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3. **Food Chemistry, Oenology and Biotechnology in the Food Industry**

Contents:

SECTION I:
Food Engineering and Technology

CHANGE BY MASS EXCHANGE THROUGH A DRIVING POTENTIAL GRADIENT

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Among the various ways to improve the processes of heat and moisture exchange and modes of dehydration of grain products, a separate area should be the method of the specified parameters of moisture absorption capacity of working gases.

However, currently in the technology of known domestic and even modern foreign drying units, the influence of the actual pressure of the gaseous medium in the layer of dehydrated bodies is either ignored or not fully taken into account, referring to the error of the process.

Material and methods: mathematical modeling and empirical analysis, criterion equations, testing.

Results. We have note that at different pressure gradients and the same energy flow of working gases up to 1.8 kPa, the intensity of moisture exchange in real production conditions of the modernized drying unit varied not within the theoretical 4% obtained by known calculation formulas, but in 5– 6 times more - by 22 – 25%! This forced us to single out the factor of the gradient of the flow of working gases into a separate significant factor influencing the rate of interfacial heat and mass transfer. Consider the above example of dehydration of the sedentary layer of grain and compare the calculated with experimental data.

Under conditions of grain drying in a dense sedentary layer of mine direct-flow dryers, the speed of the drying agent at the inlet section of the dehydrated material varies in the range of 0.35 – 0.55 m / s, the thickness of the layer in the space between the boxes is 0.25 m

For these conditions, the aerodynamics drag of the layer of dehydrated material ranges from 600 Pa (corn) to 2500 Pa (castor seeds). The aerodynamics drag causes energy losses in the low of drying gases and related:

a) difficulties in ensuring the specified modes of operation of the drying unit;

b) Different moisture content and driving potential of working gases in the cross section of the layer;

c) Increasing the difference in velocities in the cross section of the dehydrated layer;

d) The heterogeneity of the moisture of the dehydrated material in the cross section of the layer and

e) Additional costs of dehydration energy and deterioration of drying quality.

The values dPi to vary in a wide range and for mine direct dryers acquire values from 0.6 kPa for corn, 1.3 kPa for wheat and oats, 2.3 kPa and 2.5 kPa for millet and rape. Accordingly, the calculated values of the moisture content of drying gases will increase to 2 – 2.5 %, and their moisture absorption capacity will decrease by the same amount.

Thus, according to the calculated data, the intensity of interphase mass transfer at different gradients of the working gases for a layer of wheat and castor (or mustard) 0.25 m thick will vary within (2.6–2.8)% and (4.8–5.2)%, respectively. The same corrections should be taken into account in the calculations of energy consumption.

COMPARATIVE STUDY OF CONVENTIONALLY AIR DRIED AND CO2 MODIFIED ATMOSPHERE DRIED "CONFERENCE" PEARS

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Through the years of our planet development there were established a lot of countries of the first, second and third world which economy depend on their agricultural lands. The high quantities of diverse vegetal products are grown every year and then sold throughout the country or exported worldwide. Although plant food is always favored by the costumers, there are periods when the abundant harvest becomes an issue for the growers, as they may not have the opportunity to get rid of the yield before it starts to spoil. A good solution for that problem is drying. Using this method of conservation, the growers not only stop the spoilage of their fruits and vegetables, but also receive other benefits, which allows them to minimize storage spaces, transporting costs as well as they get a whole new product, that can be sold all year long. Through the years there were known a whole lot of different drying methods that brought into the process a large diversity as well as their combination allowed to merge their strong sides to create new, even more efficient drying methods. One of the new and poorly investigated directions is modified atmosphere drying. As such, the goal of the research was to compare the results of experimental dryings performed with air and CO2 modified atmosphere.

"Conference" pears were utilized as experimental object of the study. For the research one used ripe fruits which were washed and sliced in half circles upon installing them inside the drying chamber of an experimental drying installation, which allows to use different methods of heat treatment, such as microwave, air convection and modified atmosphere drying. For the experiment to begin the chamber was heated using hot air/CO2 (drying agent temperature 60 – 100°C) transported via a centrifugal fan (drying agent velocity 1.5 m·s-1). After reaching the needed temperature the drying process begins throughout which the humidity of pears drops down from 86% to 20%.

After experimental dryings were performed, one established for every drying agent and temperatures (60 – 100°C, 13-80% CO2), the drying and drying velocity graphs showing the dependencies between dried product humidity – drying process duration and drying process velocity – dried product humidity. Analyzing the set up diagrams we noticed a small deviance between same drying temperature air and CO2 drying durations (e.g. for 60°C the reduction in drying time for CO2 was 10.5% and 7.7% for 100°C) energy consumption for the two drying methods (e.g. for 60°C the reduction in energy consumption for CO2 was 4.2% and 1.2% for 100°C). To investigate the quality parameters one has determined the total polyphenols content. As a result, there was a notable change of total polyphenol content that are more retained in the dried product as the temperature grows, but as well, there is a distinguishable difference between same drying temperature total polyphenol content for air and CO2 drying methods, as such, at 80°C, there are 35 AG/gl for air and 81 AG/gl for CO2 modified atmosphere drying.

Keywords: drying, drying time, polyphenols, humidity, temperature.

Acknowledgments: The work was carried out within the State Program, ANCD no. 20.80009.5107.09 "Improving food quality and safety through biotechnology and food engineering", held at the Technical University of Moldova.

DEHYDRATION PROCESS OF TOMATO FRUIT BY FORCED CONVECTION AT THE TUNNEL-TYPE INSTALLATION

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Introduction: The Republic of Moldova being an agrarian country is rich and recognized for the rich assortment of fruits and vegetables it possesses. The problem lies in preservation the product, the number of industrial fridges is limited and the maintenance is quite expensive, an effective solution that would facilitate keeping, storing and transporting would be their dehydration.

Material and methods: Tomatoes harvested from the territory of the Republic of Moldova in 2022 were taken, later they were brought to the DIM – UTM research center as study samples and were prepared for dehydration. Meanwhile, the research facility is connected, the temperature (50 - 70°C) and the air flow speed (0.5 - 2.5 m/s) are set. As a thermal agent, the air from the room was used with an initial temperature of 20 - 25°C, relative humidity 55 - 60%, normal atmospheric pressure, dehydration was studied at different temperatures 50 - 70° ± 1°C, at an air speed of 2.0 ± 0.1m/s, the research was carried out at the GUNT stand, Germany.

Results: Following the investigation of the tomato drying process, the kinetics graph for forced convection at the temperatures of 50, 55, 60, 70 and 80°C was developed, and the drying curves were obtained. When drying with a temperature of 50°C, the maximum drying time of 250 minutes was obtained and at 80°C, 90 minutes was obtained, so the drying time is inversely proportional to the applied temperature; the drying speed was determined, for the temperature of 50°C, (du/dτ) is equal to 0.34, for 55°C – 0.41, for 60°C - 0.52, for 70°C - 0.65, and at 80°C - 0.79 is obtained. Following the dehydration of the tomatoes according to the organoleptic analysis carried out at the IM department, the sample was presented that obtained the maximum score (very good) with parameters: applied temperature 60°C; air velocity of 2 m/s and the shape of the product sliced in half.

Conclusions: Following the research of the tomato drying process, optimal drying parameters were obtained such as: temperature 60°C, air speed of 2 m/s, tomatoes being cut into halves of about 4-5 mm, ambient air temperature of about 25°C, ambient relative humidity of about 55%, normal atmospheric pressure, drying time of about 170 minutes to reach product humidity of about 20%.

Keywords: drying, experimental stand, humidity, temperature, drying time, kinetics.

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DESTRUCTION OF THE SURFACE OF PEPPER SEEDS USING THE CAVITATION METHOD

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The need for these studies is due to the fact that pepper seeds containing steroid glycosides of furostan series exhibit biological activity. Derivatives of furostanol saponins and polyphenols are the active components responsible for the antimicrobial and antioxidant effects of pepper seeds. Capsicosides isolated from pepper seeds can also be used as a natural compound to prevent obesity. At the same time, pepper seeds have a hard shell that prevents the extraction of biologically active substances (BAS).

A series of experiments were conducted on the extraction of pepper seeds of two batches using traditional technology and processed by ultrasound in order to investigate: 1) the effect of ultrasonic treatment (ultrasound) in cavitation mode on the yield of biologically active substances (BAS) and 2) the presence or absence of changes in the chemical composition of pepper seeds during ultrasound-assisted extraction (UAS).

All samples processed using traditional technology and UAS were extracted in 70% alcohol 4 times for 4 hours each. The combined extracts were evaporated on a Heidolph rotary evaporator at a vacuum of 10 - 15 Torr and at a temperature of 58-65 °C. The optimal parameters of ultrasonic treatment were determined: the duration of 60 min, amplitude of 20 microns, and temperature of 55 °C.

It is shown that the use of ultrasonic cavitation treatment of pepper seeds reduces the duration of the extraction process of biologically active compounds by 9 times and lowers the process temperature to 35-55 °C.

The action of ultrasound considerably accelerates the swelling of the seed walls and induces the cell destruction.

The study of pepper seed samples by IR spectroscopy was carried out. IR spectra were recorded using the Spectrum 100 FT-IR infrared spectrometer (PerkinElmer, USA) with an ATR-NPVO device within the wavelength range of 4000-650 cm-1.

Comparison of IR spectra of the samples obtained from pepper seeds subjected to cavitation treatment in the range of the studied amplitudes with the IR spectra of the samples obtained using traditional technology showed their absolute identity.

When extracting biologically active compounds from pepper seeds using ultrasonic cavitation treatment at a temperature of 55 °C no changes in the chemical composition of the extracted substances were registered.

Keywords: nightshade seeds, ultrasonic cavitation

Acknowledgments: The work was carried out within the framework of the ANCD Project 20.80009.5007.06

DEVICE FOR UNIFORM AIR DISTRIBUTION IN A TUNNEL DRYER

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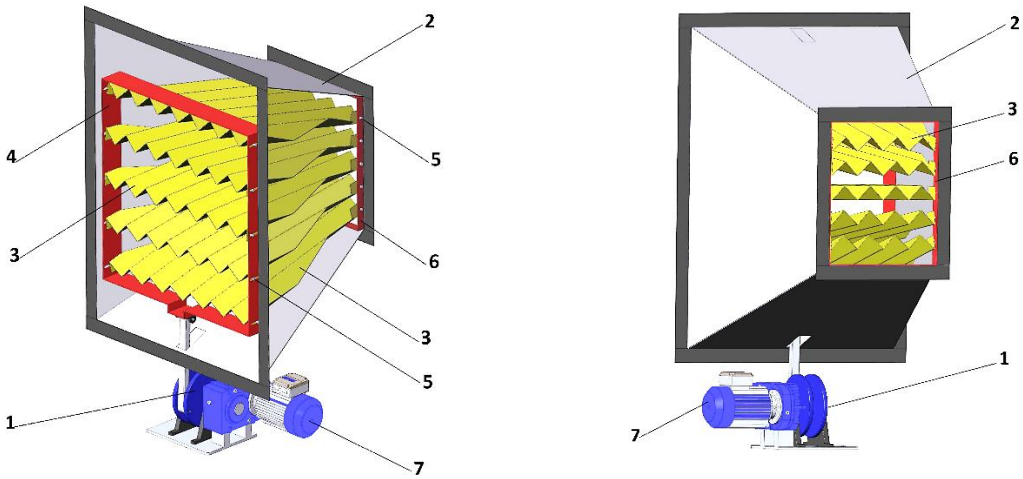
Currently in the food industry there are a lot of technological operations for the processing of agro-food products. An important element of the technological process is represented by the thermal treatment of the products, which involves increased thermal energy costs [1]. Tunnel-type drying installations include in their working regime thermal treatment, the efficiency of which directly depends on the technological parameters during the dehydration process (heat agent speed, temperature, flow rate, etc.). In addition to the listed parameters, it is necessary to ensure the uniform distribution of air over the entire section of the drying chamber [2].

For this purpose, a device was developed in 3D that ensures the uniform distribution of the thermal agent over the entire geometric volume of the tunnel. The disadvantages of the existing technical solutions consist in the fact that they have a very limited period of operation of the working organs, they have a low yield in terms of air distribution efficiency, they are complicated constructions, all these factors complicating their service and requiring increased expenses for maintenance [3]. The device for the uniform distribution of the air flow in the dryer-tunnel (fig. 1 a, b) consists of: the connecting rod-crank mechanism 1, which transmits the oscillatory movements of the mobile metal frame 4 mounted in the air flow passage body 2, in which the ribbed vanes 3 are installed, fixed with one end on a fixed metal frame 6, and with the other end moving vertically synchronously with the help of the mobile metal frame 4, coupled with it by means of cylindrical couplings 5.



a) **b)**

Figura 1. a) lateral vision; b) rear view.

The corrugated pallets 3 are of identical shape and different sizes. The fluted vane 3 in the center of the air flow passage body 2 is shorter, and the fluted vanes 3 at the ends are longer. The connecting rod-crank mechanism is set in motion by a motor-reducer 7.

The device for the uniform distribution of the air flow in the tunnel-dryer works in the following way: The air flow enters the device through the smaller section, passing between the ribbed vanes 3, it is driven in an oscillatory movement, which makes the uniform distribution of the air flow efficient in the entire cross section of the body 2 passage of the air flow where it is

directed. The ribbed vanes 3 are mounted in the body 2 by means of the fixed 6 and mobile 4 metal frames.

The distance between the ends of the ribbed vanes 3, which are mounted on the mobile metal frame 4, is greater than that between the ends, which are mounted on the fixed metal frame 6, which makes it possible for the air movement inside the body 2 to be divergent. The specific shape of the ribbed vanes 3 gives the air flow a laminar flow, which makes the uniform air distribution more efficient. The fluted vanes 3 are set in motion by the connecting rod-crank mechanism 1, which is set in motion by a motor-reducer 7.

As a result, the given device ensures the uniform distribution of air in the cross-section of the drying chamber and the regulation of the uniformity of the distribution of the air according to its speed passing between the corrugated vanes; at the same time, due to the oscillating movement of the fluted vanes, an oscillating and laminar flow of the air flow is created, which leads to the uniform drying of the product in the drying plant and to the reduction of energy consumption in the plant.

The dehydration of 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 the given 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: Tunnel type installation, drying, air flow, uniform distribution, laminar flow.

References:

1. ESPOSITO, B., SESSA, M.R., SICA, D., MALANDRINO, O. Towards Circular Economy in the Agri-Food Sector. A Systematic Literature Review. Sustainability 2020, vol.12, pp.740, doi:10.3390/su12187401.

2. SUDBROCK, F., KRUGGEL-EMDEN, H., WIRTZ, S., SCHERER, V. Convective Drying of Agitated Silica Gel and Beech Wood Particle Beds—Experiments and Transient DEM-CFD Simulations. Drying Technology 2015, vol. 33, pp.1808–1820, doi:10.1080/07373937.2015.1026 982.

3. MAHMOUDI, A.H., HOFFMANN, F., PETERS, B. Application of XDEM as a Novel Approach to Predict Drying of a Packed Bed. International Journal of Thermal Sciences 2014, vol.75, pp.65–75, doi:10.1016/j.ijthermalsci.2013.07.016.

DRIVING POTENTIAL OF GASES IN THE GRAINS LAYER

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In various processes of interphase interaction, the intensity of its course is estimated by the driving potential. The driving potential of interphase heat and moisture exchange is significantly affected by the density of working gases (ρ, kg/m3). However, when moving the working gases through the layer of porous bodies, their density is also influenced by the aerodynamic drag of this layer.

Under the production conditions of domestic grain processing industries, the flow energy of the working gases of the interphase interaction can be up to 3 and more kPa.

To establish the correspondence of the experimental data to the known regularities, we obtained mathematical dependences of the density of working gases under real conditions. That is, the thickness of the grain layer is 0.2 m thick, the variable temperature is up to 160 ºC, the moisture content is from 6.5 to 14.0 g/kgdg, the fictitious speed is up to 0.5 m/s and the sedentary state of the layer is mobile. Under the above conditions, the density and volume of gases can vary up to 40% of the starting one/

In turn, the intensity of interfacial moisture exchange is quite convenient to estimate the moisture diffusion coefficient αm. The coefficient αm depends on the moisture content and temperature of the grain. Experiments known from literature for wheat grain have established this dependence in the form of a power function.

The degree of K, for different chemical composition and different sources, varies from 8 to 14. The most widely used in the calculation formulas was the value of K = 8 for shreddeds corn.

Howevar, for a layer of grains wheat this coefficient differed significantly from the widely used ones (K = 8) and actually amounted to K =17 – 18.

Taking into account the aerodynamic drag of the sedentary layer of cereals of variable thickness, this coefficient will increase even more, in proportion to the thickness of the layer and inversely proportional to its mobility.

In conclusion: 1. In the calculations of heat and mass transfer of phase media should take into account the aerodynamic resistance of the grain layer. 2. For production parameters of grain drying in mine direct-flow dryers, temperature is a more influential factor influencing the density and specific volume of working gases. 3. Unlike liquids, the dynamic viscosity of gases □ increases, and the kinematic □ (m^2/s) decreases to 11% for the parameters of the pressure in the mine grain dryer and for the parameters of the environment "summer-winter" - up to 30%. 4. The coefficient of proportionality in the calculations of the coefficient of diffusion of moisture in the body of the grain according to our research is more than twice different from the widely used.

Keywords: convection, drying, energy, gases, grain, moisture, potential

ELECTRICAL ASPECTS AT THE ELECTROACTIVATION OF DISPERSED MEDIA

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The negative consequences of the activities of industrial enterprises that produce waste and, in particular, its disposal or reuse is a major problem, which, in the context of the circular economy, requires the processing of waste/by-products that is a complex approach to meet consumer and governmental requirements. The use of electrochemical methods, in particular, electroactivation, allows solving a number of ecological problems, beneficial in alternative industrial processes, environmental protection, and pollution monitoring. Electrotechnologies are said to be harmless at the processing of by- products [1].

Electroactivation as a sustainable method for processing dispersed media, in particular, by-products such as whey and other food residues, for example, the recovery of whey proteins, is an alternative which can be a replacement for conventional methods. The results of the research regarding the establishment of the factors that influence the electroactivation of whey, the understanding of the physico-chemical and biochemical processes that are carried out when the electric current passes through a dispersed medium with a complex biological structure such as whey, allowed us to develope the principles and the construction scheme of some electrolyzers with different geometric configurations and constructive parameters, adapted to the particularities and technological requirements of the processing of secondary dairy products with the extraction of mineral protein concentrates and the simultaneous isomerization of lactose into lactulose. Different types of electrolyzers with certain geometrical/constructive parameters have been investigated, which allows the non-residual processing of whey [2]. The main electrical parameters such as voltage, energy consumption, specific energy consumption per unit volume, and volumetric electric current density are mainly influenced by the volume of the processed whey, the constructive/geometrical parameters (with parallelepiped or semi-cylindrical casing) of electrolyzers, the solid content of the initial whey, and the volume of the secondary liquid (anode liquid). The different and non-uniform recovery of whey proteins in mineral protein concentrates at the electroactivation of different types of whey in different electrolyzers is conditioned by the properties of each individual fraction and their behavior during electrochemical activation.

The optimization of electrical and constructive parameters is a decisive factor in the study of the electroactivation of different types of whey processed in different electrolyzers, which influences the recovery of whey proteins into mineral protein concentrates and the simultaneous isomerization of lactose into lactulose.

Keywords: electrical parameters, lactulose, proteins, whey

References:

1. Ebrahim, T.Y. Clean and Sustainable Technology Innovation. Current Opinion in Environmental Sustainability, vol. 45, 2020, pp. 113–117. https://doi.org/10.1016/j.cosust.2020.11.004

2. Vrabie, E. G., Bologa, M. K., Paladii, I. V., Stepurina, T. G. et al., Electrical Processing of Whey. Role of Construction, Technological and Energy Characteristics of Reactors. Surface Engineeeing and Applied Electrochemistry, vol. 55, no 2, 2019, pp.197- 209. https://doi.org/10.3103/S1068375519020145.

EVALUATION OF ANTIOXIDANT ACTIVITY *IN VITRO* OF DONUTS ENRICHED WITH BERRY POWDER

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Nowadays fast food and products that require a short preparation time are more preferred. So the use of products with high nutritional value is becoming more and more important [1]. Thus, it was proposed to replace wheat flour with berry powder of sea buckthorn, hawthorn and rosehip in a ratio of 5 and 10%.

The evaluation of antioxidant activity following gastric digestion shows an essential increase for the enriched samples compared to control sample - 19.08± 0.70%; samples with rosehip powder - 51,57 ± 1,30%; sea buckthorn powder - 50,26 ± 1,30%; and hawthorn powder - 36,45±1,30%. The changes that occur during gastric digestion and the considerable increase in antioxidant activity for the samples enriched with berry powder are due to the bioactive compounds in the composition of the food matrix [2].

Following intestinal digestion phase the antioxidant activity shows an essential decrease for the samples enriched with berry powder compared to control sample whose values are: for control sample – 16.58 ±0.80%; for samples with rosehip powder – 25.15 ±0.80%; for seabuckthorn powder – 21.84±0.80% and hawthorn powder – 23.16 ±0.80%. A gradual decrease in antioxidant activity was observed after 2 hours of incubation both for the enriched samples and for the control sample due to changes in pH, from the acidic environment (gastric digestion) to the alkaline environment (intestinal digestion).

This can be explained by the low stability of the bioactive compounds in the conditions of the alkaline environment and the formation of metabolites that inhibit the antioxidant activity of the bioactive compounds in the analyzed samples.

Sea buckthorn, hawthorn and rosehip berries are characterized by a rich complex of bioactive compounds, the use of which in obtaining functional food products will slow down oxidative processes and ensure food with a longer shelf life.

Keywords: functional food, rosehip, hawthorn, sea buckthorn.

References:

1. PAVAN, V., SANCHO, R.A.S., și PASTORE, G.M. The Effect of in Vitro Digestion on the Antioxidant Activity of Fruit Extracts (Carica Papaya, Artocarpus Heterophillus and Annona Marcgravii). LWT - Food Science and Technology 59 (2), 2014: pp.1247–51. https://doi.org/10.1016/j.lwt.2014.05.040.

2. RODRÍGUEZ-ROQUE, M.J., ROJAS-GRAÜ, M.A., ELEZ-MARTÍNEZ, P., et al. Changes in Vitamin C, Phenolic, and Carotenoid Profiles Throughout in Vitro Gastrointestinal Digestion of a Blended Fruit Juice. Journal of Agricultural and Food Chemistry 61 (8), 2013: pp.1859–67. https://doi.org/10.1021/jf3044204.

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HEAT AND MASS EXCHANGE OF PHASE ENVIRONMENTS IN THE THICKNESS OF THE LAYES GRAIN OF THE DRYER

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In the well-known technologies of domestic and foreign dryers, the influence of the actual pressure of the gas medium in the grain layer is either ignored or partially taken into account. Inaccuracies are attributed to errors in the drying process. However, the aerodynamic resistance factor is significant for a layer of loose materials of different thickness and mobility. It affects the moisture-absorbing capacity of working gases, and therefore the driving potential of interphase moisture exchange.

We investigated the deviations of the calculated values of the driving potential from the actual values on the bench.

For the possibility of checking the correctness of comparisons of theoretical and experimental data by the general public of scientists, below we present the calculation formulas we used on the influence of the aerodynamic resistance of the dewatered layer of bodies and the gradient of the flow of drying gases.

Under the conditions of grain drying in a dense slow-moving layer of mine direct-flow dryers, the speed of the drying agent at the inlet cross-section of the dewatered material varies in the range of 0.35...0.55 m/s, the thickness of the layer in the inter-box space is 0.25 m. Aerodynamic resistance was calculated according to a known formula in the range of variable pressure values from 600 Pa (for corn) to 2500 Pa (for castor). We additionally took into account the energy losses of the flow of drying gases associated with aerodynamic resistance:

a) difficulties in ensuring the specified operating modes of the drying unit;

b) different moisture content and driving potential of working gases in the cross section of the layer;

c) growth of the difference in velocities in the section of the dewatered layer;

d) inhomogeneity of the moisture of the dewatered material in the cross-section of the layer and

e) additional energy consumption of dehydration and deterioration of drying quality.

It was established that the actual deviations exceeded the estimated ones by 40-60%. This is quite significant. therefore, the mathematical models of drying were refined taking into account the aerodynamic resistance of the grain layer. The rate of evaporation of moisture in the slow-moving grain layer qn, taking into account the correction of deviations of the actual pressure values from the barometric pressure, should be determined by the formula:

$$q_{evap} = c \cdot (p_m - p_n) \cdot [B_o/(B \pm dP_i)], \quad (1)$$

Formulas for determining the amount of heat for moisture evaporation undergo similar corrections

$$Q_{evap} = W \cdot (I_{steam} + I_{liquid}), \text{ kJ}, \quad (2)$$

where W is the amount of evaporated moisture, kJ/kg; $I_{steam} = 2500 + 1{,}842\ t.$ I_{liquid}; - enthalpy of steam at temperature t of spent drying agent, kJ/kg; $I_{steam} = 2500 + 1.842\ t.$, I_{liquid} - liquid enthalpy at grain temperature before drying, kJ/kg, $I_{liquid} = 4.19\ \theta$.

The aerodynamic resistance of the grain layer depends on its thickness and mobility. 2. The influence of aerodynamic resistance on interphase moisture exchange is 40-60% greater than the calculated values.

IMPACT OF DRYING PROCCES ON PEACH QUALITY

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Peach is one of the fruits worldwide widespread, in temperate region being available only during summer season. In order to benefit throughout the year from the biologically active compounds that are found in peaches, it seems to be rational to dry them. The effect of drying process on the final quality of peach depends on drying type, temperature, airflow speed, etc. In this study, convective drying with four different temperature regimes (50, 60, 70 and 80 °C) was applied in order to dry peaches. The quality of dried peaches was studied in terms of sensory evaluation, total phenols content, carotenoids content, antioxidant activity and color parameters modification.

The results showed that the total phenol content is inversely proportional with drying temperature reaching the value of 13.05 mg GAE/g for the samples dried at 80 °C in comparison with 14.61 mg GAE/g for the peaches dried at 50 °C. It should be noted that the content of polyphenols in fresh peaches was 3.5 times less than in dried ones, which proves the benefits of proper drying of the fruits. The same downward trend, with increasing temperature, was also recorded for the antioxidant activity by inhibiting the DPPH free radical, it recorded maximum values (93.69%) for the peach samples dried at 50 °C and for samples dried at 80 °C, the antioxidant activity recorded a value of 90.81%. Concerning the carotenoids, the results show that the drying temperature slightly affected their quantity in the product. Color parameters L*, a*, b* and Δ E were significantly affected by the drying temperature, yet the sensory evaluation showed that all of the samples were acceptable by the panelists.

Thus, from the nutritional point of view, the most recommended drying regime for peaches would be 50 °C. However, it is not only the nutritional quality that determines the choice of drying method and regimen, there are also factors such as drying time, energy consumption, equipment cost, and carbon emissions.

Keywords: antioxidants, carotenoids, convection drying, peach, phenols

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INTENSIFICATION OF GRAIN CLEANING BY INCREASING THE COEFFICIENT OF EXTERNAL FRICTION

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To bring the grain of the harvested crop to the requirements of the consumer market, it is cleaned in various ways. Instead, the common drawback of most of them is the significant dependence of the productivity of the separators on the humidity of the grain mixture, and for each percentage increase in the humidity of the mixture, the productivity of the separators decreases by 4...5%. Therefore, quite often in production conditions, the actual productivity of sieve separators for cleaning excessively wet grain mixtures is only 16-18% of their passport productivity. This has a bad effect not only on productivity, but also on the indicators of specific energy consumption of all the equipment of the technological grain processing line

The performance of the sieve separator is most significantly affected by the flowability of grain mixtures, and the flowability of the latter by the coefficient of external friction, which in turn is directly related to the moisture content of only the surface layer of the particles of these mixtures.

Our studies have established that for different components of the grain mixture of the same size and shape, the dependence of their flowability on humidity is not the same and the following pattern can be observed: with the same humidity of the various components of the grain mixture, the flowability of the particles deteriorates to a greater extent with a decrease in their volumetric mass and an increase in the active surface.

In accordance with the Research Program, we have theoretically substantiated energy-saving ways of increasing the productivity and efficiency of the process of separation of mixtures of different composition and humidity. The results of these studies, in our opinion, can be applied to most loose capillary-porous bodies with a moisture content of less than 50%, a particle size of up to 0.015 m, a volume weight of up to 900 kg/m3 and for normal (natural) environmental conditions.

In conclusion: 1. It has been experimentally confirmed that the angles of external friction on metal and wooden surfaces for wheat grains in the range of variable humidity from 13 to 28% do not differ significantly (within 0.5 degrees). 2. For particles with a density significantly smaller than the grain, N<250 kg/m3, the dependence of the coefficient of external friction on moisture on the metal surface is manifested several times to a greater extent. 3. The dependence of the angle of external friction on humidity was obtained on the basis of the conducted research. 4. The method is substantiated and mathematical equations for controlling the angle of external friction of wet mixtures are obtained. 5. The method of managing the performance of separation of wet mixtures was proven on a bench installation.

Keywords: grain, impurities, purification, productivity, separators

PRACTICAL APPLICATIONS OF HEAT PUMPS IN FOOD INDUSTRY

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Ensuring a reliable, economical and sustainable energy supply as well as protecting the environment and climate are important global challenges of the 21st century. Renewable energy and improving energy efficiency are the most important steps to achieve these energy policy goals. While impressive efficiency gains have already been achieved in the past two decades, energy use and CO_2 emissions in manufacturing industries could be further reduced if the best technologies available worldwide were applied. Heat pumps have become increasingly important in the world as a technology to improve energy efficiency and reduce CO_2 emissions. In particular, industrial heat pumps (IHP) offer various opportunities for all types of production processes and operations.

In the food industry there is a wide variety of heat sources and potential users; thus, there are various applications for industrial heat pumps such as: drying and dewatering; evaporation; washing, cleaning; cooking; sterilization, pasteurization. A central technology needed to improve energy efficiency is the application of heat pumps to recover heat from waste streams to raise temperatures, replace steam and, in some cases, simultaneously provide process cooling. Classic applications of high temperature heat pumps in food processing include:

• Food drying and washing processes, where the cold side of the heat pump captures the latent heat in the exhaust stream as well as the sensible heat to provide hot and dry incoming air, water or steam at the required temperature;

• The process of heating or cleaning water by improving the waste heat from a waste heat stream or from a refrigeration system;

• Pasteurization where the heat pump can provide heating and cooling functions to replace steam.

Keywords: heat pump, renewable energy, compressor, temperature, heat transfer.

References:

1. Samuel JG Cooper, Geoffrey P Hammond, Neil Hewitt, Jonathan B Norman, Savvas A Tassou, Walid Youssef. Energy saving potential of high temperature heat pumps in the UK Food and Drink sector. Energy Procedia, Volume 161, 2019, Pages 142-149, ISSN 1876-6102, disponibil online la https://doi.org/10.1016/j.egypro.2019.02.073.

2. Jutsen, J., Pears, A., Hutton, L. High temperature heat pumps for the Australian for industry: Opportunities assessment. Sydney: Australian Alliance for Energy Productivity. 2017. ABN: 39 137 603 993.

3. Fayose F, Huan Z. Heat Pump Drying of Fruits and Vegetables: Principles and Potentials for Sub-Saharan Africa. Int J Food Sci. 2016; 2016:9673029. doi: 10.1155/2016/9673029. Epub 2016 Jan 6. PMID: 26904668; PMCID: PMC4745420.

4. Paul Byrne, Redouane Ghoubali, Ahmadou Tidiane Diaby. Heat pumps for simultaneous heating and cooling. disponibil online la https://hal.archives-ouvertes.fr/hal-01990466/document.

PUMPKIN SEED PASTE

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In the 21st century various nuts and seeds have been added to the range of food products that are in demand among the population. As a result of grinding this raw material to a paste-like state, a series of various pastes were obtained. The most popular is peanut butter, known for many years in the Western Hemisphere. There are some variants of the recipe now known, that provide the supplementation of various additives into its composition, therefore products with different tastes are obtained and more consumers are attracted. However, the addition of salt, sugar, hydrogenated fats does not correspond to the principles of a "healthy" diet. Their use is contraindicated for some groups of the population.

The assortment of pastas made of nuts and seeds is wide nowadays, the demand for these products is only growing. Moreover, these products are in demand among vegans, as well as those who, for health reasons, follow a vegetarian diet.

Pastes are also produced in Ukraine. Given the raw materials and food traditions, it can be assumed that pumpkin seed paste will be popular. One of its manufacturers is “Aumi” (Odessa). The production technology is simple. The seeds are roasted in an innovative oven, they gush in a stream of hot air for several minutes. Then they are quickly cooled, ground and packaged in sealed containers.

The objective of this study was to obtain products based on pumpkin seed paste with the introduction of regional berry raw materials. The analysis of the paste showed that the paste contained 36.8% protein, 46.9% fat. When analyzing the fatty acid composition, there were found 12.3% palmitic acid, 4.7% stearic, 29.4% oleic, 53.7% linoleic acid.

Cranberries, viburnum and sea buckthorn were chosen as berry raw materials. The berries were dried, crushed, and the resulting powders were mixed with pumpkin seed paste. Received samples contained 10%, 20% and 30% of the berry component. The products were analyzed using the descriptor-profile method of tasting analysis. The most significant descriptors were: taste, aroma, texture, color of the product. Graphic profilograms were constructed and analyzed.

After adding cranberries and viburnum, the green color of the pastes became more pleasant, acquired a reddish tint. The flavor of the food has changed and became more pleasant as well. The taste regulators contained in the berries added sourness to the products. The consistency changed, it became thicker, obviously as a result of the swelling of the pectin molecules present in the berries. Based on sample analysis results by the descriptor-profile method, it is recommended to obtain products based on pumpkin seed paste containing viburnum berries 20%, cranberries - 25%, sea buckthorn - 20%.

It should be noted that pumpkin seed paste has a high fat and calorie content. The supplementation of berry additives into its composition makes it possible to reduce its calorie content and, accordingly, expand the circle of consumers. In addition, although consumers have become much more educated and tend to follow the principles of a "healthy" diet, very often they are still more sensory-oriented when choosing products.

Obtaining popular among the population pastes with a berry component will also contribute to the enrichment of the diet of consumers with berries, which, as an independent product, are rarely consumed by the population.

Thus, it has been shown that the addition of berries into the composition of pumpkin seed paste made it possible to obtain products with improved consumer qualities.

QUALITY INDICES OF VEGETABLE SPONGE-TYPE CONFECTIONERY PRODUCTS, OBTAINED FROM AQUAFABA

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The problem of healthy and balanced nutrition of the population is becoming more and more topical. Nowadays more and more non-traditional raw materials of plant origin are used to enrich the finished product with bioactive components, diversify the assortment, and make it accessible to the widest possible range of consumers. The manufacture of vegetable confectionery products comes to alleviate this problem by replacing foaming agents of animal origin with those of vegetable origin. The aim of this study was to develop the technology for manufacturing vegetable sponge cake based on chickpea boiling water, used as a foaming agent.

For this research, 3 domestic chickpea varieties Ovidel, BotnașiIchel were used, from which chickpea boiling water was obtained under laboratory conditions. It was determined the physico-chemical quality indicators of chickpea boiling water: dry matter content, protein and ash content, the ability to form foam, and its stability. In the vegetable sponge cake manufacturing technology, chicken eggs were replaced by chickpea boiling water, which was characterized by the highest content of dry matter and protein. The sensory quality (outer appearance, consistency of the core, color and appearance of the crust, smell and taste) and physico-chemical quality (moisture content, porosity of the core, alkalinity, friability, and water activity) of the vegetable sponge samples were analyzed. At the same time, a sample of sponge cake was prepared according to the classic recipe with chicken eggs, the control sample.

The research results showed that the boiling water obtained from all 3 chickpea varieties was characterized by increased protein content. It was found that there is a direct correlation between the number of revolutions of the agitator, the beating time and the ability to form foam and its stability. Sensory analysis shows that the vegetable sponge cake had a similar color and texture to the sponge cake prepared with eggs, well-developed volume, but less elastic, with a pleasant taste and a smell characteristic of the assortment. Analyzing physico-chemical indicators, the moisture content was higher because of a low dry matter content in the boiling water. This fact leads to the reduction of porosities in relation to the control sample. The friabilityvalues of the vegetable sponge cake were lower compared to the control sample due to the high humidity that led to the maintenance of freshness. Meantime wasascertained that the quality indicators for the vegetable sponge obtained on the aquafaba basis are in accordance with the normative documents in force.

In conclusion, it can be mentioned that there are possibilities of replacing the foaming agent of animal origin with the agent of vegetable origin for the manufacture of vegetable sponge cake. Thus, chickpea boiling water can be the basis for creating a new range of flour products for a new spectrum of consumers.

Keywords: flour confectionery product, chickpeas, chickpea boiling water (aquafaba), quality

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RESISTANCE MOISTURE DIFFUSION DECREASE IN THE CAPILLARIES OF THE BODIES BY INCREASING THEIR PRESSURE

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In the processes of grain drying, energy is lost to overcome the resistance of moisture diffusion in the capillaries of the body. These losses can exceed the cost of grain dehydration. As the drying speed increases, energy losses to overcome diffusion resistance increase.

Diffusion resistance is even greater in large grains, in particular corn and beans. These problems are characteristic of drying technologies of domestic and foreign dryers. Technological methods of changing the heat vector are used to reduce diffusion resistance. However, such methods do not solve the problem in essence. A method of reducing moisture diffusion resistance by changing the pressure in grain capillaries has been established.

The essence of our hypothesis lies in the connection of the intracapillary moisture diffusion resistance with the intracapillary pressure (dilution) of the capillary-porous colloidal bodies. According to our assumptions, rarefaction may occur in the cavities distant from the grain surface, which prevents the diffusion of moisture from the inner to the surface layers of the dehydrated body. To calculate the vapor pressure of capillary-bound moisture, located directly in the capillaries of the grain body and above its surface, under isothermal conditions and a slight temperature difference, it is more convenient to use Thomson's formulas. Our experimental studies on a bench installation at variable values of the energy of the flow of working gases $v_{work\ gas.}$ = 0...3.4 m/s and their temperature range $t_{work\ gas}$ = 45 –180 ºC, the dependence was confirmed and the numerical values were specified under the conditions of the convective method of dehydration from the variable factors of the humidity of the dehydrated body W0, its linear dimensions, the rate of dehydration and the content of cavities in the dehydrated body. On the basis of experimental data, for the period of constant rate of dehydration of a capillary-porous colloidal body, we obtained a mathematical description of the dependence of the state of the intracapillary gas pressure on the initial moisture content of this body and the energy of the working (drying) gases.

In conclusion: 1. Additional losses of grain drying energy are associated with the internal resistance of moisture diffusion in the capillaries of the body.

2. Internal moisture diffusion resistance increases with increasing grain size and drying speed.

3. By increasing the pressure in the grain capillaries, the resistance to moisture diffusion can be reduced. 4.In experimental conditions, the relationship between moisture diffusion resistance and pressure in grain capillaries has been proven. 5.The equation describing the diffusion of moisture, taking into account the pressure in the grain capillaries, was obtained.

SYNTHESIS, CHARACTERIZATION AND TESTING OF A NEW MATERIAL OBTAINED ON THE BASIS OF NATURAL CLAY INTERCALATED WITH SILVER IONS

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A facile, ecofriendly, and cost-effective method was developed to prepare a microporous material based on natural chemically modified bentonite with silver ions (BN-Ag^0). This material presents a good catalytic activity against Malachite Green (MG) dye and bacteriostatic activity against newly isolated bacterium from sewage sludge named hereafter "*ISO SS*" and *Escherichia coli* (*E. coli*). MG is usually used in agriculture and the fish industry as a strong anti-bacterial, anti-fungal, anti-parasitic and dye agent, but it is also used to give color to textiles, packaging, etc. BN-Ag^0 was characterized by the following methods: energy-dispersive X-ray spectroscopy (EDX), scanning electron microscopy (SEM), Brunauer-Emmett-Teller (BET), Fourier-transform infrared (FTIR) spectroscopy, temperature programmed desorption (TPD) and X-ray Diffraction (XRD). The newly bacterium *ISO SS* was isolated by the technique of isolating the pure culture of anaerobically stabilized sludge. A mandatory characterization of *ISO SS* isolated strains from anaerobic stabilized sludge was performed in the process of bacterial species identifying. The cationic clay-based nanomaterial showed appreciable antibacterial activity against *ISO SS*, a Gram-negative bacterium. It also showed good activity against E. coli bacteria. Involved as a catalyst in the catalytic ozonation of MG dye, BN-Ag^0 significantly improves the oxidation time of the dye, due to its good adsorption and catalytic properties. The catalytic and antibacterial activities of the natural bentonite (BN) and of BN-Ag^0 were examined using performant characterization techniques. The lifetime of BN-Ag^0 catalyst was also evaluated. The recycling analysis of the synthesized nanocomposite showed that the BN-Ag^0 is stable even after six recycling with a minor change in degradation. The studied nanomaterial (BN-Ag^0) presents interesting properties both for the oxidative degradation of MG-type dyes and for a wider use due to its antibacterial properties. Results obtained are expected to provide valuable findings for the preparation of a good microporous material with multiple functionalities.

Keywords: antibacterial activity, bacteria, clay, catalytic ozonation, dye, silver catalyst.

SYSTEMIC APPROACH AND HOLISTIC THINKING IN THE FIELD OF FOOD PRODUCT ENGINEERING

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At present, there are many scientific and technical problems that are solved based on the concept of system. The methodology for applying the system concept presents the systemic approach. This method emerged as a result of profound changes in human society's knowledge of natural processes and the accelerated development of technical progress. The traditional investigation methodology did not allow solving many complex problems in the field of engineering, biotechnology, economic problems.

The system concept allowed to formulate and solve problems at another level of thinking, called *holistic thinking*. In general, the system presents a set of interdependent elements linked together, arranged in a certain order in space and time, with compatible action, in order to achieve a common result or programmed goals.

The methodology of the systemic approach and holistic thinking significantly differs from other traditional approaches, and it is based on the concept that presents the consecutiveness of the activity procedures as follows:

initially, the activity begins with identifying the system, or formulating an idea about the system that needs to be developed;

the next step, the detailed unfolded characteristic of the properties and functions of the integral system is presented:

finally, the structure of the system is presented through the characteristic and function of each element of the system and the links between the elements.

Currently, the systemic approach methodology and holistic thinking present one of the most effective methods used in various fields of human activity: in scientific research, in engineering, medicine, biology, economics, sociology, politics, etc.

In the field of food engineering, three types of systems are known: food systems, biological systems and technical systems; they can be designed, developed, installed, transported, consumed, etc.

All these systems correspond to specific criteria that are not used in other disciplines. For example: ***stakeholders*** are the people who support and are co-interested in the realization of the system; ***holon* and *holarchy*** - characterize the hierarchical structure of the system; ***system architecture*** - characterize the integral properties of the system; ***system life cycle*** - appreciate the duration of the system's existence.

An example, a drinking water packaged in bottle is a simple food system. In this case it is necessary to present: s*takeholders* - who is interested and supports the production of drinking water in bottles; *the hierarchical structure* of bottle with water - water, bottle, cap; the chemical composition of the water, the materials of the bottle and cap, etc. *Architecture* – what kind of water, for which consumers it is intended, the structure and function of the system, the label – the information on the label. *Life cycle* of the system - manufacturing time, water shelf life, etc.

The principles and methods of engineering systems are standardized at an international level: Standard **ISO/IEC15288:2008** "*System life cycle processes*"; **ISO/IEC42010** "*Engineering. Architecture description*"; including Standard of the Republic of Moldova **SM ISO/CEI/IEEE 15288:2015** "Engineering of systems and software. Processes of system life cycle" and others.

TECHNOLOGY OF STABILIZATION OF ACTIVE FEED YEAST

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In order to obtain high productivity and preserve animal stock, in addition to the use of high-energy and high-protein feed, the modern introduction of agriculture requires the use of new effective and biologically safe feed additives. [1]

EnzActive, a high-performance probiotic microbial feed additive based on the yeast culture of the genus *Sacharomyces cerevisiae*, developed by Enzyme specialists and certified according to ISO 22000, FSSC 22000, GMP +, HACC standards, has recently appeared on the market of feed additives.

Active feed yeast is a probiotic product that improves digestion, accelerates the breakdown of fiber in the gastrointestinal tract and ensures the excretion of toxic metabolic products from the body.

Active feed yeastin feeding milking cows:

- in the rumen of ruminant yeast create an anaerobic environment that promotes the development of beneficial microflora;
- for the growth of yeast use rumen oxygen, which causes the growth of cellulosolytic bacteria – anaerobes;
- the activity of probiotic yeast in the rumen of ruminants reduces the formation of lactic acid, which allows you to control the level of acidity in the rumen;
- probiotic yeast produces enzymes that break down feed nutrients, including fiber;
- consistent and rapid fermentation of crude fiber increases the production of bacterial protein, increases the formation of free fatty acids - a source of energy for the body, reduces the ammonia content in the rumen.

Active feed yeast is used on farms, agricultural firms, as well as in feed mills. In the production of feed in bulk using active feed yeast, their activity will not decrease. Granulation technology has become widely used due to the numerous advantages of granular feed over bulk.

The purpose of our work was to investigate how temperature affects the activity of fodder yeast during granulation of loose compound feed.

The paper used standard methods of microbiological and physical research in accordance with state standards and ISO.

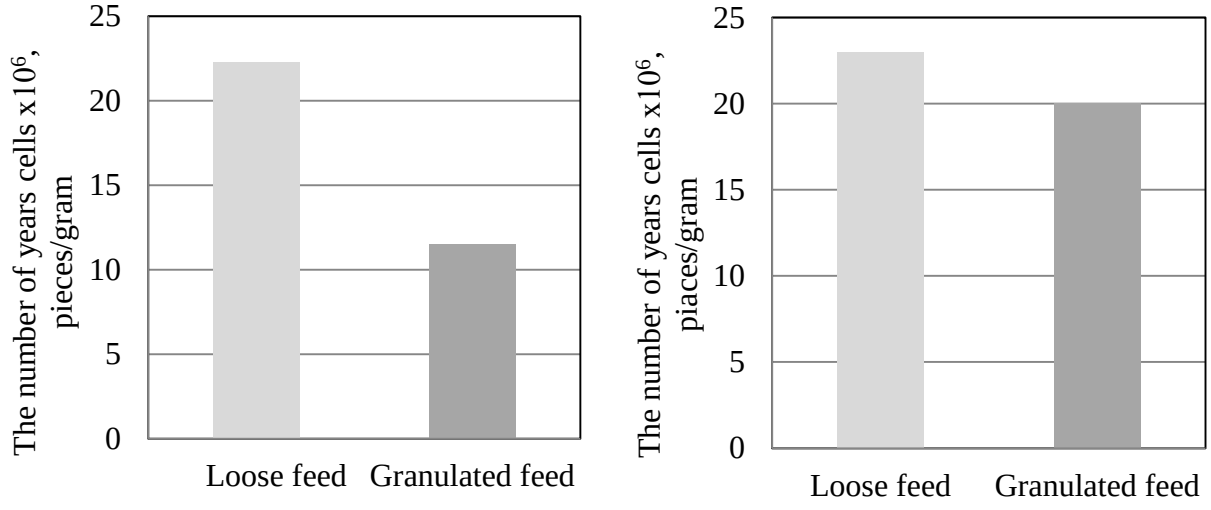
Granulation is one of the types of pressing, the essence of which is to compress an appropriately prepared loose product in a limited space for some time. Granulation is used for the purpose of forming compound feed into aggregates of particles of sizes that best meet the physiological needs of farm animals, poultry and fish.

The possibility of producing compound feed in the form of granules allows you to obtain a fixed composition according to the recipe, avoid self-sorting of components, overdose of micro-additives, selective consumption by animals of individual components of the mixture, improve their consumption, as well as mechanize and automate the distribution of feed.

Highly homogeneous compound feed of equal granulometric composition with active fodder yeast in the amount, which was determined depending on the animals for which the compound feed is produced, was granulated on a laboratory press-granulator at a temperature of 60-90 °C, a steam pressure of 0.2-0.5 MPa, consumption - 50- 80 kg/t. The resulting granules were cooled to a temperature that should not exceed the ambient temperature by more than 10 °C.

To reduce the effect of temperature during granulation on yeast, it is advisable to use encapsulation, namely the conclusion of small amounts of substances in the shell to obtain a capsule.

One of the most common molding materials for the production of capsules is gelatin. The obtained encapsulated yeast in a gelatinous shell. Gelatin is easily and quickly absorbed even in severe disorders of the gastrointestinal tract, non-toxic and shows no side effects. Ready encapsulated feed yeast is more active and stable during granulation (Fig. 1).



a b

Fig. 1 - The number of yeast cells in the feed:
a) with active feed yeast; b) with gelatin capsules of active feed yeast

In conclusions:

1. EnzActive is an innovative product, the addition of which to feed is aimed at reducing and then completely eliminating the use of antibiotics in animal nutrition.

2. It is established that the action of temperature during granulation of compound feed with active feed yeast significantly affects their activity. The number of yeast cells during granulation is reduced by almost 50%.

3. The technology of encapsulation of active feed yeast has been developed in order to create a shell that will protect the yeast from the external environment.

4. It is proved that encapsulation is one of the ways to stabilize active feed yeast, the effect of temperature during granulation of feed with gelatin capsules of active feed yeast does not significantly affect their activity. The number of yeast cells during granulation is reduced by 10%.

References:

1. Probiotic feed additives in fattening of agricultural animals. / Iegorov B. et al. // Grain Products and Mixed Fodder's. 2021.Vol. 21, Issue 4 (84). P. 25-31. DOI https://doi.org/10.15673/gpmf.v21i4.2250

THE MATHEMATICAL MODEL OF MASS AND HEAT TRANSFER FOR MICROWAVE INSTALLATIONS

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Of increased interest is the research of mass and heat transfer in the drying of vegetable products with the application of microwaves. In the case of dehydration in microwave installations in order to obtain a high yield, the product subjected to heat treatment must be optimally located to the microwave generator (magnetron) to exclude the phenomenon of reflection as much as possible.

For microwaves the reflection from the product must be minimal, this condition is written as:

$$T(x,y,z)|_{y=0} = T_o \tag{1}$$

$$\frac{\partial T^{(x,y,z)}}{\partial x}\left|\frac{\rightarrow}{x=\pm R} = \mp\frac{\varphi}{\lambda_{\text{пр}}}\left(\text{T}_{\text{п}} - \text{T}_{\text{р}}\right)\right|_{x=R} \tag{2}$$

$$\frac{\partial T^{(x,y,z)}}{\partial z} = \pm\frac{\varphi}{\lambda_{\text{пр}}}\left(\text{T}_{\text{п}} - \text{T}_{\text{р}}\right)\Big|_{z=0;l} \tag{3}$$

Solving the boundary equations for temperature, (1) - (3) by the method of separation of variables is written in the second form:

$$\text{T}=\sum_{m=1}^{\infty}\sum_{p=1}^{\infty} C_{mp}(y)\left[\cos\left(k_{zp} * z\right) - \frac{\alpha}{\lambda_d k_{2p}}\sin(k_{2p}z)\right]\cdot\cos(k_{xm}x) \tag{4}$$

For the given boundary conditions:

$$u(x,y,z)|_{y=0} = U_o \tag{5}$$

$$\frac{\partial U}{\partial x}(x,y,z)\left|\frac{\rightarrow}{x=\pm R} = \frac{\beta}{\lambda_m}U(x,y,z)\right|_{x=\pm R} \tag{6}$$

$$\frac{\partial U}{\partial z}(x,y,z)\left|\frac{\rightarrow}{z=0,l} = \mp\frac{\beta}{\alpha_m}U(x,y,z)\right|_{z=0,\ l} \tag{7}$$

Solving the system of equations (5) – (6) for humidity will have the form:

$$U = \sum_{i=1}^{\infty}.\sum_{j=1}^{\infty} A_j(y)\left(\cos\left(k_{zj}z\right) - \frac{\beta}{\alpha_m k k_{zj}}\cdot sink_{zj}z\cdot cosk_{xi}x\right) \tag{8}$$

In the design phase of dehydration installations using SHF, the position of the product tray as well as the magnetron is very important, it is recommended to position the product perpendicular to the direction of microwave propagation.

Keywords: microwave, SHF, magnetron, temperature, humidity

THE USE OF BEETROOT AND SPINACH FOOD POWDERS TO OBTAIN BREAD WITH MULTICOLORED CORE

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The use of food powders in the preparation of the dough has several advantages, such as changing the color of the core and other sensory properties, increasing the biological value by enriching the product with dietary fiber, mineral substances, vitamins, and other bioactive substances. At the same time, replacing a quantity of wheat flour with food powder reduces the amount of gluten in the dough, which can cause a decrease in the porosity and volume of the product. In this paper, the effect of the addition of beetroot and spinach powders in the dough preparation process on the sensory and physico-chemical properties of the bread core was studied. Thus, six samples of bread were obtained with the addition of each powder in the proportion of 2,5, 5,0, and 7,5% relative to the flour mass. Also, in this paper, the effect of the addition of ascorbic acid in the preparation of dough with beetroot powder was studied to prevent the change in the color of the bread core during baking. Following the physico-chemical analysis of the bread samples with both spinach powder and beetroot powder, an insignificant decrease in the porosity and volume of the bread was found with the increase in the dose of added powder. In the sensory analysis, the bread samples with the addition of beetroot powder were appreciated with a higher score compared to the bread samples with the addition of spinach powder. Tasters noted the presence of crunch and the intense smell of spinach in the samples with 5,0 and 7,5% spinach powder.

At the same time, a visible intensification of the color of the core was observed with the increase in the dose of both spinach powder and beetroot powder. It was found that the use of ascorbic acid in the preparation of the dough with the addition of beetroot powder contributes to the preservation of the red color of the bread core. Subsequently, bread with a multicolored core was obtained by rounding the pieces of dough, flattening, arranging in the desired sequence of colors, rolling, placing in baking molds, cutting on the surface, leavening, and baking. The obtained bread was characterized by its beautiful exterior and section appearance, balanced taste and smell (with the faint flavor of beetroot and spinach), high volume and well-develope porosity.

THE USE OF POLYDISPERSE CHITOSAN AS A STIMULATING FOOD ADDITIVE FOR BEES

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Chitosan is a polysaccharide obtained by the deacetylation reaction of chitin and consists of D-glucosamine and N-acetyl-D-glucosamine, joined by β- (1 → 4) glycosidic bonds. Chitosan has a wide range of practical uses. The benefits provided by chitosan are due to its low toxicity in relation to living organisms, the availability of raw materials, and the presence of biological activity [1,2].

The research aim was to determine the influence of the use of chitosan in stimulant food on immunity and winter resistance, early development, and productivity of bee colonies. The investigations were carried out on the families of Carpathian bees from the apiary in the village of Seliște, Nisporeni district, which were maintained in two-body beehives with 10 combs each with the dimensions of the frames of 435x300 cm. Polydisperse chitosan was obtained by depolymerization of commercially available natural chitosan, and represented as an aqueous solution with a mass fraction of 3% of the substance.

It was revealed that the optimal dose of using polydisperse chitosan in bee feed is 2.0 ml of 3%/L sugar syrup solution. The use of such formulation in the stimulating nutrition in the autumn period when replenishing stocks, provides an increase in immunity and resistance to wintering by 15.09%, in the spring, in the absence of maintaining the honey collection, the strength of bee colonies by 59, 2% and honey productivity by 97.8% more compared to the control batch or by 12.1% and 19.2%, respectively, compared to the standard batch.

Keywords: bee families, chitosan, stimulatory feed, sugar syrup.

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References:

1. Varlamov V.P., Il'ina A.V., Shagdarova B.Ts., Lun'kov A.P., Mysyakina I.S. Khitin/khitozan i ego proizvodnye: fundamental'nye i prikladnye aspekty. uspekhi biologicheskoy khimii. 2020, vol. 60, pp. 317-368.
2. Skryabina K.g., Mikhaylova S.N., Varlamova V.P., Khitozan M., Tsentr „Bioinzheneriya" RAN, 2013 593 p.

VALORISATION OF WASTE FROM BREWING INDUSTRY

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The beer industry generates wastes as spent grain, yeast, kieselguhr and sludge which can be reused in other industry. In this study it is researched the valorisation of brewery waste yeast.

Yeast is a natural food supplement, rich in protein, amino acids, water-soluble vitamins (thiamine, riboflavin, niacin, folic acid, vitamin B12 and pyridoxine). It can serve as a valuable raw material in various fields of application, such as: medicine, bakery, cosmetology, feed for birds and animals, land fertilizer, as well as energy production.

The presented work deals with the methods of yeast drying. The proposed rotary drum dryer machine uses vapor as the warmth source and uses indirect heat transfer to heat the material and evaporate moisture. This installation consists of the drying drum, beater, transmission system, scraper mechanism, dosing device and steam system. The installation is equipped with an electric control panel and a steam evacuation device.

As results of the research it was studied the kinetic process of yeast drying.

On the drying curve, the following periods are highlighted: -free moisture removal period-during this period, free moisture evaporates intensively from the surface (up to 10-15%), reducing the internal energy in the product, and the temperature of the product decreases continuously, - drying period at constant speed - during this period intensive evaporation of moisture occurs. Moisture is mainly removed from the surface layers of the product, constant heat resistance and moisture transfer are concentrated on the surface, therefore, the drying curve does not change during this period, - period of decreasing drying speed-the layers of the product on the surface begin to heat up, so in 30 – 60 min.

Following the study there were analysed the yeast processing methods of residual beer. The yeast separation and drying processes were analysed. The use of the drum plant for drying of waste brewer's yeast was proposed. It were analysed the processes of separation and drying of the yeast. It was proposed to use the drum installation for drying residual brewer's yeast.

Key words: brewery waste, kieselguhr, yeasts, spain grain, sludge, drying.

References:

1. KOMAROV G. G. Method of reprocessing the wastes of brewing production. Patent of the Russian Federation № 2647920. MPC A23K 10/38 (2016.01), C05F 5/00 (2016.01). Application. 05.09.2016; Republished 21.03.2018. РЖХ 18.07-19Р1.415П.
2. CHICHINA, T. V. Technology of processing residual beer yeast for food and feed needs: Proc. [44 Scientific and Educational-Methodical Conf. of the ITMO University, St. Petersburg, February 3-6, 2015. Ч. 3]. In: Alm. of scientific works of young scientists. 2015, 3, c. 224-226. РЖХ 17.03-19Р1.525

SECTION II:
Food Safety and Nutrition

AGRO-INDUSTRIAL POTENTIAL OF *CANNABIS SATIVA L.* SEEDS AS A SOURSE OF BIOLOGICAL ACTIVE SUBSTANCES

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Cannabis sativa L. is an anemophilous plant belonging to the Cannabaceae family, first botanically classified in 1753 by Carl Linnaeus. The industrial value of the plant is exceptional and very promising. This culture produces several types of raw materials with particular commercial applications. The functional properties of hemp seeds are due to its high nutritional value which provides important beneficial characteristics for human health, and also to the presence of various bioactive compounds, including unique phenolic compounds with antioxidant, anti-inflammatory, and neuroprotective actions; bioactive peptides, but also two of the main cannabinoids found in Cannabis sativa, Tetrahydrocannabinol and Cannabidiol [1].

Research has shown that phenolic amide with the highest antioxidant and arginase inhibitory activity is N-trans-caffeylthyramine, extracted from hemp seeds. Thus, inhibition of arginase could increase bioavailability which improves endothelial function and may reduce oxidative stress which plays an essential role in the onset and progression of endothelial dysfunction involved in multiple diseases, including cardiovascular. However, the most important biological effects attributed to phenylpropionamides in hemp are anti-inflammatory and neuroprotective activities. Unique bioactive hemp compounds called sativamides A and B are chemically non-lignanamide compounds derived from N-trans-caffeoyltyramine. Pre-treatment of human SH-SY5Y neuroblastoma cell line with 50 μM sativamide A or B reduced cell death from endoplasmic reticulum stress [2].

Along with phenolic compounds, other functional compounds of hemp seeds are bioactive peptides. The existence of these peptides has been demonstrated by the bioactive characteristics of the products obtained by hydrolysis of hemp seed proteins. Indeed, it has been shown that although hemp seed proteins have limited bioactive properties, their hydrolysis provides hydrolyzates with higher bioactivity, including antioxidant, antihypertensive, antiproliferative, hypocholesterolemic, anti-inflammatory, and neuroprotective.

Keywords: antioxidant activity, bioactive peptides, functional properties, high nutritional value

References

1. Oseyko, M., Sova, N., Lutsenko, M., & Kalyna, V. (2019). Chemical aspects of the composition of industrial hemp seed products. Ukrainian Food Journal, 8(3), 544-559.
2. Farinon, B., Molinari, R., Costantini, L., & Merendino, N. (2020). The seed of industrial hemp (Cannabis sativa L.): Nutritional quality and potential functionality for human health and nutrition. Nutrients, 12(7), 1935.

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ANALYSIS OF CONSUMER BEHAVIOUR RELATED TO GERIATRIC NUTRITION IN THE REPUBLIC OF MOLDOVA

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The world population is in a constant process of aging. The percentage of people aged 65 and older was about 9% in 2020 and is estimated to increase to 16% by 2050. Statistics show that the number of older persons in the Republic of Moldova is also growing every year, at the beginning of 2021, the population aging rate was 22.5%, which is 3.3% higher than in 2017 [1].

Nutrition plays a preventive role and is considered a key component of the quality of life. The nutrition peculiarities of older persons include: eating strictly at the same time and limiting the amount of food intake, while the consumed food should be nourishing, easily digestible, and rich in vitamins and minerals. The aging of the body is accompanied by a gradual decrease in the intensity of metabolism, for this reason, a reduction in the number of consumed calories is required.

As part of a sociological survey conducted between April and May 2022, it was found that the daily diet of the population of the Republic of Moldova undergoes certain changes with age. The comparative analysis of the preferences in choosing certain types of food products of representatives of different age groups showed that the diet of citizens of the Republic of Moldova over the age of 60 is characterized by reduced consumption of sugary drinks, mineral water, coffee, milk, and alcoholic beverages, while the daily consumption of cereals increases. At the same time, many people cannot refuse the consumption of confectionery and desserts, various pickles, and gastronomy products, but the overall consumption of fresh fruits and vegetables is declining. According to the survey data, positive trends are associated more with possible acquired diseases, rather than with a rational approach to choosing suitable foods. The diet of the older age group, although it includes a sufficient amount of animal protein, is characterized by a high content of saturated fatty acids. This may also be due to the fact that the majority of respondents (56.9%) have a limited income, therefore, they are restricted in their choice of certain food products.

Thus, the diet of only 29.1% of people aged 60 and over, due to accumulated diseases, undergoes forced, rather than special changes towards a more balanced diet. The culture of adherence to a balanced diet depending on age is not developed in the Republic of Moldova, as well as there is no special group of geriatric products in general access. As the main measures to improve the quality of life of the local aged citizens, it is recommended to promote geriatric nutrition by informing the population about special diets, as well as highlighting suitable foods with special labeling.

Keywords: the elderly population, sociological survey, geriatric products, balanced ration

References

1. The National Bureau of Statistics of the Republic of Moldova © 2022. Available: https://statistica.gov.md/newsview.php?l=en&id=6767&idc=168

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ASSESSING OF THE GENETIC DIVERSITY OF VARIOUS WHEAT VARIETIES CULTIVATED IN ROMANIA

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The genetic diversity of 31 wheat varieties cultivated in Romania was investigated by means of inter simple sequence repeat DNA (ISSR) markers. This molecular biology technique targets microsatellite-directed DNA fingerprinting by polymerase chain reaction (PCR) amplification of the interrepeat region.

The genetic material consisted of different wheat samples of various species such as *Triticum aestivum* L., *Triticum monococcum* L., *Triticum spelta* L. of different biological status: modern variety, local race and breeding line. The wheat varieties were of different origins such as Romania, France, Austria, Germany and Russia.

Eleven ISSR markers were used to analyze and compare genetic diversity among selected wheat varieties. The results from agarose gel electrophoresis showed that only 6 from the total of 11 ISSR primers presented significant patterns of the amplified fragments, with clear and well-defined bands. The number of DNA bands per primer varied between 3 (for UBC 859 and UBC 880) to 8 (for UBC 808), with a mean of 4.83 bands/primer. Most of the primers had a number of polymorphic fragments equal to the number of amplified fragment, excepting UBC 808 which had 7 polymorphic fragments from a total of 8. The migration pattern for each genotype was converted in a binary system where 0 means absence of a certain DNA fragment and 1 means the presence of it.

The obtained data was analyzed in NTSYSpc software using UPGMA method and Jaccard and Dice similarity coefficients were analyzed. The genotypes were divided in 5 clusters (C1-C5). C1 was the most extended cluster and contains 16 genotypes from different countries. C2 contains 6 genotypes, all from Romania, similar to C3 which also includes 6 genotypes from different countries. In C4 was only one genotype from France and in C5 was one genotype from Romania.

Keywords: *Genetic similarity coefficients, ISSR markers, Triticum*

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BIOACTIVE POTENTIAL OF SOME CONDIMENTARY PLANTS: WILD GARLIC *(ALLIUM URSINUM)*, SORREL (*RUMEX ACETOSA L.*), NETTLE (*URTICA DIOICA*)

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Condimentary plants such as wild garlic (*Allium Ursinum*), sorrel (*Rumex Acetosa L.*) and nettle (*Urtica Dioica*) are rich in biologically active compounds and well known for their nutritional and nutraceutical properties. Bioactive compounds such as vitamins, chlorophylls and phenolic compounds are natural antioxidants found in plants [1,2]. Wild garlic, nettle and sorrel are widely spread in Moldova which fact motivates their use as plant-based condiments in food industry.

The aim of this study was to investigate the bioactive profile of some local condimentary plants. For the analysis of bioactive profile plant extracts were obtained. Using analytical methods were determined the total content of chlorophylls and polyphenols. The antioxidant activity was determined by DPPH assay method.

The results showed that the results showed that the wild garlic extract has a content of chlorophylls - 2,28±0,03 mg/L and the amount of total polyphenols is 32,49±0,05 mg/L. For the sorrel extract the content of chlorophylls – 0,46±0,01 mg/L and the amount of total polyphenols is 25,16±0,05 mg/L. For the nettle extract the content of chlorophylls – 5,33±0,02 mg/L and the amount of total polyphenols is 24,04±0,03 mg/L. The bioactive profile of the samples was confirmed by the antioxidant activity determined in plant extracts. The antioxidant activity was 22,13±0,03% for nettle extract; 6,45±0,03% for sorrel extract and 10,41±0,05% for wild garlic extract.

Evaluating the bioactive profile of local condimentary plant extracts we can conclude that there is a high possibility to motivate the continuous use of this compounds in the food industry and production of functional food products to offer to consumers high-quality food products.

Keywords: antioxidants, herbs, chlorophylls, polyphenols.

References:

1. AÇIKARA, Ö.B., ERGENE ÖZ, B., BAKAR, F., et al. Evaluation of Antioxidant Activities and Phenolic Compounds of Scorzonera latifolia (Fisch. & Mey.) DC. Collected from Different Geographic Origins in Turkey. Turkish Journal of Pharmaceutical Sciences 14 (2), 2017: pp.179–84. https://doi.org/10.4274/tjps.57070.

2. MAIETTI, A., TEDESCHI, P., CATANI, M., et al. Nutrient Composition and Antioxidant Performances of Bread-Making Products Enriched with Stinging Nettle (Urtica Dioica) Leaves. Foods 10 (5), 2021: pp.938. https://doi.org/10.3390/foods10050938.

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COMPARATIVE CHARACTERISTICS OF RAW MATERIALS FOR FUNCTIONAL FRUIT CHIPS

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An important direction in the food industry is the production of domestically produced mass consumption food products with a high content of biologically active substances intended for various population groups [1]. Such products include chips from various fruits. Improving the quality of chips, as well as increasing their nutritional value, can be achieved through the use of secondary raw materials from wine products. Interest in grape seed extract has continued to grow in recent years.

The object of the study is the seeds of grapes of white and red Chardonnay and Pinot varieties, selected at the wineries of Cricova and Criuleni in the central region of the Republic of Moldova, harvest of 2021. The pear varieties Konferentsia, Kiure, Moldavskaya rannyaya, Ogorodnik were also studied. A comparative assessment of the main physical and chemical parameters was carried out. The content of solids was determined by the gravimetric method according to ISO 1026:1982, the ash content was determined by the gravimetric method according to GOST 27494-87, the titratable acidity was determined by the potentiometric method according to SM SR ISO 750: 2014, the oil content was determined by the Soxhlet method according to GOST ISO 659-2017, the content ascorbic acid was determined by the potentiometric method according to ISO 6557-2:1984, the total content of polyphenols was determined by the colorimetric method using the Folin Ciocalteu reagent according to GOST R ISO 14502-1-2010.

The seeds were preliminarily dried to a moisture content of about 4-6%, the ash content of all varieties was approximately at the same level - about 2.5-3%, titratable acidity - 1.19-2.43%. The oil content in the studied grape seeds ranges from 8.7-25%. The content of total polyphenols is in the range of 108.41-153.89 mgGAE/g. From the analysis of experimental data on pears, it follows that the content of soluble solids ranges from 14.7-17.2%. Titratable acidity ranges from 0.3-0.4% in terms of malic acid. A significantly higher content of ascorbic acid was found in the Moldavskaya rannyaya variety - 8.2 mg/%, and the lowest - in the Kiure variety - 6.3 mg/%. According to the content of total polyphenols, the Moldavskaya rannyaya variety stands out - 5.321 gGAE/100g.

The results of the case study showed that the oil content in the analyzed grape seeds formed the following percentage sequence: Pinot Noir, Pinot Grigio (24-25%) > Pinot Meunier (17.5%) > Chardonay (8.7-17%). The total content of polyphenols formed the following sequence: Pinot Grigio > Chardonay (Criuleni) > Pinot Noir > Chardonay (Cricova) > Pinot Meunier. According to the content of ascorbic acid, the studied pear varieties are distributed as follows: Moldavskaya rannyaya > Konferentsia > Ogorodnik > Kiure. According to the content of total polyphenols, the studied pear varieties are distributed as follows: Moldavskaya rannyaya > Ogorodnik > Konferentsia > Kiure.

Keywords: grape seed, acidity, properties, polyphenols, oil, pear.

References.

1. KUSTOVA, I. Razrabotka tehnologii proizvodstva ekstrakta iz vtorichnogo vinogradnogo syr'ya s povyshennymi antioksidantnymi svoystvami. In: *Materials of the 1st International Student Scientific and Practical Conference "Innovations in chemical and petrochemical industries and biotechnology*. 2015. pp. 99-104.

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ECOLOGICAL POTENTIAL OF INTERSPECIFIC RHIZOGENIC GRAPES VARIETES FOR PRODUCTION OF BIODRINKS

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Food products, which can be classified as bio products (eco, organic), in recent years enjoy an upward demand not only on international markets, but also in local places. In this context it is important to know the technological potential of some varieties of new grapes collection, made by the Institute of Genetics, Physiology and Plant Protection of the ASM (IGFPP) of the Republic of Moldova, not only for fresh consumption, but also as processing of them. These varieties are valuable due to their tolerance to diseases and pests, minimizing chemical protection, which gives them high ecological qualities that can be approved technologically.

The maturated grapes were harvested in 2021 and 2022 from the collection of the IGFPP. The uvological analysis, processing and laboratory study were carried out at the Department of Oenology and chemistry of the Technical University of Moldova. The essential parameters of musts/wines were determined according to OIV methods. The qualitative and quantitative composition of phenolic substances of grapes and products of them, was investigated by spectrophotometric methods.

The main uvological parameters of rhizogenic interspecific grapes *(Vitis Vinifera L.xMuscadinia Rotundifolia Michx),* homologated in RM were monitored: white--Alexandrina, Augustina, Nistreana, red-Amethyst. The results were correlated with the climatic parameters of the vegetation period of the respective years. In grape juice, such important parameters for the bio raw material as total phenolic substances, flavonoid phenolic substances, cinnamic phenolic substances have been determined. Some representatives of these groups, in addition to the essential role in the structure of grape drinks, their stability, possess important biological properties for the human body. The evolution of the products obtained in the post-processing period was followed.

The targeted varieties showed high resistance against cryptogamic diseases, phylloxera, pest and manifested very positively through productive potential especially in the conditions of 2021, very difficult from the point of view of ensuring phytosanitary protection. It has been demonstrated the possibility of producing bio drinks, with minimal technological interventions during processing. These varieties present an optimistic potential for the production of bio drinks, with high biological and ecological properties.

Key words: rhizogenic varieties, biological protection, bio products, uvological analysis, phenolic substances, flavonoids, cinnamates.

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EFFECT OF MILK THISTLE (SILYBUM MARIANUM L.) SEEDS POWDER ON QUALITY CHARACTERISTICS OF SPONGE CAKE

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Pastry products are often blamed for some content rich in sugars and lipids, and devoid of any biological value (vitamins, phenols, etc.), thus contributing to the development of pathologies such as obesity, diabetes, cardiovascular diseases, etc. In order to enhance the biological value of sponge cake, in this research, milk thistle (*Silybum Marianum L.*) seeds powder that are proven to have hepatoprotective effects due to the flavonolignans from their composition, especially Silymarin, was used to replace 5, 10, 15, and 20% of wheat flour in the sponge cakes formulations. The quality characteristics of sponge cake were studied in terms of sensory analysis, porosity, texture, volume, color parameters, total phenol content (Folin Ciocalteu reagent) and antioxidant activity (DPPH free radical scavenging).

The obtained results revealed that the sponge cake volume was significant affected by the addition of milk thistle seeds flour. The volume of sponge cake decreased from the average of 72.78 cm^3 for the control sample to 59.56 cm^3 for the sample with 20% milk thistle. This fact was also confirmed by the decreasing trend of the porosity (from 80.12% to 75.34% for the sample with 20% milk thistle incorporation) of the cake with the increase in the substitution level of wheat flour with milk thistle seed flour.

The inclusion of *Silybum Marianum L.* powder influenced the texture and crumb color of the baked sponge cakes. The harness and chewiness of baked cakes manifested an upward trend with increasing milk thistle powder levels, whereas the cohesiveness showed a reverse trend. For the crumb color the L^* values decreased, while the a^* and b^* values increased, showing that darker, redder and yellower samples were obtained. However, the samples with 5 and 10 % addition were not significantly different.

Concerning phenols content and antioxidant activity, the results show that the milk thistle addition has a positive effect on the total phenols content by increasing it from 63.93 (control sample) to 121.94 mg GAE/g (sample with 20 % milk thistle). However, the highest antioxidant activity (49.37%) was recorded for the sample with 10% milk thistle, while for the sample with 15 and 20% it shows a downward trend, this is probably due to some compounds or interaction that have a pro-oxidant effect when milk thistle powder exceeds certain quantities.

The results of the sensory analysis pointed out that the replacement of wheat flour with up to 10% milk thistle powder in sponge cakes is satisfactory, the samples with 5 and 10 % milk thistle being the most acceptable.

Keywords: antioxidants, flour replacement, texture, color, sensory analysis

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ENZIMATIC ASSAY OF DIGESTIBILITY OF DIETARY FATS

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Digestion of vegetable oils is influenced by the composition of the oil, but also by the particular physiological factors specific to each individual. In order to determine the digestion effort, three types of oil and two types of animal fat were subjected to *in vitro* digestion research by modeling the digestion conditions at the level of the small intestine. Liver food supplements and pork and hen bile were used to initiate digestion. The digestion effort in the presence of pancreatic lipase (1050 FIP-U/g) increased in the order - pumpkin seed oil, sunflower oil, olive oil and, respectively, poultry fat, butter. The accumulation of free fatty acids was maximal for pumpkin oil (from 1.28 to 6.68%) and for chicken fat (from 0.67 to 4.23%) during the 4 hour of simulated digestion.

In the human diet fats play an important role as a source of biologically active compounds - fatty acids, vitamins, lecithin. The bio accessibility of these compounds depends considerably on the degree of digestibility of the primary fats. The essential physiological factors - the digestive enzyme (lipase) and the liver secret (bile) contributes significantly to the running of the digestion process. Sometimes, in the practice of dietitians, it is important to know the effort of digestion for nutrients, in order to be able to select and recommend a certain type of fat in the diet.

Oils and fats were purchased from the market. Food supplements used - Flaton (Bilim, Turkey), Choliver (D-G Pharma, Vietnam). Pig bile and chicken bile were extracted after slaughtering; they were sanitized, then dried. The samples intended for digestion consisted of oil/fat, lipase preparation and bile, which after homogenization and emulsification were maintained at 37 C for 0-4 h. Acidity index was determined by titration with KOH. The amount of free fatty acids was determined according to Xylem Brand Soft (2010).

The *in vitro* digestion effect of dietary fats was maximal in the presence of lipase (C = 6 mg/g) and minimal in the control sample. Thus, the increase of free fatty acids as an effort of digestion in the control sample, which did not contain lipase, for pumpkin oil was not significant (from 1.28 to 1.83%), in comparison with the sample with lipase (from 1.28 to 6.66%). Similarly, for hen fat, the amount of AGL in the control sample changed (from 0.67 to 1.23%) in the absence of lipase and (from 0.67 to 4.23%) in the presence of lipase. In the part of the experiment that referred to the use of vesicular bile for the better emulsification of dietary fats, results were obtained that suggest the statement that the origin of fats is as important as the essence of the physiological factor. Thus, in the presence of vesicular hen bile the amount of FFA increased from 0.67-1.72% for the hen fat (or 2.6 times) and only from the 1.05-1.76 (or 1.7 times) for the butter.

The index that corresponds to the accumulation of free fatty acids was selected as an estimation criterion for *in vitro* digestibility of fats. Pancreatic lipase from food supplements can significantly influence the process of digestion of dietary fats, contributing to a 3-4 times increase in the speed of dietary fat splitting into glycerol and free fatty acids. In the *in vitro* experiment with the addition of pig or poultry bile, the digestibility of poultry fat was higher in the presence of poultry bile. Respectively the pig's bile was more effective in splitting the butter.

Keywords: dietary fats, pancreatic lipase, vesicular bile, digestibility effort, free fatty acids (FFA)

EVALUATION OF THE QUALITY OF VEGAN SAUCE WITH THE ADDITION OF MULTIFUNCTIONAL COMPOUNDS

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The modern rhythm and lifestyle of people, especially in large cities, have led to an imbalance in the diet. It is supersaturated with easily digestible carbohydrates and saturated fats of animal origin. At the same time, the population suffers from a deficiency of essential fatty acids, vitamins, minerals, dietary fiber and phospholipids. Conducted studies by numerous authors have proven the physiological activity of beta-glucans and its beneficial properties. Products containing beta-glucans have a wide range of technological properties. They retain moisture, stabilize the texture, exhibit preservative and antioxidant properties, help retain flavor and preserve the color of products. They suppress appetite due to the feeling of fullness and exhibit sorption properties.

The aim of this work was to develop a mayonnaise-type vegan sauce enriched with beta-glucans, since the modern market is full of proposals, but the number of vegan sauces is limited. For this study, four samples were prepared containing beta-glucans from 0% to 0.3% of the total mass. The organoleptic and physico-chemical parameters (solids content, pH, total acidity and viscosity) of sauces enriched with beta-glucans were obtained and studied. The result showed that by increasing the content of beta-glucans, the samples had a lower pH and higher acidity compared to the control sample. A tasting was carried out, the best samples of the obtained samples were identified. It has been established that beta-glucans obtained from processed wine yeast has a good water-retaining capacity, thereby reducing the water activity in the samples and, accordingly, increasing the food safety of the developed sauce. The addition of yeast-extracted red wine beta-glucan had a significant effect (p<0,05) on the color parameters of the resulting sauce. The lightness (L value) of the samples was higher with increasing concentration of beta-glucan than the control sample. The introduction of the developed recipe for a vegan sauce enriched with beta-glucans into production will expand the range of products for special nutrition. This product not only has improved consumer characteristics, but can also be used for people with egg allergies.

Keywords: beta-glucan, functional foods, dietary fiber, vegetable raw materials.

References:

1. Usatîi A., Chiseliţa N. Metode de extragere din levuri a glucanilor şi proprietăţile lor fizico-chimice. În: *Buletinul AŞM. Ştiinţele vieţii*. 2015, nr. 1(325), pp. 153-160.
2. Chirsanova, A., Boistean, A., Chiseliță, N., Siminiuc, R. Impact of yeast sediment beta-glucans on the quality indices of yoghurt. In: *Food systems*, 2021, nr. 4(1), pp.12–18. https://doi.org/10.21323/2618-9771-2021-4-1-12-18

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EVALUATION OF THE EATING BEHAVIOR OF TUM EMPLOYEES DURING THE LOCKDOWN

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Over the centuries, education has beenhit by several challenges. The pandemic has affected education systems around the world, leading to widespread closures of educational institutions, which has affected not only students but academics as well [1]. The stress to which academics were subjected can have consequences on occupational health and quality of life, due to negative eating behaviors and due to lack of physical activity [2]. Research on the effects of pandemic restrictions on teachers is limited. Therefore, the respective study aimed to analyze the food behavior of UTM employees, in the context of the pandemic. A study was conducted, based on the questionnaires Adult Eating Behavior Questionnaire (AEBQ), on a group of TUM employees (n = 121). Respondents completed the questionnaire on the Google platform between 13.10.2021 - 25.11.2021, and the final database has been downloaded as a Microsoft Excel file. The results of the survey were analyzed by descriptive statistics.The Cronbach's alpha coefficient was calculated to determine the full reliability of the questionnaire. 34.7 % women and 65.3% men participated in the survey, the majority (58%) being between 31 and 60 years old. Some relationships have been observed between certain emotional states and food consumption. Nervousness and anxiety are conditions that have most caused overeating or undereating. The results of this study could be a way to study the behavioral phenotype associated with obesity risk. And the strong connection between nutrition and the immune system only heightens the imperative of this study. At the same time, the results could be used in further research to help develop strategies to help promote of academic's health and shape responses to the inevitable future pandemics.

Keywords: emotional eating, food consumption, university employees.

References:

1. Țurcanu D, Siminiuc R, Bostan V, Țurcanu T (2022) Impact of the Covid-19 Pandemic on the Use of Microsoft 365 and Learning Outcomes at the Technical University of Moldova. In: Tiginyanu I, Sontea V, Railean S (eds) 5th International Conference on Nanotechnologies and Biomedical Engineering. Springer International Publishing, Cham, pp 456–462
2. Alves Durães S, das Graças Pena G, Neri Nobre L, et al (2021) Food consumption changes among teachers during the COVID-19 pandemic. Obesity Medicine 26:100366. https://doi.org/10.1016/j.obmed.2021.100366

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FOOD IN CORRELATION WITH CHILD AUTISM: CASE STUDY IN THE REPUBLIC OF MOLDOVA

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The number of children diagnosed with Autism Spectrum Disorder (ASD) is constantly increasing, based on an etiology of various disorders, starting with prenatal problems and continuing with eating habits and diets. Not all parents understand that ASD comes with a wide range of disorders, including eating disorders. In this sense, it is important to examine the antopometric characteristics and weight status, inadequate nutritional risks starting from infancy, the diets that are followed later, etc. The purpose of the study was to investigate problems related to autism, starting from etiological factors, food therapy, but also specific diets for complications and intolerances. The research was based on the general hypothesis that nutrition brings major benefits to the general condition of the child with ASD and determines the improvement of compulsive-obsessive behavior, sleep disorders and relationships with others, etc. If the gastrointestinal system does not affect the nervous system, these are the main components of the brain-gut axis. The cross-sectional study was conducted by surveying the parents of 40 children with ASD from the Republic of Moldova, who are part of the "SOS Autism" Public Association.

The questionnaire referred to the prenatal nutrition of the mother and the child from infancy to the age of 3 years and included questions related to dietary complications related to intolerances and allergies. The results confirmed that the male gender is more affected than the female gender, representing a percentage of 60%. 63% of the participants had a normal body mass index, and 18% were overweight and obese, and 19% were underweight. The results of the study confirmed the hypothesis that cesarean section is a risk factor. 53% of participants were delivered by caesarean section. At the same time, the optimal age to start diversifying the diet of children with ASD is 6 months, just like that of a child without this spectrum of disorders. 57.5% initiated diversification after 6 months. 12% of the children had gluten intolerance, 5% casein allergy and 3% gluten intolerance+casein allergy. The specific carbohydrate diet without dairy is recommended for children with ASD, this was adopted by 15% of the participants, 12% adopted the gluten-free diet, 5% adopted a casein-free diet, and 68% followed no diet. Adherence to meal times is crucial for children with ASD. The consumption of meat, fish and dairy products, mostly, was 2-4 times a week for 52.5% of the participants. Fruits were consumed, mainly 1-2 times a day by 26 participants, and vegetables also 1-2 times a day, by 20 participants. The most common way of cooking food adopted by parents of children with ASD is baking and boiling (95%), followed by steaming (62.5%). A quarter of parents prepare food by frying. The study confirmed that the appropriate diet and avoiding some foods from the daily routine of the child with ASD brings benefits and improves well-being.

Keywords: autism spectrum disorder TSA, food, disorders, intolerance.

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FOOD SECURITY FOR UKRAINIANS DURING THE ARMED CONFLICT

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Recently, nutritional security has moved to the forefront of the pressing issues of nutritional science due to the global deterioration of environmental conditions. Of particular relevance at the present time, it has become for Ukraine, due to the active armed conflict lasting for half a year. Organization of food supply for the conflict participants and temporarily displaced children and adults requires urgent development of a special range of products. These products must be packed in easy-to-use packages. In addition, the nutrient composition of these products must have elevated health-recovering capabilities.

Therefore, the purpose of the work was to participate in the development of new types of products of increased nutritional value packed in containers convenient for consumers, ensuring compliance of products with sanitary and hygienic standards and inclusion of specialized products and metabolically oriented complexes in the diet.

An analytical review and experimental studies have been conducted to analyze the nutritional value of many types of raw materials. The nutritional density of their calories was established. Taking into account the achievements and recommendations of nutrition science, the use of modern methods of preserving the nutritional value of vegetable and animal raw materials during its technological processing is reasonable.

The developed types of canned products are to be packed in retort pouches of different capacities. Heat treatment regimens have been developed for them using modern sterilizing equipment. A complex of chemical-technological and microbiological studies of the developed range of canned products was carried out. The results of determining the residual microbiota showed the commercial sterility and microbiological stability of these canned products, and also confirmed their high quality. The general safety of these products was also confirmed by biotesting.

Thus, the new types of canned products have a balanced nutritional composition and health-recovering capabilities and meet requirements for safe nutrition of Ukrainians during the armed conflict.

Keywords: health-recovering capabilities, microbiological stability, new canned products, nutritional density of calories.

FOOD SECURITY OF PEOPLE WITH CELIAC DISEASE IN THE REPUBLIC OF MOLDOVA THROUGH PRISM OF PUBLIC POLICIES

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Food security is an important lever for the implementation of rights-based legislation, policies, and programs, while being a public health and socio-economic priority. Foodborne illnesses have a major impact on public health, and nutritional interventions are essential therapeutic strategies to combat them. Gluten ingestion has been linked to several clinical disorders, collectively called gluten-related disorders. The most serious of these is celiac disease. The only way to treat celiac disease is to stick to a gluten-free diet for life. Following a strict diet is also the only way to prevent the long-term consequences of the disease. Public policies are essential to ensure the food security of people with gluten-related disorders. The aim of the research is to assess the level of care for people with celiac disease in the Republic of Moldova, in terms of public policies, to ensure a sustainable sector that effectively satisfies the food security of people with disorders associated with gluten consumption. To assess the level of care for people with gluten-related disorders, the working algorithm was taken, with reference to global public policies in support of people with celiac disease, developed and validated by Falcomer et al., Focused on 6 items. The results of the study showed that the Republic of Moldova does not have adequate policy support to ensure food security for people with gluten-related disorders, which poses major challenges and, as a result, may increase the complications of these problems.

Keywords: public policy, celiac disease, gluten free products, level of care, food security, Republic of Moldova

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FUNCTIONAL FOODS: A STUDY OF CONSUMER PERCEPTION AND PREFERENCES IN THE REPUBLIC OF MOLDOVA

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The role of functional foods is extremely important in the prevention and treatment of such diseases as obesity, diabetes, cancer [1]. In the process of a new food product development and implementation, it is very important to assess consumer perceptions and preferences [2]. The aim of the study was to analyze the consumer perceptions of functional foods with antioxidant and anticancer potential as well as with hypoglycemic effect.

The methodology included two surveys developed in the Google Forms. The respondents were residents of the Republic of Moldova, invited to answer the questions via mailing list, social media announcements and personal invitations. The surveys included the evaluation of respondents profile, the level of awareness of functional foods, the identification of the main factors influencing their purchase, etc. The applied method made it possible to assess the information regarding the consumer and market needs in functional foods.

During the study 179 respondents took part in the survey aimed to the evaluation of consumer perceptions of functional foods with hypoglycemic effects [1] and 150 respondents showed interest in the second survey designed for functional foods with antioxidant and anticancer potential [2]. It was found that the majority of respondents were women (64%, 61%), mainly students undergoing the first cycle of study (70%) and people engaged in work (59%). A part of the respondents (63%, 44%) do not have sufficient information about functional foods and their benefits, however, 88% of the respondents (Survey 1) and 74% of the participants (Survey 2) would like to learn more about functional foods with antioxidant, anticancer and hypoglycemic properties. The 94% of respondents actively supported the idea of functional food products range extension on the territory of the country. The 56% of the respondents were interested in functional dairy products, 55% in sweets and confectionery products, 40% and 50% in functional pasta and bakery products.

Keywords: antioxidants, food with anticancer potential, food with glycemic index.

References:

1. E. Sergheeva, M. Geicu-Cristea, F. Matei, M.E. Popa, E.E. Popa, E. Robu, C. Popovici. *Consumer perceptions of functional foods for type 2 diabetes in Romania and Republic of Moldova.* Book of abstracts of International Conference "New Trends on Sensing-Monitoring-Telediagnosis for Life Sciences", September 8-10, 2022, Brașov, Romania, 66 p.

2. E. Robu, E. Sergheeva, C. Popovici. *Consumer perceptions of functional foods with antioxidant and anticancer potential.* Book of abstracts of International Conference "New Trends on Sensing-Monitoring-Telediagnosis for Life Sciences", September 8-10, 2022, Brașov, Romania, 63 p.

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GOOSE BREEDING IS A PROMISING BRANCH OF THE ECONOMY

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In 2019 the share of poultry meat consumption in Ukraine exceeded 47% for the first time in the history. With the growth of the world's population, the demand for meat and meat products will grow, despite the spread of the principles of vegetarian nutrition and substitutes for animal products. Also the African swine fever in China has led to a decline in pork consumption and an increase in demand for alternative poultry meat. Under such conditions, Ukraine has all the opportunities to increase its own export of poultry meat.

Goose farming is an important source of increasing poultry meat production and expanding the range of poultry products. The goose breeding business is promising, profitable and underdeveloped, with low competition in Ukraine. The goose breeding profitability is about 75%. Goose farming is also one of the possible ways to solve the problem of animal protein deficiency in the world.

Goose meat consumption averages 0.343 kg/person/year in the world. The leader in consumption is China, 1.73 kg/person/year. The second place is occupied by France, whose population prefers foie gras. The largest producers of goose meat in Europe are Poland and Hungary. The relatively small level of goose meat consumption is explained by the fact that the produced products are mainly exported.

The industrial production of goose meat in Ukraine should focus on export to European countries, where this product is in greater demand than at home. In addition, the ban on fattening geese for fatty liver in EU countries opens up even more opportunities for us to export, because there is no such law in Ukraine.

Geese breeding can be implemented in three directions: growing young for meat, breeding (eggs incubation) and fattening geese for fatty liver. The eat of young geese has high taste qualities and contains: water — 73 - 75 %, protein — 18 - 18.8 %, fat — 5.3 - 7.3 %, minerals — 1 - 1.16 %. In addition, geese provide a very valuable industrial product – goose down, which is used to insulate clothing.

Goose down raw material is characterized by high thermal insulation properties and a long period of effective use. The feather-down raw material of intravital plucking is especially valued. Such raw materials are always in high demand on the world market. World prices for goose down raw material of intravital plucking are 100-130 USD per 1 kg, for down raw materials with a down content of 30% - 50-58 USD per kg.

The production of goose eggs is not a profitable and attractive business due to the low egg-laying capacity of geese and the poor taste of the eggs.

The question of a people’s fatty diet is highly actual nowadays in the world due to high level of atherosclerosis disease. One of the possible ways to solve this problem is to use goose fat. It is close to olive oil in terms of fatty acid composition and has a low cholesterol level. Goose fat is a valuable human food product. The purchase price for goose fat is higher than for butter in EU countries. It is also widely used in the pharmaceutical and perfume industries.

Foie gras (goose liver) is a delicate and very expensive product that is in high demand. Special breeds and certain fattening technologies are used to obtain goose liver. The weight of the liver is on average 400-1000 g. Its value on the world market ranges from 30-40 USD per 1 kg.

Keywords: goose down, goose meat, foie gras.

INFLUENCE OF BREWER`S SPENT GRAIN ON QUALITATIVE INDICATORS OF BREAD FROM WHEAT FLOUR

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Brewer's spent grain is a secondary raw material obtained during the production of beer. Studies have shown that the beneficial properties of brewer's grains (content of micro- and macro-elements, B vitamins and fiber) can be used in the production of food products for people with diabetes, obesity or simply watching their lifestyle. The purpose of this work is the production of bread with the addition of brewer's spent grains and their influence on quality indicators in comparison with control sample.

Brewer's spent grain was used in the production of sourdough from wheat wholemeal flour in proportions of 25%, 50%, 75% and 100%. The main raw material was got from the Î.M. "Efes Vitanta Moldova Brewery" S.A. Brewer's spent grain was obtained from light malt and dried at a temperature of 62±2◦C in order to further grind it to the state of flour. The fermentation of sourdough was 8 days at a temperature of 27 ±1 °C it was renewed every 24 hours. When acidity reached 8 ± 1 degrees, one part of the sourdough was used in the production of bakery products from wheat flour of superior quality and the other of this was used to renew the sourdough.

There are prepared 4 types of bread with the addition of sourdough and wheat flour of the superior quality, prepared by the monophasic method according to classic technology. These products were used to determine the effect of brewer`s spent grain on the quality of bread made from wheat flour. Samples 25%, 50%, 75% of brewer`s spent grain differed from the control sample in the golden color of the rind, pleasant aroma of malt and without foreign aftertastes. It was observed that with increase of concentration of brewer's spent grain in dough is increase in the time of proofing. Bakery products with 25% and 50% brewer's spent grain, in accordance with the regulatory documents for products made from wheat flour, were characterized by high porosity, as well as the corresponding acidity and moisture of the crumb. The sample obtained from the sourdough of 100% brewer's spent grain differed by poorly developed crumb porosity and low acidity. According to the sensory indices, the sample was distinguished by the presence of a gray shade of the crust and crumb, with an elastic and clogged texture and a crunch was felt.

There was studying the influence of sourdough with different content of brewer's spent grain on the microbiological safety of wheat bread during storage. Analyzing the results obtained, it was found that the first signs of the manifestation of rope spoilage were observed in the standard sample. The presence of whole wheat flour and brewer's grains had a bacteriostatic effect on spores of microorganisms that cause infection of bread with rope spoilage. Thus, test baking showed that the use of sourdough from whole wheat flour and brewer's spent grain increases the shelf life of bread by 24...48 hours, thus slowing down the development of rope spoilage in the bread.

Key words: brewer`s spent grain, sourdough, bread, quality, rope spoilage.

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NUTRITIONAL ATTRIBUTES OF GOJI (*LYCIUM BARBARUM*) BERRY - A REVIEW

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Goji berries have been known for over 2000 years in Tibet and have been used in traditional Chinese medicine because of the many benefits they provide to the human body. Recently, the interest in goji berries has grown considerably due to the awareness of the functional properties they carry, being rich sources of polysaccharides, phenolic substances, proteins, fibers, mineral elements, vitamins necessary in human nutrition. Today, goji berries are called a "superfood" with numerous nutritional advantages. In Europe, there is a dynamic increase in the consumption and direct cultivation of goji berries.

The most widespread species of goji berries is *Lycium Barbarum*, popularly also known as hedge buckthorn. Goji berries contain notable levels of dietary fiber, either in soluble (2.6%) or insoluble (8.8%) form. The ratio of insoluble to soluble fiber is about 3:1. The recommended dietary fiber intake for adults is 25 g/day. With the consumption of a 30 g portion of dried berries, the fiber intake for adults is about 14% of the recommended daily intake. Taking into account European legislation (EC Regulation 1924/2006), dried goji berries can be marketed with the label "high fiber content" because it contains at least 6 g of fiber per 100 g.

Goji berries represent a substantial source of microelements in this regard, it is noted that they contain K, P and Cu with a value above 15% of the recommended daily dose. *Lycium Barbarum* berries contain 15.7% of the RDA of iron, so it can be recommended as a valuable source in the daily diet.

Among the goji berries' polyphenols, caffeic acid, chlorogenic acid, p-coumaric acid, quercetin and kaempferol are present. Carotenoids represent significant values, the dominant ester being identified as zeaxanthin dipalmitate. The content of zeaxanthin dipalmitate in dried berries is about 159 mg/100g and β-carotene is about 1mg/100g.

Thus, goji berries are rich in essential compounds recommended for a balanced diet. They can be used as raw materials for obtaining new functional products, a field of perspective that can be practiced in our country.

Keywords: balanced diet, essential compounds, functional properties, high fiber content, superfood.

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NUTRITIONAL STATUS OF PREGNANT WOMEN FROM REPUBLIC OF MOLDOVA

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During pregnancy, fresh and wholesome food is most important for the unborn child, because everything that the mother eats is also given to the baby in a mandatory manner. Proper and rational nutrition in this period is the key to the birth of a healthy baby. The purpose of the study was to evaluate the level of awareness of pregnant women from the Republic of Moldova of the nutrition importance during pregnancy for the health of the future newborn. The study was conducted based on a questionnaire containing 37 questions and divided into 4 basic subchapters: General information, Lifestyle, State of health and Nutrition during pregnancy. The questionnaire was completed by 200 women, age ranged between 20 and 40 years (distributed by age as follows: 20-25 years - 40%; 26 - 30 years - 35%; 31 - 35 years - 20% and 35 - 40 years - 5%) being in their first (11.8 %), second (58.8 %) or third (29.4 %) pregnancy trimester. In the study, it was elucidated that depending on the availability of food and pregnant women's access to it, the increase in body weight varied accordingly, varying up to +13 kg for women in the 3rd pregnancy trimester.

The analysis of the results regarding nutrition during pregnancy revealed that pregnant women change their eating behavior by limiting (raw milk or fish, blue cheese, coffee, alcohol, etc.) or adding some foods (fish and bovine as complete protein sources, vegetables (especially cruciferous) as fiber sources, calcium sources, etc.) to the daily ration. The nutrition changes were mostly influenced by reliable sources (https://msmps.gov.md; www.mamaplus. md; www.familia.md, etc.) or by pregnancy doctors. Being concerned about the health of the future baby, following the recommendations of health specialists, most pregnant women also supplemented their diet with folic acid, iodine, vitamins, etc.

Keywords: eating patterns, food availability, pregnancy, supplements

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POSSIBILITIES OF PROMOTING GASTRONOMIC TOURISM IN THE REPUBLIC OF MOLDOVA

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Tourism is one of the highest profit areas in countries with rich tourism potential. At present, the contribution of tourism in the Republic of Moldova to the national economy is relatively insignificant, due to the existence of untapped tourism potential and the country's low global visibility. In order to achieve economic efficiency in tourism, it is necessary to develop the existing tourism product, raise awareness of the importance of tourism development for local development, diversify services, and develop mechanisms to provide economic incentives (including tax incentives) for economic agents in the sector.

At the same time, gastronomy represents the fundamental values of a culture and food traditions, cooking and food styles are part of national identity. The consumption of food by tourists is a privileged moment of encounter with the culture of a geographical region or country. Dining through its everydayness is part of the journey and is a main component of tourist practice. The culinary character, the assortment of dishes and drinks of a geographical region certainly highlights a tourist route. The food pattern is known as a kind of connection between people's experiences of different eras, making it possible to explain the past through the present. At the same time, it should be mentioned that each era brings both new foods and experience, inherited elements, which are intertwined with innovative ones. Alongside landscape, accommodation and climate -the culinary experience has become defining for some tourists who seek memorable taste sensations, with an emphasis on the culture of serving and eating authentic dishes, tasting drinks (wines, cognac, brandy, etc.). Gourmet holidays are the best opportunities to discover new wine varieties or traditional culinary dishes. The Republic of Moldova has a poorly developed gastronomic tourism potential, but this is highlighted by the existence of specific dishes that are appreciated locally and regionally, alongside traditional pastry products: peasant bread, colaci, pies, baba, salami, etc., and locally specific culinary preparations based on vegetables, fresh and dried fruit, jams, pickles, homemade cured meats, natural juices and syrups, herbal teas, beekeeping products, etc.).

Keywords: turism, gastronomie, potential turistic gastronomic

References:

1. Sturza, R., and A. Ghendov-Moșanu, 2021, Food, nutrition, and health in Moldova, in Nutritional and Health Aspects of Food in the Balkans: Elsevier, p.249–262, doi: 10.1016/B978-0-12-820782-6.000 21-9.
2. Tregear, A., 2003, From Stilton to Vimto: Using Food History to Re-think Typical Products in Rural Development: Sociologia Ruralis, v. 43, no. 2, p. 91– 107, doi: 10.1111/1467-9523.00233.

POSSIBLE USING OF CLAY-BASED NANOMATERIALS IN ENVIRONMENTAL DEPOLLUTION

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The toxic heavy metals must be removed from wastewater effluent prior to discharge into the environment. The most studied methods of decontamination of wastewater with heavy metals are: the adsorption, ionic exchange and filtration on membranes.

Our experimental research has focused on the production of adsorbents based on ceramic nanomaterials that are sufficiently efficient for the depollution of industrial liquid effluents. These adsorbents were realized starting from Romanian natural calcium bentonite (Orasu Nou deposit, Satu Mare) subjected to chemical and thermal treatments in order to increase their retention properties by optimizing their specific surface areas, interlamellar distances and porosities.

The adsorption of lead ions from aqueous solution on Al-pillared clays was investigated in this paper. Adsorption studies of Pb(II) ions on Al^{3+} pillared clays were carried out using the discontinuous batch technique due to its simplicity and reliability.

The raw material and the obtained nanomaterial were characterized by X-ray diffraction (XRD), Brunauer-Emmet-Teller (BET) and Barrett-Joyner-Halenda (BJH) methods. By pillaring process, the specific surface areas of modified clays were three times higher than the specific surface area of the raw material. The pillaring results in the formation of slit-like pore aggregates of varying sizes. The structure of pillared nanomaterial has a higher number of mesopores in comparison with natural bentonite.

The adsorption of lead ions depends on its initial concentration, initial pH solution, contact duration between nanomaterial and aqueous lead solution, adsorbant/adsorbat ratio. The synthetized nanomaterial appears to be a promising adsorbent for the removal of lead ions from wastewater.

Keywords: adsorption, lead, montmorillonite, pillaring, porosity

SORPTION CHARACTERISTICS OF WHEAT AND JERUSALEM ARTICHOKE (HELIANTHUS TUBEROSUS) FLOUR MIXES

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In the food industry, there is a more widespread use of Jerusalem artichoke and Jerusalem artichoke flour, thanks to the nutritional value and chemical composition. The aim of the research was to determine the hygroscopic characteristics by constructing the adsorption and desorption isotherms of Jerusalem artichoke flour in comparison with wheat flour. We used two varieties of Jerusalem artichoke Amicu II and Solar and found that the organoleptic characteristics and physico-chemical properties are the same for both types of flour. Jerusalem artichoke flour (Amicu II variety) was obtained with the following organoleptic characteristics: color-light brownish, taste-sweet, pleasant and smell-specific with shades of roasted product. Physicochemical properties: titratable acidity 28.6 degrees of acidity. Moisture 11.4% and ash is 117.6%. Experimental adsorption and desorption isotherms of raw and cooked Jerusalem artichoke flour and wheat flour were obtained. All isotherms were found to be sigmoidal, type II, characterized by specific multimolecular adsorption for a nonporous or macroporous adsorbent. It was found that the sorption properties of three types of flours are different and that the most pronounced are for cooked Jerusalem artichoke flour (38% b.s. at a_w=0.955), followed by raw Jerusalem artichoke flour (33% b.s. at a_w =0.955) and wheat flour (17% b.s. at a_w=0.955). The hysteresis effect was established on all the sorption diagrams, practically in the entire a_w range, but it increases with decreasing temperature. The maximum hysteresis values are: for raw Jerusalem artichoke flour - 7; for cooked Jerusalem artichoke flour - 9 and for wheat flour - 6 (g/100 g dry product at 5°C). It has been found that for the same water content, the activity of water at a temperature of 5°C is greater than that at a temperature of 23°C. The increase in temperature therefore has the effect of increasing the hygroscopicity of flours.

It was recommended to use raw Jerusalem artichoke flour since its hygroscopicity is quite low and can therefore be stored longer, preferably at a temperature of 15-20°C and in a dry environment. The monomolecular capacity of Jerusalem artichoke flour was calculated - 480 $\mu mol*g^{-1}$ and the surface a of one gram of adsorbent (Jerusalem flour) which is equal to 65.5 m^2*g^{-1}. The heat of sorption was determined, and the water content values were found to be inversely proportional to the heat of sorption values.

Keywords: Jerusalem artichoke, Jerusalem artichoke flour, adsorption and desorption isotherms, water content, preservation.

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

SPECIES DIVERSITY OF THE MICROBIOTA OF SEA BUCKTHORN BERRIES

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Sea buckthorn has nutritional and medicinal value, which makes it an attractive object of study for scientists around the world. Sea buckthorn berries contain many sugars, organic acids, vitamins, amino acids, etc., which are a good breeding ground for microorganisms. A wide variety of microorganisms that can cause spoilage have been found on sea buckthorn berries. These are yeasts of various families, species and genera, bacteria, mold fungi. Due to the high demand for sea buckthorn fruits and the increased demand for non-thermal products, plant microflora plays an important role in assessing the impact of fruits on food quality and human health.

As objects of study, 8 varieties of sea buckthorn R1, R2, R4, R5, L1, C6, AGG, AGA at the stage of full ripeness were used [1]. Sampling for research was carried out in accordance with SM SR ISO 874:2006. The berries of the studied sea buckthorn are dry, no external signs of damage and disease were found. The isolation of microorganisms was carried out by successive re-plating on dense nutrient media. A stroke with the culture was applied in the form of a straight or zigzag strip to grow the crop, which was kept in a thermostat at a temperature of 25-28ºC for 3-6 days. The grown colonies were subjected to diagnostic testing according to cultural and morphological characteristics, by which yeasts were identified, guided by determinants and reference books.

The results of the study of phytopathogenic microbiota (fungal and bacterial) of 8 varieties of sea buckthorn, collected in the phase of full ripeness, are the average values for 3 determinations for each variety. The percentage of detected microorganisms was calculated. The results of the study showed that the phytopathogenic microbiota identified on the studied sea buckthorn fruits formed the following percentage sequence: *Rhodotorula* (2.5%) > *Geotrichum* (2%) > *Pichia* (1.5%) > *Penicillium, Cladosporium, Mucor, Candida, Alternaria* (1%) > *Aspergillus niger* (0.5%).

Comparison of the obtained results showed that the composition of the microflora of sea buckthorn berries is diverse. Species *Rhodotorula, Geotrichum, Pichia* predominate on the surface of sea buckthorn fruits, the main share falls on *Rhodotorula* (2.5%). These microbial species are part of the specific microflora of sea buckthorn fruit and can be carried by insect vectors such as fruit flies, bees and wasps.

Keywords: sea buckthorn microbiota, yeast, nutrient medium, microbial spoilage.

References:

1. MACARI, A., NETREBA, N., BOEȘTEAN, O. et. al Proprietăţile fizice și organoleptice ale fructelor de cătină albă *Hippophae rhamnoides L.* cultivată în Republica Moldova. In: *Știința agricolă nr. 1 (2021)*, pp. 51-55, CZU: 634.743:581.1.03(478)

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THE DYNAMICS OF POTENTIAL MYCOTOXIN PRODUCING FUNGI IN CORN SAMPLES DURING STORAGE

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Mycotoxins are toxic compounds which are naturally produced by certain types of fungi, and are capable of causing diseases and death in humans and livestock. Regulations for mycotoxin concentration in food and feed exist in most countries. Methods most commonly used for detection of mycotoxin contamination in food and feed are conventional analytical methods, including High-Performance Liquid Chromatography (HPLC) and Gas Chromatography (GC) and rapid immunological methods, including enzyme linked immunosorbent assay (ELISA). An alternative method for detection of mycotoxins themselves would be detecting the fungi, capable of producing mycotoxins, in food samples. In this work, we show the results of the real-time PCR analysis of four corn samples with primers, specific to the genes involved in mycotoxin synthesis and thus capable of recognizing potentially mycotoxigenic fungi.

In this work, four corn kernel samples of two lines (CP148 and CP 137) harvested in 2008 and 2018, were studied. The real-time PCR analysis was done using primers specific to the genes involved in mycotoxin synthesis (fumonisin, aflatoxin, DON, T2) and Sybr Green I as a dye.

As a result, genes involved in the synthesis of aflatoxins, fumonisin, DON and T2 were found in those samples. The set of the pathogens capable of synthesizing mycotoxins depended both on the year of harvest and on the corn genotype (on the resistance of certain genotype to mycotoxin producing agents). The samples were stored at the controlled conditions at +4 degrees Centigrade. As a result, we did not detect the increase of the number of pathogenic agents in the older samples. Moreover, the amount of the gene involved in mycotoxin synthesis in the samples of 2018 harvest was higher than in the same genotype harvested in 2008. This indicates that the storage in the controlled conditions does not result in the increase of the amount of potential mycotoxin producers.

Our study shows that real-time PCR analysis using primers to the genes involved in mycotoxin synthesis can help to track the dynamics of potential mycotoxin producers in corn samples during storage.

Keywords: corn, filamentous fungi, mycotoxins, real-time PCR,

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THE EFFECT OF THE DRY AGING PROCESS ON THE BEEF COLOR

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Color is the most important quality trait of pre-purchase beef, serving as a quality and freshness indicator. This index determines the value of a carcass, depending on the pH value, the concentration and chemical, physical state of myoglobin and the attached ligand (O_2, CO, NO) and, to some extent, the structure of the meat. When light comes into contact with the surface of the meat, it can be reflected, absorbed or scattered. The combination of these three behaviors determines the meat color, but primarily the reflected light determines the consumer's perception and therefore acceptability. Also, the pH status of the meat is closely related to the scattering light amount, a lower meat pH being associated with increased light scattering. The change in color parameters are influenced by the post mortem biochemical and physico-chemical changes that occur in the meat, namely in the dry aging process. In this context, in the case of dry aging meat prepared to obtain beef steaks, with the increase in the aging time, there are changes in the color parameters, with an increase in pH and an improvement in texture properties.

The purpose of this paper is to analyze the impact of beef dry aging for 14, 21, 28 and 35 days on the color change through *L**, *a** and *b** values.

For analysis, Simmental beef was cut, sliced from the carcass: T-bons and Ribeye. Fresh meat and dried aged meat (14, 21, 28, 35 days) in the aging room with controlled parameters: temperature (1±1 °C), relative humidity (80±5 %) and of air circulation speed (0.5-2 m/s) were subjected to determinations.

Meat color parameters was performed with Konica Minolta Colorimeter.

The L* parameter showed average values between 37.38 and 41.91 units during the ripening period, the meat samples have a high brightness, increasing compared to fresh beef, chromatic attributes depending on the pH value of the meat, which slightly increased during dry aging. For the a* coordinate, the average values were between 19.31 and 13.55 units - decreasing values, possibly due to the reduction in the oxygenation capacity of the meat which depends on the availability of oxygen, the oxygen diffusion in the meat and the rate of oxygen consumption. This latter factor will be decreased at the end of the dry aging period when the inactivation of oxygen-using enzymes takes place, therefore, in fresh meat, oxygenation occurs faster because the increased penetration of oxygen creates a deeper layer of oxymyoglobin, thus providing a redder color more intense. In the case of the chromaticity coordinate b*, the average values were between 13.81 and 13.50, a slight decrease, all of which are located on the positive side of the axis, which represents the yellow zone. C* chroma values show decreasing values from 23.7 to 19.12, results that explain the decrease in beef color intensity during the aging period. The color differences between raw meat and dry aged meat was expressed by ΔE, which increases proportionally with the increase in dry aging period, from 1.05 to 7.33.

The dry aging process has a favorable impact on the meat color parameters. The samples showed uniformity in the three chromatic coordinates L*, a*, b* throughout the dry aging period. Beef dry aged during 28 and 35 days has dark red color, with a high brightness compared to fresh meat and a pronounced color difference that can be observed by the evaluator's eye.

Keywords: dry ageing process, beef, color, chromatic attributes

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THE PROBLEM OF LACTOSE INTOLERANCE IN CHILDREN FROM THE REPUBLIC OF MOLDOVA

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The problem of lactase deficiency and lactose intolerance (as a clinical manifestation of lactase deficiency) was described as early as 400 years BC. by Hippocrates. Lactase deficiency is associated with a decrease in the activity of the lactase enzyme, which breaks down the milk sugar lactose. The problem of lactose intolerance is especially relevant for children of the first years of life, since at this age dairy products make up a large part of the child's diet.

In order to analyze the problem of the incidence of lactose intolerance in children from Republic of Moldova, the parents of in kindergarten children were surveyed with a special questionnaire. The results of the survey revealed that the percentage of children with lactase deficiency is 11 % and 12.7 % do not know if they are sick. At the same time, of the 11 % of respondents who have children with lactase deficiency, 2.4 % of them did not pass the lactose intolerance test. 10 % of respondents do not know what lactose intolerance is, and 72 % believe that lactase deficiency and lactose intolerance are the same thing.

Keeping lactose intolerance under control takes place by eliminating lactose-containing products from the diet. However, at the same time, the use of lactose as an additive in non-dairy products is becoming increasingly common in the food industry. One of the main solutions to avoid lactose in food would be to inform consumers. The results of the survey highlighted the fact that they are insufficiently informed about the hidden lactose in food products. When asked which foods might contain lactose, respondents mostly chose foods that clearly contain lactose. Nevertheless, such products as sausage, powdered spices, instant soups, etc. were chosen by only 30% of the respondents.

The problem of determining the presence of lactose in food products is a priority one. In this study 12 sausages types from eight local manufacturers were chosed in order to confirm or infirm the presence of lactose in them. Only in the case two of the chosen samples lactose was indicated on the label, while in the remaining ten, acording to the label, the manufacturer did not used it. However, as a result of laboratory experiments, lactose was detected in nine of the samples.

Keywords: children, hidden lactose, lactase deficiency, lactose intolerance

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THE REDUCTION OF CONTAMINATION OF BAKERY PRODUCTS WITH BACILLUS SUBTILIS

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Wheat bread is a popular food in the bakery category. Wheat flour is the most used raw material for this product, but a major problem in the bread industry arises due to the use of flour contaminated with sporulation bacteria from the genus *Bacillus*, namely *Bacillus subtilis* [1]. Their activity negatively changes the quality of the bread, and their action can take place either in the dough or after baking, due to the heat-resistant endospores that they form, thus, during bread storage, they cause diseases by degrading the starch and proteins in the core [2]. The purpose of the research was to study the impact of the addition of vegetable powders from sea buckthorn berries on the pathogenic microflora *Bacillus subtilis* and the baking conditions on the proliferation of these pathogenic microorganisms, in order to reduce the risk of the development of rope spoilage in bakery products. Under this aspect, the bread was made from wheat flour of the second quality with the addition of vegetable powders from sea buckthorn berries with concentrations of 1%, 2%, 3%, according to the classic recipe, by the biphasic method, based on sourdough liquid salty. The microbiostatic and microbicidal effect of vegetable powders from sea buckthorn berries in direct contact with *Bacillus subtilis* was determined *in vitro*. The physico-chemical quality properties of the finished product were analyzed: the volume of the bread; porosity; acidity; humidity; the chromatic and sensory parameters of the bread core (color, taste, smell, appearance, consistency). The degree of *Bacillus* contamination was determined by the baking test. It was found that the optimal concentration of vegetable powder from sea buckthorn berries is 2%, which was also confirmed by the physical-chemical analyzes that are in accordance with normative documents in force. It was found that an addition of vegetable powder from sea buckthorn berries with a concentration of 2% added to the mass of flour has a bacteriostatic effect on the spores of *Bacillus* microorganisms, inhibiting their development, thus reducing the risk of being affected by rope spoilage for up to 96 hours. It was observed that in the control sample and 1% addition of vegetable powder from sea buckthorn berries, the first signs of the wilt disease appeared after 72 h, manifested by the appearance of small spots on the surface of the peel and the presence of a slightly unpleasant smell. In the following 24 h, symptoms intensified for the control sample and 1% addition of vegetable powder from sea buckthorn berries, and in the 3% sample, these symptoms were not identified. Through the obtained determinations, the use of vegetable powder from sea buckthorn berries in the manufacture of bakery products for the prevention of rope spoilage was demonstrated and justified.

Keywords: bacillus subtilis, bread, rope spoilage, vegetable powder

References:

1. Rumeus, I., Turtoi, M., Influence of sourdough use on rope spoilage of wheat bread. *Journal of Agroalimentary Processes and Technologies* 2013, 19 (1), 94-98.
2. Aida, V. Microbiologie Specială. Ed. Universitatea "Dunărea de Jos", Galaţi, 2009, p.55.

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THE USE EDIBLE INSECTS IN THE BAKERY INDUSTRY

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Climate change and the need to reduce the carbon footprint have led to the acquisition of new macronutrient resources. Unlike meat obtained from cell cultures, for which there are currently no European Regulations for authorization as an ingredient/new food in the European Union (EU) and no legislative regulation regarding the labeling of food products with this type of ingredient, starting from 2020, the Authority The European Food Safety Authority (EFSA) and the European Commission (EC) have authorized three insects as new food ingredients – the larva of *Tenebrio molitor, Locusta migratoria* and *Acheta domesticus*. In June of this year, EFSA issued a favorable Opinion for *Alphitobius diaperinus* as a new food ingredient, and the European Regulation for placing this new ingredient on the market is expected to be published by the beginning of 2023. The objectives of this paper were to identify the technological and qualitative characteristics of food products, in which one of the ingredients was an edible insect from the four authorized by EFSA and CE, the aspects of nutrivigilance, and invention patents worldwide**.**

The Web of Science, PubMed, ResearchGate and World Intellectual Property (WIPO) databases, the official EU legislation website (european-union.europa.eu) and scientific dossiers issued by EFSA for the authorization of insects have used edibles, for the period between 2016-2022.

Original articles on the use of edible insects in the meat, bakery, confectionery, and dairy industries were identified. Edible insect meal can be used as a functional ingredient for the manufacture of emulsified meat products. Although insect flours do not contain starch, due to their high protein content, they influence the formation of the gluten network by decreasing its strength. Bread with insect meal (*Tenebrio molitor, Acheta domesticus* and *Alphitobius diaperinus*) had acceptable volume and sensory qualities agreed by the tasters.

Edible insects represent a sustainable source of protein, for obtaining foods for which they have been authorized by EFSA and EC, such as *Tenebrio molitor* - multigrain bread and buns, crispy biscuits and breadsticks, cereal bars, pasta-based products dry, filled, premixes (dry) for bakery products, sauces, potato and/or legume-based preparations, meat-like products, chocolate bakery products, and others, provided for in Regulation (EU) no. 169 of 2022 - authorizing the introduction to the market of the yellow mealworm (*Tenebrio molitor larva*).

Key words: bakery, insects, protein source

THE USE OF SPENT GRAIN IN OBTAINING SOME FLOUR PRODUCTS

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Worldwide, 14% of food products are lost or wasted starting from the raw material (after harvesting, throughout the food chain) to the retail level. Food waste results not only in economic loss but also in immense environmental pollution, for example, food waste is associated with approximately 7% of total global greenhouse gas emissions. In addition, food waste is a big challenge for improving global food security, especially considering the fact of requiring around 60% more food for the growing world population by 2050. That is why it is necessary to reduce food waste during the food supply chain and find solutions for food security in a sustainable way [1,2].

Spent grain is the main by-product resulting from the brewing process and from the manufacturing process of some distilled alcoholic beverages. It contains husk, pericarp, and seed coat and is largely made up of cell walls. Spent grain can be successfully used in value-added products, enriching their nutritional value and chemical composition, being available throughout the year at a low purchase price. In our research we used spent grain resulting from the brewing and malt whisky industry. Both by-products are rich in fiber and protein content, which can increase the functional value of the finished products with the addition of spent grain. The studies carried out were based on the use of spent grain in recipes for the manufacture of pasta, wafers and an assortment of ginger bread [2,3]. The level of consumer acceptability was relatively high, averaging up to 15% spent grain, which makes it suitable for use in flour products.

The recipes for flour products developed through the research carried out demonstrate the existence of viable solutions for valorisation spent grain in new food products with added value and low costs.

References

1. Taghian Dinani, S., & van der Goot, A. J. (2022). Challenges and solutions of extracting value-added ingredients from fruit and vegetable by-products: a review. *Critical Reviews in Food Science and Nutrition*, 1-23.

2. Chetrariu, A., & Dabija, A. (2022). Valorisation of Spent Grain from Malt Whisky in the Spelt Pasta Formulation: Modelling and Optimization Study. *Applied Sciences*, *12*(3), 1441.

3. Chetrariu, A., & Dabija, A. (2022). Study of the Utilization of Spent Grain from Malt Whisky on the Quality of Wafers. *Applied Sciences*, *12*(14), 7163.

THE USE OF NATURAL PRESERVATIVE IN PRODUCTION GUMMY CANDIES: VALUATION OF LOCAL WINE VINEGAR

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Today, manufacturers need to take care of getting into this niche and gaining the trust of customers, striving to make their product high-quality and natural. Healthy lifestyle has also extended to unexpected product categories like sugary drinks, chips and candy. At present, attention is paid to the development of food products, in which not only the components are obtained from natural sources, but also natural preservatives are used. This study evaluated the use of local raw materials: grape juice, wine vinegar and natural honey to replace artificial additives in the production of natural gummy candies. Summarizing the analysis of the organoleptic properties of jelly sweets with wine vinegar, we can conclude that the best results were obtained by samples with an amount of vinegar equal to 5 ml per 150 ml of juice, that is, 2.5% of the total mass of the candy. Calorie calculation showed that the calorie content of the developed gummy sweets is not high and varies from 94 to 124 kcal/100 g, which is on average 2 times less than other dietary gummy sweets without sugar and 3 times less than ordinary sweets with sugar content. The results of the study of vit. C showed that its amount in 100g of the product is on average 2.11 ± 0.45 mg (3% of the recommended daily dose), which is approximately half the amount of vit. C contained in 100g of grape juice. It can be concluded that the developed technology for the preparation of sweets retained the vitamin from the raw materials used as much as possible. The antioxidant activity of sweets varies from 44 to 52%. The indicator is quite high and is explained by the content of grape juice, at least 75% in the composition of the product, which is rich in antioxidant properties; also, natural honey and natural wine vinegar are present in sweets, which also contain antioxidant substances in their composition. The antioxidant and antimicrobial properties of the plant materials used play an important role in suppressing the development of various microorganisms. This allows you to stabilize the system and increase the shelf life of natural chewing sweets. According to the results it can be concluded that these chewing sweets have functional properties due to the presence of biologically active compounds and are competitive along with imported analogues.

Keywords: natural candies, vinegar, honey, grape, acid acetic.

References:

1. Government Decision Nr. 221, 2009, (in Romanian), *Official Monitor of the Republic of Moldova*, 24.03.2009, no. 59-61, art. 272
2. Chirsanova, A., Boiștean, A., Covaliov, E., Reșitca, V. Valorisation de coquilles de noix broyées dans le processus de fermentation acetique afin d'obtenir du vinaigre, Le gaspillage alimentaire: gestion et revalorisation des d chets alimentaires. *Editura AcademicPres,* Cluj-Napoca. 2021, pp.151-166. ISBN :978-973-744-886-6. Disponibil: http://cris.utm.md/handle/5014/1046

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TRADITIONAL MOLDOVAN CHEESE MICROFLORA

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Moldovan cheese, named "Brinza" is a traditional cheese made from cow's, goat's and sheep's milk. Moldovan cheese is part of the cultural heritage of our country but still isn't registered as a Protected Geographical Indication. It is produced in several variants, while the main cheese made from unpasteurized milk. The quality of cheese is largely influenced by the origin of microflora of milk and traditional technological process of production, which has a crucial effect on development of microflora.

The aim of current study was to update the knowledge about diversity and concentration of lactic acid bacteria in Moldovan cheese at different levels of maturity. For the quantification of lactobacilli, lactococci, yeasts, molds and accompanying contaminating microflora (E. coli, coagulase-positive staphylococci) was used culture analysis. Selected isolates of estimated lactobacilli and lactococci were identified using polymerase chain reaction (PCR) and DNA sequencing. To characterize prokaryotic and eukaryotic diversity of microbial communities, we used culture analysis.

In samples of sheep cheese, were found that the concentration of lactic acid bacteria reached values of 1×10^6 UFC/g already after the first day of ripening, but pH value were found on the 2nd and 3rd days of ripening (5.1–4.8), corresponding with the recommended range. Also, was observed increased concentrations of *E. coli* and yeasts in cheese and several colonies of *Streptococcus aureus* correspond to the fact that the cheeses were made from unpasteurized milk without added support culture and the suppression of undesirable microorganisms was left to competition and the effect of matrix acidification.

A total of 40 colonies of presumed lactococci and 20 colonies of presumed lactobacilli were identified from each sample of cheese by species multi-stage multiplex PCR, or by amplification and sequencing of the 16S rDNA section.

Were identified the highest number of selected colonies as *Lactococcus lactis subsp. Lactis* and *Lactobacillus plantarum*. Other identified species were *Lb. paracasei*, *Lb. brevis*, *Lc. lactis subsp. cremoris, Lb. fermentum, Lb. rhamnosus*, *Lb.delbrueckii* and *Lb. casei.*

Through cultivation analysis, were found that the main component of bacterial microflora of cheese are lactococci (mainly *Lc. lactis subsp. lactis),* lactobacilli (mainly *Lb. paracasei, Lb. helveticus, Lb. brevis and Lb. plantarum*), further *Streptococcus thermophilus*, and bacteria from the genera *Leuconostoc* and *Enterococcus*. Other highly identified yeast genera were *Yarrowia spp.* (*esp Y. lipolytica*), and *Kluyveromyces spp.* (*especially K. lactis and K. marxianus*).

On this basis, maybe assume the presence of metabolites and products of autolysis, including enzymes that they contribute to the creation of a typical profile of aromatic substances of the product.

Keywords: lactic acid bacteria, PCR, microbiota, brinza.

USE OF BY-PRODUCTS OF THE FOOD INDUSTRY IN THE ANIMAL FEEDS

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The fourth major crop after rice, wheat and corn, the potato plays an important role in human nutrition around the world. In the food industry, potatoes are used in the production of french fries, instant mashed potatoes, chips, which are gaining popularity among consumers due to their taste. In the feed industry, potato by-products are used in the production of feed for farm animals and poultry. In other industries, potatoes are used to produce starch, alcohol, lactic acid, acetone, glue, and biofuels. Growing and processing potatoes is a profitable industry, but the processing produces a large amount of by-products that must be processed. The food industry creates a huge amount of potato peels as a by-product, which poses a threat to the environment due to its microbial spoilage. Potato peeling can be done mechanically or manually. With the mechanical method of peeling potatoes, 15-60% of by-products are formed [1, 2]. Industrial processing of potatoes annually produces from 70 to 140 thousand tons of cleanings worldwide.

Physical properties, chemical and microbiological indicators were determined in fresh potato peels according to standard methods and techniques recommended for scientific research.

The physical properties of fresh potato peelings were studied, namely, the moisture content, which was 69.6%, and the bulk density, which was 620 kg/m^3. Potato peelings are characterized by unsatisfactory physical properties, which distinguishes them from traditional raw materials and belongs to the class of heavy raw materials. Potato peelings are rich in nutrients and biologically active substances containing crude protein - 1.9%, crude fat - 0.1%, crude fiber - 1.1%, crude ash - 0.9%, nitrogen-free extractives - 21.6% The use of potato peels as a feed component for farm animals and poultry reduces feed conversion. When wet, they can be introduced into cattle feed up to 20%. Fresh potato peelings in the first hours contained MAFAnM - 3.2*10^3 CFU/h, when stored for 24 hours, MAFAnM increased to 90*10^3 CFU/h, after storage of 48 hours, MAFAnM increased to 160*10^3 CFU/h. Wet cleaning must be used in the immediate vicinity of the potato processing site on the first day due to microbial and enzymatic spoilage. Various technological processes for processing potato waste are used, such as drying, granulation with grain raw materials, ensiling. the extrusion process, which makes it possible to obtain a new generation of compound feed. Extrusion is an ideal technological process for enriching animal feed with nutrients and biologically active substances. The use of potato peelings as a component of extruded feed additives will make it possible to expand the range of the feed base, reduce the costs of concentrated feed per unit of production and reduce the harmful impact of waste on the environment.

Based on the analysis of the problems of using fresh potato peelings in the production of mixed fodders, their physical properties, chemical and microbiological indicators were studied, which distinguishes potato peelings from traditional raw materials and belongs to the class of heaviness, which must be taken into account when included in the composition of mixed fodders. It is proposed to include fresh potato peelings in the compound feed using extrusion, which will make it possible to obtain a new generation of compound feed.

Keywords: potato peelings, food waste, potato processing.

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

ANALYSIS OF THE ELEMENTAL COMPOSITION OF MOLDOVAN WINES

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The increase in the competitiveness of wines from the Republic of Moldova is extremely current. In order to provide the domestic wine industry with a base on foreign markets, its production must reach an internationally accepted quality level. The production of wines with protected geographical indication (PGI) and protected origin (PDO) presents such an opportunity.

Mineral composition of wine is of great interest for wine consumers and producers, since it can provide determinant criteria for wine price, guarantees of quality, identification of wine geographical origin. The main objective of this paper was to apply inductively coupled plasma atomic emission spectroscopy (ICP-AES) for determination of major and trace elements in wines and to determine the relationship between geographical regions and technological factors. The ICP-AES measurements were carried out on a ICPE-9000 spectrometer (ICP-AES, Shimadzu Co., Japan).

Two high sensitivity multi-elemental techniques for used to determine concentration of eight elements in 22 red and white wine samples. Potassium (K) is the most abundant of the inorganic constituents of the wines (about 75% of the total cation content of wines). K concentration in the studied samples ranged from 276 to 768 mg/L. The concentration of sodium (Na) was approximately 20 fold lower in comparison with potassium content. The Na content was found to be between 9 and 30 mg/L. Calcium (Ca) is a natural constituent of musts and wines, necessary for the normal course of alcoholic fermentation. Ca sources for wines include the soil, the treatment of the musts with Ca salts and, ion exchange treatment. In studied wines Ca concentration was between 38-90 mg/L. Magnesium (Mg) concentration in studied wines was between 42.2-108 mg/L. The concentrations of aluminium (Al) in studied wines were in the range 0.9-2.5 mg/L and do not exceed the recommended value for Al, which should be not upper than 3 mg/L. Iron (Fe) content in wines is an important parameter controlling their quality and stability, the main problem that appears in wines is their instability to Fe concentrations greater than 10 mg/L. In present study Fe content in wines varied from 0.5 to 7.9 mg/L. Low zinc (Zn) concentrations in wines play a vital role during fermentation, whereas high concentrations influence badly its organoleptic properties. Data obtained for Zn do not exceed value recommended by OIV and average out at 0.3 -1.2 mg/L

The concentrations of eight studied elements in Moldovan wines are in the good agreement with the literature data. Concentration of Zn and Na do not exceed permissible levels. Mg and Al concentration permit to divide wines in two groups, supporting their different geographical origin. Moderate wine consumption contributes for the daily nutritional requirements of essential metals.

Keywords: elemental content, ICP-AES, metal level, wines.

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ANALYSIS OF THE PHYSICAL PROPERTIES OF FRUIT YOGURT

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In this work, there were examined the rheological attributes of yogurt processed from a mixture of goat and cow milk (series I) and actual goat milk (series II) supplemented with black chokeberries (*Aronia melanocarpa*, Nero variety), raspberries (*Rubus idaeus*, Cușma lui Guguță variety) and strawberries (*Fragaria xanassa*, Selva variety).

Texture, firmness and viscosity are the main quality parameters of yogurt. Consumer acceptance of yogurt is based on physical attributes such as: without syneresis, characteristic flavor and good textural properties. The differences in texture between yogurts depend on the type of milk and the chemical composition.

The yogurt was manufactured, under laboratory conditions, by the thermostat method, from a mixture of cow's milk and goat's milk in a ratio of 45:45% +10 % of black chokeberries, or raspberries, or strawberries puree (Series I) and from goat's milk 90 % + 10 % of black chokeberries, or raspberries, or strawberries puree (Series II). The methods used were: viscosity determination and texture evaluation.

The obtained results show differences between the yogurt samples. However, adding 10% fruit puree to yogurt increases the viscosity during fermentation in all samples, and the best viscosity and firmness is observed in P2 (2500 ±0.023 mPa·s) of Series 1, due to the presence of hydrocolloids in black chokeberries fruits, which produced a better textural quality than the rest of the samples. In the samples of Series II, in which only goat's milk was used, a lower viscosity was observed compared to the rest of the samples.

The effect of storage temperature was compared between samples, and the results were recorded at different temperatures (6, 12, 18°C). It was found that the lower the storage temperature, the higher the viscosity values. Regarding the storage temperature, it was observed that P2 (yogurt with black chokeberries) from the yogurt Series I presented the most consistent values with a decreasing tempo, these results being due to the gel formation process through the influenced casein values of hydrophobic interactions, favored by low temperature and higher resistance.

The results obtained demonstrate the positive influence of fruit hydrocolloids. Thus, Series I presented the best values of the texture evolution in relation to the samples from Series II, a fact explained by the increased density of the network from a physical point of view, and by facilitating the connection with water molecules, increasing the water binding capacity of the gel, from a chemical point of view. P3 of Series I had higher firmness due to high fiber raspberries and total dry matter. Series II yogurt was characterized by lower hardness, stickiness, extrusion forces and higher susceptibility to syneresis, was less viscous than series I yogurts.

Samples from Series 1 of yogurt is shown to be better in textural properties and appearance: viscosity improved, structure maintained, syneresis inhibited and taste perception modified, because the cow's milk had a stronger protein network.

Keywords: goat's milk, cow's milk, viscosity, texture, temperature.

ANTIMICROBIAL EFFECT OF BASIL, THYME AND TARRAGON AGAINST *S. ABONY*

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New advances and techniques in food technology have facilitated efficient identification, processing and extraction of bioactive compounds from herbs and spices in order to include them in functional foods and nutritional supplements. Plants, due to the large biological and structural diversity of their components, constitute a unique and renewable source for the discovery of new antibacterial, antifungal and antiparasitic compounds. The majority of natural antioxidants are phenolic compounds, and the most important are the tocopherols, flavonoids, and phenolic acids.

The research focuses particularly on basil, thyme and tarragon as an alternative natural antioxidants and antimicrobials with potential use in the meat industry. Use of herbs and spices essential oils in meat products may be interesting to food processors due to their antimicrobial characteristics. This paper provides an overview of the most important information on the positive effect of the bioactive compounds of basil, thyme and tarragon and its uses as a preservative in foods.

Sausages was obtained by the classical method (control test) and with the addition of extracts of basil, thyme and tarragon in concentrations of 0.1; 0.2 and 0.3%. Sausages previously infected with reference strains: *S. Abony* were investigated for the growth rate of pathogenic microorganisms within 24 and 48 h. The bacterial cell suspensions were adjusted with sterile saline to a concentration of approximately $2*10^5$ CFU/mL. All assays were performed in triplicate. The differences were considered statistically significant if p-value <0.05.

The experimental results confirm the antimicrobial properties of ttymus basils and tarrogon. The most effective in reducing S. *Abony* was basil, in the samples with an addition of 0.2%, the decrease in bacterial growth was 77.2%, and in those with an addition of 0.3% the decrease in infestation was 84.4%. Approximately these values were also maintained in the samples with the addition of 3% tarragon (76.7%) and thyme (61.6%). The interdependence between the percentage reduction of *S. Abony* infestation and the concentration of basil, mushrooms and tarragon was respectively: basil (R^2 = 0.7495 …. 0.8236), thyme (R^2 = 0.7536 … 0.7681), tarragon (R^2 = 0.7689 … 0.8137).

Keywords: basil, tarragon, thyme, antimicrobial activity, antioxidant activity, meat products

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BIOPOLYMERS FROM FOOD WASTES

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Economic and social progress over the last century has been accompanied by environmental degradation that is endangering the very systems on which our future development, our very survival depends. Worldwide consumption and production is a driving force of the global economy which rest on the use of the natural environment and resources, and waste generation. Around the world, waste generation rates are rising. In 2020, the world was estimated to generate 2.24 billion tonnes of solid waste. With rapid population growth and urbanization, annual waste generation is expected to increase by 73% from 2020 levels to 3.88 billion tonnes in 2050. Food and plastic waste constitutes a remarkable portion of municipal solid waste, with the bulk of it ending up in landfill, incinerated or leaking into the environment.

The waste resulting from synthetic plastic materials (especially those from packaging) has greatly expanded in the surrounding environment and it has become a serious global problem. Thus, the scientists began to research biopolymers made of natural sources of plant, animal, insects, microbes or their waste. So, in order to produce bioplastic materials, it can be used the food waste (husk, leaves, sawdust, egg shells, exoskeletons of crustaceans and so on), which, also, are recycled for energy recovery or to produce fuels, cement, fertilizers, biosensors, nanomaterials, fillers, fibers etc. [1]. The most important characteristics of the food waste are regenerability, compostability, biodegradability and low cost. The natural biopolymers can be produced from polysaccharides, such as starch (rice, potato, wheat and corn), cellulose (straw and wood), chitin (crustaceans and insects), lignin (various plants) and, also, from proteins such as collagen (pig and cattle skin and bones). The biopolymers produced by various microorganisms and bacterial fermentation of cellulosic, agro and organic waste are the polyhydroxyalkanoates (PHAs). The properties of polyhydroxyalkanoate copolymers can be adjusted so that they can replace petroleum-based polymers such as polyethylene (PE), polypropylene (PP) and polyethylene terephthalate (PET). Thus, the natural and microbial biopolymers often are used for food packaging applications.

Keywords: biodegradability, biopolymers, environmental protection, plastic waste

References:

[1] O. Das, K. Babu, V. Shanmugam, K. Sykam, M. Tebyetekerwa, R.E. Neisiany, M. Försth, G. Sas, J. Gonzalez-Libreros, A.J. Capezza, M.S. Hedenqvist, F. Berto, S. Ramakrishna, Natural and industrial wastes for sustainable and renewable polymer composites, Renewable and Sustainable Energy Reviews. 158 (2022) 112054. https://doi.org/10.1016/j.rser.2021.112054.

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CHEMICAL CHARACTERIZATION OF ALGINATE-ENCAPSULATED PLANT EXTRACTS

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Aromatic plant extracts can serve as an alternative source of bioactive compounds with a broad spectrum of antioxidants. However, their use in food industry is limited by factors such as the instability of bioactive compounds during food processing and adverse effects on the sensory properties of food. An efficient approach to protect bioactive compounds sensitive to environmental factors is the encapsulation of extracts in biopolymer matrices, which leads to improved stability and bioavailability, controlled release in the gastrointestinal tract.

In this study, hydroethanolic extracts of three species of plants: basil (*Ocimum basilicum*), rosemary (*Rosmarinus officinalis*) and summer savory (*Satureja hortensis*) were encapsulated in sodium alginate using the drop technique. Afterwards the microcapsules were dried by lyophilization. In order to characterize the microcapsules, the following parameters were determined: solubility, swelling index, encapsulation yield and efficiency, scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC).

The values of the total polyphenol content of the aromatic plant extracts showed a variation between 26.18 mg GA/g DW obtained for basil and 43.10 mg GA/g DW for summer savory. SEM images revealed the presence of microparticles with spongy appearance, showing heterogeneous surface morphologies. The encapsulation yield varied between 76.8±1.1% in the case of basil extract and 81.0±1.3% in the case of rosemary extract, while the encapsulation efficiency varied between 1.41±0.03 for basil and 14.76±0.16 for rosemary. The swelling index and solubility varied in the range of 79.2±0.2–87.4±0.4% and 19.8±0.3–22.5±0.4%, respectively. The chemical constitution of the microcapsules was confirmed by FTIR and high thermal stability was proved by DSC. Alginate-encapsulated plant extracts were used to fortify cream cheese and concentrated yogurt.

The results suggested that sodium alginate forms stable interactions between the reactive sites of the polymer and the aromatic plant extracts, keeping the bioactive compounds intact. Therefore, alginate-encapsulated plant extracts are an effective and important tool in the preparation of high-quality products, improving their chemical, oxidative and thermal stability.

Keywords: aromatic plants, hydroethanolic extracts, polyphenols, encapsulation, cream cheese, yogurt

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COLOUR-THE MARKER MATURITY FRUITE OF SEA BUCKTHORN BERRIES

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The sea buckthorn (Hippophae rhamnoides L.), is widely cultivated on the territory of the Republic of Moldova, is distinguished by a consistently high fruit yield and is of particular importance in the food industry.

In this work, the colour change of white catina fruits during the ripening period was examined.

The timing of harvesting of white currant fruit is very essential, differs from one variety to another and depends on the soil and climatic conditions, the agronomic measures applied [1].

During the ripening period, the colour of white currant fruit changes from green to yellow-orange due to the accumulation of carotenoids. In parallel with the accumulation of carotenoids, the vitamin content and antioxidant capacity increase significantly [2].

The aim of this work is to analyse the evolution of colour, as a ripening marker, during ripening of white hawthorn fruits.

Color changes were compared as a marker of ripening of white hawthorn during ripening/ripening of Cora and Mara varieties, 2021 harvest, Dubasari district, Pohrebea village, Republic of Moldova.

Color indices of white currant were determined on the surface of the fruit by CIELAB method using "CROMA METER CR-400" apparatus.

The values of the red-green component a*, in the variety Mara increased from 15.98 to 24.9, in the variety Clara from 12.58 to 22.3, this is explained by the decrease of the green hue. The values of the yellow-blue component b*are also increasing, the Mara variety from 46.51 to 53.2 and the Clara variety from 55.27 to 64.2, which shows the progression of the yellow colour. Once the ripening age is reached the b* component values remain constant.

The H* shade angle for Mara is 1.240 to 0.990, which represents a lighter shade, and for Clara a darker shade from 1.350 to 0.90. The overall colour difference, ΔE* was more considerable in the Mara variety.

It has been shown that at the point of eating maturity, the a* and b* component values remain constant, indicating that instrumental colour analysis can be used as a marker of ripening stage.

Keywords: white currant, baking marker, evolution, hue angle.

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DELAWARE - AN OLD GRAPE VARIETY – REDISCOVERED

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Delaware is a hybrid grape variety of American origin. It was first grown in Delaware City, Ohio, but it is said to originate in New Jersey. It is widely cultivated in the MidWest and North - East of the USA, especially in the New York state. In Delaware, we can find a much smaller surface. Delaware is also widely grown in Japan, where it's used for light table wine. In Japan, as well as in South Korea it's also sold for direct consumption as table grapes. This variety was first discovered in Frenchtown, at the border of New Jersey and Pennsylvania states, which are separated by the Delaware river. Afterwards the vines have spread to all over the world under the name of "Delaware", from the city's name. The DNA analysis, made in 2015 in USA, has determined that Delaware is an interbreeding between (*V. aestivalis* x *V. labrusca*) with *Vitis vinifera* [2, p. 9]. It probably reached Romania and Moldova somewhere in the post-phylloxera period. In the Republic of Moldova this variety is found scattered in a few areas within Calarasi and Ungheni districts (Cula Valley), its local name being Dolivar. During the research within the project "Education for national cultural revitalization through traditional technologies for processing various heritages in the Republic of Moldova, in the context of multiculturalism and European integration", the variety was localized in the CODRU wine region. Afterwards we proceeded to the monitoring and detailed research phase of the terroir and the variety. It was very interesting to observe the artisanal ancient technique of winemaking, while also experimenting with modern oenological technologies. A unique experience which encompassed the full spectrum research, as well as managing the winemaking processes from Dolivar grapes, while using performant processing equipment. The grape skin has a dark pink color, so Dolivar looks like a red wine grape variety, however it is habitually used for making white and rose wines. It is a "slipskin" variety, meaning its skin is easily removed from the pulp. Therefore, during pressing, the juice gets minimal color pigment. Delaware can be transformed in a wide variety of wine styles, most famous being Ice Wine and Sparkling Wine. In the vineyard, it ripens faster than Concord; the variety to which is often compared. In the Republic of Moldova territory, this variety ripens after Pinot gris and Traminer. We have gathered a certain amount of Dolivar grapes from existing vineyards. The grapes were harvested on 14th of September 2022, at a sugar level of 25%. First, the grapes were cooled outside during the night at a temperature of +6 C^0. In the morning of 15th of September, the grapes were crushed; the must temperature being + 8 C^0. After crushing, the must was macerated for 2 days, and the yeast was added on the 3rd day and left to ferment for one more day. On the 4th day we separated the juice from the pulp and skins. The amount of clear juice was 50% from the total amount of crushed grapes. The juice was left to ferment in the cellar at a temperature of + 14 C^0. The wine evolution is under strict supervision. We will continue to monitor the fermentation process and appreciate the organoleptic properties of the Dolivar Wine. As we want to deepen our scientific research, we are connecting with experts from the field, in order to eventually obtain a DNA analysis of the Dolivar variety from Cula Valley. We would like to compare the DNA of the local variety to the american one in order to detect differences and/or similarities of Delaware variations. The alliance of modern and traditional technologies brings added value and offers new dimensions to the revival and perpetuation of the national cultural heritage. As the winemaking tradition is a deeply rooted compound of national patrimony.

Keywords: Dolivar, ravac, wine region, terroir, wine.

References:

1. http://www.wineloverspage.com/wlp_archive/wineguest/wgg.html
2. Making Wine for Home Use, Karl L. Wilker, Tavis S. Harris, Marilyn B. Odnealand Murli R. Dharmadhikari, State Fruit Experiment Station Southwest Missouri State University Mountain Grove, 2015

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EXTRACTION AND PURIFICATION OF TOTAL DNA FROM SOIL FOR PCR IDENTIFICATION OF MICROORGANISM COMPOSITION

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Monitoring the composition of the soil microbiome is an important aspect of successful vineyard management. Microorganisms involved in the production of wine during the fermentation process affect its metabolite profiles and, ultimately, quality. Firstly, for successful identification of the species composition of soil microflora, using PCR analysis, high quality DNA free from inhibitors is required. Secondly, representative amount of microorganisms' DNA must be in the sample. This paper outlines the combination of several methods of DNA extraction and purification from the soil, suitable for PCR analysis.

15 soil samples were collected from vineyards from different regions of Moldova, 1 g of each sample was thoroughly grinded with equivalent amount of Al2O3. The extraction was carried out in 5 ml 5% SDS buffer (0.2M Tris pH 8, 0.25M NaCl, 0.025M Na2EDTA) during 1.5 hours at 650C with occasional vortexing. After cooling at room temperature, the samples were centrifuged at 6000 rpm for 20 minutes and the supernatants were transferred to the new tubes. Considering the high content of humic acids (PCR inhibitors) in the material, several methods from ISO 21571:2005 were successively applied for DNA purification. So, 240 mg of PVP powder (M 360) and 0,5 V of ammonium acetate 7,5 M were added to each sample. After mixing, the samples were incubated on ice for 30 min, then centrifuged at 6000 rpm for 20 min. The supernatants were transferred to the new tubes, DNA was precipitated with equal volume of isopropanol at −20 °C for 30 min. The samples were centrifuged at 6000 rpm for 20 minutes, the residues were washed with 80% ethanol, dried and dissolved in 1 ml of CTAB extraction buffer. (CTAB 20g/l, NaCl 1.4M, Tris 0.1M, EDTA 0.02M). Next, double volume of CTAB precipitation buffer was added (CTAB 5g/l, NaCl 0.04M). After mixing, samples were incubated for 1 hour at 160C, then centrifuged at 12000g for 10 minutes. The residues were dissolved in 0,6 ml 1.2 M NaCl, farther equal volume of chloroform: isoamyl alcohol (24:1) was added, mixed and centrifuged at 12000g for 10 minutes. The supernatants were transferred to the new tubes. DNA was precipitated with 2,5 volumes of ethanol, was washed three times with 80%, dried and dissolved in 0,2 ml of deionized water.

The quality of the soil DNA was determined by PCR using the primers homologous to the specific regions of the 18S rRNA gene sequences of the plant and purified tomato DNA as an internal positive control.

As a result of the action of the primers pair to the 18S rRNA gene of plants, a 315 pb fragments were synthesized, the length of which corresponds to the expected. The positive signals were detected for all 15 samples of soil DNA using PCR assay. It was shown that the material is free from inhibitors, in an amount acceptable for use in PCR. So, the proposed procedure of DNA isolating and purifying from soil allows to obtain high quality material for subsequent molecular studies.

Keywords: DNA isolation, DNA quality, soil, PCR, primers

Acknowledgements: This work was funded by the State Project 20.80009.5107.09 "Improving of food quality and safety through biotechnology and food engineering", running at Technical University of Moldova.

FETEASCĂ NEAGRĂ WINE QUALITY INFLUENCED BY TERROIR IN DIFFERENT ECOSYSTEMS FROM REPUBLIC OF MOLDOVA

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Wines' authenticity and typology is a difficult but important problem that can be solved by a correct quantification of a large segment of aspects, starting with vine cultivation conditions and ending with ways of selling the wine. The local Moldavian grape varieties *Feteasca Neagra* is an attractive prospect to winegrowers, as it is resistant to both cold temperatures and drought conditions. It ripens late and has thick skins, leading to wines with an excellent concentration of anthocyanins, giving good pigment to the wines.

The aim of the study is to quantitatively evaluate the summary content of phenolic substances in *Feteasca Neagra* wine samples obtained by classical technological variant of maceration-fermentation of grapes from different national wine-growing regions. The harvest time was at the same date and grapes presented similar uvological and physico-chemical parameters.

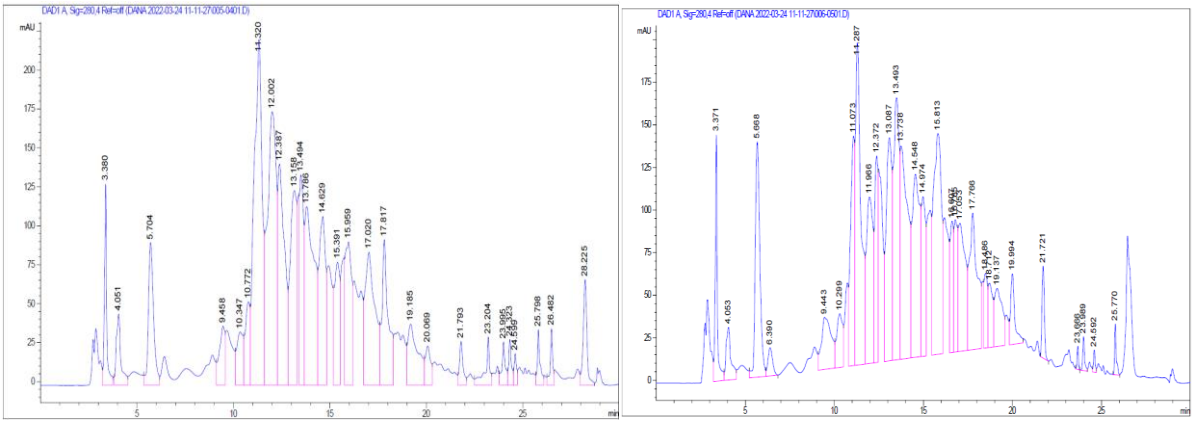

Figure 1. HPLC chromatogram of *Fetească Neagră* wine sample (left image cultivated in the Mileștii Mici vineyard/Ialoveni district and right – Stefan Vodă, vintage of year 2021).

The results show a high variability, induced both by the cultivation conditions and the selected type of Fetească Neagră. The different climatic conditions during the years, different soil types from one area to another, the crop load and vine age, were factors that influenced the quality of grapes and wine, highlighted the particular adaptability of this variety. Variety gives good results on deep and fertile soils which ensure acceptable production and both on thin and rocky soil type, on which are highlighted the variety quality potential. Under these conditions of growing technology with the soil type and environmental resources of the area, make it possible to achieve special wine that ensures customer demands through the special sensory qualities, typicity and authenticity in promoting Moldavian wine.

Keywords: authenticity, cultivation conditions, phenolic substances and vinification conditions

Acknowledgment: The authors would like to thank the Moldova State Project no. 20.80009.5107.09, "Improvement of food quality and safety by biotechnology and food engineering", running at Technical University of Moldova.

INFLUENCE OF TEMPERATURE AND PH ON THE COLOUR PARAMETERS OF RED BEETROOT PIGMENTS

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Food colour is an important characteristic influencing considerably the consumption decision and it can be drastically changed by different factors. More than that, the increasing demand for functional foods and the potential of plant kingdom to offer an endless source of healthy pigments, recommends natural pigments originated from plants as replacement for the synthetic pigments. But, simultaneously, it rise the problem of pigments stability during the extraction and all the procedures concerning their inclusion into the functional foods. There are also, important qualitative and quantitative differences between the pigment content of different varieties of the same plant. The present research studies the influence of temperature and pH on the colour of 3 varieties of red beetroot aqueous extracts.

Three varieties of red beetroot (*Beta vulgaris* L. var. rubra) were analysed: Bordeaux, Cylindra and Detroit. The pigments extraction was performed using distilled water, at room temperature for 75 min and was followed by filtration. The initial betanin content was measured at 538 nm. The CIELab colour parameters were determined for the native pH (4.96±0.11), but also at more acidic (3.29±0.07) and alkaline (10.53±0.03) pH. The influence of temperature was studied at 25°C (room temperature), 45°C and 75°C.

The variety Detroit proved the highest betanin content, followed by Bordeaux and Cylindra. The analysis of CIELab parameters confirms that pH strongly affects the colour of betalains. At native and more acidic pH, the initial colour of all extracts was reddish at room temperature, but at pH 3.29±0.07, it was very unstable in case of Bordeaux (changing to brown after about 16 hours at 4°C) and Cylindra (changing to yellow). At alkaline pH, the initial colour of extracts at room temperature was blue-violet. The temperature affects the colour stability, especially in the presence of acid or alkaline pH. At the native pH, the temperature effect was lighter, especially in case of 45°C treatment and of Detroit variety.

Detroit variety of red beetroot proved the most important betanin content, and the best colour stability at native pH, for all the studied temperatures. As consequence, from the three studied varieties, Detroit is recommended to be used as a source of betanins, which can be used as natural food dyes at pH around 5.

Keywords: Beta vulgaris, betacyanins, betalains, betanin content, CIELab, stability

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The selected papers in extenso will be published in the Journal of Engineering Sciences (https://jes.utm.md/)

KINETIC AND TECHNOLOGICAL INVESTIGATION ON FETEASCĂ NEAGRĂ GRAPE POMACE EXTRACTS

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Grapes are one of the most cultivated fruits worldwide. Red and white winemaking processes result in substantial quantities of solid organic waste, such as grape marc (pomace) and stalks, which requires suitable disposal. Grape marc accounts for 15-25% of the mass of grapes crushed and contains unfermented sugar, alcohol, polyphenols, tannins, pigments, and others valuable compounds. Despite grape marc having a bioactive potential, advanced technologies to exploit this have not been widely adopted in wineries and allied industries. The recovery of functional phenolic compounds from red grape marc can be achieved, obtaining products that can be reinserted into the economy as a new raw material.

The purpose of the presented research is to obtain *Feteasсă Neagră* grape pomace extracts with numerous potential applications, such as food and feed additives, functional foods, nutraceuticals and cosmeceuticals. The influence of extraction conditions on the total polyphenol content (TPC), total anthocyanins content (TAC) and antioxidant activity (AA) (determined by the DPPH test), in the ethanolic extracts of 40 and 60 % (v/v) of *Feteasсă Neagră* grape marc was research. It was shown that by increasing the extraction temperature from 35 to 75°C the extraction of the TPC and TAC increased by 17.4 % and respectively 19.6 %. The highest values of antioxidant activity (AA) correspond to the extraction rate of phenolic compounds at the temperature of 75°C and the duration of ultrasound application 10 min, being 80,50 % inhibition of DPPH radical /100 g d.s.

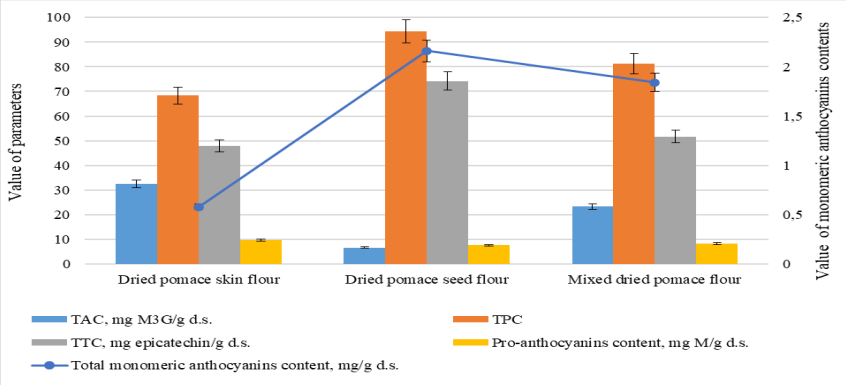

Figure 1. Dynamics of experimental parameters depending on the type of analyzed sample.

The correlation between the determined parameters varies within the 0,889-0,987 limits R^2.

The obtained results attest that the addition of citric acid, glucose and fructose in *Feteasсă Neagră* grape pomace extracts contribute to increasing the stability of the content of biologically active compounds, mainly monomeric anthocyanins. Thus, it has been shown that the degradation of anthocyanins in the presence of citric acid is much slower, which exerts a protective effect. The stabilizing effect of anthocyanins induced by the addition of carbohydrates can be explained by the reduction of water activity in the extracts.

Keywords: bioactive compounds and grape pomace extracts.

Acknowledgments: The State Project 20.80009.500727 "Physico-chemical mechanisms of redox processes with electron transfer involved in vital, technological and environmental systems", running at Technical University of Moldova, Department of Oenology and Chemistry.

MICROENCAPSULATION OF ANTHOCYANINS FROM CORNELIAN CHERRY FRUITS IN WHEY PROTEIN ISOLATE AND PECTIN

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Cornelian cherry (*Cornus mas* L.) is one of the most important forest fruits, considered as a valuable horticultural resource of bioactives, such as anthocyanins - cyanidin-3-glucoside, flavonoids, vitamins (e.g. vitamin C), carotenoids (e.g. β-carotene).

The aim of this study was to obtain designed delivery systems of bioactive from cornelian cherry, as microencapsulated powders in order to assure their controlled release and to develop stable and natural additives for different application. Anthocyanin's (concentrated extract) from cornelian cherry fruits were microencapsulated in a complex, biopolymeric matrice, formed by whey protein isolate (WPI) and pectin (PT). Two experimental variants were obtained by varying the ratio between WPI and PT, such as 1:1 (PT1) and 1:2 (PT2). The powders were tested for encapsulation efficiency of the anthocyanins, phytochemical profile of the extract and freeze-dried powders, as well as colorimetric analysis.

Encapsulation efficiency of the anthocyanins varied between 80.04 and 82.11% with an important level of biologically active compounds (total polyphenols, total flavonoids) and remarkable antioxidant activity. Colorimetric analysis reveals a red colour of the powders, associated with their anthocyanin content.

Both experimental variants proposed in this study protected the anthocyanins from cornelian cherry fruits. Moreover, microencapsulated powders can be used as natural food additives due to their red colour and phytochemical profile.

Keywords: anthocyanins, cornelian cherry, microencapsulation, pectin

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NEW APPROACHES FOR *FETEASCĂ NEAGRĂ* GRAPE POMACE VALORISATION

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Romania is an important wine producer ranked 6th among European Union countries according to International Organization of Vine and Wine. An annual evaluation on wine consumption in Romania revealed that *Feteasca Neagră* was the most consumed variety of red wine. Thus, the waste from wine industry represents an important environmental issue at national level as well as worldwide; therefore, the concern for the grape pomace reuse becomes a significant part of our research, in an attempt to find new and innovative solutions for its valorisation in different fields.

One of the strategies of valorising the grape pomace is to use it as a raw material to obtain functional foods. An innovative product based on honey and different proportion of *Feteasca Neagră* grape pomace powder was prepared, the sensorial properties and overall acceptability of fortified honey samples being evaluated. The results of the study indicate that grape pomace powder can be used as functional ingredient for the development of new product honeybased, contributing to a sustainable process innovation [1].

Another approach of valorising the grape pomace involves exploring the influence of its chemical composition on *in vitro* cultures. Therefore, the effect of the addition of different concentrations of *Feteasca Neagră* grape pomace extracts on *in vitro* growth and development of oregano was investigated. It was found that grape pomace hydroalcoholic extracts influenced the regeneration processes of *Origanum vulgare* explants inoculated *in vitro*. The stimulatory effect on the morphogenetic response depends both on the extraction method used and on the proportion in which nutrient medium was supplemented with grape pomace extracts. The research has allowed obtaining significant information concerning the influence of the extraction method on the quality content of extracts and consequently on the potential application of these grape pomace extracts on *in vitro* plant growth and development [2].

Grape pomace still represents a by-product of interest for researchers, offering permanently new approaches for its valorisation.

Keywords: functional food, grape pomace powder and extract, in vitro propagation, valorisation

References:

1. E.M. Suceveanu, L. Grosu, I.C. Alexa, A.L. Fînaru, Valorisation potential of *Feteasca neagră* grape pomace for obtaining honeybased fortified innovative product, *Scientific Study & Research Chemistry & Chemical Engineering, Biotechnology, Food Industry*, **2020**, 21, 243-252.

2. P.E. Bran, D. Nicuţă, L. Grosu, O.-I. Patriciu, I.-C. Alexa, Investigation regarding the potential application of grape pomace extracts on *in vitro* plant growth and development, *Ovidius University Annals of Chemistry*, **2022**, 33 (2), 135-142. DOI: 10.2478/auoc-2022-0020

NEW FUNCTIONALIZED DERIVATIVES OF BIMESITYLENE AS PRECURSOR FOR OBTAINING OF POLYFUNCTIONAL LIGANDS

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An important class of organic compounds, which are found in many natural products, such as biologically active compounds, alkaloids or natural dyes, is represented by biaryls and their derivatives.

One of the interesting representatives of this family is bimesitylene due to the fact that, for steric reasons, the two conjugated aromatic rings are perpendicular to each other. In this molecule, the four aromatic hydrogen atoms are arranged at the corners of a tetrahedron, and their replacement by chelating functional groups could lead to derivatives capable of forming three-dimensional (3D) networks with metal ions. Thus, the synthesis of ligands based on functionalized derivatives of bimesitylene is promising for the subsequent assembly of metal-organic frameworks, as promising materials in sorption processes.

The aim of this study was the synthesis of the compound 3,3',5,5'-tetrakis(4-iodophenyl)-2,2',4,4',6,6'-hexamethyl-1,10-biphenyl, a precursor for obtaining new ligands, which was carried out in 4 successive stages.

At the initial stage, using 2-mesitylmagnesium bromide as a starting material, bimesitylene was synthesized with a yield of 60% through the Grignard reaction in an argon atmosphere and in the presence of the catalyst.

At the second stage of the synthesis, the product 3,3',5,5'-tetraiodo-bimesitylene was obtained by the interaction of bimesitylene with iodine in a strongly acidic medium [1].

The compound 3,3',5,5'-tetraiodobimesitylene was converted by Suzuki coupling reaction to 3,3',5,5'-tetraphenyl-2,2',4,4',6,6'-hexamethyl-1,10-biphenyl upon the interaction of 3,3',5,5'-tetraiodobimesityl with phenylboronic acid in the presence of Pd^0 catalyst by refluxing the reactant mixture under inert atmosphere. After the purification and recrystallization procedure from ethylacetate/hexane, the final product was isolated in 82% yield.

In the final step of the synthesis, tetraphenyl-bimesitylene was iodinated in the *para*-positions with iodine and the oxidizing agent bis(trifluoroacetoxy)iodobenzene (PIFA) for 24 h at room temperature. The desired compound 3,3',5,5'-tetrakis(4-iodophenyl)-2,2',4,4',6,6'-hexamethyl-1,10-biphenyl was obtained in ~70% yield after recrystallization from DCM/methanol.

The composition and structures of the synthesized compounds were confirmed by the physical methods of analysis - FTIR spectroscopy, GC MS, ^{1}H and ^{13}C NMR.

Keywords: bimesitylene, ligand, organic synthesis, physical methods of analysis.

References:

[1] Bahrin, L.G., Clima, L., Shova, S. *et al. Res Chem Intermed* **45**, 453–469 (2019).

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OXIDATIVE-REDUCING PROCESSES IN WINEMAKING

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Oxidative-reducing processes are indispensable for the production, maturation and aging of wines. Some of them lead to the ennobling of wines, their stabilization, while others to the alteration, degradation of wines, to numerous defects in wines. Their consecutive, parallel, spontaneous realization, the dependence of many factors characteristic of the concrete variety of *Vitis vinifera*, on the pedo-climatic, agrotechnical, technological conditions in wine production determine their complexity and interaction with many wine parameters, as well as difficulties in studying their time impact on the main pillars of wine - structure, appearance, aromas / bouquet, taste, stability. Knowing the mechanisms of their production, the influencing factors, the particularities, allows the implementation of the precision vinification, reduction of technological, additive and subtractive interventions, quantities of adjuvants and the production of organic wines. Lately they industry focus on the realization of the equipment, meant to monitor and adjust the redox potential of wines during their production and storage. The processing of the grapes themselves involves redox processes, especially in the case of damaged and contaminated grapes, when the contact of oxygen in the air with the grape juice is facilitated. The substances, which form redox couples in grapes, must and wine, are numerous - polyphenols / quinones, GSH / GSSG, endiol diketones, acetoin / diacetyl, anthocyanins / reduced anthocyanins, dioximaleic acid / dioxitartaric acid, etc., and their influence on the product depends on their share in the general transformations during the life of the wine and become responsible for their self-life. In oxidative-reducing chemical transformations, an essential role belongs to the pairs of transition metals Fe^{3+}/Fe^{2+}, Cu^{2+}/Cu^{+}, naturally present in wines, but also in many enzymes (until their inactivation by ethanol and elimination by technological processes). The presence of phenolic substances in grapes, must and wine largely determines the physicochemical properties and quality of the finished product. In grains their oxidative transformations are catalysed by oxidase enzymes, present in healthy grapes. Monophenols are converted to ortho-diphenols by oxidation in the presence of tyrosinase (monophenoloxidase), while di- and triphenols are oxidized to quinones in the presence of polyphenol oxidase (PFO). This ferment is quite specific in relation to ortho-diphenols, which are oxidized to ortho-quinones, compounds highly reactive. They form brown polymers in the must, which affect the color of white wines. Grapes affected by Botrytis cinerea contain a much more active yeast produced by gray rot, which oxidizes a much wider spectrum of substances in must and wine. All of these oxidative enzymes contain active sites of Cu ions. Oxidations are favored by high temperatures, high pH, oxygen content. At the stage of processing white grapes is crucial inactivation of these enzymes, which is achieved by administering in grapes or must the antioxidants, SO_2 and ascorbic acid. Monitoring redox processes during alcoholic fermentation by oxygen management is essential for the resulting quality of dry wines. Oxidations in the wine production process lead to a decrease in varietal aromas. At the same time, the reducing conditions are responsible for possible undesirable aromas of disulfides and hydrogen sulfide. In particular, ensuring the reduced environment in bottled white wines affects the quality of white wines, in which, after several months, atypical, reduced aromas can be attested. Ensuring strongly reducing bottling conditions by applying inert gases and sealing, contributes, in the long run, to achieving reactions with the participation of varietal thiols. The quality of wines can be disastrously affected by the phenomenon of redox photoactivation of wine bottled in transparent

vessels, exposed for a certain period (a few hours being sufficient) to natural or artificial light. As a result, the redox state is modified, which causes the modeling of the organoleptic properties of wines and causes the olfactory defect called "light taste" (sunlight flavour, light-struck gout). It is accompanied by the smell of boiled cabbage, onions, damp wool, rubber. A major role in this adverse phenomenon belongs to riboflavin (B2), the photoreduction of which involves the photooxidative degradation of sulphur amino acids (methionine) and the formation of volatile methanethiol (MeSH, with a perception threshold of 0.3-3 ug/L), responsible for the smell of cabbage, hydrogen sulfide), dimethylsulfide (DMS), dimethyldisulfide (DMDS), thiol esters and mercaptans in wines. At the same time, the redox balance of wines is disturbed by the simultaneous formation of peroxides, glyoxylates, acrolein. In the production of red wines, the redox processes are no less important, although the impact is less significant. During alcoholic fermentation, the presence of oxygen contributes to the activity of yeast cells by stimulating the production of sterols. At the same time, at this stage, oxygen influences the colour of the must, contributing to its stability, including the formation of tannin-anthocyanin compounds. In the post-fermentation phases, redox processes with the participation of oxygen can have both a positive impact (maturation) and a negative impact (uncontrolled oxidations). Redox phenomena are decisive for the production of certain types of wines (Heres, Marsala, Madeira, Portwein, etc.) and their production must be carried out under the control of the oenologist.

Keywords: Polyphenols/quinones, anthocyanins, transition metals, photooxidative degradation, glyoxylates, acrolein, maturation, uncontrolled oxidations.

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PERSPECTIVE DIRECTIONS FOR THE RECOVERY OF WINE WASTE IN THE REPUBLIC OF MOLDOVA

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The global production of grapes exceeds 79 million tons in 2018, of which 75% is intended for wine production, which generates approx. 20–30% of the residual products (FAO-United Nations). These by-products are used to produce wine alcohol, serve as fertilizer or as animal feed, but most often remain unused. The disposal of these wastes creates environmental problems such as ground and surface water pollution, attraction of disease vectors and excessive oxygen consumption in soil and groundwater. The biodegradation of these wastes is slow, due to the low pH and the presence of compounds with antibacterial properties, such as polyphenols. At the same time, grape pomace contains significant amounts of substances that can be considered beneficial for health. Grape seeds are composed of 40% fiber, 10–20% lipids, 10% protein, and the rest are sugars, polyphenolic compounds, and minerals. The most important component of grape seeds is oil, rich in unsaturated fatty acids, especially linoleic and oleic acid. In addition, there is a significant amount of vitamin E, sterols and other bioactive compounds that possess antioxidant and anticancer activity. The utilization of grape pomace seeds for oil extraction presents an opportunity that brings important added value to primary processing enterprises of grapes. But to carry out this process, it is necessary to have equipment for drying and separating the seeds, given the perishability of the pomace, which must be processed immediately after the vinification process.

Dietary fibers and polyphenolic compounds remain in the pomace after the winemaking process in significant quantities (approximately 70%). The main part of dietary fiber consists of insoluble fibers such as cellulose and hemicelluloses. Insoluble fibers are characterized by high porosity and low density, improving the efficiency of the digestive tract [4]. Some fibers in grape pomace form chemical bonds with phenolic substances and thus create antioxidant dietary fiber, giving pomace radical scavenging potential. This gives them a higher nutritional value compared to the dietary fiber present in grains.

Together with dietary fiber, polyphenols are the most valuable compounds in grape pomace with beneficial health properties, such as maintaining intestinal health, preventing chronic diseases, cancer, etc. The antioxidant potential of polyphenols allows their use in food preservation due to the inhibition of lipid oxidation and the marked antibacterial effect. The mechanisms of antioxidant activity are based on their structure and include the ability to capture radicals, electron donation or metal ion chelation. Anthocyanins have a food coloring potential, but being susceptible to changes due to light, temperature, pH or other external factors, it is necessary to stabilize these pigments.

But in addition to compounds beneficial to health, grape pomace may also contain compounds dangerous to health - mycotoxins, including ochratoxin A, which is classified as carcinogenic. Over 90% of ochratoxin A (OTA) from grape processing is retained in the pomace. This imposes the need to verify the presence of the DNA of toxic species and, depending on their absence/presence, the subsequent distribution of the pomace for processing. The thermal stability of OTA at temperatures up to 250 ◦C makes contaminated pomace unavailable even for the production of sorbents.

Thus, the management of grape pomace waste represents an important environmental issue. On the other hand, grape pomace as a by-product of wine production represents a valuable source of important nutrients. But for the valorisation of this product, a rigorous microbiological control is necessary, after which the uncontaminated pomace will be directed for the extraction of biologically active compounds (polyphenols, anthocyanins, fibers) with the subsequent processing of the spent pomace to obtain sorbents intended for water purification https://intelwastes.utm.md/wp-content/uploads/2022/02/Ghid-de-bune-practici-Intelwastes.pdf. Otherwise, the pomace will be directed to obtain composts or for methanization.

Keywords: grape pomace, dietary fibers, polyphenols, grape oil, anthocyanins.

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PHTALATE DECONTAMINATION IN THE ALCOHOLIC MATRIX

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Humans always are surrounded by materials containing phthalates, such as insulation of wires, pipes, plastic housings, varnishes, paints and packaging materials. It is supposed that phthalates accumulate in the human body, which negatively affects its hormones, liver and kidneys may also become the causes of allergies diabetes, asthma and cancer, neurodevelopment disorders and abnormalities in the development of children**.** Molecules of phthalates are not structural elements of the polymer chains and therefore easily stand out in the environment, getting into the human body through food, skin or by inhalation. The aim of this work was the need to develop an effective, available and cost-effective procedure for phthalates decontamination of wines and alcoholic matrix. Sorption activity of seven natural and synthetic sorbents towards for six phthalates in the alcoholic matrix was investigated.

Sorption capacity of activated carbon, silicagel, kieselguhr, bentonite as an agent for the wine treatment [1] and synthetic adsorbent RELITE SP 411, anion exchange resin RELITE RAM 1, cation exchange resin FIBAN K-1 were studied in matrices of wines and eau de vie aged. Phthalate concentration in the extracts was analyzed by gas chromatograph with mass spectrometer SHIMADZU GCMS-QP-2010S (IS) with a COMBI PAL autosampler (CTC ANALYTICS, Zwingen, Switzerland) equipped with fused silica column RESTEK - Rtx-5MS (30m/0.25mm/0.25µm 5% diphenyl / 95% dimethylpolisiloxane phase) was used to perform injections and gas chromatographic analyses in an automated way [2]. Nature of the mentioned synthetic sorbents is based on the divinylbenzene copolymers [3]. Some regularities in the homologous series of phthalates such as dimethylphthalate, diethylphthalate, dibutylphthalate, bis(2-ethylhexyl)phthalate, dioctylphthalate and didecylphthalate were done. Also the negative contribution of sorbents on the different quality parameters of wine and eau de vie aged was assessed. There was studied the influence of different sorbents on the wines, in particular, on the red natural pigments - anthocyans (HPLC method), flavoring compounds (HS-GC-MS method) and such factors as: density (g L^{-1}), total extract (g L^{-1}) and alcohol content (% v/v) by combined **analysis system Alcolyzer** Anton Paar. Further the action of sorbents was tested with real aged wines distillates. Influence on the light ethers (esters) was determined by GC-FID method and phenolic aldehydes such as vanillin, sinapaldehyde, coniferaldehyde and syringaldehyde was assessed by CZE. Changes of the copper ions content were estimated by atomic absorption spectroscopy. Moreover, by UV-VIS spectroscopy, sorption of coloring matter of aged wines distillates was defined. There was established that, in real samples, some part of sorption capacity was spent for non-target reactions. Considering all factors, the potential of all sorbents as reagents for wine decontamination was investigated.

Keywords: decontamination, phthalate, sorbent, GC-MS, sorption.

References:

1. S. Venkata Mohan, S. Shailaja, M. Rama Krishna, P.N. Sarma. Adsorptive removal of phthalate ester (Di-ethyl phthalate) from aqueous phase by activated carbon: A kinetic study. Journal of Hazardous Materials 146 (2007) 278–282.

2. J.D. Carrillo, C. Salazar, C. Moreta, M.T. Tena. Determination of phthalates in wine by headspace solid-phase microextraction followed by gas chromatography–mass spectrometry: Fibre comparison and selection. Journal of Chromatography A, 1164 (2007) 248–261.

3. A.V.Paniko, I.G. Kovzun, Z.R.Ulberg, I.T.Protsenko, V.A.Zubkova. Ispolzovanie nanoporistih glin v kachestve sorbentov dla udalenia ftalatov iz vodnih sred. Nanostrukturnoe materialovedenie, 2009, № 2. pp 93-102

PINKING EFFECT IN WHITE WINES AND ITS REMOVAL WITH EXPERIMENTAL ACTIVATED CARBON AC-C

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The pinking effect of white wines, known for more than 4 decades, is associated with reductive winemaking, applied with the aim of significant decrease of the oxygen content in wines and, thereby, the unwanted oxidative processes. Oenologists also use these technologies to preserve the aromatic profile of the grapes, for superior organoleptic qualities. As a result, some wines develop a noticeable pink color at various stages of winemaking and storage, including after bottling. Until now, the mechanism of this phenomenon is not known with certainty, and winemakers combat its consequences with different methods.

Different wines and musts, overall 21, from grapes of white-European varieties (Sauvignon Blanc, Aligote, Souvignier Gris) and local, old (Feteasca Albă, Feteasca Regală) and new selection (Alb de Onițcani, Viorica) were studied. Predominant were Sauvignon Blanc wines and musts (15) that were produced industrially or experimentally, using different technologies, from raw material originating from different wine-growing areas (Codru, Valul lui Traian) from Moldova, but also from France. Separately, musts were also produced from Sauvignon Blanc grapes, with the predominance of exposure to the sun, from the shade, from clones with white and pink skin. The research was carried out using ultraviolet-visible spectrophotometry, including second-order derivatives. Isolation of the pigments was carried out by the SPE method (C18) with their recovery in methanolic solution. The experimental AC-C activated carbon of vegetable origin was provided by Laboratory of Ecological Chemistry of the Institute of Chemistry. Desorption of pigments from AC-C was facilitated by ultrasound (20 kHz). The effect of AC-C was compared with the effects of additions of SO2, PVPP, bentonite, exposure to UV light. In all samples, the usual physico-chemical parameters were determined, as well as the content of total phenolic substances (SFT), flavonoids (SFF), cinnamic (SFC), proanthocyanidins, anthocyanins. All samples were subjected to the POM-test and the Pinking-test. The chromatic parameters of the wines as such, but also before/after the pinking test, were determined according to CIELa*b*.

In the studied batch, the Total Polyphenol Index (TPI) varies from 4.27 to 9.90, total phenolic substances - from 7.9 to 173.5 mg/l (gallic acid), cinnamates - from 7.6 to 46.1 mg/l (caffeic acid). POM-test extends from 0.2 to 197.6% Pinking-test demonstrated pinking susceptibility of most samples except 4. Anthocyanin content varied between 0.1 and 2.7 mg/l (cyanidin-3-glucoside). It does not correlate with the content of proanthocyanidins (0.1-230.8 mg/l). All samples demonstrated positive values for a* (red color component) after light oxidation. Wines decolorized effectively with AC-C at moderate concentrations (up to 80 mg/l), comparable to PVPP at concentrations up to 1 g/l. SO_2 removes the effect (45 mg/l), but reversible.

In the studied wines and musts, there are no correlations between the content of putative precursors (proanthocyanidins), total phenolic substances, cinnamic phenolic substances, POM-test, on the one hand, and the content of anthocyanins and Pinking-test, on the other. This implies mechanisms of chemical formation of pigments much more complex than direct transformations of precursors. AC-C has proven to be effective in removing the consequences of the pinking phenomenon, in moderate concentrations, which do not essentially affect important organoleptic properties of wines.

Keywords: white wines, reductive winemaking, proantocianidine, pinking test, POM-test, derivative spectrophotometry, C18 SPE-extraction, SO_2, PVPP, CIELa*b*.

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REDUCTION OF THE IMPACT OF GRAY ROT OF CABERNET-SAUVIGNON AND PINOT GRIS GRAPES ON THE FERMENTING MUST WITH THE HELP OF ACTIVE CARBON AC-C

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Gray rot is a frequent disease in vineyards in our country, which produces the most significant losses in yield and quality in favorable years, with rainy and warm autumns. The disease is caused by the fungus *Botrytis Cinerea*, which attacks all the organs of the vine: leaves, shoots, bunches, berries, as well as vine cuttings placed in stratification. The most frequent attack occurs on grains, whose susceptibility increases as they ripen and accumulate sugars [1;]. *Botrytis Cinerea* is also dangerous because it generates the oxidizing enzyme Laccase.

Gray rot in the 2021 harvest year affected the Pinot Gris variety because it is denser in the grains and juicy, with a thin grain skin, as well as the Cabernet - Sauvignon variety.

In some critical years with rainy autumns, gray rot can affect up to 80-90% of the harvest, it can even completely compromise grape production. However, in years with sunny autumns the given fungus develops its noble form, i.e. noble rot. Thus, the grains become botrytized by cracking the skin of the grain, evaporating the water and accumulating a high amount of sugars. Then we lose in quantity, but gain in quality [1]. Noble rot is of great importance in the production of Cotnari, Tokay wines, etc.

In this article, the impact of the additions of experimental active carbon AC-C on the gray rot of Cabernet-Sauvignon and Pinot Gris grapes in the fermentation must was investigated, using different doses, allowed by the OIV. Fermentation kinetics and some important physico-chemical parameters were monitored. AC-C has been shown to be effective in removing mold and related green pigments from wine. Doses of 1 g/l reduced the content of these pigments by about 58% - a result very close to that demonstrated by the commercialized activated carbon Granucol GE (Germany).

The activated carbon, as a rule, in high concentrations negatively influences the natural aromatic profile of the wine, so it is recommended to use the minimum effective concentrations, calculated strictly based on the experimental results.

Keywords: must, wine, AC-C carbons, rot, noble, variety, grapes, organoleptic and physico – chemical parameters

References:

1. Dumitriu I.C. Viticultura. Editura CERES, Bucureşti -2008

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RESEARCH ON OBTAINING SOME TYPES OF BEER FROM UNCONVENTIONAL RAW MATERIALS

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The consumers' interest for beer has increased due to the unprecedented assortment diversification, the rebirth of craft beer, the increase demand for functional beer, for gluten-free beer and other type of beers. Beer is most commonly obtained from barley malt and wheat malt, but currently other cereals and pseudo-cereals are also used [1-3]. Among pseudo-cereals, buckwheat is the most widely used in the research for the manufacture of gluten-free beers, as it has shown over the years excellent results in terms of productivity, enzymatic activity and chemical composition [1, 3]. Sorghum is a genetically close to corn cereal, it is also called the camel plant due to its resistance in extreme drought conditions, being a vital staple food in many semi-arid areas of the developing world [2]. The paper presents the use of buckwheat, buckwheat malt, sorghum, and sorghum malt in the production of beer on a laboratory scale.

Barley malt was used as control in all experimental variants of obtaining beer in laboratory conditions. For the finished product beer, the following physicochemical analyzes were performed according to standard procedures: real extract (% m/m), apparent extract (% m/m), alcohol content (% v/v, % m/m), density (g/cm^3), turbidity, pH, colour, bitter value, CO_2 content (g/L), O_2 content (mg/L). Determinations were performed in triplicate, and mean values were used in this study.

The obtained results show that raw materials investigated can be used successfully in the production of beer in malted form, but also unmalted, for the last option it is recommended to use enzymatic preparations to facilitate the mashing and filtration of beer wort. In the current conditions, in which climate changes are increasingly felt in our country, the production of beer from this raw material represents a viable alternative, but at the same time a novelty on the profile market in Romania.

References:

1. Brasil V.C., Guimarães B.P., Evaristo R.B.W., Carmo T.S., & Ghesti G.F.(2020). Buckwheat (Fagopyrum esculentum Moench) characterization as adjunct in beer brewing. *Food Science and Technology*, *41*, 265-272.

2. Dabija, A., Ciocan, M. E., Chetrariu, A., & Codină, G. G. (2021). Maize and sorghum as raw materials for brewing, a review. *Applied Sciences*, *11*(7), 3139.

3. Dabija, A., Ciocan, M. E., Chetrariu, A., & Codină, G. G. (2022). Buckwheat and Amaranth as Raw Materials for Brewing, a Review. *Plants*, *11*(6), 756.

RETENTION OF WINE POLLUTANTS ON CHEMICALLY MODIFIED CLAYS WITH DENDRIMERS

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According to the specialized literature, it was found that of the variety of PAEs, the most common in both wine and other food products are di-ethylhexyl phthalate (DEHP) and di-butyl phthalate (DBP). These, if they reach the food chain, significantly affect the health of the consumer. In their 99% purified form, PAEs are viscous, transparent, low-volatile, colorless, odorless, hydrophobic organic liquids under normal conditions, insoluble in water, and have a high affinity for alcoholic solutions. The daily intake of PAEs tolerated and established by the European Food Safety Authority (EFSA) is: 50 μg·kg-1 bw for DEHP and 10 μg·kg-1 bw for DBP. The most common method for identifying and quantifying low concentrations of phthalates in alcoholic beverages is gas chromatography coupled to mass spectrometry (GC-MS). The purpose of this paper is to highlight the effect of chemically modified clays with dendrimers. The natural clay impregnated with dendrimers was used in several series of tests, with the aim of presenting their capacity regarding the retention of pollutant compounds, the effect on protein stability, the nephelometric degree and the level of polyphenolic compounds of an autochthonous white wine Aligote (before and after treatment with the modified sorbents). In order to correctly evaluate the effect of the chemically modified material, natural clay was also tested. After performing the protein stability test, it was observed that the protein level in the contaminated wine decreased more after its treatment with the bentonite modified with third and fourth generation of Boltorn dendrimers. This effect is more pronounced at volumes of 250-500 μL of sorbent used for 15 mL of white wine samples. This statement is reinforced by the results of nephelometric analyses. For the phthalic content in Aligote wine, positive results were found after treatment with natural bentonite and the one modified with dendrimers of the second generation, followed by the one impregnated with Boltorn of the fourth generation. In conclusion, it can be mentioned that natural bentonite impregnated with dendritic polymers shows promising results for the absorption of protein compounds from wine and at the same time they have the ability to retain a large volume of polymeric pollutants with a complex structure such as phthalates.

Keywords: absorption, clay, dendrimers, pollutants, wine

THE ANTIOXIDANT PROPERTIES OF PECTIN OBTAINED FROM FRESH, FROZEN, AND DRIED APPLE POMACE

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Apple pomace, obtained after juice extraction, is an agro-industrial residue, but also a potential source of carbohydrates, fibres, phenolic compounds, vitamins, pectins, etc. Pectins are one of the most important substances found in apples and account for approximately 10% of the daily fibre requirement of the consumer. In industry pectin is obtained from apple pomace in aqueous solutions of mineral acids (hydrochloric acid, sulfuric acid), with a pH of 1-3, temperature of 50-90 ºC, and extraction time of 3-12 hours. The use of mineral acids leads to a lower extraction yield, further, due to a more advanced hydrolysis process of the glycosidic bonds, and rigorous purification, we assume that the commercial pectin has a lower antioxidant activity and a scant content of phenolic acids.

The aim of the conducted research was to spectrophotometrically measure the total polyphenol content (TPC) and determine the *DPPH•* antioxidant activity of commercial pectin, and of pectin that was obtained by conventional method from fresh (*P1*), frozen (*P2*), and dried (*P3*) apple pomace leftovers from" Floresti" juice factory. The pectic matter was extracted with an aqueous solution of citric acid, with a ~2.2 *pH*, temperature of 90°C, for 180 min, with the following sample: solvent ratios: *P1*- 1:8; *P2*- 1:8; *P3*- 1:12 (m/v).

Pectin was precipitated with 96% ethyl alcohol. The obtained pectin was dried at a temperature of 60°C till a humidity of 9.31±0.62 %. For UV-Vis spectrophotometric analysis (DR5000 spectrophotometer), samples were prepared in triplicate by dissolving pectin in distilled water to a concentration of $5 \cdot 10^{-3}$ mg/ml. *TPC* was determined by the Folin-Ciocalteu method according to the calibration curve of the gallic acid standard, expressed in mf GAE/g of sample. The commercial pectin solution (*P*) was the reference sample.

According to the recorded results, TPC in pectin samples *P1, P2, P3* was higher than in sample *P*. The highest TPC was recorded in *P1* (5.015±1.07)*; P3* (4.34±0.14 mg GAE/g) had the second highest result. Negligible TPC was detected in *P*. The Trolox equivalent antioxidant capacity assay was carried out for the concentration of $5 \cdot 10^{-3}$ g/ml of pectin in water. Measurements determined that the % *DPPH•* inhibition of the pectin samples varied as follows: *P1*- 39.32; *P2*- 17.43; *P3*- 19.64, and 2% for the commercial pectin *P*.

The highest antioxidant activity was recorded for pectin *P1,* obtained from fresh pomace. The antioxidant activity largely depends on the content of phenolic acids, which contaminate the pomace.

Keywords: pectin, antioxidants, apple pomace, Trolox.

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THE DETERMINATION OF YEAST VIABILITY IN THE CONCENTRATED SUGAR SOLUTIONS

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The quality of sparkling wines depends on the biologically active substances which go over in the wine out of the yeast cells in the autolysis process. The autolysis of yeast releases substances with antioxidant properties as well as amino acids, peptides, nucleotides, polysaccharides, mannoproteins, fatty and nucleic acids, enzymes, vitamins of B group, mineral substances and etc. All these compounds have a direct or indirect positive effect on sparkling wine [1;2]. In the production of sparkling wines in pressure tanks, the cycle is short and practically the autolysis process of the yeast is missing.

For amelioration of the quality of sparkling wines produced in pressure tanks at the Department of Oenology and Chemistry, research was carried out on the prior autolysis (plasmolysis) process of yeast under the action of osmotic pressure [3].

The object of this investigation is to find new methods of directing the autolysis process, which has a positive effect on the production of sparkling wines in pressure tanks by administering active dry yeast in the draft liquor, to speed up the autolysis process of the yeast and with the release autolysis compounds in wine.

The viability of active dry yeast in concentrated sugar solutions with doses of 400, 500, 600, 700 and 800 g/l was determined with the help of the Motic type microscope during a certain period of time. The following served as research objects: the raw material wine from the Alb de Oniţcani variety; active dry yeast of the Anchor type and refined sugar containing sucrose 99.9%.

It was established that at the concentration of the sugar solution 600 g/l and at the temperature of 20^{o}C, for 24 hours 49% of yeast plasmolysis, and for 72 hours – 54%. Practically under production conditions, the plasmolysis of yeast under the action of osmotic pressure in the draft liquor can be carried out for 24 hours at usually conditions.

Key words: dry white wine, variety, sugar, liquor, microscope, mortified, viable yeast, hours

References:

1. Valeriu V. Cotea Tehnologia vinurilor efervescente. Editura Academiei Române, 2005,249p
2. Monografia colectivă “Principii de dezvoltare a oenologiei moderne și organizarea pieței ivitivinicole”, Ch.: “Tehnica-Info”, UTM, 2020.- 328 p.
3. Angela Țîrdea, Constantin Țîrdea, Gheorghe Sîrbu, Tratat de vinificație, ed.” Ion Ionescu de la Brad”, Iași, 2010, 766 p.

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THE DEVELOPMENT OF THE REAL-TIME PCR FOR DETECTING COMMON FOODBORNE PATHOGENS

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Foodborne diseases are a major global public health challenge in the entire world. An important way of assuring food safety is controlling the food for the presence of foodborne pathogens. The conventional methods of foodborne pathogen detection are highly precise and sensitive, but are laborious and time consuming. Besides, it may take several days to obtain the results, and sometimes it is important to detect rapidly the potential hazard. So, there is an urging need for development of rapid methods of detection of foodborne pathogens. In this work, we describe the development and testing of the home-designed primers for Sybr Green I real-time PCR (Polymerase Chain Reaction) detection of some common foodborne pathogens*: Listeria monocytogenes, Salmonella enterica subsp. enterica, Staphylococcus aureus, Escherichia coli*.

The primers were designed using the gene sequence listeriolysin O (hly) for detection of *Listeria monocytogenes,* InvA gene for detection of *Salmonella enterica,* Spa gene for detection of *Staphylococcus aureus,* and uidA gene for detection of *Escherichia coli.* The primer specificity was tested in silico by BLASTing their sequences against the GeneBank database. The performance of the primers was tested in vitro, using the DNA of the corresponding pathogens as a positive control.

All tested primer pairs could specifically recognize the template DNA of the corresponding pathogens, which make them suitable for real-time PCR analysis of foodborne pathogens. Sybr Green I real-time PCR using the designed primer pairs can be a rapid alternative to the traditional culture-based methods for detection of pathogens in food samples.

Keywords: foodborne pathogens, Escherichia coli, Listeria monocytogenes, Salmonella enterica, Staphylococcus aureus, primers, PCR

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THE DYNAMICS OF THE OXIDATION PROCESS OF WHITE WINES DEPENDING ON TEMPERATURE, MOLECULAR OXYGEN RATE AND PH

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Oxidation processes are slow phenomena that take place throughout the wine's life, from the beginning of winemaking to aging in bottles. Several parameters play an important role in aging of the wine, such as the temperature and hygrometry during the storage of the bottles but also the permeability of the corks which will influence the amount of oxygen brought to the wine. The impact of storage conditions on the evolution of wine was studied by comparing storage in optimal conditions (temperature between 15 and 17°C, relative humidity 70%) representing aging in the cellar, and aging reproducing the conditions of a house or apartment (temperature fluctuation between 20 and 27°C and humidity depending on the seasons). The results showed 3 times more fast aging for wines stored in conditions that reproduce an apartment, by comparison to aging in the cellar. The impact of storage temperature was also studied on sensory properties of Sauvignon blanc wine, three temperatures of storage (5, 10 and 18°C) being studied for one year. The wines stored in cooler conditions (5 and 10°C) were characterized by fruity aromas while the wines stored at higher temperatures were characterized by woody, buttery or of asparagus. White wines have a lower concentration of phenolic compounds than red wines (10 to 20 times less) and therefore a lower antioxidant capacity, are more susceptible to oxidation [1]. The amount of oxygen received by the wine is very dependent on the type of cork which defines the oxygen transfer rate. They can be classified by permeability to oxygen depletion with: synthetic plug > threaded cap > natural cork > plug microagglomerate.

Under normal conditions of pressure and temperature, the maximum solubility of oxygen is 8.6 mg/L, then it gradually reduces to the hydroperoxyl radical anion (O_2•-), oxygenated water (H_2O_2), to the hydroxyl radical (HO•) and finally to water (H_2O), producing species called “reactive oxygen species" (ROS). The fundamental electronic configuration of oxygen is the triplet state, so it can be considered as a diradical. The Pauli exclusion principle limits reactivity to oxygen. This is why oxygen must be "activated" to go into the singlet electronic configuration. In singlet form oxygen can reacts directly with carotenoids, olefins or polyphenols. In addition, from a thermodynamic point of view, the reaction between oxygen and phenolics such as catechin or caffeic acid is at a disadvantage, the redox potential of of O_2/H_2O_2 couples, catechin and caffeic acid with quinones respectively being 0.57, 0.58 and 0.60 V 25. Therefore, a catalysis is required to obtain the first oxygen reduction reaction (O_2 to HO_2•). In must enzymes oxidases will have this role and in the wine there will be mainly Fe^{2+} ions. The radical hydroperoxyl (HO_2•) can react directly with phenolic compounds in wine, as it is a stronger oxidant than oxygen with a redox potential of 1.23 V vs -0.09 V at pH 3.5. Hydrogen peroxide is formed by the reduction of HO_2•, which in the presence of iron leads to the Fenton reaction and the production of the hydroxyl radical. HO• will react non-selectively, due to its strong oxidizing power, forming the final product of reduction of oxygen, a water molecule.

Keywords: White wine, aging, oxygen, storage conditions, aromas.

References:

1. Remy Romanet, Zina Sarhane, Florian Bahut et al. Exploring the chemical space of white wine antioxidant capacity: A combined DPPH, EPR and FT-ICR-MS study. 2021, Food Chemistry. 355(5):129566. DOI: 10.1016/j.foodchem.2021.129566

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THE EFFECTS OF LACTOSE HYDROLYSIS ON THE LACTOSE-FREE YOGURT QUALITY

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Yogurt is a dairy product obtained by fermenting milk appreciated for the benefits presented to the digestive and general consumers health and for the reduction of symptoms caused by inadequate lactose digestion. Therefore, the lactose in yogurt is better digested than that in milk, as a result of the microorganisms ability to synthesize lactase. However, a low lactose content in yogurt is not suitable for people with lactose intolerance. Thus, the most reliable remedy seems to be complete enzymatic digestion of the lactose in yogurt. The aim of the study was to investigate the influence of different lactose hydrolysis processes, the contribution of the enzyme and the milk type on the characteristics of the obtained yogurt. For a systematic approach, the non-hydrolyzed yogurt (control sample), the yogurt that was hydrolyzed before fermentation, and the co-hydrolyzed yogurt (concomitant addition of β-galactosidase and starter culture) were performed simultaneously.

The degree of lactose hydrolysis was determined in accordance with the method for the measurement of lactose in low-lactose and lactose-free products under Standard Method Performance Requirement (SMPRVR) 2018.009. The pH was measured with a digital pH-meter at 20°C. Viscosity was determined with a Brookfield DV-III Ultra rotational viscometer. Chemical analyzes of yogurt samples were analyzed according to the International Dairy Federation and International Organization for Standardization.

The influence of lactose hydrolysis on the yogurt fermentation time, sensory and rheological properties was investigated using two types of β-galactosidase enzymes and two types of products (cow's milk and goat's milk yogurt). In each trial (control, pre-hydrolyzed substrate, co-hydrolyzed approach), fermentations were performed simultaneously with the same starter culture. The fermentation time of the yogurt samples to reach pH 4.60 generally varied between 5 and 7 hours. In the yogurt samples in which the prior hydrolysis of milk lactose was performed, the fermentation accelerated by 30 minutes, and in the yogurt obtained by co-hydrolysis, the fermentation time was reduced from 420 to 360 minutes, a decrease determined by the rapid lactic acid production even from the first hours of fermentation. The sensory quality of the yogurt samples obtained from hydrolyzed milk by co-hydrolysis is characterized by a better flavor than the control sample. This may be due to the availability of a greater amount of glucose for the production of aromatic compounds, a sweeter taste than natural yogurt, with a light caramel flavor, a firm clot, a porcelain appearance, without whey removal. Cow's milk yogurt showed higher viscosity values compared to goat's milk yogurt for both hydrolyzed and co-hydrolyzed milk. Lactose hydrolysis determined the reduction of the syneresis index of the yogurt compared to the control samples.

Lactose hydrolysis in milk influences fermentation time, textural properties and sensory attributes of yogurt. In yogurt samples obtained from pre-hydrolyzed and co-hydrolyzed milk accelerated the fermentation compared to the references, suggesting that lactose hydrolysis improves the fermentation process. Sensory and textural properties of lactose-free yogurt are superior to those of natural yogurts.

Keywords: hydrolysis, fermentation, yogurt, lactose, lactase

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THE IMPACT OF ANTIOXIDANTS ON THE OXIDATIVE STABILITY OF SOME EDIBLE OILS

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The present study aimed to investigate the effectiveness of the use of some antioxidants as inhibitors of some edible oils oxidation (grape seeds, walnuts and corn germ). Lipid oxidation is one of the major causes that decrease the nutritional value of food products and reducing their shelf life. This phenomenon leads to changes in the nutritional and organoleptic quality of the edible oils. Lipid self-oxidation is recognized as the main oxidation mechanism in edible oils and fats. Inhibition of the lipid self-oxidation process is important for various industrial applications, especially for the food industry [1, 2]. In order to study and select antioxidants used for inhibiting the oxidative process, it was necessary to study and understand the mechanism of the lipid oxidation process in the absence and in presence of antioxidants. It was found that the forced oxidation process of edible oils is completed in about 600 hours.

Lipid oxidation, especially edible oils that contain unsaturated fatty acids, lead to the formation of a wide range of aldehyde compounds. The formation of these compounds was monitored during the process of forced oxidation for 48 hours. Analysing the dynamics of hexanal formation during the oxidation of edible oils, was noticed that the hexanal formed following the oxidation of lipids in grape oil has a constant evolution throughout 48 hours. The initial values at 0 hours of oxidation the values are considerably lower, which during 24 hours attests an essential increase of the hexanal content formed both for the grape oil and for the walnut or corn oil. When studying the process of inhibiting the oils oxidation, the action of α-tocopherol, n-octyl gallate, L-ascorbic acid, 6-palmitate and green tea extract was analysed. As a result of the analysis of antioxidants influence on the studied edible oils, was established that the most effective oxidation inhibitors are n-octyl gallate and 6-palmitate or L-ascorbic acid. A less pronounced action was found for α-tocopherol and green tea extract. It was found that edible oil samples enriched with antioxidants showed considerably lower values compared to the oxidized oil samples, which is explained by the slowdown in the formation of lipid oxidation products such as peroxides and hydroperoxides.

Keywords: oxidation, grapeseed, corn germ, walnut, green tea.

References:

1. STURZA, R., DRUŢĂ, R., COVACI, E., et al. Mechanisms of sunflower oil transforming into forced thermal oxidation processes, septembrie, 2020. https://doi.org/10.5281/ZENODO.3949716.
2. SUBOTIN, I., DRUTA, R., POPOVICI, V., et al. Kinetic of Forced Oxidation of Grape Seeds, Walnuts and Corn Germs Oils in the Presence of Antioxidants. *Food and Nutrition Sciences* 12 (12), 2021: pp.1326–39. https://doi.org/10.4236/fns.2021.1212097.

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THE IMPACT OF EXPERIMENTAL ACTIVATED CARBONS ON POLYPHENOL OXIDASE ACTIVITY IN MUST AND WINE

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Browning in the processing of grapes and obtaining of grape juice is a well-known phenomenon, the causes of which are mainly enzymatic in nature. In the presence of atmospheric oxygen, polyphenol oxidase (PPO) can catalyze the oxidation of natural phenolic substances, while the resulting quinones enter into secondary reactions with the formation of unwanted colored products.

These processes can cause drastic changes in the color and flavour of both the grapes and the grape juice, and significantly reduce the quality of the final product, which should be prevented in order to produce good quality wine [1].

The paper studies the modification of the oxidase activity, which is manifested by the browning of juice and wine made from white grapes varieties, such as Sauvignon, Viorica, Legenda, Pinot Gris, and the change in the chromatic characteristics of juice and wine obtained from red varieties (Cabernet – Petit, Cabernet-Sauvignon) from the Central region as well as from the Southern region of the Republic of Moldova with the administration of various doses of experimental activated carbon AC-C (0.2; 0.4; 0.6; 1.0 g/l), obtained from local raw material in the Laboratory of Ecology, the Institute of Chemistry of ASM. The PPO activity was traced from the processing of grapes to the production of wines. The involution of PPO activity over time is determined by the doses of sorbent used, but in different ways for different musts and wines.

It was found that the enzymatic activity was the highest in the grape juices of Viorica, Pinot Griș and Legenda varieties immediately after crushing fresh grapes and this activity was not detected after treatment with activated carbon. The best results were in juices treated with 1 g/l dose of activated carbon in all grape juices, where the PPO activity decreases to about 15 times. The decrease in PFO activity tends to reach constant values with increasing AC-C concentrations up to 1 g/l.

In particular, AC-C has reduced PPO activity in the wines produced from grapes affected by the gray mold *(Botrytis Cinerea)* by about 15 times compared to untreated must (Pinot Griș).

The use of AC-C allows to reduce the need for sulfites through 2 mechanisms: the elimination of some easily oxidizable components (cinnamates) and the elimination of the most important oxidases in grapes.

Keywords: activity, enzymes, polyphenol oxidase, activated carbon, grapes, juice, browning, dynamics, wine, must.

References:

1. Edelmira Valero, A. Sanchez-Ferrer, R. Varon and F. Garcia-Carmona. L'evolution de l'activite polyphenoloxidasique de raisin et du contenu phenolique pendant la maturation et la vinification. Catedra de Quinica 1, Escuela Universitaria Politecnica de Albacete. Universidad de Castilla-La Mancha, Espania

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THE INFLUENCE OF BIOACTIVE ADDITIVES ON THE PROCESS OF ALCOHOLIC FERMENTATION OF WASTE BIOMAS

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The quantity of agricultural waste has been rising rapidly all over the world, many studies has revealed that fruits and vegetables are the main source of bioactive compounds. Wastes from the agro-industrial sector, due to their toxic effects with regard to plants and living organisms, cannot be dumped in the soil. However, they can serve as renewable source of value-added products, following the specific digestive treatment. This research was focused on studies of vinasse fermentation processes in the presence of bioactive substances introduced directly into the digested biomass.

Table 1. Comparative efficiency of different types of additives of bioactive substances in the vinasse fermentation process at concentration of 0,003 g/L biomass.

Nr. crt.	Bioactive substance used as an additive to the fermented biomass, 3g/L	Total volume of CO_2 emitted gas, cm^3	Fermentation time, h
1.	Dihydroxy fumaric acid	266.00	76
2.	Aescinum	251.01	55
3.	Tomatin	233.46	78
4.	Sclareol	232.50	55
5.	Vanillin	229.00	69
6.	Catechin	180.00	61
7.	Betuline	250.00	80
8.	Menthol	200.00	70

The comparative assessment of different additives action in the studied processes have demonstrated that the dihydroxyfumaric acid caused the emission of 266 cm^3 CO_2 in 76 hours, aescinum – 251 cm^3 in 55 hours, tomatin – 233 cm^3 during 78 hours, sclareol – 232 cm^3 during 55 hours, vanillin – 229 cm^3 during 69 hours, whereas catechin – 180 cm^3 during 61 hours of fermentation, until the fermentation process was completed. The principle of stimulating and intensifying the biochemical fermentation process may be due to the oxidation - reducing properties of SBA.

Keywords: Agro-industrial wastes, vinasse, fermentation, bioactive additives.

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THE MOLECULAR DETECTION OF BRETTANOMYCES WILD YEAST IN RAW WINES

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Brettanomyces is the yeast commonly associated with red wine spoilage through the production of volatile phenol compounds. If not managed properly, it can cause severe economic loss. Timely detection of *Brettanomyces* in raw wine is essential for ensuring wine quality preservation.

In this work, home-designed primers for detection of *Brettanomyces* in wine by Sybr Green I-based real-time PCR (Polymerase Chain Reaction) were developed. Primers were tested both in silico and in vitro. The primers were designed using the sequence of *Brettanomyces internal transcribed spacer 1, partial sequence; 5.8S ribosomal RNA gene and internal transcribed spacer 2, complete sequence; and large subunit ribosomal RNA gene, partial sequence*, available in GeneBank. Primer specificity was checked by aligning the primers against the sequences available in GeneBank using BLAST. Primer performance was tested using positive (wine sample infected with Brettanomyces) and negative controls.

The developed primers were used for analyzing 5 raw wines (Pinot Noir Taraclia, Merlot Taraclia, Merlot Nisporeni, Malbec Romanești, Cabernet-Sauvignon Taraclia), produced in the winery of the Technical University of Moldova, for the presence of *Brettanomyces*. Two methods of DNA extraction from wine were tested and compared, DNAsol-based method and SDS-PVP-based method of DNA extraction.

In the result, four out of five samples (Merlot Taraclia, Merlot Nisporeni, Malbec Romanești, Cabernet-Sauvignon Taraclia) were positive for Brettanomyces, when the DNA was extracted using SDS-PVP-based method, and three out of five (Merlot Taraclia, Malbec Romanești, Cabernet-Sauvignon Taraclia) were positive, when DNA was extracted using DNAsol-based method. Moreover, the Ct values of all positive samples extracted by SDS-PVP method were lower than of those extracted by DNAsol, indicating higher amount of Brettanomyces DNA in those samples. This confirms that SDS-PVP DNA extraction method from wine was more efficient, and allows to detect *Brettanomyces* even in the samples with low abundance.

The developed primers for Sybr Green I-based qPCR detection of *Brettanomyces* allow for a rapid and reliable detection of this wine spoilage yeast in raw wines and prevent the economic loss. Also, our findings highlight the importance of the DNA extraction method of choice for the successful PCR detection of *Brettanomyces* in wine, especially in the wines with relatively low level of Brettanomyces infection.

Keywords: Brettanomyces, DNA extraction, primers, PCR, Sybr Green, wine

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THE ROLE OF DEPHENOLISATION FOR THE BIOLOGICAL AND TECHNOLOGICAL VALUE OF THE OLD WALNUTS

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The walnut kernel is a natural concentrate of biologically active substances, including polyunsaturated fatty acids, polyphenols and proteins. In addition to the white core rich in lipids and proteins, nut kernels are covered with a polymer pellicle impregnated with phenolic compounds, especially naphthalene- and gallic acid derivatives. It is this pellicle that performs a protective function in relation to the polyunsaturated fatty acids located in the core, since it serves as a barrier to active atmospheric oxygen. It has been shown that there are no significant changes in the fatty acid and protein composition of nuts within three years of proper storage [1]. However, the transformations of juglone, naphthoquinones, phenolic acids and its derivatives, which are just necessary to protect the contents of the kernel, lead to the loss of the marketable appearance and taste of nuts – their oxidative deterioration [2]. In this context, dephenolization seems to be a very efficient method for correcting the taste of two- or three-year-old walnut kernels.

Samples of walnut seeds, harvested in a three-years sequence, were triple extracted with a solution, containing 10…20% ethanol and 0.04…0.08% NaOH. Each extraction was five minutes long. Then all samples were neutralized with 1% citric acid solution and dried on air. After that, dried dephenolized nuts were pressed at 25MPa in order to obtain degreased cake. The oxidative stabilities of the cakes were determined in the Rancimat instrument at 120°C, under a constant air flow of 20L/h). Total phenolic acid content was determined using spectrophotometric method, the results were expressed in Caffeic Acid Equivalent, CAEq, mg/g.

The induction time of oxidation for the dephenolized nuts cake is approximately equal to 9 hours for the cake obtained from kernels stored for a one year, and, respectively, are 8 and 6 hours for two- and three-year-old nuts. The total CAEq in weakly dephenolized samples decreases from 2.5mg/g in the cakes of three-year-old nuts to 1.0mg/g in one-year ones. At the same time, in severely dephenolized samples, there is no obvious dependence of the total phenol content on the age of the nuts. HPLC demonstrates, that hydrolysis of phenolic glycosides takes place.

Antioxidative stability increases significantly from 3-year-old walnuts to 1-year old walnuts. In this case, there is practically no dependence of the oxidation induction time on the degree of the pellicle's dephenolization. The pellicles of two- and three-year old walnuts contain compounds, with low biological activity. So, the dephenolization process does not reduce the biological value of old walnuts, but significantly increases their technological value.

Keywords: Caffeic Acid Equivalent, Gallic Acid, Naphthoquinones, Rancimat

References:

1. ÖZCAN A., SUTYEMEZ M. Determination of the Effect of Storage Time on Walnut Fat, and Protein Composition. Yüzüncü Yıl University J. Agric. Sci. 29(4), pp. 628-633 – in Turkish.
2. GRILO F.S., SRISAARD Y., WANG S.C. Prediction of Walnut Deterioration Using Kernel Oxidative Stability. Foods 2020, 9, 1207

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TREATMENT OF RED WINES FROM LOCAL AND EUROPEAN VARIETIES WITH ACTIVATED CARBON: THE IMPACT ON CHROMATIC PARAMETERS

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Activated carbons of vegetable origin are allowed by the OIV for use in the wine industry, with the aim of eliminating defects of an olfactory and/or gustatory nature. Also, activated carbons are used to correct the color of white, rosé and red wines. Technological processes, in which activated carbons are used to eliminate defects, can result in uncontrolled changes in the trichromatic characteristics and, thus, in diminishing the organoleptic characteristics of wines.

The aim of this study was to elucidate the impact of treatments with experimental activated carbon AC-C (produced in the Laboratory of Ecology of the Institute of Chemistry of Republic of Moldova) of red wines obtained from old local grapes (Feteasca Neagra, Rara Neagra) and European (Cabernet Sauvignon, Merlot, Pinot Noir) both from different wine-growing areas and produced according to different technologies, on the color parameters, that is represented mathematically according to the Glories, tristimulus and CIELa*b* methods.

AC-C has been shown to predominantly eliminate monomeric anthocyanins, responsible for the vivid red color. In addition to the global decrease in color intensity, there is an increase in color shade, a phenomenon that accompanies the maturation and aging of red wines, correlated with the partial oxidation, oligomerization and polymerization of anthocyanin pigments. Much more sensitive to the changes made as a result of the AC-C action, are the individual CIELa*b* parameters-L, a* and b*, but also the global ΔE, which is correlated with the consumer's ability to perceive color differences.

The effect of AC-C activated carbon on the copigmentation factors of red wines was determined. Among them there are phenolic substances without chromophores in the visible range - cinnamic phenolic substances, non-flavonoid phenolic substances, flavonoids and tannins. Removing of the part of them causes a reduction in color intensity and changes in other chromatic parameters.

The results were compared with those obtained as a result of other technological treatments (cold, PVPP, bentonite, ZrO_2, etc.).

As a result of the current investigation, the development of recommendations for the practical sector has been proposed, aimed at keeping under control the color of wines as an important organoleptic parameter by predicting the influence of activated carbon treatments (as well as other treatments) on the chromatic characteristics and the evaluation of the treatment conditions (quantities), which will not be perceptible by the consumer.

Keywords: red wines, Feteasca Neagra, Rara Neagra, anthocyanins, monomeric pigments, polymers, color intensity, shade, tristimulus, CIELa*b*, organoleptic examination.

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UNDERSTANDING THE BARRIER PROPERTIES OF CLAY-BASED FOOD PACKAGING. A CONTRIBUTION FROM COMPUTATIONAL MODELLING

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Non-swelling clays have been used in traditional paper coating technologies for many years because these exert the least effect on the rheological properties of a formulate coating. However, recent work [1] has demonstrated that combining swelling clays, particularly the smectites, with starch and plasticisers to form a sustainable coating, results in water vapour transmission rates (WVTR) that are competitive with oilderived barrier coatings. Coatings with high barriers to gases, vapours and flavours find their major application in food packaging materials [1]. Taking into account the amount of food currently wasted every year, packaging that keeps it fresh for a longer time has an important role to play in reducing the amount of energy consumed during the food production and transport cycle.

The simultaneous presence of both starch and plasticiser in the clay gallery is critical in order to achieve the lowest possible WVTR values, though only some clays are able to incorporate starch into the gallery. Current experimental techniques are lacking in performance for investigation intercalated layered materials and give little information due to static and dynamic disorder. Because of these limitations, interest in the use of computational methods [2] for studying these layered solids has increased in order that observed physical and chemical properties may be rationalised and predicted, thus providing sustainable paper coatings, which are competitive with oil-derived barrier coatings.

We have employed computer simulation techniques – Molecular Dynamics (MD) to extend understanding of the roles played by the clay, water, starch and plasticiser in these sustainable coatings. The impact on the barrier properties is assessed as well. MD models were validated with experimental observations. Later, the influence of the magnitude of the clay layer charge and its distribution on the hydration dynamics of smectite clay minerals and its barrier properties.

Keywords: barrier packaging, bio-polymer, simulation, clay-polymer nanocomposites, food-safety

References.

[1] C. Johansson, J. Bras et al. Renewable fibers and bio-based materials for packaging applications – a review of recent developments. Bioresources, 7(2), 2506-2552 (2012)

[2] R. Cygan, J. Liang, A. Kalinichev. Molecular Models of Hydroxide, Oxyhydroxide, and Clay Phases and the Development of a General Force Field. J. Phys. Chem. B, 108, 1255-1266 (2004)

USE OF YELLOW FOOD DYE FROM SAFFLOWER PETALES IN PRODUCING OF CARAMEL

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Color is the first quality indicator of the food product. Candies based on synthetic dyes are loved by children even from a young age, but because of their negative effect, the question arises of replacing synthetic dyes with natural ones. Safflower plant from Asteraceae family is perspective plant for obtaining natural dyes. The purpose of this paper presents the scientific study of the efficiency of using the natural yellow dye - YFDS (yellow food dye from safflower), obtained from the petals of the safflower petals (*Carthamus tinctorius* L.) on the production of caramel. ***Preparation of Yellow Food Dye from Safflower.*** Separation of yellow and red natural dyes from the petals of safflower was performed according to [1], after the YFDS liquid concentrate was evaporated at dried under vacuum. ***Prepared of caramel mass:*** Caramel samples were obtained based on glucose syrup, by homogenizing sugar, water and anti-crystallizer. Mixtures were subjected to heat treatment at a temperature of 155°C. At 115±2°C, adding citric acid and YFDS. After cooling, caramel masses was poured into molds to achieve the desired appearance and shape. ***HPLC-method:*** HPLC method was carried out using a Shimadzu "Provenience LC-2030C 3D-Plus", with integrated Photodiode Array Detector (PDA), on a "Phenomenex" reversed-phase C18 column, with the gradient elution technique through two mobile phases: water, containing 0.1% (v) acetic acid (Phase A) and acetonitrile containing 0.1% (v) acetic acid (Phase B). ***Prepared of caramel samples:*** Sampels of caramel were desolved in 100 mL of distilled water. Resulted solutions were filtred through PES filter with 0.22 nm pores.

The obtained HPLC chromatograms demonstrated that the YFDS dye is suitable for its use as a natural dye in the production of caramel**.** The peaks obtained in the caramel samples demonstrated that the three chalcones (hydroxysafflor yellow A, anhydrosafflor yellow B and precarthamin), which are contained in the YFDS dye in powder form, remain stable during the heat treatment of the caramel mass at high temperatures and in acid medium.

It has been demonstrated that to obtain a caramel, harmless to consumers, yellow synthetic dyes can be replaced by the natural yellow dye YFDS, which does not undergo chemical degradation during the producing of caramel.

Keywords: caramel, food natural dye YFDS, HPLC, safflower.

References:

1. SAVCENCO A., BAERLE A., TATAROV P., IVANOVA R. Process for producing dyes from Safflower petals. Patent of Moldova, MD-1453, issued 31.03.2021.

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

VALORIZATION OF BREWERY SPENT YEAST FOR THE SYNTHESIS OF BIOCOMPOSITE MATERIALS WITH APPLICATIONS IN WATER TREATMENT

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Brewing is one of the industry sector with great economic importance, according to Conway (2019) [1], who said that in 2018, worldwide beer output topped 1.94 billion hL. Large volumes of wastes are produced by the brewing industry, whose handling is both economically challenging and ecologically problematic since they build up in the environment. Residual yeast is one of the three main brewery wastes for which research into new ways of exploiting is encouraged. A literature overview [2] reveals that brewery spent yeast could be utilized in the production of nutritional supplements, functional food ingredients and other value-added products. However, *Saccharomyces pastorianus* residual biomass has not been explored for obtaining biocomposite materials and particularly not in biosorbent synthesis.

The objectives of this study were to obtain biosorbents based on *Saccharomyces pastorianus* residual biomass and natural polymers by immobilization technique and to carry out an evaluation of biosorptive capabilities for pharmaceuticals removal from aqueous matrices. Two types of biosorbents called SPRBDA 5% and SPRBA 5% were synthetized using *Saccharomyces pastorianus* residual biomass in dry and wet forms and sodium alginate. The resulted beads were characterized by scanning electron microscopy, and Fourier-transform infrared spectroscopy. Beads size and point of zero charge were also determined. In a batch system, laboratory-scale biosorption studies were conducted. Ethacridine lactate (EL) was chosen as target molecule. Removal efficiency in the case of SPRBA 5% was found to be 87.82% compared with 54.26% for SPRBDA 5% in the same operational conditions (pH 4, biosorbent dose 2 g/L, initial EL solution concentration 40 mg/L). The recorded data show that the eco-friendly synthesized biosorbents can be successfully used for the removal of pharmaceuticals from aqueous solutions and open a new direction for brewery spent yeast valorization.

Keywords: biosorption; calcium alginate; Ethacridine lactate; Saccharomyces pastorianus residual biomass

References

1. Conway, J. (2019). Beer production worldwide from 1998 to 2018. Available at https://www.statista.com/statistics/270275/worldwide-beer-production/

Jaeger, A., Arendt, E. K., Zannini, E., & Sahin, A. W. (2020). Brewer's spent yeast (BSY), an underutilized brewing by-product, *Fermentation*, 6(4), 123.

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YIELD AND PHYSICO-CHEMICAL PROPERTIES OF PECTIN OBTAINED FROM APPLE POMACE IN NON-TRADITIONAL WAYS

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The commercial, nutritional, and health benefits of apples are the objectives of growing these fruits on the territory of the Republic of Moldova. During the processing of apples, apple pomace is formed, which is a rich source of carbohydrates, fiber, pectin, and phenolic acids. The significant amount of agro-industrial waste produced in the world has directed research to develop new methods to effectively add value to pomace. Conventional techniques for obtaining pectin from apple pomace require large amounts of solvents, high energy expenditure, and long realization time. As an alternative, non-traditional methods are known, such as extraction using ultrasound, microwaves, pulsed electric field, the use of enzymes, which provide increased pectin yield and reduced environmental impact. The aim of the research was to study the influence of microwave assisted extraction (MAE) and ultrasound (UAE) conditions on the physicochemical characteristics and yield of pectin obtained from apple pomace of the "Gold delicious" variety.

The pomace obtained as a result of juice extraction was dried to a moisture content of 12.0 ± 0.05% and shredded to a grain size of 140 ± 10 μm. For the extraction of pectin in the presence of microwaves and ultrasound, apple pomace and a solvent with pH 1.5, 2 and 2.5 (adjusted with citric acid) were used in the ratio (RS) 1:10, 1:15, 1:20 (m/v). In the case of microwave extraction, the power of the magnetron was 450–650 W at exposure times of 5 and 10 min. In the case of ultrasound, the parameters were as follows: amplitude - 100%; frequency - 37 kHz and duration of extraction 15 and 30 min.

Analyzing the obtained results, it was found that with an increase in the power of the magnetron from 450 to 650 W, at the same pH value and at the same RLS coefficient, the extraction yield increased by 12%, due to the rupture of cell walls and fragmentation of macromolecules in the acid medium. An increase in the number of methoxyl groups in the analyzed samples was also demonstrated. At pH 1.5, in the samples obtained under the conditions of UAE and MAE extraction, a decrease in the equivalent mass of pectin, an increase in the content of galacturonic acid, and a decrease in alkalinity were observed. A direct dependence between pectin yield and extraction conditions was shown. Regarding to the extraction of MAE, it was proved that in the presence of UAE at pH 1.5, the pectin yield decreased by 7.3%, and the pectin equivalent mass increased. It was also demonstrated that prolonged exposure to ultrasound (30 min) led to a decrease in the amount of galacturonic acid in all analyzed samples. It was shown that the highest yield of pectin was obtained by the MAE process. The physicochemical properties (content of galacturonic acid, methoxyl groups, equivalent mass, degree of esterification, etc.) of pectin obtained by microwave extraction with commercial pectin were compared. At the same time, it was found that all pectin samples obtained in the course of this research retained an increased amount of phenolic acids and showed more pronounced antioxidant properties compared to commercial pectin.

Keywords: apple pomace, pectin, extraction, microwave, ultrasound, degree of esterification.

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

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Î.M. "Fabrica de brânzeturi din Soroca" S.A.
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http://www.lactalis-alba.md/

The plant was established in 1973 with 100% state capital and property.

In 1999, the diversity of products has been reduced for economic reasons. In the same year, the plant was bought by the company FOOD Master (American company), which continues the company's manufacturing base - hard rennet cheese and butter.

In 2005, the plant became a member of the French Group Lactalis (World's 1st Leading Dairy Group, and 15th largest agro-food Group worldwide), which transformed it into a modern dairy manufacturing, responding to the requirements of European quality standards. Due to the significant investments (more than 15 millions EUR) were made substantial changes to the infrastructure and the plant was equipped with many modern machines.

The plant diversified the assortment of products (pasteurized milk, kefir, sour cream, yogurts, biokefir) while continuing the production of cheese.

Since March 2010 "**Fabrica de brînzeturi din Soroca"** received permission to produce for the first time in Moldova under international brand "President" for sour cream, and 2014 for cheese. Today the Président brand is a French dairy market leader, distributed in 128 countries and covers the entire range of dairy produce, where it is recognized for its top quality. Also, for local market the plant have a strong brand "ALBA", that was considered with gold medal in 2012 the "Brand of the year".

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Bere Chișinău este un produs al companiei Efes Vitanta Moldova Brewery S.A., care este parte a grupului «Efes Beverage Group» - unul din cei mai importanți producători de bere și băuturi răcoritoare din Turcia și spațiul CSI.

Prima fabrică de bere din Moldova, de unde își trage originile actuala companie Efes Vitanta Moldova Brewery, a fost fondată în 1873 de către un întreprinzător german. Abia peste un secol, în anul 1974, prin fuzionarea fabricii vechi de bere cu cea nouă, au fost puse bazele actualei companii. Pe parcurs, fabrica a fost modernizată considerabil, noile utilaje de producție permițând o creștere substanțială a capacităților de producție și calității produselor. Mărcile fabricii au fost desemnate pentru calitate cu numeroase medalii de aur, argint și bronz, de la zeci de expoziții și târguri internaționale.

O nouă etapă în istoria companiei și a mărcii Chișinău începe în anul 2003, cînd "Efes Beverage Group", unul din cei mai mari producători de bere de pe piața Europeană, achiziționează pachetul majoritar de acțiuni al companiei "Vitanta Intravest", din acest mariaj rezultând noua companie "Efes Vitanta Moldova Brewery". Această schimbare a adus un suflu nou în companie și a ridicat și mai mult standardele de calitate practicate, fapt confirmat de primirea Certificatului ISO 9001 de implementare a unui sistem performant de management al calității, în noiembrie 2004.

În 2012 companiile internaţionale de producere a berii SABMiller şi Anadolu Efes au încheiat acordul de alianţă care vizează dezvoltarea afacerilor în Turcia, Rusia, CSI, Asia Centrală şi Orientul Mijlociu. Ca rezultat, Anadolu Efes îşi extinde acoperirea geografică şi îşi consolidează poziţiile în ţările unde activează. În Republica Moldova, încheierea acestei alianțe a însemnat faptul că compania Efes Vitanta Moldova Brewery, devine distribuitor exclusiv pentru mărcile de bere care aparţin companiei SABMiller.

Astăzi, Efes Vitanta Moldova Brewery este cel mai mare producător de bere local și una din cele mai admirate companii din Republica Moldova, cu o contribuție considerabilă la bugetul statului și o companie cu responsabilitate socială care întreprinde numeroase inițiative spre binele societății.

Marca Bere Chișinău, care poartă cu mândrie numele capitalei țării, este cea mai consumată și preferată marcă de bere în Republica Moldova. Marca Bere Chișinău își propune să devină o sursă de optimism și mândrie pentru moldoveni.

Mai multe detalii despre compania Efes Vitanta Moldova Brewery S.A. le găsiţi la adresa web www.EfesMoldova.md.

Farm Meat Group
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Farm Meat Group was founded in 1999. The founder of this company is a 4th generation farmer (the first farm in his family was founded in 1878).

Today, Farm Meat Group has a modern meat processing plant, own poultry and pig breeding farms, employing about 400 employees. The company with over 18 years of experience has become one of the leaders on the local market in the production, processing and preserving of meat and meat products, as well as the production of sausages, offering to its consumers always fresh and safe products, made using the most modern technologies. Quality Control Policy is built in accordance with international standard ISO:22000, certificate nr. AJAEU/13/12947.

All the processes are kept under strict control, so the company is confident in the quality and safety of products that are offered to customers. Another ingredient of success is the largest variety of products on the market - all kinds of meat, sausages and grill products, hams and salami, which can be an ideal solution for each family.

The company's products meet the highest quality standards and are presented in all retail networks under the folowing brands:

- is a well-known Moldavian brand, that has more than a century of existence;
- the widest and most complete range of sausages and canned meat on the Moldavian market is produced under this brand.

- the range of products offered by this brand is comprised of a variety of sausages for different market segments;
- balancing the quality of the products and refined tastes, this brand reflects the main feature that distinguishes it among competitors.

- this brand offers a wide range of fresh meat (pork, beef, chicken), semi-finished products, “mititei”, “cîrnăței” and different marinated meat products for barbecue;
- under this brand, for the first time on the Moldavian market, were produced chilled meat using protective atmosphere packaging;

Company’s customers are modern people which tend to spend their time in the most efficient way and unfortunately in a very fast pace of modern life do not have time to cook for hours, but they lead a healthy way of life, are real gourmets and company’s goal is to offer them such products.

Farm Meat Group always tends to build long-term relationships with consumers, based on sincerely, devotion and mutual respect.

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Practically all the citizens of the Republic of Moldova know and love us. Our production is held in deserved respect also beyond the bounds of our republic. The widest geography of our deliveries proves the popularity of our products - these are Germany, Canada, USA, Greece, Romania, Italy, Spain, Bulgaria, Australia, United Kingdom, Israel.

S.A. Franzeluta "- a company with experience in the baking industry for over 65 years old, established traditions, a solid reputation, including 3 bakeries, pasta factory, experimental - mechanical workshops, shop for food production of carbon dioxide, as well as its own sales network.

The leaders and workers of the industrial complex is a group of associates, the main thing for whom is concern for customers. The international quality system ISO 9001 and ISO 22000 introduced into the industrial complex permits to put out the production on the level of the world standard. The company is certificated with Kosher Certificate for risp bread rings production.

The close control and raw material analysis, as well as flavoring qualities control of the products, made by the skilled and experienced staff, guarantee the quality of our products. The technologists of the JSC "Franzeluta" apply their whole skill and experience for the high quality and good taste of the production on your table. Our production is manufactured following the classical technologies, using of mainly natural additions and baking powder. The equipment of the leading European firms is installed in our enterprises.

"Franzeluta" is a permanent participant of the international, regional and branch exhibitions. Our production was presented in Germany, Romania, Bulgaria, Moscow. Besides, we are the permanent participants of republican exhibitions. A customary result of taking part in testing competitions of the exhibitions is the prizes and medals for the excellent flavor and high quality of the products.

The organization of joint tastings and conferences with the representatives of trade organizations has become our good tradition. You can make sure of the whole assortment variety of bakery, confectionary and macaroni products, as well as appreciate its flavor qualities, if you will visit our trading shops "Franzeluta".

We are open for the collaboration with new partners on mutually beneficial terms. We have a good industrial base and many years' experience for it. We pay much attention to the joint work with the customers; it paves the way for the effective business collaboration. Disposing of all the necessary possibilities, we work both with bulk and small-bulk buyers, and the presence of the own auto park permits us to deliver the production. Regularity in the work, definite observance of the agreement obligations and of the delivery schedule, the individual work with customers are the factors that will make our collaboration pleasant and mutually beneficial.

And that is why we would like to see you more frequently - there always is an occasion for the meeting! "Franzeluta" is glad to offer to you the widest production assortment:

- Different sorts of bread (white, rye sorts, the bread with health-giving additions)
- Baking products (Swiss rolls, buns)
- Rich assortment of pasta with and without supplements (spaghetti, pasta, noodles, shaped products)
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"La Mămuca" este o patiserie/covrigărie de tip street-food, care oferă produse mereu proaspete și gustoase pentru trecători.

Patiseria / covrigăria ”La Mămuca” și-a început activitatea în anul 2014. Ocupația sa de bază este producerea și comercializarea produselor făinoase. La moment în companie activează cca. 85 de angajați și sunt deschise 8 puncte de vânzare în mun. Chișinău, 1 dintre care este secția de producere. Ea a devenit rapid unul dintre locurile preferate ale chișinăuienilor pentru a lua o gustare. Aici pot fi găsite croissante, covrigi cu diverse adaosuri precum susan, mac, scorțișoară, cașcaval, dar și gogoși, chifle din foietaj ș.a.

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PELICAN este un serviciu de livrare a produselr naturale și a apei. Denumirea juridică a companiei noastre: CC "AquaTrade" SRL. Noi livrăm apă produsă de Rusnac-MoldAqua, care a fost fondată în 1994 într-o zonă ecologic curată în satul Gura Căinarului din raionul Floresti, Republica Moldova. Serviciile unice, prestate de Pelican, sunt orientate în primul rînd spre persoanele care doresc să consume apă potabilă de calitate înaltă și tind să-şi economisească timpul. Calitatea produselor noastre este garantată de o abordare fără precedent a procesului de producție și controlul strict al calităţii şi securităţii produselor. Flexibilitatea, loialitatea, confortul, graficul de livrare convenabil, varietatea de promoţii, condițiile speciale pentru clienți, nivelul modern al deservirii - toate acestea caracterizează înalta calitate a serviciilor de livrare a apei potabile la domiciliu şi la birou prestate de către compania Pelican. Compania Rusnac-MoldAqua este singurul producator din Republica Moldova, care deţine două dintre cele mai moderne laboratoare certificate în conformitate cu sistemul ISO17025, în cadrul cărora are loc monitorizarea constantă a parametrilor fizico-chimici şi bacteriologici ai apei. Acest lucru ne permite să garantăm calitatea şi siguranţa absolută a apei.

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