained, it can be concluded that the biopolymer composition of buckwheat hulls indicates that such raw materials are promising to produce high-quality biochar. The production and subsequent use of biochar from such raw materials as an additive to compost can positively affect the decomposition of organic waste and improve the properties of compost, making it an important component in the field of environmentally friendly waste management.

Keywords: *biotechnology, buckwheat hull, food waste, lignocellulosic components*

BLACK AND RED CURRANT POMACE EXTRACTS – CHARACTERIZATION AND BIOSAFETY ASSESSMENT USING SUSTAINABLE METHODS

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The interest of the researchers in red fruits by-products, such as black and red currant pomaces, has permanently increased due to their content in bioactive compounds with antioxidants and cardioprotective effects.

At the same time, a permanent concern of scientists is to use sustainable methods for characterizing and evaluating extracts from plant sources.

As part of our research, our team focused, on the one hand, on finding innovative solutions for the valorization of some by-products from the food industry [1] and, on the other hand, on the use of sustainable methods for the characterization and biosafety screening of plant-based extracts [2].

Therefore, the present study aims to conduct *in vivo* investigation on black and red currant berries pomace extracts using *Allium cepa* assay.

In this view, aqueous and hydroethanolic extractions from black and red currant pomaces were carried out. The obtained extracts were characterized using rapid, efficient and easy-to-operate analytical methods such as electrometry, colorimetry and UV-Vis spectrometry.

Further, biosafety assessment of pomace extracts was performed using sustainable method, namely *Allium cepa* test, by scoring the mitotic index and chromosomal aberrations.

Following the microscopic evaluation of onion meristematic cells exposed to the tested pomace extracts, different stages of mitotic division and several types of chromosomal aberrations were observed. Both the type of pomace and the experimental extraction conditions influenced the cytogenetic response of the investigated extracts.

Overall, the present study allowed to obtain reliable results using rapid, easy-to-handle environmental friendly methods and to conclude that black and red currant pomace extracts can be safely used for potential therapeutic purposes.

Keywords: *extract, berries pomace, Allium cepa test, phytochemical evaluation; cytotoxic and genotoxic effects*

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CORRELATIONS BETWEEN PHYTOCOMPOUNDS OF AROMATIC CULINARY VEGETABLES

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In the Republic of Moldova there are strong traditions of cultivating and using aromatic vegetables in culinary practice. Aromatic vegetables aromatic plants not only give better taste to meat or vegetables, but are also useful for good digestion and detoxification. In addition, by adding flavor to food, they help limit the amount of salt added to dishes. They have a low calorie content, providing no more than 15-30 calories per 100 g.

During the vegetation period, aromatic plants accumulate various phytocompounds as bioactive qualities - vitamins, minerals, chlorophyll. The rate of accumulation of these compounds depends on the synthesis mechanism specific to the plant, but also on the transfer of minerals from the soil.

In the current study, the phytocompounds accumulated in 8 aromatic vegetables, widely used in the modern kitchen - mint, parsley, dill, lovage, red basil, green basil, celery and green onion were determined. The list of determined phytocompounds included - β-carotene, chlorophyll, calcium, phosphorus and iron.

After determining the value of organic compounds and minerals, the Pearson r correlation coefficient was calculated, using a respective calculator available online.

Thus, it was established that there is a direct similarity between the accumulation of β-carotene and the accumulation of P ($r=0.5458$, $p=0.046$) and Fe ($r=0.8508$, $p=0.068$). Also, there is a direct similarity and close correlation between the accumulation of chlorophyll and Ca ($r=0.6471$, $p=0.036$) or Fe ($r=-0.7899$, $p=0.082$). The presence of Ca and Fe in the soil can influence the accumulation of organic compounds, β-carotene ($r=-0.7105$, $p=0.043$) and chlorophyll ($r=0.8508$, $p=0.051$). At the same time, the presence of P in the soil influences to a lesser extent the accumulation during the growth period of these two synthetic organic compounds.

Results of the Pearson correlation coefficient r indicated that there is a significant large negative relationship between accumulation of Ca and Fe in aromatic culinary vegetables ($r=-0.5971$, $p=0.015$). In contrast, there is no close correlation between Ca and P accumulation ($r=0.3909$, $p=0.034$). Also, there is a non-significant medium negative relationship between P and Fe accumulation ($r=-0.4759$, $p=0.062$).

The data on the accumulation of phytocompounds in aromatic culinary vegetables are important for nutritionists, food manufactures, also consumers, due to their nutritional potential and therapeutic effects. In the same time, the data about the possible correlations between the phytocompounds accumulated in aromatic vegetables are necessary to understand more deeply the mechanisms of plant synthesis, and additionally, to know the nutrients from the soil, which have a high rate of assimilation by vegetables.

Keywords: *correlation coefficient r, aromatic culinary vegetables, bioactive compounds, minerals, growth period*

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COTTAGE CHEESE BASED MOUSSE MANUFACTURING TECHNOLOGY WITH VEGETABLE ADDITIONS

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Cottage cheese-based mousse presents a dessert product with good taste properties and a harmonious chemical composition. The chemical composition is characterized by a protein content of 10.5%, fat 7.2%, carbohydrates 6.9%, and an energy value of 135.78 kcal/100g.

Enriching this product with bioactive compounds is important for diversifying the product range and valorizing the by-products of agricultural raw material processing.

The mousse manufacturing technology involves hydrating gelatin in water, which is then mixed with a sugar solution, heated to a temperature of 103-107°C, and tempered to 30-35°C. The pureed cottage cheese is then incorporated into the resulting mixture and homogenized until a uniform composition is obtained. Vanilla sugar is added, and the mixture is homogenized and foamed until a homogeneous consistency is achieved. It is then shaped and stabilized at a temperature of 4-6°C for 2-4 hours, packaged, and stored at 4-6°C.

The composition of the cottage cheese mousse was optimized by incorporating vegetable powders made from the skins of red and white grapes, apples, pears, and quinces. These additions have a fine and homogeneous structure, moisture content of 6-8%, a total polyphenol content of 18.57-24.82 mg GAE/g, and antioxidant activity of 35.24-53.87% DPPH. The mousse-making technology was modified by incorporating these powders at the homogenization stage before the subsequent foaming process. The quantities of vegetable powders varied from 2.5 to 5, 7.5, and 10% of the total mass. Organoleptic examination showed that the optimal addition of powder is 5 and 7.5%.

The resulting product is distinguished by changes in color, aroma, and taste characteristics depending on the added vegetable raw materials. It is characterized by high biological value, superior sensory characteristics, and extended shelf life.

Keywords: *vegetable powder, bioactive compounds, technological parameters, sensorial characteristics*

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DETECTION OF FALSIFIED FERMENTED DAIRY PRODUCTS

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Introduction. Food adulteration is a current problem. In dairy products, lactic fat is totally or partially replaced with vegetable oils. Specialized laboratories in quality control apply the usual method of detecting non-conformities [1]. This method is sufficiently accurate, but requires expensive equipment and advanced operator training. The work aimed to identify the presence of vegetable oils in dairy products using simpler and cheaper methods.

Material and methods. Study objects served 12 samples of kefir and 6 sour milk, placed in the markets of the Chisinau city. The fat mass fraction was determined by the ISO 2450 method [2]. The composition of the fatty acids in fermented dairy products was determined using the Reichert-Meissl value, which demonstrates the content of short-chain fatty acids, and the Polenske value, which characterizes the content of volatile fatty acids. These two indices are used to find out the content of lactic fat in products.

Results. An alternative method to detect the falsification of the lactic fat content in lactic acid products was applied. It was established that in 11 samples of kefir the Reichert-Meissl value varied between 18.4...22.3, respectively Polenske 1.9...2.1, which corresponds to a content of 100% lactic fat. Only one sample had lower values of the Reichert-Meissl index – 16.4 and Polenske – 1.6.; these values confirm an addition of 10% vegetable fat. Out of 6 sour milk samples, 5 have full lactic fat, because the Reichert-Meissl values are between 18.6...23.0, respectively Polenske 1.8...2.2. One sample, however, had lower values, Reichert-Meissl – 16.8 and Polenske 1.7. The principle of detecting the addition of vegetable oils is explained by the fact that lactic fat contains a much higher percentage of short-chain fatty acids, which are also volatile, compared to sunflower, soybean, and rapeseed vegetable oils.

Conclusions. Detecting dairy product falsification regarding the addition of vegetable oils can be achieved by the method that establishes reduced values of the Reichert-Meissl and Polenske indices. The application of this method has shown that counterfeit samples of kefir and sour milk are present in the markets.

Keywords: *milk fats, Polenske value, Reichert-Meissl value*

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EFFECT OF DISSOLUTION MEDIA ON THE ENCAPSULATION EFFICIENCY OF CAROTENOID-RICH EXTRACT IN LIPOSOMES

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Food safety is a significant concern for both consumers and the food industry. Oxidation of biomolecules causes serious health issues such as cancer, cardiovascular diseases, cataracts, and diabetes. A possible strategy to protect against oxidation is to use antioxidant compounds. The application of plant-based extracts as natural antioxidants is vital to protect various food products against oxidation. Among the most important classes of natural antioxidants carotenoids are commonly used to prevent oxidation and increase the shelf-life of food material. Liposomal encapsulation is a promising technique for enhancing the stability and bioavailability of bioactive compounds. Liposomal formulation protects carotenoids from oxidative degradation, thereby extending their shelf life and maintaining their biological activity. This study aims to evaluate the impact of the dissolution media on encapsulation efficiency of sea buckthorn lipophilic extract rich in carotenoids in liposomes. Encapsulated bioactive compounds liposomes were prepared by an adapted heating method (Mozafari method) [1]. The study of liposomes incorporating lipophilic extracts from sea buckthorn reveals distinct encapsulation efficiencies, retention rates, and amounts of encapsulated bioactive compounds. The CLW sample exhibited the highest encapsulation efficiency (EE) at 90.90%, indicating superior encapsulation of carotenoids when water was used as the dissolution medium. Similar to the encapsulation efficiency, the water-based liposomes (CLW) demonstrated higher retention rates at 86.74%. The ethanol-based liposomes (CLEt) had slightly lower encapsulation efficiency of 87.83% and lower retention rates of 80.18%. The amount of encapsulated bioactive compounds (EBA) reflects the actual quantity of bioactives trapped within the liposomes. The CLW sample contained the highest amount of encapsulated bioactive compounds at 83.74 μg, followed closely by CLEt at 81.18 μg [2]. These results suggest that both water and ethanol can be used as dissolution media, but water tends to be slightly more effective in preserving higher amounts of encapsulated bioactives. The findings indicate that liposomes prepared in double-distilled water generally outperform those prepared in ethanol in terms of encapsulation efficiency, retention rate, and the amount of encapsulated bioactive compounds. The superior performance of water-based liposomes could be attributed to better stability and integrity of the liposomal bilayers in aqueous environments, which enhances the encapsulation and retention of bioactive compounds.

Keywords: *bioactive compounds, seabuckthorn, oxidative stability, antioxidants*

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ENRICHMENT OF WHEAT FLOUR WITH MICROGREENS

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According to nutritionists, the diet of Ukrainians is depleted of such important components of products as vitamins and mineral elements. The solution to this problem should be based on focus on enriching the foods that various segments of the population consume regularly. In this context, it is particularly relevant to consider wheat flour, from which a wide range of bread, baked goods, and confectionery products are made, with assortments varying by country and tradition. The technologies used to process wheat into flour diminish the nutritional value of the final product compared to the raw material in terms of minerals and vitamins.

Currently, a popular source of bioactive compounds in diets is the consumption of microgreens. They are grown from the seeds of various crops and are environmentally friendly. However, it is recommended to consume them fresh, which restricts the ways they can be incorporated into diets.

The aim of this research was to evaluate the feasibility of enriching wheat flour with dried microgreens.

Microgreens from wheat, peas, and sunflower were dried in a convection dryer at a temperature of 60 °C, then ground and added to high-grade wheat flour. The resulting flour samples were characterized by their gluten content and quality (elasticity). The content of bioactive compounds was determined using classical biochemical methods. The biological activity of the samples was assessed by measuring the reaction rate involving the coenzyme nicotinamide adenine dinucleotide (NAD).

It was established that adding microgreens to the flour in quantity of 3 % and 5 % did not change its sensory characteristics. The addition of 5% pea and sunflower microgreens slightly improved the elasticity of the gluten compared to the original flour (control sample). The quality of the gluten obtained from the other studied samples remained at the level of the original flour.

The content of vitamins B_1, B_2, E, chlorophyll and carotenoids in the samples was determined. It was shown that the addition of 5 % microgreens resulted in thiamine levels in the samples ranging from 0.37 to 0.39 mg/100 g. The riboflavin content was found to be 0.38 mg for peas, 0.43 mg for wheat, and 0.58 mg/100 g for sunflower.

To evaluate the antioxidant activity of microgreens samples, a biological method was used that takes into account two main factors: the intermolecular interaction of the ingredients in the product and the cooperative contribution of bioactive components to the intensity of electron transport, which models the energy homeostasis of the body. It was established that the antioxidant activity of microgreen wheat extract was 0.35 arb.u. relative to gallic acid, while for peas - 1.22 arb.u. and 1.92 arb.u. for sunflower microgreens. The indicator of antioxidant activity in this case serves as an integral characteristic, influenced by the presence of several bioactive compounds, including, in particular, tocopherols, bioflavonoids, carotenoids, etc. The maximum activity of sunflower microgreens is likely related to their significantly greater tocopherol content compared to the other crops.

The obtained results indicate that the enrichment of wheat flour with dried microgreens of wheat, peas, and sunflower increases the content of vitamins B_1 and B_2 in it, as well as the total biological activity. Therefore, the production of wheat flour enriched with microgreens is feasible.

Keywords: *biological activity*, *fortification of flour, vitamins*

INFLUENCE OF BREWING TIME ON PHYSICOCHEMICAL AND SENSORIAL PROPERTIES OF SOME ROMANIAN RED FRUITS TEA INFUSIONS

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Red fruit teas infusions represent an important source of natural antioxidants [1] and are among the preferences of Romanian consumers, especially during the cold season.

Some parameters, such as brewing time, temperature and water, influence the infusion process and implicitly the quality of the obtained tea infusions [2].

The present study aims to investigate the effect of brewing time on the physicochemical and sensorial characteristics of some red fruit tea infusions available on the Romanian market.

In this perspective, infusions of five red fruits teas were prepared using different brewing time.

The samples were analyzed to estimate some physicochemical parameters: pH, electrical conductivity, salinity, total dissolved solids, and oxidation reduction potential. These measurements were carried out by electrometric method using Thermo Scientific™ Orion™ Versa Star Pro™ Multiparameter Benchtop Meter. Also, the samples were spectrophotometrically evaluated using Shimadzu Spectrophotometer UV-1280.

Sensorial examination of fruit tea infusions was performed through the 7-points hedonic scale method, evaluating the appearance, aroma, taste, color and global impression.

The results obtained for all the red fruit teas tested revealed that the brewing time recommended by the manufacturer is not sufficient to obtain an infusion with maximum consumer satisfaction.

Keywords: *red fruit tea, infusion, brewing time, physicochemical parameters, sensorial examination*

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LEGISLATIVE REQUIREMENTS OF PESTICIDE LEVELS IN THE GRAIN FROM UKRAINE

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Introduction. Ukraine often referred to as the breadbasket of Europe, supplies grain to markets across Europe and beyond. To ensure the safety of these grain crops, strict limits are set for safety indicators, including toxic elements, mycotoxins, radionuclides, and pesticides. In light of the 2023 controversy involving elevated pesticide levels in Ukrainian grain, it is crucial to monitor pesticide levels in Ukrainian grain and feed, compare these with EU regulations, and assess the industry's overall situation.

Results. Grain is delivered to storage facilities according to contractual requirements that align with the Ukrainian DSTU "Technical Requirements" and legislation. However, these standards often differ from EU requirements, with contract standards sometimes being more stringent than both ISO and EU regulations. Safety indicators, in particular, show significant discrepancies. For grain exports, GAFTA contracts are commonly used, while FOSFA contracts are preferred for oil crops and oil certification. GMP+ International standards apply to feed and feed products, incorporating many GAFTA and EU regulations but with additional controls on critical quality indicators such as pesticides, aflatoxin B1, heavy metals, and dioxins.

In 2023, RASFF reported four instances of pesticide contamination in Ukrainian grain and feed, including clothianidin, chlorpyrifos, glyphosate, and chlormequat, found in brewer's grain, wheat, barley, and yellow millet. In the first four months of 2024, RASFF recorded another four cases of pesticide contamination (acetamiprid, chlorpyrifos, clothianidin, glyphosate) in flax seeds, brewer's spent grain, and dried apple pulp from Ukraine.

Conclusions. A comparison of Ukrainian standards with EU Regulation (EC) No. 396/2005, which sets maximum residue levels for pesticides in food and feed, reveals notable differences. Furthermore, Ukraine still registers chlorpyrifos, a pesticide banned in the EU. As Ukraine seeks EU membership, aligning its legislation with EU standards requires phasing out the use of chlorpyrifos and chlorpyrifos-methyl. This would also fall into line with EU Directive 2009/128/EC in establishing a framework for Community action to achieve the sustainable use of pesticides.

Keywords: *grain quality and safety, grain export, pesticides, legislation*

MICROBIOLOGICAL QUALITY OF BY-PRODUCTS FROM THE LOCAL OIL AND FAT INDUSTRY

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The use of oilseed by-products in food production is gaining attention due to the rising demand for plant-based alternatives. These products offer several advantages: they are lactose-free, cholesterol-free and allergen-free, rich in nutrients, and more affordable than animal products. In the Republic of Moldova, oilseed cakes and vegetable oils are significant in industrial production, though their use remains mostly limited to animal feed. One major challenge to wider adoption in food production is ensuring the sanitary and microbiological quality of these by-products. Oilseed cakes are susceptible to microbial contamination during harvesting and storage. The oil extraction process has little effect on the initial contamination. During storage, the quantity and species composition of the microflora change: under optimal conditions, the number of non-spore-forming bacteria decreases, while the number of spore-forming bacteria, resistant to unfavorable conditions, increases. Heat-resistant spore-forming bacteria remain in the oilseed cake and begin to proliferate under favorable conditions, leading to their predominance. Fungal microflora is also found in oilseed cakes. The main danger of mold fungi development in oilseed by-products lies in their ability to produce mycotoxins. The microbiological profile of three locally sourced oilseed cakes – sunflower, almond, and pumpkin – was investigated. It was found that sunflower oilseed cake had the highest total microbial cell count per 1 gram. Microflora quantitative analysis revealed the presence of aerobic putrefactive microorganisms such as *Bac. subtilis* and *Bac. mesentericus*, as well as mesophilic anaerobes like *Clostridium sporogenes*. The representatives of mold fungi from the *Penicillium* and *Aspergillus* genera were also identified. In this regard, it is essential to focus on the quality control of oilseed cakes used in food production. They must be free from vegetative cells and spores of pathogenic and opportunistic microorganisms, as well as mold fungi capable of reproduction. It is also important to consider that while technological operations can reduce microbial contamination, complete destruction is rarely achieved. Sometimes, pH and temperature during processing may even favor microbial growth. Given the microbiological condition of the studied oilseed cakes, their use can be recommended for food technologies that include measures to reduce pathogenic microbial contamination.

Keywords: *microbiological contamination, microflora, oilseed cake, quality indicators*

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MINERAL AND PHYSICAL-CHEMICAL COMPOSITION OF BEE POLLEN COLLECTED IN THE REPUBLIC OF MOLDOVA

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During the COVID 19 pandemic and after it, consumer interest in bee products, including bee pollen, has increased. Contemporary consumers are oriented towards a healthy, nutrient-dense, environmentally friendly lifestyle. This interest is argued by the content of lipids, proteins and essential micronutrients for bees, while presenting a nutraceutical potential for humans, thus participating in the prevention of several diseases [1]. At the same time, not all bee products receive the same attention in research. Bee honey is analyzed and exploited quite a lot, while bee pollen, bee bread and others are less studied [2].

The physico-chemical composition and techno-functional properties of bee pollen collected from three apiaries in the south of the Republic of Moldova, fruit of the year 2023, were evaluated. The mineral content shows that there are no significant differences in terms of the total mineral content per sample according to of the beehive. However, the mineral content varied depending on the origin of the bee pollen. The following general trend was observed in terms of mineral content in higher concentration in bee pollen as follows: K (2.3–4.9 g/kg) > P (2.1–3.9 g/kg) > Ca (0.48–2.3 g/kg) > Na (0.35–1.4 g/kg) > Mg (79–601 mg/kg). At the same time, the bee pollen analyzed contained 58.24–79.17% carbohydrates, 9.98–29.15% proteins, 1.11–5.18% lipids, and 1.18–3.21% ash.

The analyzed bee pollen showed low protein solubility (2.79–25.90 g/100 g), high carbohydrate solubility (31.2–75 g/100 g), good emulsifying properties (emulsion stability index of varied between 18.4 and 47.1 min and emulsion activity index varied between 11.04 and 24.52 m2/g), non-foaming properties, poor water absorption capacity (0.92–2.25 g/ g) and excellent oil absorption capacity (1.11–3.61 g/g). Protein solubility was positively correlated with carbohydrate content ($r = 0.75$, $p < 0.05$) but negatively with ash and lipid content ($r = -0.38$, $r = -0.47$, respectively $p < 0.05$). Total protein content and lipid content showed a positive relationship with carbohydrate solubility ($r = 0.38$, $r = 0.44$, $p < 0.05$, respectively). Emulsion stability was also positively correlated with protein solubility ($r = 0.48$, $p < 0.05$), while emulsion activity was negatively correlated with this parameter ($r = -0.33$, $p < 0.05$) . Water and oil absorption capacity did not reveal important correlations with other parameters investigated in bee pollen.

The obtained results encourage the use of bee pollen as useful applications, as a food ingredient in a variety of food products.

Keywords: *Bee pollen; mineral composition; solubility, functional properties; food applications*

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NITROSAMINES-EXCESS DETECTION IN SMOKED FISH AND SAUSAGES

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Nitrosamines possess general formula R_1R_2N-N=O, they are toxic cancerogenic compounds damaging the human liver and all metabolism. The nitrosamines content is need to control after the processes of fuming (also called "smoking") of fish or meat, or were nitrites as a food additive are used. An acceptable limit content of nitrosamines in food is 4 micrograms per kg (4 μg/kg). UV absorption at 220…255 nm with molar extinction ε ~ 5000 $L \cdot mol^{-1} \cdot cm^{-1}$, allows HPLC/PDA use for detection or for exclusion of its dangerous excess in smoked foods. Reversed-phase gradient elution HPLC with C_{18}-column (150mm · 4,6mm · 5μm · 80nm, "Phenomenex"), assisted with Photo Diode Array detector ("Shimadzu"), was used. Phase A: Water with 0.01% Trichloroacetic Acid. Phase B: Acetonitrile with 0,1% Acetic Acid. Oven temperature: 25°C. Flow: 0,8 mL/min., 5% Phase B. Gradient points: 7 min. – flow, 24 min. – 65% Phase B, 25 min. – 95% Phase B, 26min. – 95% Phase B, 27 min. – flow, 35 min. – flow, stop data acquisition. PDA detection: 200…800 nm, spectrum resolution 512, cell temperature 31°C, slit width: 8nm. Sampling: 12.5Hz. Basic wavelength: 230 nm (corresponding with maximum for majority of N-nitrosamines). Standards from "Merck" of dimethyl-nitrosamine $(CH_3)_2N$-N=O (or Me_2NNO), and of dipropyl-nitrosamine $(C_3H_7)_2N$-N=O (or Pr_2NNO), 0.2mg/mL were used, injected volume being 10μL. Experimental absorption maximums in conditions of elution: 227 and 231 nm. Smoked fish and sausages samples, 5,00 g, were homogenized, extracted with 5,00 mL of Acetonitrile and centrifugated 10 minutes at 10000 rpm. Obtained liquid phase was filtered through Polytetrafluoroethylene (PTFL) filter with 0.22 μm pores. To increase targeted signal expression, volumes of 100μL of these filtrates were injected. Solutions of Me_2NNO and Pr_2NNO, give t_R = 4.00-4.10 min. and t_R = 19.15-19.35 min., baseline-related pick heights, h, of 1350 mAU and ~ 890 mAU, pick areas, A, of $15.1 \cdot 10^6$ and $8.5 \cdot 10^6$, respectively. In this condition, calculated molar areas, A_{molar}, are $5.6 \cdot 10^9$ and $5.5 \cdot 10^9$, that is, they practically coincide for the studied nitrosamines, and this characterize used method as good. Very high resolution, R_S ~ 15, is good for separation and analysis of these two nitrosamines. According to these data, acceptable concentrations of 4 ng/kg in food correspond with Me_2NNO and Pr_2NNO pick areas of ~ 1500 and ~ 850, respectively – low values for this type of detection. Thus, HPLC/PDA allows with a very low probability to reliably detect concentrations of nitrosamines that are less than the maximum permissible level. But 3-10-fold excess of the maximum permissible level of nitrosamines can be reliably determined by this method. It is quite enough to detect a danger. Thus, in the smoked capelin and herring samples, the maximum permissible level of nitrosamines was exceeded by 20-30 times. At the same time, were not find chromatographic signals confirming the great exceed of studied nitrosamines in common types of smoked sausages.

Keywords. *caplin, detection, dimethylnitrosamine, dipropylnitrosamine, fuming, herring, HPLC*

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NUTRITIONAL AND ANTIOXIDANT PROPERTIES OF CAROB (*CERATONIA SILIQUA*): A COMPARATIVE STUDY AND FUNCTIONAL FOOD APPLICATION

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Ceratonia siliqua, commonly known as carob, is a legume species native to Mediterranean climates, notable for its hardiness and low agricultural demands. Despite its potential as a sustainable crop, global carob cultivation has declined due to shifts in agricultural practices, climate change, and decreased consumer awareness of its nutritional benefits. This study aims to evaluate the nutritional and antioxidant properties of carob samples from different regions - Moldova, Spain, Italy, and Algeria with a focus on nutritional value, antioxidant activity, and functional food applications. Carob pods and beans were collected, processed, and analyzed for calcium (Ca), magnesium (Mg), and iron (Fe) content. Moldovan carob exhibited significantly higher mineral concentrations, with Ca, Mg, and Fe levels of 4506.7 mg/kg, 1864.4 mg/kg, and 78.19 mg/kg, respectively, compared to the Mediterranean samples [1]. The antioxidant capacity of the Moldovan samples was also superior, with values ranging from 47.00–74.24%. A strong correlation was observed between the levels of total flavonoids, tannins, and phenolic compounds and the antioxidant capacity of the samples [2]. The study further explored the functional potential of carob powder in the formulation of pastry sau ces. Carob powder from both pods and beans was incorporated into three different sauce formulations, replacing traditional cocoa powder. The sauce made with carob pod pulp exhibited the highest polyphenol content (29.12 mg GAE/g), while sensory evaluations showed a preference for the sauce made with carob bean powder due to its smoother texture and chocolate-like flavor. The control sauce made with cocoa had the lowest antioxidant activity and total polyphenol content [3]. This research highlights the nutritional and functional food potential of carob, particularly Moldovan carob. Its inclusion in food products like pastry sauces can improve nutritional value, offering healthier alternatives to conventional ingredients. These findings underscore the importance of carob in food innovation and sustainable food production.

Keywords: *agricultural practices, antioxidant activity, Ceratonia siliqua, climate change, nutritional value, sustainable food productions*

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NUTRITIONAL AND SENSORY QUALITIES OF PTASIE MLECZKO (BIRD'S MILK) CONFECTIONERY WITH GRAPE SKIN POWDER

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In Moldova, viticulture is a key economic driver and accounts for 25% of the workforce. A major byproduct of this industry, grape pomace—composed of skins, seeds, and stems—accounts for an estimated 6 million tons globally, necessitating effective management.

The primary aim of the research was to evaluate the bioactive potential of grape skins from native varieties Feteasca Neagra (FN) and Rara Neagra (RN), and to investigate the feasibility of utilizing these grape skins by incorporating them into confectionery product matrices. Analysis of the grape skin powders revealed that the proteins comprised around 9.84% in FN and 9.91% in RN varieties, with sugars contributing approximately 12.77% and 12.43%, respectively. Moreover, the fiber content was slightly higher in RN at 31.2%, compared to 30.5% for FN, suggesting both are rich sources for potential food applications. In order to capitalize on the potential of grape skin powder, it was incorporated into the formulations of the confectionery product type Ptasie Mleczko (Bird's Milk) at concentrations of 1% and 3% relative to the total ingredients' mass. Ptasie Mleczko with 3% FN grape skin powder exhibited the highest total polyphenol content at 103.44 mg GAE/100 g, followed by the sample enriched with 1% FN grape skin powder (97.83 mg GAE/100 g) and RN at 3% (92.46 mg GAE/100 g). In terms of antioxidant activity, FN grape skin powder had a more pronounced effect on the inhibition of DPPH free radical, recording a value of 22.84% for FN3% sample, compared to 20.45% for RN3% and 0.75% for the control sample, likely due to differences in chemical composition and polyphenol content. Color parameter analysis revealed a color difference (ΔE) of 4.25 and 5.39 for the 1% FN and RN samples, respectively, while the 3% additions showed a ΔE exceeding 10. Texture analysis indicated that adding grape skin powder reduced firmness and chewiness of Ptasie Mleczko samples while increasing cohesiveness. Sensory evaluation showed minimal differentiation, with all samples rated as "very pleasant to extremely pleasant".

Keywords: *grape skin powder, bioactive compounds, polyphenols, antioxidant activity, color, sensory parameters*

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NUTRITIONAL EVALUATION OF KADOTA SPECIES FIGS CULTIVATED IN THE REPUBLIC OF MOLDOVA

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The cultivation of figs in the Republic of Moldova, is still in its infancy compared to other fruits. Figs are sensitive to climatic conditions, and the climate in Moldova can often be too cold to reliably produce a consistent harvest without proper protection.

However, there is a trend of increasing interest in this culture, especially in areas with a more favorable microclimate and with support for protection techniques such as winter roofs or greenhouses. Modern agriculture and protection technologies help to expand this crop in the region. However, fig orchards are present in the Republic of Moldova, albeit uncommon. The Mediterranean climate in some areas of the country allows the cultivation of this fruit, and local producers are increasingly engaged in fig culture.

Figs are beneficial for a healthy diet for several reasons like aids digestion and maintains gut health; contains antioxidants that protect cells from oxidative stress; they are a good source of B vitamins, K and minerals such as potassium, magnesium and calcium; may help lower blood pressure and reduce the risk of heart disease due to their potassium and fiber content. In addition, they have a naturally sweet taste that can replace processed sweets.

Standard methods of assessing parameters were used for physico-chemical analysis of fresh figs grown in the Republic of Moldova, such as: titratable acidity, pH, content in dry substances and the amount of total sugars. To determine the content of polyphenols, organic acids and anthocyanins in fresh figs, the spectrophotometric method was used using the DR-5000 device (Germany) in the wave spectrum between 190 and 1100 nm.

Thus, it was determined that the DW content is 24,3%, the titratable acidity is 2.45%, the pH is 4.9 and the amount of total sugars is 20.5%. Following the quantitative determination of polyphenols in fresh figs, it was found that chlorogenic acid predominates (46 mg/100g), followed by gallic acid (31 mg/100g), quercetin (5.3 mg/100g), kaempferol (2.12 mg /100g) and rutinoside (2.56 mg/100g). Regarding the presence of anthocyanins, the content is quite low, represented mostly by cyanidin (1.46 mg/100g product). The presence of organic acids is also insignificant: malic acid (0.87 mg/100 g); citric acid (0.24 mg/100 g) and tartric acid (0.132 mg/100 g). After evaluating the composition of figs in minerals, it can be found that they are predominantly K (230 mg/100 g) and Ca (38 mg/100 g). Then, comes Mg (15 mg/100g) and P (14 mg/100g). The lowest content, but not insignificant, are Fe (0.4 mg/100g) and Zn (0.15 mg/100g product).

Based on this study, Kadota fig cultivars grown in the Republic of Moldova demonstrate significant nutritional and phytochemical value, making them promising candidates for inclusion in healthy diets.

Keywords: *figs, nutritional value, polyphenols, organic acids, anthocyanins, healthy diet*

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OILCROP POMACE AS A SOURCE OF VEGETABLE PROTEIN

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Scientists predict that the demand for animal proteins will double in the next 25 years. The availability of animal proteins is becoming increasingly problematic due to factors such as pollution, climate change, high energy consumption, and rising prices. Consequently, research into alternative, environmentally friendly protein sources is attracting increasing attention. Plant sources rich in proteins with favourable amino acid composition are particularly promising. Once extracted, these plant proteins can serve as food supplements, are easily digestible, non-toxic, and suitable as substitutes for animal proteins. In addition, there is an increasing focus on addressing the problem of food waste by converting it into products suitable for human consumption. An example of such agro-waste is oilseed pomace, a by-product of oil production that can be a valuable source of protein. Methods of extracting valuable proteins from oil refinery by-products using new technologies have been analysed. Depending on the method of oil extraction, the wastes are divided into two categories: pomace (residues after mechanical extraction) and cakes (residues after chemical extraction). Despite the high oil yield of the chemical method, pomace is more valuable because it is not exposed to chemicals and is a more environmentally friendly product. In addition, pomace is rich in biological substances, minerals and vitamins. The chemical composition depends on the type of pomace, but it is mainly rich in phosphorus, magnesium, folic acid, tocopherol, thiamine, etc.

To extract protein from the pomace, water, alkalis, saline solutions, organic solvents or acids are usually used. The process starts with the alkaline solubilisation of proteins, after which insoluble substances such as starch and fiber are removed by centrifugation. The protein is then precipitated at the isoelectric point using hydrochloric acid. Spray drying is often used to obtain powdered concentrate, which is advantageous in that it avoids overheating the product, preserving its quality, and avoids the need for additional grinding. Modern methods aim to reduce the use of chemicals, reduce temperature, shorten extraction time, and increase efficiency and protein yield. These methods include high-pressure treatment, microwave extraction, supercritical fluid extraction, ultrasonic extraction, cold plasma treatment, pulsed electric fields, and radio frequency treatment. The protein yield after extraction can reach 80% with lower phenolic content.

The obtained concentrates are widely used as food supplements as a source of vegetable protein, have antioxidant properties and are rich in minerals.

Keywords: *oilcakes, protein isolates, pumpkin seed, rapeseed, sunflower seeds, waste processing*

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PERSPECTIVE WAYS TO IMPROVE THE PROCESS AND EQUIPMENT FOR THE PRODUCTION OF FERMENTED DRINKS BASED ON TEA MUSHROOM

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Introduction. In the recent time, Kombucha, a fermented drink of natural composition with health and wellness properties, has become widely popular on the soft drink market. The health and preventive benefits of this drink are based on its unique biochemical composition: it contains antioxidants, vitamins, minerals and organic acids. With the growing tendency to increase the production of the drink, the problem of improving the process and equipment for making Kombucha on an industrial level is becoming more acute.

Materials and methods. The object of research is the equipment and process of production of the Kombucha drink. The purpose of this work is to identify perspective directions for improving the object of research based on the literature and analytical review and analysis of the current status of technological and technical solutions for the production of Kombucha drinks with its transition from low-productivity "handicraft" to large-scale production in industrial conditions.

Results. The producing of the fermented drink such as Kombucha is a natural process based on the fermentation of a sugar solution based on tea with the help of a special fungus (a symbiotic culture of alcoholic yeast and acetic acid bacteria). The process begins with the preparation of a sugar tea solution using tea leaves of the Camellia sinensis plant. Then, alcoholic yeast converts sugar into alcohol, and acetic acid bacteria converts alcohol into acetic acids. By qualitatively controlling and implementing this process, a delicious and nutritious sweet and sour drink, world-famous as Kombucha, can be produced.

At the moment, the process of making a Kombucha drink is not widely researched and is actually close to home and amateur production in rather limited quantities. There is no specialized equipment for the production of this drink in industrial levels at the moment. In some cases, there is an adaptation of certain technological equipment borrowed from related industries where a similar process takes place, such as brewing or kvass production. Therefore, one of the most promising ways is to develop specialized technological equipment specifically for this process on an industrial level.

The second fundamental problem with the production of these drinks, despite their later filtration and pasteurization, is their short storage life at a temperature not exceeding +15°C and their marketing life of up to 30 days, which significantly affects production volumes and generally complicates the process of their widespread sale through the retail network. The reason for this is the problem of the appearance and further reproduction of the fungus in an already corked bottle, which causes a negative reaction from the consumer.

Conclusions. The article identifies a series of perspective ways to improve the equipment and process of production of the fermented beverage "Kombucha".

Keywords: *Kombucha, tea mushroom, fermented drink, fermentation*

PHYSICO-CHEMICAL AND SENSORY CHANGES IN BREAD FORTIFIED WITH RED WINE

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The Republic of Moldova is renowned for its rich tradition in winemaking, a cultural and economic pillar of the country. About 200 thousand people work in this branch, wine production constituting 25% of the total volume of Moldovan exports [1]. Given the increasing interest in functional foods and the potential health benefits associated with polyphenol-rich ingredients, this study explores the incorporation of red wine into bread formulation, aiming to enhance its nutritional and sensory qualities [2]. The research focuses on the physico-chemical and sensory changes in bread fortified with red wine. Starting from the French recipe of "Beaujolais Nouveau" bread, which is currently enjoying success in France, representing a symbol of the alliance between agriculture and wine, this research underscores the potential of red wine fortification as a means to valorize Moldova's viniculture heritage, while contributing to the development of functional foods. By integrating a traditional product like wine into bread, we aim to create innovative food solutions that could bolster the local economy and enhance the nutritional offerings available to consumers. In order to analyze how the type of wine used influences the physico-chemical and organoleptic parameters, 3 samples of bread with the addition of wine were prepared according to the traditional French recipe, replacing the Beaujolais Nouveau wine with Moldovan red wine. Thus, 2 types of wines were used: dry red wine and pastoral wine. The addition of wine to bread increases acidity and reduces porosity. Bread made with dry red wine has an acidity of 0.98, higher than that made with a 50/50 mix of dry red and pastoral wine (0.82) or with pastoral wine alone (0.74). While regular bread has a porosity of 60-80%, the porosity drops to 55% with dry red wine, 49% with the wine mix, and 43% with pastoral wine. Organoleptic analysis shows a decrease in taste, smell, and consistency scores compared to the control sample, but the product remains acceptable for consumption. In conclusion, in terms of physicochemical characteristics, the addition of wine can influence the porosity of the bread, possibly leading to changes in its texture and structure. From the point of view of organoleptic analysis, bread with added wine can offer pleasant characteristics in terms of appearance, color, smell and taste, although this may vary depending on the type of wine used and the amount added.

Keywords: *bread, functional foods, red wine, sensory qualities*

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PROPERTIES OF ANTIOXIDANTS EXTRACTED BY NON-CONVENTIONAL METHODS FROM JOSTABERRY GROWN IN MOLDOVA

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In recent years, there is a growing interest in the use of natural dyes in the food industry, considering the harmful aspects of synthetic ones. The results of research in the field have shown that natural dyes are appreciated due to their antioxidant properties, bioavailability, beneficial effects on health. The great advantage in obtaining natural dyes is the diversity of vegetable raw materials (plants, seeds, fruits and vegetables), emphasis being also placed on secondary raw materials, as well as environmentally friendly technological methods of production.

This research aimed to evaluate the quantitative profile and antioxidant activity (AA) of the biologically active compounds (BAC), the color parameters of the extracts obtained from frozen (FJ), freeze-dried (FDJ) and oven-dried (DJ) jostaberry by ultrasound-assisted extractions (UAE) and microwaves-assisted extractions (MAE).

Jostaberry is a local product, from the south of the Republic of Moldova. After harvesting jostaberry was subjected to pretreatment processes in order to preserve the fruits by freezing, freeze-drying and oven-drying. Pretreated jostaberry was ground and mixed with hydroethanolic solution with a concentration of 60% (*v/v*). To establish the optimal extraction conditions, BACs were extracted by two unconventional methods: UAE with time variation, and MAE with magnetron power and time variation. The AA of jostaberry extracts was determined based on their ability to inhibit the free radical 2,2-diphenyl-1-picrylhydrazyl hydrate (DPPH) and the free radical cation 2,2-azinobis-3-ethylbenzothiazoline-6-sulfonate (ABTS). Total anthocyanins (TA) in jostaberry extracts were measured spectrophotometrically, by the differential pH method, and color parameters were elucidated using a Chroma Meter CR-400.

The results showed that non-conventional extraction methods are less destructive to anthocyanins. Oven-drying of berries reduced TA by 99.4% compared to FJ, regardless of the extraction method. Pretreatment of berries by freeze-drying and oven-drying contributed to the AA reduction of jostaberry extracts. In all extraction conditions, the ABTS assay recorded AA values (mg TE/g DW) between 35.64 and 109.17 for FJ extracts, 45.73 and 82.22 for FDJ and 34.04 and 52.20 for DJ extracts. AA (mg TE/g DW) by the DPPH method varied between 17.70 and 35.26 for FJ, 7.50 and 7.96 of FGJ, 6.31 and 7.40 of DJ. Jostaberry pretreatment led to significant changes in all color parameters. The red tone predominates in the FJ and FDJ extracts, and the orange tone in the DJ ones.

The obtained results demonstrate that jostaberry is a valuable raw material for obtaining extracts that can later be used in the food industry as natural dyes with significant antioxidant properties and high coloring capacity.

Keywords: *jostaberry; color parameters, microwave-assisted extraction; ultrasound-assisted extraction; total anthocyanin*

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SENSORY CHARACTERISTICS OF THE MEAD OBTAINED FROM POLYFLORA HONEY

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Mead is a drink that results from the alcoholic fermentation of honey by yeasts. The production technology of mead has been quite studied in recent years, but studies focused on its physico-chemical and sensory properties depending on the yeast strain used are still few. Therefore, the aim of this work was to analyze the physico-chemical and sensory properties of mead produced with immobilized cells of Saccharomyces cerevisiae strain QA23, as well as the use of the spontaneous flora of polyflora honey.

The mead was made from polyflora honey that was diluted with water to reach 24 °Brix. Once the musts were ready, they were pasteurized at 60 °C for 15 minutes. At the same time, commercial yeast culture was activated at 37 °C for 30 min and then added. The media were incubated at 30 °C; the time taken varied from 16 to 20 days. The concentration of glucose, fructose and ethanol were measured throughout the fermentation process.

Polyflora honey collected from the central area of the Republic of Moldova, the harvest of 2023, was used in the study. Mead samples were subjected to sensory characterization by a panel of 16 semi-trained tasters using a total of 10 sensory attributes: two for appearance (color and turbidity), three for taste (sweet, sour and astringent) and five for aroma (honey, fruit, alcohol, vegetable and chemicals). All results were evaluated based on the Codex Alimentarius Commission and the harmonized methods of the International Honey Commission.

The results of the sensory analysis reflect the degree of clarification of the mead produced by the immobilized cells, correlated with the appearance (color), while the mead obtained with spontaneous cells was correlated with the turbidity attribute. The yeast strain Saccharomyces cerevisiae QA23 had a significant effect on the volatile acidity and therefore on the concentration of acetic acid, which were higher in the drink obtained with it.

Considering the obtained results are quite promising regarding the sensory properties of the mead and to have a better understanding of the correlation between the volatile composition and the sensory properties, further studies focused on the sensory quality should be carried out.

Keywords: *polyflora honey, fermented drink, mead, organoleptic indices*

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SOUS-VIDE COOKING AND ITS EFFECTS ON ANTIOXIDANT-RICH VEGETABLES

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The research aims to study optimal conditions for processing plant-based foods using the sous-vide technique, a vacuum-sealed cooking method performed at relatively low and constant temperatures. While sous-vide is typically associated with meat, its use in vegetables is gaining popularity due to its ability to preserve thermolabile vitamins, enhance natural flavours, and ensure even cooking. The method prevents contact with air and minimizes the leaching of nutrients into water, preserving both the nutritional and organoleptic properties of the foods. The focus of this research was to investigate the effects of sous-vide on antioxidant-rich vegetables such as broccoli and carrots, as well as the impact of various food additives on the final product.

Instrumental methods were used to analyse the properties of raw and cooked samples, comparing them with traditional cooking techniques. Broccoli and carrots were cooked at 85°C for 25…40 minutes per 100 grams of product and evaluated for changes in antioxidant content, texture, colour, acidity, and sugar retention. Additives such as salt, sugar, and citric acid were tested in solution form (0.2…1%) for their effectiveness in preserving antioxidants and maintaining the colour of the products. Vegetables were pre-soaked in these solutions for 30 minutes before heat treatment.

The sous-vide method was found to maintain more natural sugars and increase acidity in vegetables while preserving the texture and shape better than traditional cooking. Broccoli and carrots, after 25 and 40 minutes of sous-vide cooking, respectively, maintained higher carotenoid levels and better texture than traditionally cooked samples.

The results showed that sugar solutions were the most effective in preserving carotenoids in carrots and chlorophyll in broccoli, while salt and citric acid also contributed to the retention of nutrients. Carrots preserved a bright colour and crunchy texture, salt and citric acid solutions (2 g/l of water) being most effective in preserving lycopene. Broccoli showed significant preservation of chlorophyll (up to 86%) when treated with a sugar solution (10 g/l).

Thus, it is recommended to cook broccoli at 85°C for 25 minutes using a sugar solution (10 g/l) to preserve chlorophyll and improve both texture and sweetness. For carrots, to enhance colour and maintain a crisp texture, sous-vide cooking at 85°C for 40 minutes, following pre-treatment with salt or citric acid solutions (2 g/l), is preferable. However, sugar solutions can also be used for carrots, as they demonstrated the highest carotenoid retention among all tested additives. These conditions optimize nutrient retention and sensory qualities, making sous-vide a promising method for processing plant-based foods.

Keywords: *carotenoids*, *chlorophylls*, *low-temperature processing, nutrient retention*

Acknowledgment. The research was supported by *Institutional Project, subprogram 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova*.

SUSTAINABLE UTILIZATION OF OILSEED INDUSTRY WASTE FOR FUNCTIONAL FOOD PRODUCTS

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This study addresses the sustainable valorization of waste from the oilseed industry and the development of widely accessible functional food products tailored to the specific needs of the Republic of Moldova's population. The research employs an interdisciplinary approach, integrating knowledge from nutrition, food technology, biochemistry, and food engineering. The methodology encompasses a variety of analytical, physicochemical, chemical, biochemical, and technological techniques, aligned with international standards. These methods assess the quality of multifunctional compounds and functional food products derived from oilseed waste [1]. The study emphasizes innovation, seeking novel and efficient solutions for waste utilization and functional food development, promoting sustainability through resource efficiency and environmental impact minimization. Collaboration with research institutions, universities, the food industry, and government organizations is crucial for effective execution [2]. Expected outcomes include the creation of functional food products, particularly bakery items, enriched with multifunctional compounds from oilseed waste, thereby reducing waste and promoting sustainable use [3]. The novelty and scientific originality lie in using oilseed industry waste as a source of multifunctional compounds, creating functional additives for modern, competitive food products, and addressing nutritional deficiencies in the Moldovan diet using renewable resources. The study also aims to foster collaboration between young researchers and local producers to develop commercially viable food products. The research focuses on optimizing extraction methods, evaluating the nutritional and functional potential of compounds, and developing innovative bakery products. These efforts align with national and international strategies, contributing to a sustainable food system, enhancing public health, and advancing the Moldovan food industry in line with EU standards.

Keywords: *biochemical analysis, food technology, nutritional deficiencies, oleaginous waste, resource recovery*

Acknowledgment. The research was supported by *State Project for young researchers 24.80012.5107.06TC "Waste sustainable utilization from the oil industry", Va-D-Oil, being implemented at the Technical University of Moldova.*

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TECHNOLOGICAL AND INGREDIENT FEATURES OF FOOD PRODUCT DEVELOPMENT IN UKRAINE

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The war in Ukraine, which has been going on for over 2,5 years, requires not only a change in the organization of nutrition for the participants in the conflict, temporarily displaced children and adults, but also the development of a special range of food products. Constant anxiety and stressful situations of the country's population require improvement of their nutrient composition and consumer properties, in particular shelf life. In this regard, the goal of the work was to develop a range of special food products with increased anti-stress properties, in user-friendly packaging and with an extended shelf life. To achieve this goal, it was necessary to solve the following tasks:

- monitor common food products with increased health benefits and significant concentrations of anti-stress ingredients;
- develop recipes for a special range of food products with the specified properties;
-develop heat treatment modes that ensure the absence of pathogenic and opportunistic microbiota, as well as pathogens that spoil the developed products;
- test the stability of the developed products during prolonged storage, as well as substantiate recommendations for their shelf life.

Based on the results of the monitoring, ingredients suitable for enrichment and development of a special range of food products were identified, determined based on the results of our experimental studies and analytical data [1]. These include metabiotics - metabolites of probiotic types of microorganisms, a number of types of raw materials with an increased content of stress-protective amino acids, vitamins, etc. We have developed heat treatment modes for special food products taking into account the features of their composition: in a combined metal container with a lid made of a polymer soft barrier material (PET/PE) for the product "Smoked Sprats in Oil"; in a polymer semi-rigid container made of multilayer barrier material PET/EVOH/CPP with a lid made of aluminum foil with thermoplastic application, for the product "Meat Pate" [2], as well as optimal storage periods without changing the ingredients that determine the target properties of the product.

Thus, taking into account the war in Ukraine, a special assortment of food products was developed, the consumption of which will reduce the negative impact on the health of the population.

Keywords: *special food products, technology, heat treatment, shelf life, stress-protective ingredients*

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THE COMPOSITION OF AMINO ACIDS IN THE LIGHT AND DARK BREWER'S SPENT GRAIN AS A FOOD FORTIFICATION INGREDIENT

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Enriching everyday products with important nutrients is a promising direction in food technology. Currently, there is active development of grain-based products enriched with vitamins, minerals, proteins, amino acids, and fiber. Amino acids play a key role in the human body and are the main building blocks of proteins, which perform numerous functions. They help maintain fluid balance in the body and participate in regulating acid-base balance, which is critically important for the normal functioning of cells and organs. They also contribute to detoxifying the body by helping eliminate toxins and waste. Additionally, they play a role in the recovery of cells and tissues after injury. To maintain health, it is essential to provide the body with all necessary amino acids, both essential and non-essential.

The objective of this study is to determine the quantitative and qualitative composition of amino acids in light and dark brewer's spent grain. For the research, the spent grain was dried using a convection method to a moisture content of 6.3±0.2%, ground, and sifted to a flour-like consistency. The Ion-Exchange Chromatographic Method was used to determine the quantitative and qualitative composition of amino acids.

It was found that the flour from brewer's spent grain contains both essential and non-essential amino acids. The light spent grain contained a greater amount of amino acids compared to the dark. In the light spent grain, the concentration of glutamic acid was 1.15 times higher than in the dark. The content of proline in the light spent grain was 1.1 times greater than in the dark. Serine, alanine, and glycine were found to be 1.2 times more abundant in the light spent grain than in the dark. Lysine and methionine were also present in 1.5 and 0.9 times greater amounts, respectively, in the light spent grain compared to the dark. Both light and dark spent grains contained equal amounts of cysteine.

The study demonstrated that both light and dark brewer's spent grain contain significant amounts of amino acids, which can enrich food products when added. The higher concentration of amino acids in light spent grain compared to dark is associated with the thermal processing technologies used in the production of dark spent grain.

Keywords: *light brewer's spent grain, dark brewer's spent grain, essential and non-essential amino acids*

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THE IMPACT OF HYDROTHERMAL TREATMENTS ON THE GLYCEMIC INDEX OF ROUND GRAIN RICE GROATS

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Introduction. This study examines the impact of hydrothermal treatments on the glycemic index (GI) of porridge made from different types of rice: brown, round grain, long grain, and parboiled long grain. Given the rising incidence of diabetes mellitus, identifying methods to reduce the GI of foods has become a priority. Rice, one of the most consumed cereals worldwide, can significantly impact blood glucose levels depending on how it is processed.

Methodology. To determine the glycemic index, the glucose oxidase endpoint method was used on a sample of five healthy subjects. These individuals consumed 50 g portions of pure glucose and various types of rice prepared according to international standards. Blood glucose levels were measured at intervals of 15, 30, 45, 60, 90, and 120 minutes after food consumption, and the values obtained were used to calculate the GI. The study was approved by the ethics committee and was conducted under the supervision of specialized physicians.

Results.The results indicated significant variations in the GI among the different types of rice. Round grain rice recorded the highest GI (94.75±2.09), while brown rice had the lowest GI (61.48±2.05). These differences can be explained by the variation in the amylopectin and amylose content in rice. For instance, round grain rice contains a higher percentage of amylopectin (88%) compared to long grain rice (77%), which promotes a higher degree of gelatinization, leading to faster digestion and a higher GI. Brown rice, with its higher dietary fiber content (3.4 g/100 g), exhibits a slower absorption of starch, resulting in lower blood glucose levels.

Conclusions. The study demonstrates that hydrothermal treatments and rice types significantly influence the GI of final products. Brown rice, due to its fiber and amylose content, can be considered a more favorable option for individuals looking to maintain better glycemic control. Additionally, parboiled long grain rice has a lower GI than round grain rice but a higher GI than brown rice. These findings provide an important basis for developing dietary recommendations to help manage diabetes and other metabolic disorders.

This information contributes to understanding how rice and preparation methods can affect metabolic health and provides a basis for developing dietary strategies to reduce the glycemic impact of foods.

Keywords: *diabetes mellitus, brown rice, dietary fiber, glycemic control, metabolic health*

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SUSTAINABLE GASTRONOMY: THE IMPACT ON THE FUTURE DIET AGENDA

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The current global scenario underlines the threats that may follow in the next period. The consequences of climate change, natural cataclysms, armed conflicts, the COVID-19 pandemic, etc. have an impact both on the economy and on agricultural production chains, respectively on human nutrition. Therefore, it is not surprising that gastronomy and the gastronomic industry is in a process of transformation based on ecological practices, including investments in renewable energy sources and the use of sustainable materials. Incorporating sustainability issues into food and dietary patterns has been increasingly discussed since the 1980s, with the aim of making them healthier for both consumers and the environment. Thus, the term "sustainable diet" has been suggested to describe a diet based primarily on foods chosen not only for health but also for sustainability.

The research reviewed the most representative studies that do not only address the sustainable development of gastronomy, but also take into account the "place" dimension (rural areas, cities, regions and destinations). To ensure that the main issues related to each research area were included, this study is based on systematic reviews of the literature in each area, on alternative food networks and short food supply chains, on local marketing and branding. In this study, major online databases such as Google Scholar, Business Source Premier, Scopus and JSTOR were accessed. Based on this analysis, the identified tangible and intangible elements appear to have the capacity to support sustainable territorial development if approached in a manner that reinforces the place and human dimensions of F&G and is supported by participatory approaches to governance.

Finally, some suggested benefits based on a holistic perspective were highlighted for local sustainable development, such as: local food may support agricultural differentiation, maintain local resources (biodiversity and natural and cultural resources) and contribute to the preservation of local landscapes; local foods sold through alternative outlets may boost the sustainability of traditional farming, landscapes and farming communities; adding value to local food products can improve producers' remuneration. This can be realized through certification, through place branding by strengthening the associations between food (geographical and heritage components) and place, and through food tourism, because local foods represent an important means of marketing a destination's identity and culture.

This study contributes a focused perspective on an extremely important research area and provides a local, resource-based interpretation of the potential of food and gastronomy for sustainable place development that could supports a better understanding of decision makers and coherent actions. This study also has some limitations. Finally, future research needs to determine whether the relevant dimensions identified at the theoretical level are confirmed, challenged or extended through case studies.

Keywords: *food; gastronomy; sustainable development; place development; literature review; sustainability*

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SECTION III
Food Chemistry, Oenology and Biotechnology in the Food Industry

A HYBRID APPROACH TO ASSESSING OF AGRICULTURAL PRODUCTS BIOSAFETY INDICATORS MEASUREMENT UNCERTAINTY

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Introduction. The current state of the concept of safety of agricultural raw materials and products has undergone significant changes in recent decades due to the active harmonization of national requirements with international standards. One of the requirements is the need to take into account measurement uncertainty. In the case of measuring biosafety parameters, this procedure faces challenges, including inherent analyte and matrix variability. Most of the modern approaches proposed by international rules are focused on stable systems: calibration or chemical analysis, which have a number of advantages and disadvantages, and can significantly affect the quality of the calculated interval. Uncertainty has significant changes over time, so it is necessary to periodically reassess its interval. The purpose of the work is to develop a model approach to the assessment of uncertainty, which will allow taking into account as many sources of influence on the result of the analysis of biological safety indicators as possible.

Material and methods. The model used is a procedure for determining the content of GMOs using polymerase chain reaction in real time. The research material is a sample of the results of 147 consecutive scheduled measurements of the concentration of GMO soybeans of the MON 40-3-2 line in the CPM at the TC "SGS Ukraine" using 2 batches of the certified standard sample produced by "ERM" and in 2 rounds of qualification checks with the accredited provider "Bipea". The normality of the distribution was checked by the Shapiro-Wilk test. Stability assessment from z-score charts and Shewhart control charts with integrated min and max limits of agreement. Sources of uncertainty were determined by the method of causal analysis. Uncertainty assessment was carried out according to: arithmetic, reference value, result of qualification check without error, result of qualification check with error and using a hybrid approach. A hybrid approach that takes into account the precision factor using data from a retrospective analysis of routine CRM measurement and the error factor by including the spread from the reference value of the sample by the accredited supplier and the measurement result obtained in the laboratory.

The results. In the process of stability assessment, no contradictory values were obtained, indicating the influence of special factors on the results. The integrated compliance limits are not violated. Data normality is established. The results of the uncertainty assessment demonstrate the similarity of the intervals obtained by the hybrid method to the intervals calculated by the estimation based on the chain of CRM measurements. The hybrid method reconciles the result of the assessment with the dynamics observed in the error recognized by the results of interlaboratory comparisons. The hybrid method of uncertainty estimation forms limits of suitability almost twice narrower than those obtained from the results of interlaboratory comparison. The least acceptable method is to use the arithmetic mean. The obtained results showed an insufficiently narrow uncertainty interval, which is 5 times narrower than the results of using the hybrid method.

Conclusions. The combination of standardized score charts and Shewhart control charts with the integration of additional limits of fit to a set of control limits holds great promise for providing objective evidence of the suitability of retrospective data for estimating measurement uncertainty. Combined maps make it possible to make reasonable claims about the statistical controllability, stability and compliance of the measurement procedure in a specific period based on the analysis of variability and average values of measurements. The combination of retrospective analysis of the sequence of routine CPM measurement results with confirmed stability allows consideration of the effects of laboratory-specific variability in reproducibility conditions, temporal variability, and error contributions assessed using proficiency testing. The hybrid method of uncertainty assessment provides a reasonable characterization of laboratory uncertainty based on evidence and creates the possibility of balanced control of the probability of α and β errors in the implementation of conclusions regarding the compliance of agricultural raw materials with modern national and international standards of biological safety requirements.

Keywords: *certification, food safety, raw materials, quality control*

A THREE YEAR WINE MONITORING FOR *BRETANOMYCES BRUXELLENSIS* INFECTION

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Brettanomyces bruxellensis is a wild yeast that causes wine spoilage by contributing to wine's volatile acidity and producing volatile phenol compounds with specific off-odors. In order to prevent wine spoilage and minimize the negative effects of *Brettanomyces* spp on wine quality, it would be opportune to detect *B. bruxellensis* at the molecular level using real-time PCR method. The dynamics of *B. bruxellensis* infection of musts and wines during three years of observation in the university microwinery was analysed.

Analysed musts and wines was obtained from varieties grown in different regions of Moldova with Protected Geographical Indication (PGI) – Codru, Stefan Voda and Valul lui Traian. Wine samples were taken for *B. bruxellensis* detection three months after clarification and stabilization before bottling. DNA isolation from musts and wines was performed according to ISO 21571:2005 protocol with modifications.

Most of the wine samples were obtained from vineyards of the Codru and Stefan Voda PGI regions, and no statistical difference was identified in *B. bruxellensis* propagation in wines obtained from grapes cultivated in the mentioned regions. In addition, the data imply that this species under favorable conditions propagates equally on both white and red wines, not manifesting specific media preference for its growth and development.

The contamination levels of mature wines with *B. bruxellensis* fluctuated in accordance with the year of grape cultivation. Thus, it may be noted that climatic, edaphic, biotic factors as well as agrotechnical practices of grapevine cultivation in two different regions PGI of Moldova – Codru and Stefan Voda – do not play a major role in *B. bruxellensis* propagation in mature wines. The dynamics of respective yeast species infection of mature wines might speak in favor of the hypothesis that grape berries can be a potential source of *B. bruxellensis* in wine.

Keywords: *Brettanomyces yeasts, micro-winery*, *wine spoilage, primers, real-time PCR*

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ACHIEVEMENTS OF BIOTECHNOLOGY IN THE DEVELOPMENT OF THE FEED BASE OF UKRAINE

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The modern world cannot be imagined without the consumption of biotechnology products. Thus, various biologically active substances, including organic acids, vitamins, enzymes are used in the food and other industries.

Ukraine, as an agrarian state, depends on the development of agriculture. One of the key aspects of this development is the provision of high-quality and efficient animal feed. In recent years, biotechnology has become an important tool in improving the fodder base, contributing to the growth of yield and quality of fodder.

It is known that the leading role in providing the population with food products is occupied by animal husbandry, which accounts for 40% of the total structure of agricultural production. The development of animal husbandry also depends on fodder production.

Biotechnology makes it possible to produce feed additives that have nutritional value and beneficial properties for animals. Advances in biotechnology can be considered as a way to optimize the production of silage and biologically active substances in feed additives.

Recently, scientists have been paying special attention to the development of probiotic and enzyme feed products. The use of enzymes in the production of feed additives is a key aspect of biotechnology in feed production.

Potases are one of the most modern innovative products used in animal diets. Proteases allow animals to better absorb nutrients from feed. Thus, the enzyme-probiotic supplement "Immunobacterin-D" contains cultures of *Bacillus subtilis*, *Bacillus licheniformis* and enzymes (protease and lipase). The enzyme-probiotic complex provides polyvector action in the digestive tract in general and the rumen in particular.

The amount of protease added to compound feed depends on the age and species of farm animals for which the enzyme is intended. Research carried out by research institutes, namely, the JBS company, which is a world leader in the field of veterinary medicine and animal nutrition, together with FUV annually conducts numerous studies that confirm the need for the use of protease. Practical experience shows that the growth of animals is significantly greater when using high-quality compound feed with the use of proteases than without the addition of additional enzymes.

On the market of Ukraine, the Enzym company manufactures animal feed additives under the EnzActive brand. Additives are made on the basis of yeast cells, contain a complex of nutrients that can replace antibiotics and artificial growth stimulants in the feed of farm animals.

EnzActive MIX probiotic-enzyme complex contains a unique combination of live yeast of the genus Saccharomyces cerevisiae and a complex of 6 enzymes (protease, cellulase, xinalase, glucoamylase, β-glucanase, phytase), which catalyze the hydrolysis of carbohydrates that are part of cell walls and starch grains instead of glycosidic connections.

Biologically active substances play the role of catalysts of metabolic processes and increase the coefficients of digestion and assimilation of feed nutrients. Therefore, further study of biotechnological processes and development of technologies for obtaining biologically active substances, including enzymes, is promising.

Keywords: *animal husbandry, enzymes, feed additives, protease*

ADVANCED WINE PRODUCTION TECHNOLOGY FOR LOCAL VARIETIES GRAPES UNDER MICROVINIFICATION CONDITIONS

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Viticulture in the Republic of Moldova aligns with global trends, featuring varieties from Western Europe, the Black Sea Basin, as well as indigenous types. The vineyards in these regions have been cultivated for centuries through hard work and dedication. Wine has become an emblem of Moldova, symbolizing its growth and success.

The authenticity and unique character of Moldovan wine are ensured by local varieties such as Feteasca Alba, Feteasca Regala, Legenda, and Viorica, which make up 5% of the vineyard areas. These varieties are continually expanding due to increasing interest from international consumers and support from various sectoral programs.

The aim of the research was to refine the technology for producing dry wines from local varieties – Feteasca Alba, Feteasca Regala, Legenda, and Viorica - grown in different vine regions under microvinification conditions, in order to enhance their aromatic potential.

The analysis of physicochemical indices was conducted using the following equipment: the Foss Near Infrared (NIR) analyzer from Puhoi, the Gibertini DEE distiller (Gibertini, Italy), the digital DR 6300 spectrophotometer (A. Kruss Optronic, Germany), the Glass Chem VA-1 distiller with electric heater (Glass Chem, South Africa), the Glass Chem SO_2 analyzer (Glass Chem, South Africa), and the PG T70+ spectrophotometer (United Kingdom).

The results of the research led to the development of an optimized technological scheme for the production of dry white wines, focusing on highlighting their distinct aromatic characteristics. This process involved improving winemaking techniques and carefully selecting the grapes to produce a dry white wine with pronounced and well-defined aromas.

The comparative analysis of the aromatic profiles and physicochemical properties of the indigenous white grape varieties Feteasca RegalA, Viorica, and Legenda from the Codru and Valul lui Traian regions, along with the sensory analysis of the wine produced from these five varieties, demonstrated that, although the wines exhibit similar quality trends during the technological process, they significantly depend on the taste characteristics of the grapes of each variety and the aromatic profile of the wine. This was assessed by the Oenology and Chemistry Department, through a group of expert wine and alcoholic beverage tasters, as well as small producers.

Keywords: *local varieties, grape ripening, microvinification conditions, physical-chemical indices, alcoholic fermentation, and sensory profile*

Acknowledgments. The authors would like to thank *the* ***National Office of Vine and Wine*** *for the collaboration with Technical University of Moldova in the research of wines production from local and new selection grape varieties in the microvinification conditions. Also, the research was supported by the Institutional Project, subprogram 020405 "Optimization of Food Processing Technologies in the Context of Circular Bioeconomy and Climate Change," Bio-OpTehPAS.*

BIOLOGICAL EVALUATION OF THE EFFECTIVENESS OF USING HIGH-OLEIC SUNFLOWER CAKE IN COMPOUND FEED PRODUCTION

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Introduction. High-oleic oil has been used in the global food industry for more than 10 years. The advantages of this oil include a neutral taste, resistance to thermal effects without forming carcinogens, peroxides, free radical oxidation, peroxide oxidation, and it can act as an antioxidant, among other benefits. The oxidative stability index of high-oleic sunflower oil is 1.6 to 3.3 times higher than that of linoleic-type sunflower oil and soybean oil. During oil production using the pressing method, a by-product known as cake is obtained, containing up to 10%, and in some cases, depending on the technology, up to 14% of this oil. Given the above, the use of sunflower cake in feed production is relevant for improving the quality and zootechnical efficiency of the final product.

Material and methods. The biological evaluation of the effectiveness of using high-oleic sunflower cake and traditional linoleic-type cake was conducted on laboratory animals under conditions of dysbiosis (ED) as well as on intact animals. The feeding period lasted 18 days, and the animals were euthanized under thiopental anesthesia (20 mg/kg) through total blood loss from the heart. The liver and mucous membranes of the cheek (oral cavity), small, and large intestines were separated after washing them with a cold 0.9% NaCl solution. In the tissue homogenates, the content of malondialdehyde (MDA), the final product of lipid peroxidation (LPO), and the activity of the antioxidant enzyme catalase were determined.

Results. It was found that in all rats with ED, the MDA content significantly increased: in the oral mucosa by 45% (37.18±0.74 mmol/kg), and in the small intestine by 69% (7.74±0.32 mmol/kg). This indicates a significant increase in lipid peroxidation (LPO) activity in the body under dysbiosis conditions, partly due to decreased catalase activity. In rats that consumed feed containing cake from conventional sunflower seeds, the MDA content in tissues decreased: in the oral mucosa by 37%, in the small intestine by 25%, in the large intestine by 23%, and in the liver by 15%. In rats fed with high-oleic sunflower seed cake, the MDA content decreased in the oral mucosa by 34% (24.68±1.94 mmol/kg), in the small intestine by 43% (4.42±0.26 mmol/kg), in the large intestine by 40% (4.46±0.49 mmol/kg), and in the liver by 37% (20.77±2.30 mmol/kg), which is significantly more and almost reaches the values of the intact group. Consumption of feed with high-linoleic sunflower seed cake had little effect on the MDA content.

In animals fed with high-oleic sunflower seed cake, catalase activity increased compared to those in the group that received conventional sunflower cake, specifically: in the oral mucosa by 7.2% (7.70±0.24 mkat/kg), in the small intestine by 61.5% (3.73±0.11 mkat/kg), in the large intestine by 96.3% (2.16±0.03 mkat/kg), and almost reached the same levels as in group 1 (intact animals).

Conclusions. The use of high-oleic sunflower cake in feed production improves its zootechnical efficiency. A reduction in lipid peroxidation in laboratory animals and a decrease in the intensity of inflammatory processes in digestive tract tissues were observed.

Keywords: *laboratory animals, nutrition, compound feed*

COMPARATIVE STUDY BETWEEN THE ADSORBENT MATERIAL BASED ON CLAY AND THE BIOLOGICAL MATERIAL EXTRACTED FROM *CYPRINUS CARPIO*

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In the context of increasing concerns about environmental pollution and the need for efficient solutions for wastewater treatment, this research has focused on the development and use of innovative adsorbent materials. This comparative study aims to evaluate the efficiency of a cationic clay-based adsorbent in comparison with two biological materials derived from fish: the bladder and the scales. Cationic clays are recognized for their ability to adsorb various contaminants due to their large specific surface areas and specific chemical properties. On the other hand, biological materials from fish, such as the bladder and scales, offer an ecological and sustainable alternative, having the potential to adsorb pollutants due to their unique composition and porous structure. The clay-based materials, fish scales, and fish bladder were dried and impregnated with Vanadium (IV) oxide sulfate hydrates 97%. Vanadium can have several effects on clay-based materials, fish scales and fish bladder, such as: increased adsorption capacity, chemical stability, and catalytic properties. The newly synthesized materials were characterized using the following methods: X-ray powder diffraction (XRD), scanning electron microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDAX), Fourier transform infrared spectroscopy (FTIR), and the BET (Brunauer-Emmett-Teller) method was used to determine the specific surface area. The three synthesized and characterized materials denoted *Al-PILC-BN-V*, *FSV* and *B-V* were tested for the retention and catalytic destruction of the food dye Malachite Green, as well as of the organic pollutant Trinitrotoluene. This study aims to identify the advantages and limitations of each type of adsorbent, thus contributing to the development of more efficient and sustainable solutions for environmental remediation.

Keywords: *adsorption, catalyst, clay, fish bladder, fish scales*

COMPLEX OF MEASURES TO PREVENT FOOD PRODUCT AND CONTAINER

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Prevention of counterfeiting includes a set of preventive measures consisting of the following areas:

Market monitoring and analysis. Organization of a market scanning system, monitoring the state of the container and food market, determining and assessing the real level of counterfeiting, studying trends.

Creation of a counterfeiting database that is formed on the basis of monitoring. This is a structured data system, scientific articles, analytical and statistical calculations, regulatory documents.

Risk assessment and management. Scientifically based risk assessment allows for measures to prevent counterfeiting, minimize associated moral and material losses, and build appropriate barriers to counterfeiting (for example, developing appropriate laws).

Forecasting counterfeiting. Creating a strategy, determining indicative parameters and mechanisms to counteract counterfeiting. Conclusions and assessments obtained on the basis of a comprehensive market analysis and the use of modern methods.

Identification of typical counterfeiting schemes and establishment of barriers to counterfeiting. This is the differentiation of the entire path of production, from its theoretical development to its transfer to the consumer, into separate sections, including the preparation of regulatory documents, the purchase of raw materials, production, storage, transportation, sales, etc. In potentially dangerous areas, additional reporting forms should be established, elements of external control should be introduced and expanded, etc.

Evidence base. The legal and evidentiary base is built on the methodology of identifying counterfeiting and includes methods for establishing signs of counterfeiting, determining how, at what stage, when, where, by whom the counterfeiting was carried out and who is responsible for it. **Methods.** It is necessary to develop special methods to identify counterfeiting, which must meet the conditions of efficiency, availability, accuracy and reproducibility, safety and cost-effectiveness. Since counterfeiting is transformed, accordingly, detection methods must be constantly adapted and improved. Based on scientific methods, techniques and methods are developed, laboratories are created.

Laboratories. A conclusion on determining falsification will be recognized as legitimate only if the laboratory that issued it is accredited.

Expert. In addition to generally known, publicly available knowledge, an expert must have narrow professional skills, competence in the field of food technology, nutrition, nutraceuticals, chemistry and biochemistry of food.

Thus. the algorithm for counteracting falsification includes identifying a specific object, identifying the type and method of falsification, finding out who produced the falsified product, when and who is responsible for it.

Keywords: *events, counterfeiting, food products, container*

COORDINATION COMPOUND OF FE(III) AS STIMULATOR OF EXOCELLULAR LIPASE SYNTHESIS FOR THE *RHIZOPUS ARRHIZUS* CNMN FD 03 FUNGAL STRAIN

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In the present work, the biological effect of 2,6-diacetylpyridine-bis(picolinoylhydrazone)-bis(aqua)iron(III)-hydrate(1/2.5), with the formula $[Fe(H_2L)(H_2O)_2](NO_3)_3 \cdot 2.5H_2O$ (where H_2L represents 2,6-diacetylpyridine bis(picolinoylhydrazone)), has been described.

This coordination compound is highly soluble in water, which ensures a practical use as a component of nutrient mediums. The nutrient medium for submerged cultivation of the fungal strain *Rhizopus arrhizus* CNMN FD 03 contains soybean meal, $(NH_4)_2SO_4$, KH_2PO_4, water and stimulant ($[Fe(H_2L)(H_2O)_2](NO_3)_3 \cdot 2.5H_2O$) in the following quantitative ratio of the components (*g*): soy flour – 35.0, $(NH_4)_2SO_4$ – 1.0, KH_2PO_4 – 5.0, $[Fe(H_2L)(H_2O)_2](NO_3)_3 \cdot 2.5H_2O$ – 0.005…0.015, drinking water – up to 1 L. The addition of coordination compound $[Fe(H_2L)(H_2O)_2](NO_3)_3 \cdot 2.5H_2O$ to the nutrient medium of *Rhizopus arrhizus* CNMN FD 03 fungal strain, in concentration of 5.0…15.0 mg/L increases biosynthesis of lipases with 17.4…82.7%, depending on the concentration and reduces the producer`s cycle of cultivation by 24 h.

Thus, the highest values of lipase activity were found in the first day of growth, while in the control (without stimulator) the maxim of activity was revealed in the second day. The most effective concentration for enzyme production was 5.0 mg/L [1].

In conclusion, the coordination compound $[Fe(H_2L)(H_2O)_2](NO_3)_3 \cdot 2.5H_2O$ can be used as biostimulator of exocellular lipase synthesis for the mycelial fungal strain *Rhizopus arrhizus* CNMN FD 03 for the development of biotechnologies to obtain lipolytic enzymes.

Keywords: *Fe (III) coordination compound, fungal strain*, *micromicetes, Rhizopus arrhizus*

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ENGINEERING APPROACH TO OPTIMIZATION OF PNEUMATIC TRANSPORTATION PROCESSES IN THE FOOD INDUSTRY

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The study is aimed at developing and improving mechatronic systems for pneumatic transportation of bulk food products. The relevance of this topic is due to the ever-increasing requirements for the efficiency and accuracy of such systems in modern production processes. Existing models of pneumatic conveying often do not take into account the complex physical processes that occur during the movement of particles in a compressed air stream, such as particle migration, hydrodynamic and electrical interactions. This leads to inaccuracies in calculations and, as a result, to a decrease in the efficiency and reliability of systems. To solve this problem, we developed an experimental mechatronic module that allows us to study the process of pneumatic transportation in detail. Based on the experimental data and theoretical calculations, a mathematical model was built that describes the movement of bulk material particles in a compressed air flow, taking into account the geometric characteristics of the system, physical properties of the material, and flow parameters. The study determined the optimal parameters of pneumatic transportation, such as air flow rate, pressure, pipeline diameter, etc. It was found that the number of transported particles reaches a maximum within a short period of time after the compressed air is supplied. The dependence of compressed air consumption on system pressure was also determined. The results of the study made it possible to develop a new approach to modeling pneumatic transport, which takes into account a wide range of factors affecting this process. The proposed model can be used to develop more efficient and reliable pneumatic transportation systems in various industries.

A comprehensive analysis of the process of pneumatic transportation of fine products was carried out to develop effective control systems. A mathematical model has been created that describes in detail the dynamics of the movement of individual particles in a compressed air flow, taking into account their interaction with the walls of the pipeline and with each other. The model takes into account the geometric characteristics of the system and the physical properties of the transported material. To verify the model, an experimental bench was developed to investigate the effect of various process parameters on the flow characteristics. In particular, the effect of compressed air pressure, flow rate, and pipeline geometry on the particle distribution in the flow was analyzed. The experimental data obtained are in good agreement with the results of mathematical modeling.

Keywords: *pneumatic transport, fine products, mathematical modeling, experimental studies, automatic control system, dynamic characteristics*

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FORMULATION AND STABILITY OF BIODEGRADABLE FILMS MADE FROM CELLULOSE, PECTIN, AND BEE BREAD OIL

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Introduction. Polymers that are biodegradable, environmentally safe, and edible are produced from sustainable and edible ingredients like lipids, polysaccharides, and proteins, and degrade faster than non-renewable petroleum-based polymeric compounds [1]. Cellulose, starch, and chitosan are natural sources of polysaccharide that can be used as an edible film in agricultural products to extend the shelf life of fresh fruits and vegetables, reduce oil/fat absorption in fried food, and prevent food flavor loss [1,2]. The aim of this study was to produce films from carboxymethyl cellulose (CMC), pectin, bee bread oil (BBO), and glycerol in order to determine some mechanical and physicochemical parameters (e.g., oxygen permeability, color, thickness) of obtained films.

Material and methods. Films were prepared by mixing pectin (P) and CMC solutions with glycerol and BBO in different concentrations (1, 2, and 3%). The oxygen permeability (OP) of the formulated films was determined by using Ox-Tran system 1/50, while the CIE L*a*b* model was used to determine color parameters. The thickness of the films was determined by using thickness gauge Mitutoyo Absolute. FT-IR analysis of the films was made using a Nicolet i-20 spectrophotometer, Thermo Fisher Scientific.

Results. The thickness of the film is a major characteristic that determines other properties (such as optical, barrier, mechanical, and thermal properties) of the films that have been developed. The highest value of thickness (63.2 μm) was obtained for control sample (CMC), while the lowest value (54.4 μm) was recorded for sample formulated with 1% bee bread oil (CMC + 10% P + 1% BBO). It can be explained by the fact that CMC is able to form ionic bonds with ionic polysaccharides like pectin because of its anionic structure [1]. The OP of prepared films decreased with the addition of 1% BBO (0.78 cc × mm/m^2 × atm × day) but increased after addition with higher concentrations of BBO (0.84 cc × mm/m^2 × atm × day). OP values in the case of 2 and 3% BBO films can be explained by the fact that essential oil influenced the polymeric matrix, dynamics, and statics of polysaccharides used in film formulation. L* values decreased when BBO was incorporated into the CMC films, while the h^*_{ab} values ranged between 5.8 and 345.4; all developed films were ascribed to the red color. Additionally, principal functional groups and interaction between CMC, P, and BBO were observed by FT-IR spectroscopy.

Conclusions. BBO can easily be incorporated into polymer aqueous solutions to obtain cast films. The CMC + 10% P + 2% BBO film showed best results in all the characterizations. The results showed that values for OP were lower for films incorporated with BBO in comparison with control sample. Therefore, these films are suitable for application in food industry in which a high oxygen barrier is needed.

Keywords: *carboxymethyl cellulose, oxygen permeability, polymer, thickness*

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FUNCTIONALITY PROLONGATION AND BIOLOGICALLY ACTIVE COMPOUNDS PROTECTION IN FOOD COMPOSITIONS

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Food products are derivatives of living organisms that represent complex biological systems, which, despite differing theoretical and philosophical views, strictly adhere to the fundamental laws and principles of classical thermodynamics. These principles apply equally to both simple model systems and real systems created in vitro. The state of biological and food systems can be characterized by thermodynamic functions, particularly through the values of internal and released entropy. The changes that occur within biologically active compounds in living organisms, which are genetically coded, serve the fundamental purpose of maintaining essential life functions. This is achieved through the accumulation of chemical energy and the cyclical processes of synthesis and decomposition of these compounds. The stability and extended functionality of biologically active compounds in living organisms are sustained by prolonging their quasi-stationary states. This is often achieved by inhibiting various biochemical processes via the input of external work. However, during technological processing, the edible parts of plants, such as fruits, leaves, roots, stems, and flowers, are typically transformed from thermodynamically stable living systems into thermodynamically labile food systems. These processed food systems contain essential chemical compounds needed by the human body, but the lability of the biologically active compounds within them leads to increased entropy. Consequently, there is a decrease in both their nutritional and functional values. Furthermore, incorporating biologically active compounds into food products tends to destabilize the structural integrity of the food system, thereby thermodynamically compromising its functionality. The introduction of these compounds into food compositions necessitates measures aimed at prolonging their activity, as their integration can lead to further destabilization. To preserve the stability and enhance the functional properties of biologically active compounds within food systems, efforts must focus on reducing entropy, inhibiting interactions with low-molecular-weight substances, and creating ordered thermodynamic structures. This can be achieved by designing microstructures that contain biologically active compounds in either isolated forms or as part of stable complexes. Effective strategies to extend the functionality of biologically active compounds, which can significantly improve the quality of functional foods, include several advanced techniques. These include the integration of these compounds into hierarchical structures typical of functional food products, complexation with biopolymers that are chemically compatible, the creation of novel barrier structures such as edible films, and the isolation of biologically active compounds from the surrounding food matrix through micro- and nanoencapsulation methods. These approaches not only contribute to maintaining the stability of these valuable compounds but also enhance their bioavailability and overall efficacy within the food system. The application of thermodynamic principles, combined with advanced techniques for stabilizing biologically active compounds, plays a crucial role in maintaining the nutritional and functional integrity of food systems, ultimately enhancing the quality and efficacy of functional foods.

Keywords: *biopolymers, entropy, external work, functional foods, microencapsulation*

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GOOD CLIMATE CHANGE ADAPTATION PRACTICES OF SMALL AGRICULTURAL ENTERPRISES IN THE REPUBLIC OF MOLDOVA

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Climate change in recent years for the Republic of Moldova represents one of the primary challenges for the state. Being an agrarian country, the well-being of the population, as well as of the country as a whole, is closely dependent on the performance of farmers. With the aggressive manifestation of heat waves there are truly catastrophic consequences. In recent agricultural seasons, some crops have been partially or totally compromised. Water shortages have been felt not only by farmers but by every citizen of the country. Both in the summer of 2023 and 2024, the government of the Republic of Moldova came out with appeals to the population to save water, and some activities that involved wasting water were banned. Climate change has also dried up lakes and rivers, and hot winds have hastened the drying out of plants. As a developing country, Moldova is feeling the full impact of climate change not only in the field but also financially. Climate change in combination with extreme events has led to a sharp decline in agricultural production of several crops, posing a real threat to poverty and food security [1]. It is safe to say that most of the basic branches of the national industry are suffering as a result of climate change, such as wine production, fruit and vegetable processing and transformation. Specialists in the field are recording changes in the quantity and quality indices of some agricultural products (external appearance, smell, taste, caliber). We cannot ignore the fact that climate change has become synonymous with food waste [2]. This problem will become even more important with the aggressiveness of climate change and the need to feed the world's ever-growing population. Current estimates indicate that about a third of the food produced globally for human consumption is affected by climate change, wastage and loss, resulting in significant economic and environmental costs. Small farmers or small agricultural enterprises are often the most vulnerable to climate change. That's why the government is paying more attention to them with subsidies aimed at "greening the business" but also at adapting to climate change. In order to change some approaches, soil tillage techniques are being practiced which are a real adaptation to climate change. The small farmers are always ready to learn good practices to get the right yield in an ever-changing climate.

Keywords: *climate change, farm business, adaptation, successful practices, agricultural crops*

Acknowledgment. The research was carried out within the framework of *the Institutional Project 020405 Optimization of food processing technologies in the context of the circular bioeconomy and climate change-Bio-OpTehPAS.*

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GRAPE MICROBIOME FROM `STEFAN VODA` PGI AS A SOURCE OF STARTER CULTURES

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Oenological selected yeasts confer evident advantages compared to spontaneous fermentation. Numerous microorganisms from the vineyard are found on the surface of grape berries, and many of them are known to influence the must fermentation process that shapes the character and authenticity of wine. An efficient use of the grape microbiome would be the selection of specific microorganisms and their subsequent multiplication to be used for fermentation (starter cultures), thus, this could possibly limit problems regarding the infection of the wine with other types of microorganisms which are on the grapes, and especially the authenticity of the wine from the specific geographical area is preserved.

The purpose of the research consisted in the application of microbiological methods and techniques for the observation, isolation and identification of microorganisms existing on the grapes to establish the presence of the indigenous microflora.

The study methods focused on the direct microscopy of the washing water of Cabernet Sauvignon and Merlot grapes from Javgur village, CimiSlia district and the inoculation of microorganisms on media by scarification, after which the microbiological media were placed in a thermostat at a temperature of 30 ºC and maintained for 7 days. Inoculation was performed on the following media: Sabouraud (SDA), MRS (sterilized), Broth and Brettanomyces Agar. The presence of a diverse microbiome was detected on the studied grapes and it was concluded that the grapes from the mentioned region have yeasts from the *Saccharomyces* genus that allow spontaneous fermentation to take place on indigenous yeasts. An efficient use of the grape microbiome is the selection and subsequent multiplication in order to be used for fermentation (starter cultures).

This study reflects that using starter cultures, complete fermentation takes place quickly, and as a result more alcohol is formed compared to spontaneous fermentation (1 to 1,5 %vol), the sensorial characteristics emphasize the grape variety and terroir characteristics, also less sensitive to microbial alterations.

The data from monitoring the fermentation processes pointed out that the selected flora produced a minimal degree of foaming in the pre-fermentation stage, the active stage started after 24-48 hours from inoculation of starter culture, the tumultuous stage started after 48 hours and continued for 8-10 days. Thus, the use of selected starter cultures can ensure a balanced wine and it also may develop wines to support their geographical authenticity.

Keywords: *authenticity, microbiota, indigenous flora, wine*

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I I O T: A TOOL TO INCREASE PRODUCTIVITY AND REDUCE COSTS IN THE PACKAGING INDUSTRY

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The study focuses on the use of the Industrial Internet of Things (IIoT) concept to optimize the operation of packaging machines. The study examines the potential of IIoT to collect, process, and analyze data on the operation of individual components of packaging machines, such as solenoid valves. Using sensors and electronic systems, data on temperature, vibration, pressure, and other valve parameters can be obtained. Analyzing this data allows us to assess the health of the valves, identify potential problems, and optimize their performance. The results of the study show that the use of IIoT can significantly improve the efficiency and reliability of packaging machines, as well as reduce maintenance and repair costs. The study, which aims to develop a formalized approach to IIoT-based modeling in the structure of packaging machines, allows us to analyze the impact of intelligent control systems on productivity, flexibility, reliability, and product quality.

To achieve this goal, a detailed analysis of the key components of the ICS, such as sensors, actuators, data collection and analysis platforms, and decision-making algorithms, was conducted.

The research object was the process of dosing liquid products in a packaging machine. A mathematical model was developed that describes the dynamics of the dosing process, taking into account the characteristics of a proportional pressure regulator. The results of modeling and experimental studies have shown that the proposed module of the intelligent control system is able to effectively stabilize lifting and lowering operations within the specified accuracy and speed limits. The results confirmed that with a stepwise change in the output absolute pressure setpoint signal from 0.5 to 6.5 bar at an absolute supply pressure of 8 bar and a regulator throughput of 1500 Nl/min for small volumes of the outlet cavity (no more than 0.01 l), the process proceeds quickly (t = 0.12 c) and practically without fluctuations. With an increase in the volume of the initial cavity, the duration of the transient process increases and at a volume of V = 4 l reaches approximately 1 s (t = 0.3 c). At the same time, the overshoot of 0...7 % and the oscillation slightly increase, remaining within the permissible limits. For all values of the receiver volume, the steady-state error does not exceed 2000 Pa, which is 0.25% of the supply pressure. As a result of the experimental studies, it was found that the duration and nature of the transient processes of pressure control at the output of the PRE, as a compensator for dynamic loads, depend on the volume of the receiver connected to its output, the throughput of the inlet and outlet ports of the pressure regulator, and the supply pressure.

Keywords: *Industrial Internet of Things (IIoT), packaging machines, optimization, sensors*

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INCREASING THE TECHNICAL EFFICIENCY OF BEAD MILLS FOR ULTRA-FINE GRINDING OF COMPONENTS OF MEDICINAL AND COSMETIC PRODUCTS

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Introduction. Research was conducted with the aim of determining changes in the particle size distribution of drug and cosmetic suspensions during processing in a bead mill and improving the efficiency of its operation.

Material and methods. Ultrafine grinding of model suspensions based on castor oil and solid dye particles is being studied. The research was carried out on an experimental stand based on a vertical type bead mill. The particle size distribution of the suspension was determined by the method of photo registration of images magnified by 100-900 times and their further processing by software.

Results. Experimental studies of changes in the particle size distribution of suspensions and the analysis of the obtained results show that the composition of suspensions within the investigated range is actively crushed and redistributed during the entire time interval of measurements.

The resulting curve of the degree of grinding during grinding shows an active reduction in the size of the particles in the first 4 minutes of the process. Grinding rate curves and size distribution diagrams demonstrate that slurries with a higher solid phase content are ground more intensively than slurries with a lower solid phase content.

The obtained results of studies of the distribution of suspension particles by size classes make it possible to monitor and adjust the necessary parameters of the ultrafine grinding process to achieve the required product quality, as well as to be used for simulation modeling of the process in bead mills.

Accordingly, for the production of medicinal and cosmetic products, it is advisable to use formulations of suspensions that have a higher concentration of the solid phase in their composition.

Conclusions. The obtained results are useful for choosing rational modes of operation of the bead mill and conducting the grinding process, in particular, choosing the construction of working elements, kinematic parameters, grinding time.

Keywords: *bead mill, granulometric composition. grinding, suspension, ultrafine*

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INFLUENCE OF FINING WITH PLANT PROTEINS ON OXIDABILITY OF FETEASCA ALBA WINE

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White wines contain a wide variety of proteins, some of which are unstable, naturally forming an opalescent precipitate, so the wine will have an unpleasant appearance. From the oenological point of view, the protein stability process is considered to be the state of equilibrium, the main role being to preserve the clarity, the specific physico-chemical parameters in winemaking and the particular organoleptic properties of the type of raw material variety. Given the allergenic problems associated with the use of animal proteins to clarify wines and the increased demand for vegan wines, new research is needed to promote alternative wine clarifying agents such as plant-derived proteins.

In this work, the influence of treatment with proteins of plant origin on the dynamics of polyphenolic compounds in Feteasca Alba white wine was studied.

The research was carried out within the Oenological Research Center of the Technical University of Moldova. For an optimal determination of the degree of oxidation and protein stability, a dry white wine from the Feteasca Alba variety was chosen for analysis. The grape samples were harvested in October 2023 in the Cricova area, belonging to the PGI "Centru".

The wine samples were subjected to finning with adjuvants of vegetable origin (patatin, pea protein) compared with protein of animal origin (gelatin). In order to determine the degree of oxidation, the POM test ("Polyphenol Oxidative Medium test") was used, which consists in introducing hydrogen peroxide into the white wine samples. Following the application of the oxidation test, it is measured by means of the UV spectrum with wavelengths in the range of 260-280 nm characteristic for phenolic substances.

The POM test applied on the white wine offers the possibility to predict the risk of browning. Thus, it showed the increased oxidation behavior in the wine treated with the addition of gelatin (60,63 %). This fact can be explained by the presence in the respective sample of unoxidized forms of hydroxycinnamic acids and their derivatives and specific protein affinity. The lowest value of POM-test has been identified in wine samples treated with plant proteins (33,05% - patatin and 17,07% - pea protein).

The applicability of the POM-test offers the possibility to predict the risk of browning of the white wine, therefore it is a cost-efficient essay in order to choose the fining scheme.

Keywords: *oenology, oxidation, phenolic compounds, POM-test*

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LIPOSOMES - METHODS OF PREPARATION

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The encapsulation of food ingredients using liposomal systems consisting of natural phospholipids is of the greatest interest for the food industry. One of the advantages of encapsulation using liposomal systems is the amphiphilicity of their constituent phospholipids, which allows the encapsulation of both hydrophilic and hydrophobic ingredients, whereas the majority of other encapsulating agents can only encapsulate hydrophilic ingredients. It should be noted that development of methods for the production of liposomal systems that could be implemented on an industrial scale in food technology is currently becoming more and more relevant. Thus, research in this field is essential.

Liposomes can be obtained using different methods: injection of ethanol or other organic solvent, detergent removal system (lipids and other compounds are dissolved with detergent, and then the detergent is separated by dialysis), manual agitation, ultrasonic procedures, phase evaporation reverse, lyophilization, dialysis, homogenization at high pressures, extrusion. The classical method of liposome production, namely the thin film hydration method, does not allow obtaining uniform liposomal dispersions in shape and size. Physical methods that are known make it possible to obtain liposome dispersions uniform in shape and size, namely ultrasonic treatment, pressure extrusion and microfluidization.

The dehydration-rehydration method involves obtaining a liposomal system by hydrating a thin film and drying it (lyophilization) with subsequent rehydration in an aqueous solution and allows for the production of multilayer liposomes with high encapsulating capacity. The solvent injection method involves dissolving phospholipids in an organic solvent, usually ethanol, and introducing the resulting solution into the aqueous phase, followed by removal of the solvent [8]. Liposomal systems can also be formed by solubilizing lipids with a detergent. The detergent is then removed by dialysis, resulting in the formation of single-layer liposomes. The thin film hydration method involves dissolving phospholipids and lipophilic ingredients in an organic solvent, usually chloroform, and then evaporating it under low pressure to obtain a thin lipid film, to which an aqueous phase with hydrophilic ingredients dissolved in it is added through mechanical action, forming a liposomal dispersion. The most common methods are ultrasonic treatment, pressure extrusion and microfluidization. Ultrasonic treatment of the liposomal system leads to a decrease in the size and a change of the structure of liposomes, i.e. to obtain single-layer liposomes, uniform in shape and size. Microfluidization is based on the principle of dividing the flow of liposomal dispersion into two jets, which are pumped under high pressure through microchannels and collide with each other at high speed inside the microfluidizer chamber. Nowadays, the research of methods that would be used for obtaining liposomal systems that would be implemented afterwards in food technology is of great significance.

Keywords: *phospholipids, liposomal systems, production methods, encapsulation*

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MATHEMATICAL MODEL OF THE VACUUM COOLING PROCESS OF A LOAF

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Introduction. Vacuum cooling is an innovative method that significantly reduces the cooling time of bakery products through the adiabatic boiling of moisture as pressure decreases. It offers advantages such as faster cooling, improved rheological properties, and extended shelf life, but it also leads to moisture loss and crust hardening. To improve this process, the development of mathematical models is essential to help optimize parameters and maintain product quality.

Material and methods. To develop a mathematical model for the vacuum cooling process of a 0.5 kg loaf made from premium wheat flour, various approaches were used, including a review of literature sources and the results of experimental studies on vacuum cooling, as well as studies on the rheological properties of the crumb and the gas permeability of the loaf's crust. The main characteristics of the loaf are its initial moisture content, mass, volume, porosity, and temperature after baking.

Results. The developed mathematical model of vacuum cooling for bakery products is based on the comprehensive use of heat conduction and mass transfer equations, which occur during moisture evaporation as a result of adiabatic boiling. During the vacuum cooling process, when the pressure in the chamber decreases, moisture inside the bakery product begins to evaporate actively, leading to rapid temperature reduction. The model accounts not only for the physical aspects of the process—such as heat transfer and moisture evaporation—but also for the impact of these processes on the product's quality characteristics, including crumb structure, crust condition, and overall moisture content.

Additionally, the model considers potential deformations and damages that may occur due to rapid changes in pressure and temperature. This allowed for the determination of optimal vacuum cooling parameters that prevent the destruction of the bread's structure, preserve its organoleptic properties, and avoid excessive moisture loss. The calculations revealed that there is a specific set of parameters for loaf cooling, under which the process is both maximally efficient and safe for product quality. According to the calculations, the cooling time for the loaf under these conditions is only 27 seconds, significantly reducing the production cycle while maintaining high bread quality.

Conclusions. A mathematical model of vacuum cooling for loaves has been developed, which optimizes the process and allows for the formulation of recommendations regarding technological parameters. The model ensures high product quality with minimal costs, facilitates the automation and control of the process, increases productivity, and reduces energy consumption.

Keywords: *loaf, mathematical model, pressure, throughput, vacuum cooling*

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MODIFICATION OF THE SURFACE PROPERTIES OF ALUMOSILICATES BY GRAFTING MOLECULES CARRYING SEVERAL ACTIVE FUNCTIONAL GROUPS

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The presence of pollutants in the environment, food, drinking water and other compounds in direct or indirect contact with humans, fauna and flora constitutes a major problem. The capture and/or decomposition of pollutants without producing traces of residual toxins is very actual trend. An interesting approach for decontamination and/or pollution prevention lies in the use of natural, non-toxic, recyclable materials for new processes of reversible retention of pollutants and toxins. This approach also calls for more ecological processes of synthesis and modification of materials that do not use or produce potential pollutants - aluminosilicates (AS) of natural origin. By grafting different molecules carrying various chemical functions to the surface of an AS, it is possible to broaden the spectrum of interactions, essentially acid-base, with the surrounding fluids. This innovative concept opens the way to a wide range of possible applications ranging from the reversible capture of pollutants, to the oxidative or reductive decomposition of various toxins such as antibiotics, drugs, pesticides, phthalates, hormonal regulating agents, to the elimination of inhibitory agents and toxins in food technologies. Thus, in the present work the following activities were carried out:

- The modification of the surface properties of AS by grafting molecules carrying several active functional groups;
- The evaluation of the acid-base properties by programmed thermodesorption;
- A characterization of the modified AS having demonstrated the best reversible retention performances;

The obtained preliminary results attest the significant impact capacity of AS grafted to various groups with acid-base properties. The use of AS as sustainable raw materials, due to their availability, ease of purification and recyclability for industrial applications by intercalating them with different dendrimers, presents many opportunities. The study of the interactions of organo-AS composites that can reversibly fix pollutants (phthalates), including the retention capacity and kinetics, will be necessary.

Keywords: *aluminosilicates, grafting, poluanti, programmed thermodesorption, reversible retention*

MOLECULAR POLYMORPHISM OF *BRETTANOMYCES BRUXELLENSIS* ISOLATED FROM MOLDOVAN WINE

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Brettanomyces bruxellensis yeasts are common wine spoilage agents able to produce volatile phenol compounds. The substances are responsible for the specific off-odors regarded as olfactory defects in wines. Therefore, *B. bruxellensis* propagation during winemaking requires strict control. Current work focuses on assessing the genetic diversity of *B. bruxellensis* in wine samples for purpose of identifying the potential source of wine infection with the respective yeast under conditions of micro-wineries.

Fourteen wine samples obtained from different grape varieties were used for isolating *B. bruxellensis*. Total DNA was extracted and purified as described in ISO 21571:2005 protocol with modifications. DNA extracted from two independent colonies was used for amplifying a specific region with ITS1 and ITS4 primer, the fragment was sent for sequencing to CeMIA SA, Greece.

Several *B. bruxellensis* strains were identified in local wine samples by comparing the sequenced fragments with accessions stored in GenBank database. The identified strains originated from different geographical regions: South Africa, Belgium, Lebanon, Portugal, and France. Sequence analysis revealed molecular polymorphism in the ribosomal DNA fragment generated by ITS primers. Five unique sequences were submitted to NCBI database with the following accession numbers–PQ219467, PQ219468, PQ219469, PQ219470, PQ219471.

Molecular analysis data imply the presence of local *B. bruxellensis* strains specific for the republic of Moldova. Moreover, the results obtained favors the hypothesis that *Brettanomyces* yeasts most likely contaminate microwineries with grape berries.

Keywords: *ITS*, *micro-winery, sequencing, volatile phenols, wine spoilage*

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MOLECULAR TECHNOLOGIES IN WINE-MAKING

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Essentially, wine production is a microbiological process where yeasts and bacteria play a decisive role. The microbes are present throughout the winemaking process. For example, *Saccharomyces* yeast convert grape sugars to ethanol during alcoholic fermentation, while lactic acid bacteria convert malic acid into lactic acid during malolactic fermentation. While some of the microbes are beneficial and enhance wine aroma, others have a negative effect on wine quality, producing various secondary metabolites with undesirable sensory qualities, thus behaving as 'wine spoilers'. Accurate and timely detection and quantification of wine spoilers during the production process is important to determine the sources of contamination in the wineries and take timely measures to prevent potential damage with minimal economic costs. Traditionally, methods of detection of wine spoilers included plating and colony count. Recently, DNA-based methods of detection and quantification of wine spoilage microorganisms have been developed.

In this work, the methods of molecular biology are applied for monitoring the dynamics of wine spoilers during wine production process. Some issues related to detection and quantification of the most common wine spoilers are highlighted, with special focus on *Brettanomyces* and acetic acid bacteria.

Keywords: *wine spoilers, Brettanomyces, acetic acid bacteria real-time PCR*

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OENOLOGICAL CHARACTERISTICS OF FETEASCA NEAGRA AND RARA NEAGRA GRAPE VARIETIES

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Moldova, with its rich viticultural heritage, cultivates a variety of indigenous grape varieties that are central to its winemaking tradition. Understanding the procyanidin content in these local grapes can provide insights into their potential health benefits and flavor profiles.

FeteascA NeagrA typically contains a variety of procyanidins, including both monomers and oligomers (dimers, trimers, and tetramers). These compounds contribute to the overall phenolic profile of the wine. Procyanidins in FeteascA NeagrA contribute to its antioxidant activity, helping to neutralize free radicals and reduce oxidative stress. This antioxidant capacity can enhance the health benefits associated with consuming the wine.

The aim of researching procyanidins in Feteasca NeagrA and Rara NeagrA is to investigate their antioxidant properties, assess their potential health benefits, and evaluate their impact on the quality of the wines produced from these grapes. This research underscores the importance of these indigenous Moldovan grape varieties, supports the development of improved wine products, and emphasizes the benefits of Moldovan viticulture.

The study of the physicochemical composition of red wines throughout the technological cycle demonstrated that the concentration of titratable acids increases slightly during the initial stages, specifically during maceration-fermentation, but then decreases by approximately 0.9 g/dm³ during the malolactic fermentation process. The concentration of volatile acids gradually increases throughout the technological cycle, due to the formation of acetic acid as a secondary product of alcoholic fermentation. Analysis of the pH dynamics reveals that the pH of dry red wines remains stable throughout the technological cycle and does not change significantly.

The study of specific indices of dry red wines from indigenous varieties under microvinification conditions has demonstrated that the total polyphenolic index in dry red wine from Feteasca NeagrA is approximately 20 units higher than in dry red wine from Rara NeagrA. The anthocyanin content is also higher in dry red Feteasca NeagrA, reaching a value of 126.7 mg/dm³, compared to 101.5 mg/dm³ in dry red Rara NeagrA. Additionally, color characteristics such as color intensity and hue are more pronounced in dry red Feteasca NeagrA compared to dry red Rara NeagrA.

Therefore, FeteascA NeagrA and RarA NeagrA wines contain various procyanidins, including monomers and oligomers. However, the specific composition and concentration can differ, giving each variety distinct characteristics.

Keywords: *local grapes, procyanidins, red wines, maceration-fermentation process, physicochemical composition*

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OPTIMIZATION PROGRAMS IN FEED PRODUCTION

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Feed production facilities manufacture feed products, such as compound feeds, protein-vitamin supplements (PVS), and premixes, in accordance with approved recipes and quality requirements, which are industry standards for feeding livestock, poultry, and fish. This process is automated with specialized software solutions that consider various parameters, such as raw material composition, animals' physiological needs, and quality standards. These programs can be integrated with production management systems to optimize processes and ensure high product quality.

A recipe is a document that defines the composition and proportion of components needed to produce feed for livestock, poultry, and fish. It contains information on the types and amounts of raw materials required to manufacture the feed, as well as additional data such as energy content, nutritional value, and the presence of biologically active substances.

In the calculation of compound feed recipes, constant changes occur in response to scientific advancements in animal nutrition, technological progress, and shifting market demands. The main changes include:

1. A free raw materials market for feed production has been established.
2. A free market for compound feed has been formed.
3. Consumers now have the option to order compound feed of the desired quality.
4. Large consumers of compound feed have started building small-scale feed mills.
5. Production of compound feed for personal use.
6. Changes in the maximum allowable inclusion rates for certain ingredients (such as rye and barley) due to the use of modern enzyme preparations and multi-enzyme complexes in feed recipes.

Compound feed is produced based on recommended, calculated, or targeted recipes.

Recommended recipes are developed by scientific institutions specializing in animal nutrition. These recipes have been tested in practice and have proven feeding efficiency. Calculated feed formulas are developed using optimization software. They comply with the requirements of regulatory and technical documentation, such as interstate standards (ISO), national standards, consumer specifications, and company standards. Targeted feed formulas are those created or adapted for a specific client or particular feeding conditions. These formulas take into account the individual needs of animals or the specific characteristics of a farm, such as animal species, age, gender, physiological condition, climate conditions, and other factors.

Optimization programs for feed recipes are a key tool in the technological chain of compound feed production and in the interaction between producers and consumers. The accuracy of these optimization programs determines the degree of correspondence between theoretically calculated nutritional values and the actual quality of the final product. Modern programs for creating feed formulas not only apply optimization procedures to the available range of raw materials but also consider all possible factors that may affect product quality. This allows for maximum alignment between the theoretically calculated and actual nutritional value of the feed. As a result, these programs enable the optimization of feed in terms of both quality and cost, while also assessing the feasibility of using various additives from both biological and economic perspectives.

Keywords: *recipes, calculation, compound feed, quality*

POTENTIAL OF PHENOLIC SUBSTANCES IN RARA NEAGRA AND MALBEC RED GRAPES FROM PURCARI VINEYARD

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To evaluate the phenolic potential of Malbec and Rara NeagrA grapes, extracts were prepared from the separated skins and seeds of berries, harvested at different times, with a difference of 25 days. Total and group phenolic compounds were determined in the produced wines, but also in the pomace, dried under various thermal conditions and separated into skins and seeds, applying the Folin-CiocAlteu method and ultraviolet-visible spectrophotometry. The total content of anthocyanins, monomeric anthocyanins and those resistant to SO_2 was estimated in all samples.

The chromatic characteristics of both wines and berry and pomace extracts were assessed by applying the traditional XYZ trichromatic method, and the CIELa*b* method.

Extension of the ripening period of the grapes facilitated the formation of stable pigments. Moderate drying temperature (40ºC) resulted in a higher content of pigments extracted in the hydroalcoholic solvent compared to a drying temperature of 105ºC - by 61.5% in the case of Rara NeagrA grapes, and by 85% in Malbec grapes. In the acetone solvent, the extracts from the skins of Rara NeagrA and Malbec grapes, dried at 40ºC and 105ºC, contain comparable amounts of total phenolic substances, while the content of extracted pigments is higher when dried at 105ºC for both varieties - by 55% for Malbec grapes and by 22 % for Rara NeagrA grapes. Thus, thermal destruction of the vacuole membrane facilitates the extraction of less polar pigments.

Phenolic substances from seeds are significantly better extracted by a solvent of higher polarity (4-4.6 for Rara NeagrA grapes and 4.9-6.8 for Malbec grapes), while the impact of temperature is much lower. The wines produced in industrial conditions at the Purcari Winery, by applying various enzyme preparations, turned out to be richer in extractive phenolic substances. This conclusion is true for total phenolic substances, flavonoid phenolic substances, cinnamic phenolic substances and the anthocyanin complex. The polymerized pigment index (PPI) in industrial wines and those obtained by microvinification from single-origin grapes ranges from 41 to 67, and in the latter case it is higher for wines from both varieties. Malbec and Rara NeagrA wines, produced industrially and experimentally, differ significantly in trichromatic parameters (E), and various adjuvants, in the first case, contributed to the stabilization of anthocyanin compounds (lower values of a* and b* parameters).

Under both vinification conditions, the majority of phenolic substances, including pigments (60-80%), remain in the pomace, which represents a very rich potential source of phenolic substances with important biological activity and natural colorants, the extraction of which is essentially determined by the storage, drying and extraction conditions.

Keywords: *red grapes, phenolic substances, pigments, maceration, alcoholic fermentation, skins*

PROCESS OF HOP PARTICLE PRECIPITATION IN COMBINED WORT BREW MACHINE

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Introduction. The development of new equipment capable of performing several operations is an urgent task for small-scale enterprises, in particular mini-breweries, where there is an urgent need for multifunctional equipment. The task was set to create an adequate mathematical model of the process of separation of solid particles of crushed hops from the wort in order to improve the combined wort brew machine, which will provide not only heating and boiling of the wort with hops but also the separation of hop pellets.

Material and methods. The precipitation of hop particles occurs during the slow rotational motion of the wort in the apparatus. To calculate the area of sediment accumulation, we used the results of the well-known problem solved by U.T. Bedevadt on the rotation of a liquid over a fixed bottom. It is advisable to describe the motion in the apparatus mathematically in a cylindrical coordinate system. The problem statement includes equations of motion and uniqueness conditions.

Results. The theory of viscous fluid motion states that a boundary layer is formed near a solid surface, in the middle of which the velocities of the fluid particles vary from zero to a certain distribution typical for each individual problem.

If the flow velocities exceed the uniform deposition rate and the initial velocity, the particle is suspended. When the vertical velocity component is less than the deposition velocity, the particle slides along the bottom. Taking into account the active frontal force on the particle, the friction force of the particle on the bottom surface, and Archimedes' law, the relationship for the speed of the particle's initial movement on the bottom (the deposition rate in the reverse process) is obtained.

A formula for determining the radius of the sediment formation region, which depends on the characteristics of the medium, the operating modes of the apparatus, and the functions characterizing the velocity distribution in the boundary layer, is proposed.

The experimental results at stirrer rotation speeds of less than 15 rpm are fully confirmed by the data obtained from the mathematical model. Thus, at n = 10 rpm, particles of all sizes begin to settle to the bottom. The largest particles of granulated hops (2.8–8 mm in size) settle over the entire surface of the bottom of the apparatus. Particles with a size of 2.0–2.8 mm settle in the zone. And the particles that make up almost 63% of the total amount (their size is 0.28–2 mm) settle in the radius r*=0.12–0.17m. Further slowing of the agitator speed expands the settling zone of the smaller fraction.

Conclusion. The dependence for calculating the deposition rate at which moving particles settle to the bottom of the combined wort brew machine was obtained. It was found that for particles of different sizes and shapes the deposition rate under the condition of wort movement in the apparatus ranges from 0.65 to 0.08 m/s. Based on of the obtained results, recommendations on the design and operating parameters of the device are given. The deviation of theoretical and experimental data obtained does not exceed 7.15%, so the developed model is adequate to the actual sedimentation process.

Keywords: *wort brew machine, particles, sedimentation, stirrer, speed*

RATIONALE FOR THE DEVELOPMENT OF THE DESIGN AND MANUFACTURING TECHNOLOGY OF FLEXIBLE CONSUMER PACKAGING FOR COFFEE BEANS

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Introduction. One of the most promising materials for coffee packaging is polymer films, which have a high barrier ability, protecting coffee from external factors. They can also be made from recycled materials or be biodegradable, which meets environmental safety requirements.

Materials and methods. The purpose of this study is to develop the design and manufacturing technology for a 500 gram coffee packaging. To achieve this goal, we set ourselves the following tasks: to analyze the coffee packaging market, to study consumer requirements and to develop an optimal packaging design taking into account its functionality, usability and aesthetic appearance. We will also consider the technological process of packaging production, including the choice of materials, equipment and quality control methods.

Results and discussion. The coffee packaging market is large and competitive. It covers a wide range of products, including packaging for bean coffee, ground coffee, instant coffee, as well as other coffee-related products such as coffee beverages.

According to Allied Market Research, the global coffee packaging market was worth USD 11.2 billion in 2022. It is expected to grow at an average of 4.5% between 2023 and 2030.

The main factors contributing to the growth of the coffee packaging market are the rising consumption of coffee worldwide, as well as the growing popularity of alternative ways of brewing coffee, such as espresso and cappuccino.

The idea behind the packaging presented in the study was as follows: the packaging has a rectangular shape, which makes it easy to fold, transport and store on the shelf. The wide base provides stability, minimizing the risk of tipping over, and the rectangular shape is easy to grip. These factors make it a good option for coffee packaging, and the material is sealed on top of the packaging so that the consumer can easily open it without using any foreign objects.

Thus, when packaging coffee using a 3D flat-bottomed bag made of PE-MDO, it is necessary to ensure that the pressure does not exceed 0.056 MPa to ensure the integrity and strength of the package.

So, our choice of a symmetrical composition for the packaging was dictated by the desire to create a harmonious, balanced and attractive design that emphasizes the quality of the product and makes the brand recognizable.

As a result of the work done, we developed the design and manufacturing technology for a 500 gram pack of coffee beans. The packaging meets modern requirements for maintaining product quality, ease of use and environmental safety.

The developed packaging design has optimal dimensions and shape, which ensures convenient transportation and storage of the product. The choice of MDO-PE material guarantees a high barrier function, mechanical strength and resistance to external influences, which allows you to preserve the freshness and aroma of coffee for a long time.

The artistic design of the packaging was created taking into account the specifics of the target audience and market requirements. The use of colors, fonts and graphic elements creates an attractive and informative design that makes the product stand out on the store shelf.

The developed packaging for bean coffee is competitive in the market due to its technical, functional and aesthetic characteristics. It meets modern requirements for quality, safety and environmental friendliness, which makes it attractive to coffee consumers and producers.

Keywords: *packaging, coffee beans, polymer bag, flexographic printing, laminating, environmental safety*

STUDIES ON THE USE OF CLAY-BASED NANOMATERIALS IN THE PROCESSES OF CONTAMINATED ENVIRONMENTS NEUTRALIZATION WITH POLLUTANTS FROM MILITARY INDUSTRY

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Modern military explosives are generally aromatic compounds containing nitrogen. These are the most used in military operations and terrorism, being widely used in the composition of artillery or aviation munitions worldwide. As the main chemical component of active munitions, high explosives present a significant risk to the environment, primarily due to their toxicity to environmental receptors. The most commonly used secondary explosive is 2,4,6-trinitrotoluene (TNT). TNT and similar compounds are toxic to humans, animals, and plants. The risk of TNT contamination is higher when there is groundwater nearby. There is also a risk in sandy soil that does not contain organic material, as TNT will not degrade as quickly and can migrate into groundwater or leach into surface waters. The present study aims to analyze the adsorption properties of montmorillonite clay-based catalysts on TNT solutions with a molar concentration of 10^{-4} M. The adsorption capacity of the clay material will be subsequently analyzed based on factors such as p*H*, exposure time in contact with the pollutant, or the amount of adsorbent material used. Clays represent a category of minerals formed from very small particles, under 2 μm, with extremely varied properties. These properties are derived from the chemical compounds present in their structure, the symmetrical arrangement of atoms and ions, and the forces that bind them together. The two unconventional materials, K10 montmorillonite clay and aluminum-vanadium-pillared clay (K10Al-V-PILC), have shown promising results in terms of the retention capacity of TNT molecules in a basic medium (pH 12) and a relatively short exposure time (20 min). Thus, superior adsorption capacities of the materials compared to the acidic medium were observed, as well as the possibility of decomposing TNT into compounds with lower toxicity than the initial pollutant.

Keywords: *adsorption, montmorillonite, pH, trinitrotoluene*

STUDY OF THE INFLUENCE OF PH VALUES ON THE ANTIOXIDANT ACTIVITY OF BERRIES EXTRACTS

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The study of natural antioxidants and their use in the food industry is a current area of research. An undoubted interest in this field is shown by berries, which are rich in ascorbic acid (vitamin C), sugars, organic acids, pectin, anthocyanin, minerals (iron, iodine, potassium, copper, etc.) and rutin (vitamin P). Berries also contain valuable bioflavonoids, including flavonols, isoflavones, anthocyanin and proanthocyanidins, which have antioxidant, anti-inflammatory, antiviral and anti-carcinogenic properties.

Thus, the purpose of this research was to determine the influence of pH on the antioxidant activity of jostabery extracts, obtained by non-conventional methods.

Research has shown that the pH value influences the stability and color of anthocyanins. At an acidic or slightly basic pH level, the highly conjugated phenolic groups of anthocyanin have the ability to protonate or deprotonate, which leads to a change in electron distribution.

Frozen josta berries were used to determine the influence of pH on the antioxidant capacity of jostaberry extracts. The jostaberry extracts were obtained under optimal conditions, selected in preliminary research: sample/solvent ratio of 1:20 (m/v), UAE (20 min time, 37 kHz), and in three MAE regimes (100, 180, and 300 W for 6 min). These extracts were adjusted to pH 2.5, 3.5, 4.5 with citric acid monohydrate, then the antioxidant activity (AA) was determined by the DPPH and ABTS method.

It has been established that the free radical scavenging activity of polyphenolic compounds from jostaberry extracts depends on the pH value. With the increase in pH, an increase in the scavenging activity of the $DPPH^{\bullet}$ radical and the $ABTS^{\bullet+}$ cationic free radical is observed. At pH 4.5, AA are approximately twice as high as the values obtained at pH 2.5.

Some authors have demonstrated that polyphenols, such as hydroxyflavones and anthocyanins, contain more OH groups, which with increasing pH of solutions, will have a greater degree of dissociation. Also, electron transfer is dependent on pH [1].

Anthocyanidins are considered strong radical scavengers, especially under slightly alkaline conditions, followed by flavonoids and phenolic acids. Thus, with the increase in pH value and the deprotonation of hydroxyl groups, the antiradical activity of polyphenols increases.

Keywords: *anthocyanidin, jostaberry extracts, scavenging capacity, the free-cation radical*

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STUDY OF THE SORPTION ACTIVITY OF SORBENTS BASED ON ALGINATE AND BIOCHAR FUNCTIONALIZED WITH METAL OXIDES

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The largest volume of industrial production of phthalates today falls on two main homologues DBP and DEHP. Due to satisfactory characteristics of phthalates as plasticizers, they have long been involved in the production of polymeric materials for a wide variety of purposes. In the era of active consumption of goods, demand and production of petrochemical products is steadily increasing. And the time interval, in turn, between its production and disposal is decreasing. More and more phthalate-containing materials end up buried in landfills. The rate of their natural degradation in nature through hydrolysis, photochemical processes and the activity of soil consortia of microorganisms is significantly lower than the rate of their production. A negative consequence of the widespread use of phthalates is the widespread pollution of soils, air, surface and groundwater with these substances. Regions of the planet with severely limited water resources are forced to include in their consumption cycles sources whose quality and safety sometimes do not correspond to any sanitary standards. The problem of water conditioning in such cases is of vital importance. Water treatment in such circumstances should be a simple but effective process.

The sorption activity of eleven experimental samples of sorbents based on alginate and biochar functionalized with metal oxides (Fe_3O_4) was studied in relation to two phthalates – dibutylphthalate and bis(2-ethylhexyl) phthalate. The sorption activity of all 11 studied samples was experimentally recorded. The data obtained in preliminary tests can serve as a starting point for planning further studies of the sorption activity of the experimental samples. The obvious difference in activity in relation to DBP and DEHP can probably be explained by different hydrophilic (hydrophobic) properties of the two homologous esters of phthalic acid, as well as their molecular weights and spatial structures. The sorption properties of materials on real samples can differ greatly from the data obtained on models. Competitive reactions with cations, anions, dissolved gases, hydrocarbons, POP's and other natural water pollutants of various origins can reduce the target capacity.

Keywords: *phthalate, water, sorption, GCMS*

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STUDY ON THE CAPACITY OF YEAST STRAINS TO FORM SULFUR COMPOUNDS DURING THE FERMENTATION PROCESS

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The determination of sulfur compounds in wines fulfills multiple objectives with scientific and practical relevance in the wine industry. This process serves as an essential tool for controlling and ensuring the organoleptic quality of wine, monitoring yeast activity, preventing olfactory defects, and guaranteeing compliance with rigorous production standards [1].

Sulfur compounds, including thiols and sulfides, have an extremely low perception threshold, with the ability to substantially influence the organoleptic quality of wine even at minimal concentrations. Their low perception threshold highlights the high sensitivity of tasters to these compounds, requiring careful and precise analysis [1, 2].

The origin of these compounds in wines is related to yeast activity, which can metabolize added sulfites and sulfates in the must, generating volatile sulfur compounds. By determining the concentrations of these compounds, potential olfactory defects can be prevented or minimized, thus ensuring the quality and taste integrity of the wine [1, 2].

The study focused on the analysis of sulfur compounds (methanethiol, ethanethiol, dimethyl sulfide, diethyl sulfide, dimethyl disulfide, diethyl disulfide) produced by the indigenous yeast strains CNMN-Y-34, CNMN-Y-35, CNMN-Y-36, and CNMN-Y-37, used in the fermentation of white wines Chardonnay, Muscat Ottonel, and red wines Merlot and Cabernet-Sauvignon. Industrial yeast strains (IOC B-2000, IOC R-9008) were used as controls for the alcoholic fermentation of must and pomace.

The determination of sulfur compounds was performed using gas chromatography (Hewlett-Packard) on a quartz capillary column with a photometric flame detector, after prior liquid extraction of the analyzed compounds.

The results indicated that all studied yeast strains produced low concentrations of sulfur compounds, which did not exceed the organoleptic perception thresholds. Comparisons between wines fermented with indigenous strains and controls showed insignificant differences in the presence of sulfurous compounds, highlighting the potential of these strains to improve the sensory profile of wines.

The indigenous yeast strains CNMN-Y-34, CNMN-Y-35, CNMN-Y-36, and CNMN-Y-37 contribute to the reduction of sulfur compound concentrations in wines, which has a positive impact on the organoleptic quality of the final product. The use of these strains can significantly improve the control of the fermentation process and, consequently, the quality of dry wines.

Keywords: *aroma, organoleptic quality, olfactory defects, yeast activity*

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THE COMPARATIVE ASSESSMENT OF PROTEIN STABILITY IN WHITE WINES AND THE INTERFERENCE OF PROTEINS IN THE SPECTROPHOTOMETRIC DETERMINATION OF POLYPHENOLS

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The presence of proteins in wine is associated with instability risks, often manifesting as spontaneous turbidity during storage and commercialization. Conventional methods for evaluating protein instability, such as thermal shocks or chemical reactions with gelatin and tannins, combined with turbidity measurements, do not offer a thorough assessment of wine stability. This complexity is attributed to several factors, which can be classified into two primary categories: intrinsic factors related to the wine's composition, and extrinsic factors linked to processing and storage conditions. Only a small subset of proteins in wine exhibit thermal instability, typically those with molecular weights around 24-32 kDa. Interactions between proteins and other components in wine can either stabilize or destabilize protein colloids, leading to sedimentation. Moreover, proteins can affect the accuracy of analytical measurements of phenolic compounds. Specifically, they may interfere with the Folin-Ciocalteu reagent, which is used to quantify polyphenols, by influencing the ultraviolet range (260-280 nm) spectrophotometrically, thus distorting the results.

This study aimed to identify and compare the most effective tests for assessing protein stability in white wines produced under both industrial and microvinification conditions. It also sought to evaluate how proteins affect the spectrophotometric quantification of phenolic compounds. To achieve this, the study applied thermal stress tests to induce protein instability, using various temperature shocks and exposure durations, as well as chemical destabilization tests for protein colloids. Results were analyzed by measuring turbidity (NTU) and comparing different wine series. The wines examined included Viorica (from different grape sources and harvest years), Feteasca Alba, Feteasca Regala, Rkatsiteli, and Riton.

To investigate how proteins, affect the spectrophotometric measurement of polyphenols, various methods were employed to remove proteins from wines before analysis. Deproteinization involved sodium dodecyl sulfate (SDS) for denaturation at 100°C and sedimentation with potassium chloride (KCl) at 4°C. Glycoproteins were precipitated with acetone, though excessive acetone interfered with ultraviolet spectrophotometry. Ethanol was also used for protein sedimentation. Quantitative protein assays included Bradford, Lowry, and Folin-Ciocalteu, using Bovine Serum Albumin (BSA) fraction V (66 kDa) as the reference. Protein content varied significantly among wines, from 0.33 to 4.6 UA using the Folin-Ciocalteu method (λ = 750 nm). No correlation was found between protein concentration and stability. Partial sedimentation of phenolic compounds, like tannins, was observed, with proteins forming biopolymers, including those involving polysaccharides. Accurate spectrophotometric measurements of polyphenols remain challenging in both untreated and deproteinized wines.

Keywords: *wine proteins, phenolic substances, protein stability, spectrophotometry*

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THE IMPACT OF MODERN EQUIPMENT ON THE QUALITY OF DEALCOHOLIZED WINES

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In the wine industry, technology and innovation have become essential forces transforming the sector. In recent years, winemaking has made significant progress thanks to modern technology, which plays a crucial role in improving various aspects of winemaking.

In the age of digitization, the ancient craft of winemaking may not be left behind. The transition from traditional practices to modern approaches has become not only advantageous but essential for both winegrowers and winemakers. With the global wine market expected to reach USD 450.59 billion by 2028, maintaining competitiveness requires a balance between tradition and innovation.

This paper analyzed the major impact of modern equipment on the winemaking process, highlighting their important contribution to increasing the quality, consistency and economic efficiency of the final product.

The process of removing ethanol from wine, also known as dealcoholization, has become an important aspect in the contemporary wine industry, with economic, social and environmental consequences.

Scientific research in the field was carried out at the company "Imperial Vin" and highlighted the importance of the dealcoholization process in the production of wines with a low alcohol content. To remove ethanol from wines, the DVR-200 model vacuum dealcoholizer was used, by processing time of 1 hour for each, working temperature, which started the dealcoholization process at temperatures from 17°C to 35°C according to the elaborated technological scheme. The physico-chemical indices and the sensory profile after the alcoholization process were determined and analyzed.

The study of the influence of temperature on the dealcoholization process and wine quality is essential for the development and optimization of the production of low-alcohol wines. This research makes significant contributions to the understanding and improvement of technological processes and the quality of the final product.

Keywords: *must, wine, dealcoholization, temperature, wine products, physico-chemical indices*

Acknowledgment. The research was funded by *Institutional Project 020405 Bio-OpTehPAS "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", running at Technical University of Moldova*.

VALORIZATION OF GRAPE POMACE - ASPECTS OF THE CIRCULATING ECONOMY IN WINEMAKING

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In the production of wines, organic waste is generated, consisting of grape pomace, yeast, stems and sludge. Grape pomace, composed of seeds and fruit skins produced during grape pressing, contains many bioactive compounds including anthocyanins, catechins, flavonoids, phenolic acids, and stilbenes. This makes grape pomace a valuable source of phenolic compounds with high fiber content, suggesting its potential use as a functional food ingredient.

The purpose of scientific studies focused on the preparation and compositional analysis of extracts from fermented grape pomace of Cabernet Sauvignon and Rara Neagra red grapes harvested in 2023. The 2 types of grapes were technologically processed according to the classic vinification scheme within the Micro-winery section of the Department of Oenology and Chemistry. The solvent used for extraction was 60% ethyl alcohol acidified with 1 % hydrochloric acid in a ratio of 1:10 by volume with grape pomace powder and temperature of extraction 40 ± 2 °C and 55 ± 2 °C.

To characterize the study extracts the titratable acidity (TA), pH value, certain chromatic indices, antioxidant capacity evaluated by DPPH assay, and anthocyanin content, were established. The lowest values were recorded in the non-acidulated samples, as a result, acidulated extracts were the richest in biologically active substances. When creating the absorption spectra, a high content of anthocyanins was observed – components that describe the most significant increases in the spectral line at wavelengths between 510 and 550 nm, specific to these phenolic compounds, confirming the participation of anthocyanins in the formation of the color of grapes as main constituents.

Valorizing grape pomace is crucial for obtaining its constituent bioactive substances, which exhibit an antioxidant capacity of over 80%, a total phenolic content value of 4.9 mg GAE/g DW for Cabernet Sauvignon and higher values of 5.5 mg GAE/g DW respectively for Rara Neagra.

The results obtained demonstrate the feasibility of obtaining grape pomace extracts rich in bioactive substances without requiring technologies that would necessitate expensive equipment and chemicals.

Valorizing grape pomace is crucial for obtaining its constituent bioactive substances, which exhibit an antioxidant capacity of over 80%. Therefore, the use of enocolorant extracts in the food industry presents an alternative that allows for the use of natural resources and the generation of inexpensive and healthy raw materials.

Keywords: *anthocyanins, extract, grape pomace, natural resources, phenolic substances*

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