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1. **Modern Processes and Equipment in the Food Industry**
2. **Food Technology**
3. **Chemistry and Microbiology of Food**
4. **Colloque francophone : « Sécurité alimentaire, nutrition et agriculture durable » (section française)**

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Section I

Modern Processes and Equipment in the Food Industry

DESUBLIMATION OF STEAM ON A CYLINDRICAL SURFACE

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Abstract: The operation of the sublimation unit is largely determined by the mode of operation of the desublimation unit. The buildup of ice, during the process of dewatering the material, on the surface of the desublimator-evaporator of the refrigerating machine leads to an increase in thermal resistance between the vapor-air phase and the boiling refrigerant.

Keywords: temperature, desublimation, thermal resistance, refrigerant.

Introduction

The heat flow to the refrigerant is transmitted through a layer of ice (frost) whose thickness is a function of the time of the process. An increase in thermal resistance due to ice chilling leads to an increase in the desublimation temperature (vapor-ice phase transition) at a constant boiling temperature of the refrigerant, which, other things being equal, leads to a decrease in the freezing rate and, consequently, the entire sublimation process. If the desublimation temperature is kept constant, the boiling point of the refrigerant will decrease, which leads to additional energy consumption (due to a decrease in the refrigeration coefficient.

Materials and methods

We were tasked to calculate the temperature field during sublimation on a cylindrical surface. Desublimator is taken as an endless cylinder consisting of two layers: a layer of ice and a tube of the evaporator itself. The heat exchange between the shell of the frozen layer of ice and the medium occurs according to the Newton-Richmann law. Our task is to determine the temperature in this system.

The energy equations are written as:

$$\frac{\partial T_i}{\partial \tau} = \frac{a_i}{R}\frac{\partial}{\partial R}\frac{R\partial T_i}{\partial R} + \frac{1}{R^2}\frac{\partial}{\partial \varphi} + \left(\frac{\partial T}{\partial \varphi}\right) + a_i \frac{\partial^2 T_i}{\partial 2^2}, \quad (1)$$

where $i = 1$ for the frozen layer and $i = 2$ in the thickness of the evaporator wall.

In the first case, the value R changes within $R_0 < R \le \xi$, ξ – the coordinate of the frozen layer at the moment of time τ. a_1 and a_2 – thermal conductivity coefficients of the frozen and boundary layers, respectively m^2/s; T – temperature, K; τ – time, s.

Taking the process of crystallization symmetric and the edge effect is insignificant, and then equation (1) for the frozen layer is simplified to the form:

$$\frac{\partial T_i}{\partial \tau} = \frac{a_1}{R}\frac{\partial}{\partial R}\left(\frac{R\partial T_1}{\partial R}\right). \quad (2)$$

The boundary conditions we write in the form:

$$T(\xi, \tau) = T_{kp}; \; T(\infty, \tau) = T_c; \quad (3)$$

$$\alpha_1\left(T_C - T_\xi\right) = \lambda_2 \frac{dT_2}{dR} + 4\rho \frac{d\xi}{d\tau}; \tag{4}$$

$$T\left(R_\partial, 0\right) = T_0 : \frac{\partial T}{\partial R}\Big|_{n=3} = -\frac{\alpha}{\lambda_1}\left(T_3 - T_c\right). \tag{5}$$

The solution of equation (2) with boundary conditions (5) can be solved by the operational Laplace method [1]. The type of solution in our case will be written in the form:

$$\frac{T_c\left(R,T\right) - T_0}{T_c - T_0} = 1 - \sum_{n=1}^{\infty} A_n I_0\left(\mu_n \frac{R}{R_1}\right) \exp\left(-\mu_n^2 F_0\right), \tag{6}$$

where the temperature amplitude A_n is defined as:

$$A_n = \frac{2I_1\left(\mu_n\right)}{\mu_n\left[I_0^2\left(\mu_n\right) + I_1^2\left(\mu_n\right)\right]} = \frac{2Bi}{I_0\left(\mu_n\right)\left[\mu_n^2 + Bi^2\right]}, \tag{7}$$

for large values $Bi \to \infty$, μ_n are the roots of the Bessel function of the first kind of zero order $I_0\left(\mu_n\right)$, then:

$$A_n = \frac{2}{\mu_n I_1\left(\mu_n\right)}, \tag{8}$$

$I_1\left(\mu_n\right)$ Bessel function of the first kind of the first order.

For small values $\beta_i \to \infty$, the amplitude A_n tends to 1 (except for the value $A_n = 0$ except $A_1 = 1$).

Then the solution (6) can be written in the form:

$$\frac{T_1\left(R,T\right) - T_0}{T_c - T_0} = 1 - I_0\left(\sqrt{2Bi}\,\frac{R}{R_1}\right) \mathrm{e}^{-2BiF_0} \tag{9}$$

The temperature distribution in the thickness of the wall of the evaporator - desublimator is described by equation (2), where the temperature value T_2, the boundary conditions are written in the form:

$$T\left(\mathrm{R}_0, \tau\right) = T_{кип}; \; T\left(\mathrm{R}_1, \tau\right) = T_\xi; \; T\left(0, \mathrm{K}\right) = T_0, \tag{10}$$

we have boundary conditions of the first kind.

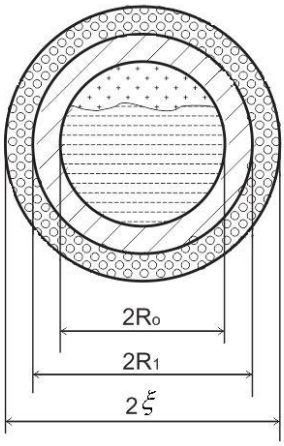

Fig. 1. *Representation of the vaporizer pipe in section*

The solution in this case is written in the form:

$$T_2\left(\mathrm{R},\tau\right)=\frac{\pi^2}{2}\sum_{n=1}^{\infty}\frac{k_n^2 I_0^2\left(k_n R_1\right)V_0\left(k_n R\right)}{I_0^2\left(k_n R_0\right)-I_0^2\left(k_n R_1\right)}\cdot\int_{R_0}^{R_1} RT_0 V_0\left(k_n R\right)dR\cdot e^{-ak_n^2\tau}, \quad (11)$$

where $V_0\left(k_n R\right)-$is the Bessel function of the second kind of zero order. The roots $\mu_n=k_n R_0$, $R_1/R_0=m$ and $F_0=\dfrac{a\tau}{R_0^2}$ are determined from the characteristic equation:

$$I_0\left(\mu\right)Y_0\left(m\mu\right)-I_0\left(m\mu\right)Y_0\left(\mu\right)=0. \quad (12)$$

The obtained solutions of temperature distribution in the system. The pipe in the pipe describes the non-stationary process of heat exchange in this system complicated by the phase transition. The process of sublimation, and, consequently, of desublimation is quite long, we have the value of the Fourier criterion, tending to infinity. Therefore, the freezing process can be considered quasi-stationary (the phase transition zone moves.

The temperature at the interface of the condenser (ice) and the outer surface of the evaporator - desublimator is determined from equation (6) and (11) by setting the coordinate value R_1.

Putting the value of the temperature distribution (6) into equation (4), we obtain the rate of increase of desublimate:

$$L\rho\frac{d\xi}{d\tau}=-\lambda_1\left(T_c-T_0\right)\sum_{n=1}^{\infty}A_n\exp\left(-\mu_n^2F_0\right)\frac{d}{dR}\left[I_0\left(\mu_n\frac{R}{R_0}\right)\right]. \quad (13)$$

Sublimation in stationary mode greatly simplifies the process of condensation in the desublimator.

In this case, the speed of freezing ice in the installation can be written in the form:

$$\frac{\xi^2}{x}\left[\frac{2}{\alpha,\xi}+\frac{1}{2\lambda_{л}}\left(\ln\frac{\xi}{R_1}-1\right)+\frac{1}{4x_m}\ln\frac{R_1}{R_0}+\frac{1}{2\alpha_2 d_2}\right]=\frac{\Delta t\tau}{x\pi 4\rho}, \qquad (14)$$

where T – is the temperature, K; a – thermal diffusivity, m^2/s; τ – time, s; L – phase transition heat, $\frac{J}{kg}$; ρ – specific density, $\frac{kg}{m^3}$; α – heat exchange coefficient, $\frac{W}{m^2\cdot K}$; λ – heat transfer coefficient, $\frac{J}{m\cdot K}$; ξ – condensate coefficient, m; R_1 and R_2 the geometric dimensions of the evaporator chiller, m.

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DRYING INSTALLATION FOR GRANULAR PRODUCTS IN THE SUSPENSION LAYER

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Abstract: Applying internal heat source (high frequency currents) to dry granular wet products, namely grape seed in the suspended layer allows the adjustment of the drying time, hence the duration of thermal treatment, for each particle by automatically removing it from the respective area of the drying chamber. In order to study the kinetics of the given drying process, a drying facility for wet granular particles in the suspension layer was made.

Keywords: Seeds, grapes, suspension layer, drying.

Introduction

Currently, viticulture has not lost its relevance in Moldova, and grapes continue to enjoy increased popularity. However, it was found that unique benefits in nutrition, cosmetics and treatment of multiple diseases and seeds of grapes, often neglected. Grape seed is rich in strong antioxidants (as proanthocyanidin) and natural biologically active compounds such as calcium and potassium, contain large amounts of vitamin E. Increased antioxidant properties of grape seeds helps to destroy free radicals in the body, which, in turn, helps to avoid premature aging. The tocopherol (vitamin E) plays an important role in vital processes, which take place permanently in the human body.

Considering that grapes contain up to 7% of seeds, as a result of their processing, they are obtained in the Republic of Moldova approx. 18-20 thousand tons of grape seed. Industrial processing of grape seeds reflects a number of specific technological operations including drying **[1, 2]**. One of the methods to intensify the drying process of grape seed is drying in the suspended layer with the application of internal heat sources - microwaves. This method involves increasing the quality of the dry product and reducing energy consumption, because each seed is dry in part.

Materials and methods

For the design of the drying instalation described below, was used 3D design software SolidWord.

Computer simulation of the dynamics of the drying agent along with grape seeds the various forms of the work chamber was done using the ANSYS software using the laws of numerical methods.

As the source of thermal energy, has accepted a 900 W magnetron type Panasonic 2M210-M1.

Results and discussions

For the kinetics study the drying process of granular products in the suspended layer, a drying installation has been made (Figura 1). As a source of heat the energy of high-frequency electromagnetic fields was used, which allows the product only to be heated, thus excluding heat losses removed from the working chamber with the drying agent (the air) and minimizing those from insulation to the environment. At the same time

the given method of application of thermal energy allows location of the heating process (drying) only in the field of electromagnetic field formation, which coincides with the suspension zone (floating) of wet granules, thus ensuring a good self-selection of dry particles.

The drying installation is made up of the casing 1 (figure 1) on which the construction elements are mounted, namely: the product feed unit made up of the rotor 5 powered by the electric motor 12; the drying agent feed system (air), made up of the fan 4 driven by the electric motor and the air filter 11; the aerodynamic tube 6 with tapered section on which the drying chamber is mounted 8 equipped with a magnetron 7; the exhaust system consisting of discharge pipe 9 and the cyclone 10.

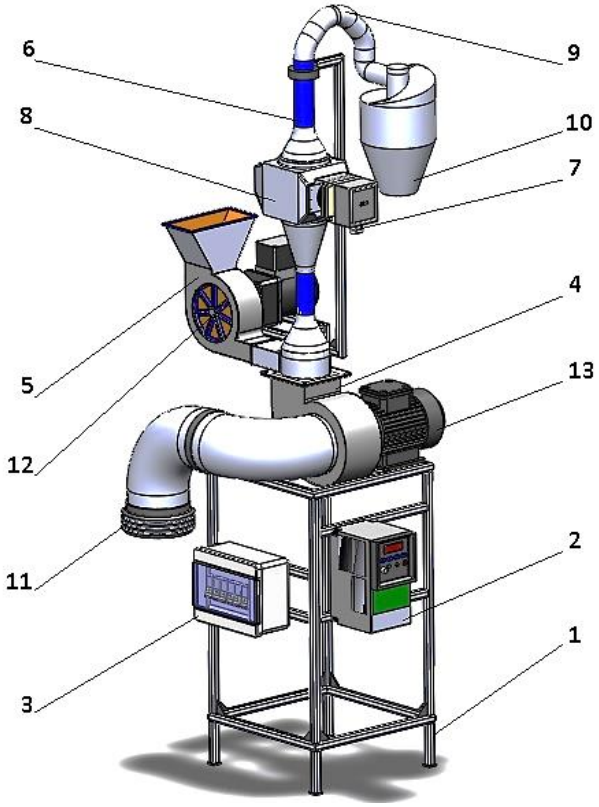

Figure 1. General view of of the drying plant in the suspended layer: 1 - carcase; 2 – frequency converter; 3 – control panel; 4 - fan; 5 - rotor; 6 – aerodynamic tube; 7 – magnetron; 8 – drying chamber; 9 – discharge pipe; 10 - cyclone; 11 - filter; 12 – electric motor; 13 – electric motor;

The instalation is equipped with temperature and humidity sensors mounted at the inlet and outlet of the aerodynamic tube 6. The air speed is adjusted by changing the fan speed 13 with the help of the frequency converter 2. Product temperature in the microwave heating area is measured with the type thermocouple EC060V, measurement error ± 0,99ºC. Decrease in mass of product is determined by periodic extraction of

samples in the drying zone and their subsequent weighing on electronic scales type JJ2000B, measurement error ± 0,01g.

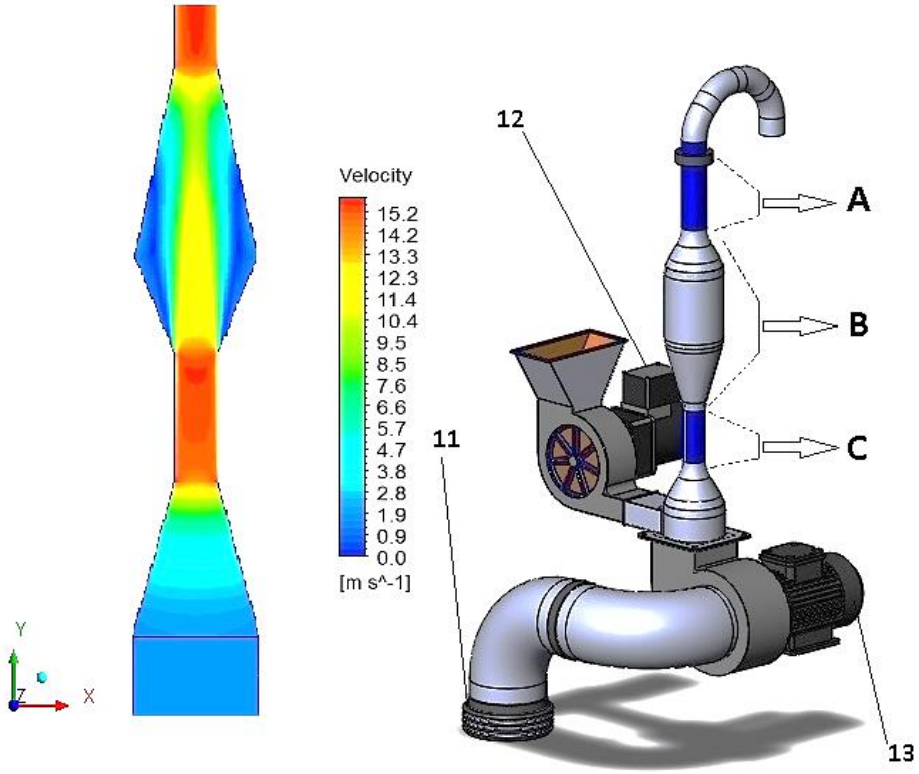

Figure 2. Variation of linear velocity across the entire section of the trizonal tube.

The geometric shape of the aerodynamic tube 6 was done as a result of computer simulation of the flow dynamics of the air-seeds mixture due to the reasons for obtaining it in the drying zone of a stable layer of suspended seed (figure 2). Thus, in zones B and C the mixing´s speed is maximum (cca. 15 m/s), so the particles run through them without being held back, and in Zone B (consisting of a loudspeaker and confuser), due to the slow widening of the speaker diameter, the air velocity decreases up to the wet weight of the wet seed (8,5 m/s) [3, 4]. Due to inertia forces, the area in which the air velocity equal to that of the water is established of wet seeds was obtained in the second half of the confuzor. Namely here and product heating takes place in the microwave field. With drying (decreasing mass) of the particles, floating speed decreases, thus, already dried particles are entrained by the air flow and displaced from the heating zone. Due to the further narrowing of the confuser, air speed increases, which provides for a better traction of dry granules, which is subsequently removed from the tube aerodynamically due to the increased speed of the mixture in zone A [5].

The laboratory installation works the following way. The wet granules are loaded through the rotor 5 in the lower zone of the aerodynamic tube, from where they are taken

over by the air flow flowing from the fan 4. In the area B (in the middle of the confessor) the wet granules stop and pass into suspension, being in a Brownian state of motion. An electromagnetic field is formed in the given area, which undergoes heating in volume granules blown by air, drying them. The dry granules, losing weight rises to the upper area of the confuzor where it is trained by the airflow with increasing speed and via tube A are circulated in the cyclone 10 in which separation of the dry air product takes place.

Conclusion:

The proposed laboratory allows research on the kinetics of the drying process of wet granular products in the suspended layer and subject to microwave application thermal treatment. The air velocity can be adjusted within the limits 0 – 20 m/s, air temperature within the limits 20 – 100 ^{O}C, magnetron power 900 W. The instalation enables the online registration of temperature, air velocity and humidity at the inlet and output and periodic recording of the product mass decrease. Application of new drying method in suspended layer, in the food industry will contribute to increasing the quality of the drying products by optimizing the duration of thermal treatment.

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ELECTRODYNAMICS, MASS AND HEAT TRANSFER LIMIT PROBLEM FOR MICROWAVE SISTEM

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Abstract: The paper describes the general formulation of the problem of mass and heat exchange in the high and super high frequency electromagnetic field, which solves a wide range of applicative problems related to thermal treatment and drying of materials.
Key words: Maxwell's equations, mass and heat transfer.

Introducere

The process of heating and dewatering in microwave installations is described by the equations system of Maxwell and Lykov. In most cases we can take the dependence of the electric induction vector D from the E tension and the magnetic induction B from H, for an isotropic environment, the equation (1) of mathematics can be written as:

$$D = \varepsilon E;\ B = \mu H;\ j = \sigma E \tag{1}$$

Where:
ε, μ – permeability of the dielectric and magnetic environment;
σ – conductivity of the environment;
j – current density of conduction.

Development of equation systems

In microwave installations, applicators are typically used to process imperfect dielectrics, where structural heterogeneity is less than the wavelength in the environment, which allows the hypothesis of homogeneity of the object. In product processing, relative dielectric permittivity ε' and $tg\ \delta$ (dielectric loss angle) depend on the temperature. From the well-designed device account, the heat treatment takes place considerably uniform throughout the volume. Thermo physical parameters within a narrow range can be considered permanent. Then the system of equations (2 – 9) of transferred heat mass and electrodynamics can be written as:

$$\frac{\partial T}{\partial \tau} + v\nabla T = a\nabla^2 + \frac{\varepsilon 2}{c}\frac{\partial u}{\partial \tau} + \frac{Qv}{c\rho} \tag{2}$$

$$\frac{\partial u}{\partial \tau} + v\nabla u = a_m\nabla^2 u + a_m\delta_T\nabla^2 T + \varepsilon\frac{\partial u}{\partial \tau} \tag{2}$$

$$\frac{\partial p}{\partial \tau} + v\nabla p = a_p\nabla^2 p + \frac{\varepsilon}{c_b}\frac{\partial u}{\partial \tau} \tag{3}$$

$$rotH = j + \frac{\partial D}{\partial \tau} \tag{4}$$

$$rotE = -\frac{\partial B}{\partial \tau} \tag{5}$$

$$divD = 0 \tag{6}$$

$$divB = 0 \tag{7}$$

where:
T – the environment temperature, [$°C$]; u – moisture content, [$g/cube$]; v – the transportation speed of the object, [m/s]; a – thermal conductivity, [m^2/s]; a_m – mass conductivity, [m²/s]; a_p – the convective filter diffusion coefficient; c_b – capillary-porous body capacity in relation to wet air; c – the specific heat of a substance, [$J/Kg\cdot{}^{\circ}K$]; ρ – density, [$kg/cube$]; p – water vapor pressure in the material, [Pa];

$$Q_v = 0{,}5w\varepsilon_0\varepsilon' tg\left|\dot{E}\right|^2 \tag{8}$$

Where:
w – angular frequency, ε_0 – dielectric permeability in vacuum.

Calculus solution

Electromagnetic fields in some areas are interfaced (9):

$$\begin{gathered}[H_2 - H_1, n] = 0 \;;\; [n, E_2 - E_1] = 0 \\ n(D_2 - D_1) = 0 \;;\; n(B_2 - B_1) = 0\end{gathered} \tag{9}$$

n – the unity vector, guided from one medium to another

The limit condition for heat transfer can be written as follows:

$$\begin{gathered}\lambda\nabla T|_n + q(\tau) + 2j_n(\tau) = Q \\ \lambda_m\nabla u_n + \delta_T\nabla T_n + \delta\nabla p_n + j_n(\tau) = 0 \\ p_n = 0\end{gathered} \tag{10}$$

q, j_n – density of heat and mass flow.

Conclusion

Thermal processes in a heated environment can be described by solving the limit value issue (1), (2), (3) and (9). And the electromagnetic field can be calculated from solutions (4) - (7) and (8). The problem of the declared limit value can be considered correct.

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IMPLEMENTATION OF THE QUALITY MANAGEMENT SYSTEM IN THE DEVELOPMENT OF UNIVERSITY TRAINING

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Abstract: Currently education in Moldova is going through the reforming period, changes that consequently may decide the place and even the role of our country in the worldwide educational system. At the moment, in the Technical University of Moldova has been introduced a system of quality teaching and development to support strategic management and continuous improvement of the work of all levels of the university.

Quality management – is the assurance of educational programs' quality, which stress out and develop two main directions – the culture and the experience. Nowadays, university`s culture may be changed in the following perceptions: management style, the practice of recruitment of students and employees, information support of quality management processes, intra-organizational communication and interaction with the Ministry of Education, culture and research. Because of its position upstream from all the other institutions to which it provides human resources, the University represents, from this point of view, a critical locus of national culture.

Thus, improving the quality of education in the Technical University as well is an important part of the process of creating a European educational space, since the quality of university education is the leading tool for international competitiveness and the key value of the concept of modernization of education.

Key words: quality teaching, management, standards, education, training program.

Currently education in Moldova is going through the reforming period, changes that consequently may decide the place and even the role of our country in the worldwide educational system. That`s why, the introduction of quality management systems of education is one of the main directions for the development of higher education.

At the moment, in the Technical University of Moldova has been introduced a system of quality teaching and development to support strategic management and continuous improvement of the work of all levels of the university. The basic quality standard that sets the requirements for quality management systems is the ISO-9001 standard, the principles of which are: customer orientation, leadership, employee involvement, process approach, system approach to management, continuous improvement, decision-making based on facts, etc.

A quality policy has been drawn up, where are presented the mission, principles of management and quality objectives of the University.

As well as, it is necessary to provide some definitions of "quality" in general.

The quality represents the level of satisfaction, which ensures the effectiveness of approaches in education and professional training. As well as, for any approach to work, previously there were needed to achieve some standards, and some accomplishments made by participants and other interested parties.

The quality control ensures the qualitative education that will be provided for students. This is about keeping standards at the same level as before, not about creating new ones.

Quality assurance of education is accomplished by realizing a set of activities which main purpose is to evolve University`s potential, to create, to plan and to put in practice educational programs, which will make them see the institution as one which assures an education that corresponds to the quality standards.

The methodology of quality assurance in the field of education is based on the relationship between:

a) Criteria;
b) Standards;
c) Results;
d) Qualifications;

The quality of education is ensured by following processes:

a) Planning and achieving high results in education;
b) The monitoring of results;
c) The internal assessment of results;
d) The external assessment of results;
e) The continuous evolving of results in educational area.

The components and processes of quality assurance and the relationship between them differ:

a) by level of education and if necessary;
b) by qualification level;
c) by the type of organization of the provider of education;
d) the type of training program.

Quality management – is the assurance of educational programs' quality, which stress out and develop two main directions – the culture and the experience. Nowadays, university`s culture may be changed in the following perceptions: management style, the practice of recruitment of students and employees, information support of quality management processes, intra-organizational communication and interaction with the Ministry of Education, culture and research. There is even possible to say with certainty that a quality culture does not exist without consistent leadership throughout the university.

One of the management`s functions, which is especially important at the present moment in the development of educational system – is the choice of the direction of the evolving of the University when traditional methods are no longer working or the changes from outside impose a new approach. A competent leader is obliged to contribute to the creation of an atmosphere for workers and students, which will promote creative and effective work inside the University. A leader makes the personal to want to be involved in the activity of the institution, and whatsoever this is the basic principle in building qualitative management inside the University. Leadership develops the plans, visions, values, policies and strategies of the organization and is responsible for monitoring processes and systems.

Responsibilities of the quality management system:

- characterizes the effectiveness in terms of the quality of the curricula of development / training;

- supports actively and directly participates in the development and quality assurance of training programs;
- develops and maintains effective partnership relations with interested external factors;
- meets the needs and expectations of both internal and external stakeholders.

The organization provides students with a safe and harmonious environment, offers support. When teaching, it is appropriate to respond to the collective and individual needs of students. Resources, teaching methods should be available to all students. The organization employs employees according to clear recruitment and selection criteria (the minimal standards for qualifications and experience), defines the job description, suggests introductory programs and training of personnel.

The educational institution reacts to the needs of individuals, companies and communities (external stakeholders), but also to the different needs of students (internal stakeholders). The university is constantly developing training programs that meet the requirements of stakeholders, the software puts the student at the center of their interest. The purpose of these programs is social integration, providing access and equal opportunities for each student.

Quality, fairness and efficiency are the backbone of educational reforms in Europe and the world over the past decades, which should be taken into account when creating national management and quality control systems. This is necessary not only to ensure a real and functional integration, from the point of view of education, to the European Union, but because initiatives in this area must correspond to theoretical and methodological points of view, with what is happening in educational system now in the world. Backwardness from the point of view of the concepts and system of quality management, values and related methodology will make it extremely difficult, not only integration, but even mutual understanding.

There are three types of projects that provide quality education.

Educational project with the general interests of activities, the main directions of education: the concept of a person, the ideal of education and the values of society. It refers to the policy of education and materializes in programs for reforming and developing the education system as a whole.

The educational program as a configuration of actions and expectations of specific activities and educational processes related to the work of teachers and students, as well as the relationship between them.

Institutional project as an instrument of managerial management policy, is focused on innovations and changes, on the development of the university in structural and functional plans, being a tool for coordinating all activities of the organization.

At the level of each education organization, a commission was established to evaluate and control quality. Educational institutions develop and adopt their own strategy and rules for the work of the commission for assessment and quality control. The head is directly responsible for the quality of education. The commission for evaluation and quality control includes members of the teaching staff and excellent students, who are multilaterally developed and educated in terms of the quality of education.

Obstacles to quality assurance in education:

- lack of knowledge / skills in the field of quality management for those involved in ensuring the quality of education;
- methods and tools of quality management are often considered an end itself;
- the concept: "quality is obtained through the detection, correction and resolution of any problems", and not by preventing their occurrence;
- lack / inadequacy of quality objectives, policies and strategies;
- excessive confidence in the documents of the quality management system due to management decisions and actions in relation to quality assurance;
- the provision and improvement of quality is perceived by the staff solely as the performance of a “debt”;
- priority attention to quantitative indicators, due to which quality is lost;
- lack of resources allocated to quality in the field of education;
- lack of available financial resources / refusal to invest in laboratory equipment, information technology, multimedia equipment and their maintenance.

Quality is also an element of culture. Organizational culture, along with art, science, philosophy, the cultural heritage of a nation is a part of it.

Because of its position upstream from all the other institutions to which it provides human resources, the University represents, from this point of view, a critical locus of national culture. For many reasons, it is necessary to develop an organizational culture in higher education that leads to greater efficiency, increased accountability, greater creativity and greater autonomy throughout the entire social system. Such an organizational culture can only be a culture of quality.

Thus, improving the quality of education in the Technical University as well is an important part of the process of creating a European educational space, since the quality of university education is the leading tool for international competitiveness and the key value of the concept of modernization of education.

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RESEARCH OF ELECTRICAL TREATMENT OF PLANT RAW MATERIALS IN VIBROEXTRACTION

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Abstract: The paper presents the results of research on the influence of low-frequency mechanical oscillations and electric discharges on morphological changes in a structure of hop raw material for vibroextraction. Shown expedience of preliminary processing of water-hops suspension by electropulse discharges in order to intensify vibroextraction of plant raw material with low extractive property. Determined rational process parameters.

Keywords: extraction, plant raw materials, electroprocessing, extraction curves, hop raw material, kinetics of process.

Materials and methods

Research methods include analytical modeling. Used methodology to establish diffusion characteristics of tissue of plant material. Autotransformer type LATR-1-5. Microscope MBI-15. Electrodischarge camera. Generator of pulsed currents GIT 50-5x1 / 4C UHL4. Laboratory vibration extractor of continuous action. Treatment of experimental data was carried out using the MathCAD 15, KOMPAS-3D systems..

Introduction

Efficiency of use of vibroextraction equipment for processing of plant material is caused by creation of intensive hydrodynamic regimes by turbulent pulsating jets generated by vibration elements. This gives rise to favorable conditions for external mass transfer. [1, 2]. However, there may be and limiting circumstances associated with decrease in concentration difference on the surface of particle material in its middle. There is a need to increase of output of target components from substance to its surface.

In this regard, noteworthy use of electrohydraulic methods for processing of plant raw materials, which have a high degree of influence on internal mass transfer [1], in comparison with traditional (maceration, percolation, mixing, etc.). However, despite the known experimental data, to date, the kinetic regularities of process in conjunction with vibroextraction have not been investigated and not developed appropriate methods for calculating industrial apparatuses.

Result and discussion

Essence of this method of intensifying the process is formation of a shock wave in a liquid when there is a specially formed pulsed high-voltage electric discharge in it. Thus, in the area surrounding channel of discharge develops high pulse pressure, which manifests itself in the form of explosive mechanical impact on the environment in the vicinity of the channel. The dynamics of radial expansion of the channel is determined on the one side by the discharge current, and on the other side depends on development of the hydrodynamic shock-wave process in a liquid environment that surrounds the discharge.

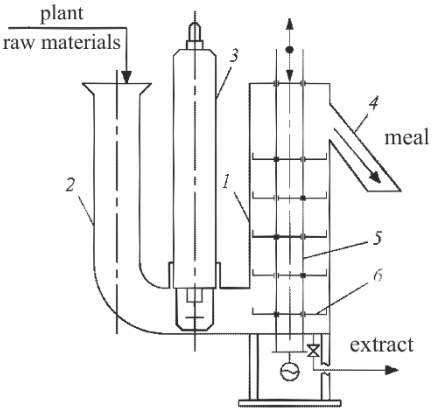

Fig.1. *Scheme vibroextractor with electrodischarge device: 1 - corps; 2 - loading device; 3 - electric discharge device; 4 - tray; 5 - stock; 6 - plate.*

At the first stage performed processing of hop raw material by the electric discharges in the electrodischarge chamber of a special construction [3]. During research, the discharge voltage was established by adjusting gap between an ends of a torsion air arrester, and also changed frequency of discharges. Intermediate sampling was carried out through a drain pipe.

Operating parameters of the generator of electropulse currents were as follows: nominal output power 10 kW; voltage 10 kV; frequency 2 Hz; accumulated energy 5 kJ; full power 18 kVA.

After determining the rational parameters of the preliminary processing of raw materials study was conducted of joint effect of electroshock processing of raw materials and low-frequency mechanical vibrations with the following basic parameters of the switching arrester: nominal voltage 50 kV; nominal switching energy 5 kJ; frequency up to 4 Hz; amplitude of pulses of current up to 40 kA.

Experiments were carried out on a pilot plant (Fig.1).

Prepared plant material was fed into vertical part of the loading device 2, where under action of the pusher 1, it moved into the lower part, where the electric discharge device is located 3. In this zone raw materials were subjected to electrohydraulic treatment with a single impulse at a voltage of 30 kV in the discharge channel. Further, the raw material was supplied to working volume of the apparatus, where process of vibroextraction took place. Under the influence of the vibration transport system 5 the raw material was moved to upper part of the apparatus countercurrently to the extractant, where it was unloaded through the tray 6. Extract samples were taken from bottom of the vibroextractor through the crane.

Visualization of change in structure of the hop raw material during operation of low frequency mechanical oscillations and electroshock was carried out using a microscope.

Found that after vibroextraction occurred almost complete destruction of the strongest morphological component - lupulin grains. At the same time there was a transition to a liquid and conversion of alpha acids into iso-alpha acid by isomerization. Even greater destruction occurred after a joint effect of low-frequency mechanical oscillations and electric discharge. As a result, due to destruction of cell, it is possible to reduce time of the process almost triple in comparison with infusion. This result is achieved by mechanical action on raw materials vibration transport devices, turbulent pulsating jets, and also by the action of a shock wave formed by a pulsed high-voltage electric discharge generated in an electrodischarge chamber of a special device.

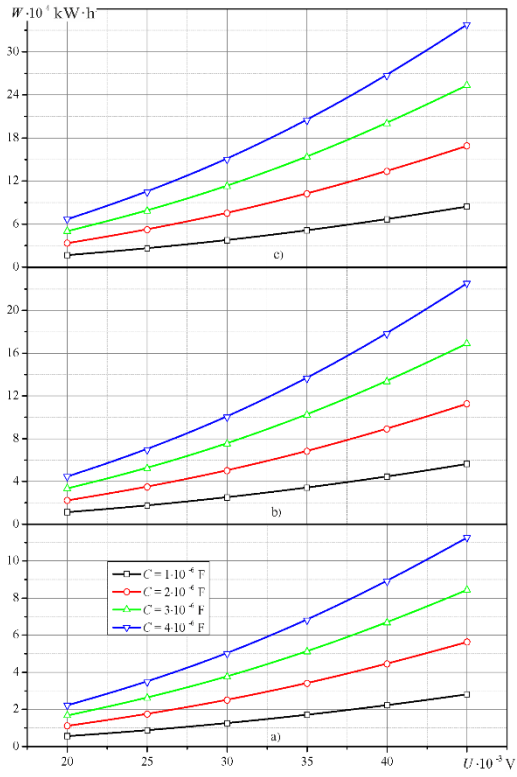

***Fig. 2**. Dependence of energy consumption from the processing of raw materials of electrohydraulic actuator on the discharge voltage for different capacities and number of discharges: a) - 1 discharge; b) - 2 discharges; c) - 3 discharges.*

Rational energy costs and the necessary technological indices of raw materials for electric processing can be justified by choosing the optimal distance between electrodes [5]

$$l_{opt} = 15.75 \cdot 10^{-3} (Ur)^{0.5} (LC)^{0.125}, \quad (1)$$

where r — distance from the axis of discharge to the object of influence, m; U_0 — circuit voltage spark arrester channel, V; L — inductance of the discharge circuit, H; C — capacity of the storage capacitor, F. The consumed pulsed power, which is needed for perform work at the electrodischarge processing of raw materials and electricity consumption for the processing of a given volume of suspension in a rational treatment mode was determined by the equations [5]:

$$P_{\text{imp}} = U_m^2 / R = U_m^2 \gamma; \; W = W_i N, \quad (2)$$

where U_m – amplitude voltage, V; R – ohmic resistance of the processed product, ohm; $W_i = U^2C/2$ – energy released during one pulse, J; N – number of discharges per portion of the product, kg; U – breakdown voltage of intermediate gap, V; C – capacitance of capacitors, F.

Generalization of the calculated dependence of energy consumption on the processing of raw materials by electric discharge pulses from the discharge voltage in range of 20-45 kV and number of discharges 1-3 is commented by the graphs of Fig.2.

During researches was established influence of parameters of electric discharges on degree of extraction of dry substances from hops raw material and quality of extract obtained by amount of accumulation of bitter substances in it [3]. Experimental results are summarized in Figures 3, 4.

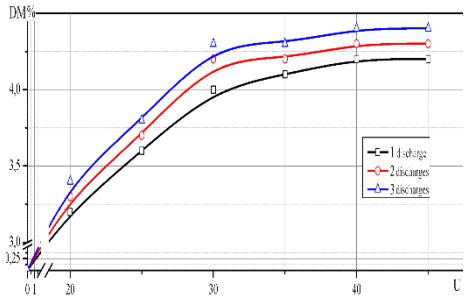

Fig. 3. *Change in concentration of total solids removed from the hop raw material in the extractant from voltage of electric discharge.*

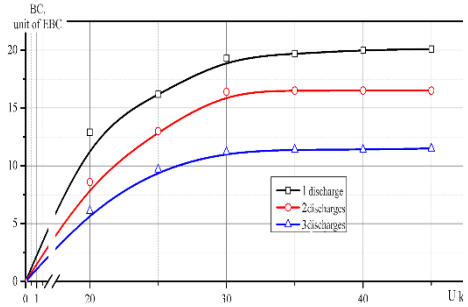

Fig. 4. *Change in content of bitter substances in hop extract from voltage of electric discharge.*

As can be seen from the graphs of increasing energy of electric pulse leads to an increase in degree of extraction of target components. This increase goes up to 30 kV, obviously this limit and define the destruction of cells. At the same time, it should be noted that an increase in number of discharge pulses from one to three does not lead to a significant accumulation of total solids in the extractant, however, the energy consumption and processability of the process worsen the overall result.

Taking into account the goal of obtaining a non-isomerized hop extract, which is basically only bitter and aromatic substances and a limited fraction of the complex of water-soluble substances, polyphenols, we consider it appropriate to show, on the nomogram, the corresponding approximated ratios of contents of amount of accumulation of total solids and bitterness from number of discharge pulses (Fig.5).

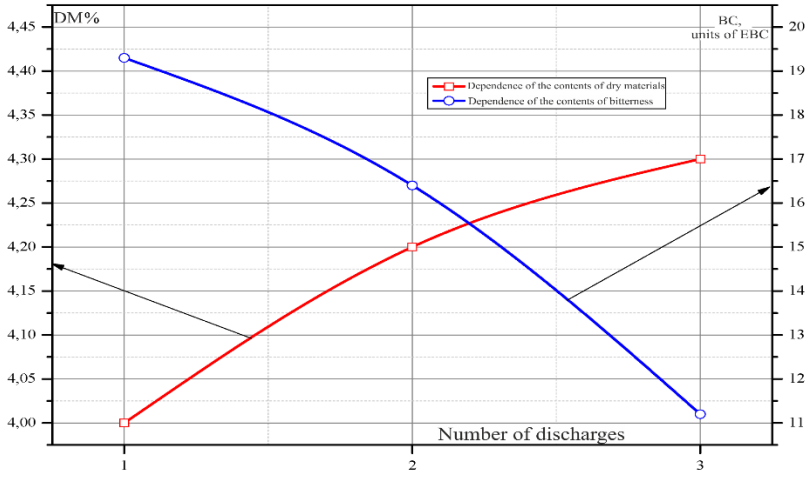

Fig. 5. *Nomogram of content of accumulation of total solids and bitterness from number of discharge pulses.*

Research results of joint influence of the electric processing of plant raw material and low-frequency mechanical vibrations on intensification of extraction are summarized

by construction of the corresponding extraction curves in Fig.6. Extraction curve of extraction with pre-treatment begins from ordinate of 4,03%, since the extract already has such a concentration of solids before the processing of raw material in the working volume of the apparatus by low-frequency mechanical vibrations.

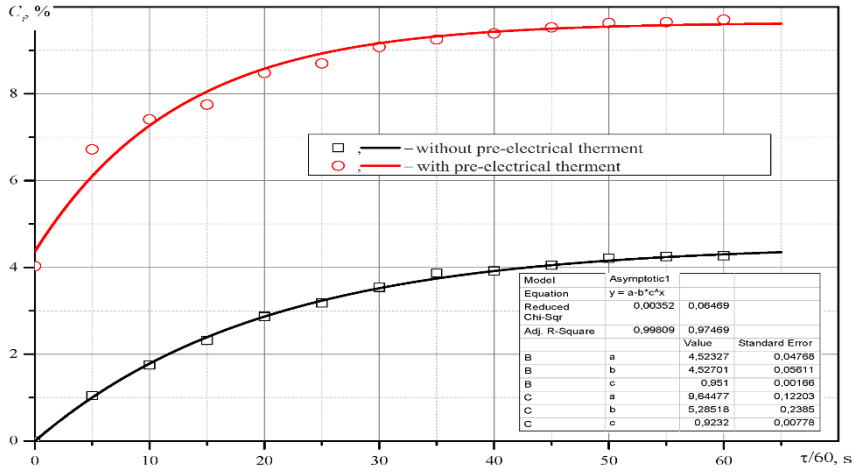

Fig.6. *Determination of relaxation time of accumulation of total dry substances in the extract during vibroextraction and vibroextraction with pre-electric treatment of hop raw material (q = 20, f = 3 Hz).*

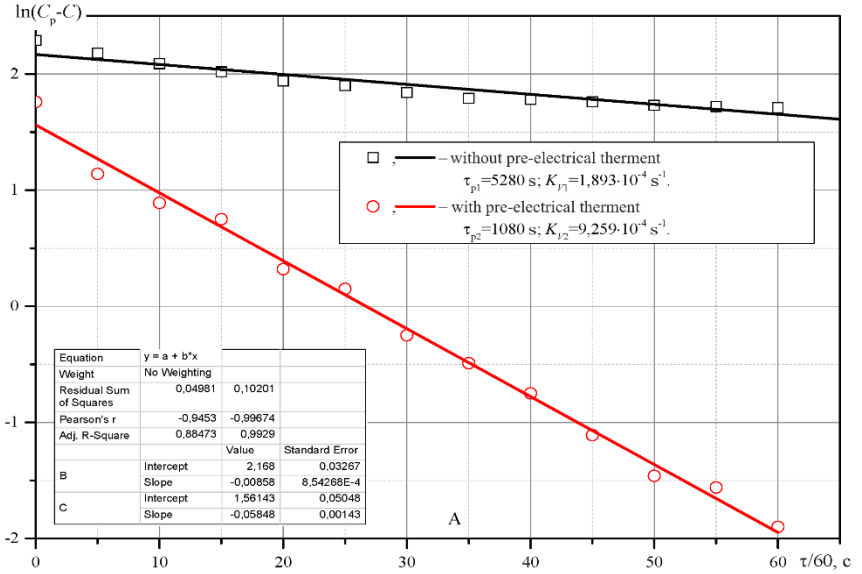

Fig.7. *To determine the total relaxation time accumulation of solids in the extract during the process of intensifying low-frequency mechanical vibrations with and without previous electric-treating of hop raw material (q = 20, f = 3 Hz, W = 9.86%)*

Since effect of low-frequency mechanical oscillations is directed at the intensification of external mass transfer, and the electrodischarge effect on the raw material is intended in this combination to eliminate the limiting step of internal mass transfer, it is decided to compare the combined method with the usual vibration extraction, to carry out an indicator taking into account general effect of the mass transfer between phases - the volume mass transfer coefficient K_V, which in our experiments is defined as the inverse of the relaxation time process τ_p. As can be seen from the graph, even tangent of inclination angle of combined process is considerably larger, and at the same time, the relaxation time of the process and the volumetric coefficient of mass transfer of vibroextraction and vibroextraction with electrical influences were respectively $\tau_{p1} = 5280$ s, $K_{V1} = 1{,}893 \cdot 10^{-4}$ s^{-1} and $\tau_{p2} = 1080$ s, $K_{V2} = 9{,}259 \cdot 10^{-4}$ s^{-1}.

This confirms the efficiency of the use of pre-electrical processing of plant raw materials in vibroextraction.

Conclusion

According to the results of experiments it was established that for the practical realization of the process of extracting the target components from plant raw materials by vibroextraction with the use of preliminary electrosurgical treatment of raw materials of plant origin, the discharge voltage should not exceed more than 30 kV at a single pulse, frequency and amplitude of oscillations of the vibration transport system, respectively, 3 Hz and 10- 15 mm, hydromodule 20. This mode of operation of the apparatus will provide increased volumetric mass transfer coefficient more than four times.

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STUDY OF DRYING SUGAR SORGHUM PROCESS

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Abstract*:* This article presents the study of the kinetics of the process of convection drying and the application of microwaves of the sugar sorghum cultivated under the conditions of the Republic of Moldova. The kinetics of the convection drying process were studied at different temperatures: 50°C, 60°C, 70°C, 80°C, 90°C and by microwave application at different magnetron powers: 150W, 240W, 360W, 480W, and 550W. The external appearance of the samples obtained in order to determine optimal drying parameters, both quantitatively and qualitatively, was also analyzed.

Key words: drying process, convection, microwave, sugar sorghum

Introduction

Sorghum is a plant species of the Poaceae family. The main representative, Sorghum bicolor, is the main bread cereal in Africa, Southern Europe, Central America and South Asia. The sorghum originates in Equatorial Africa, being a cereal adapted to the warm and dry climate. A sorghum species used as an energy plant is Sudan Grass (Sorghum Sudanese). Of this family belongs a variety called technical sorghum, known in Moldova between Prut and Nistru as a broom dressing. The sorghum reaches the height of 1.5-2 m (grain sorghum, soris) to 3.5-4 m (sugar sorghum). [1]

Sugar sorghum as object of study

The sorghum is a perennial herbaceous plant with a height of up to 2.5 m, exterior to the corn. The stem is straight, dry, with nodosites, is a well-developed root that penetrates deep into the soil. The sucrose strain contains 12-15% sucrose, which is quite a lot, and sometimes it reaches more than 20%. Usually, the upper part of the strain is not used because it is deficient in sucrose and it is pointless to be processed. It also contains cellulose up to 17%, very high water around 63-75%, starch - 5-7%, protein - 2-4%, gum - 3%, fat 0.02%, pectin - 60%, the juice content is 80-85% of the mass of the slopes. The leaves are alternate, late, pubescent, with sharp edges, green. Flowers are placed in straight, ragged or ablaze bunches, up to 70 cm long. [2]

Materials and methods

To perform the experiments, some samples of sugar sorghum were taken as research samples, which were then cleaned from the leaves and the protective coating, after which they were cut into segments of equal lengths of 10 cm, and split into four equal parts. The use of electronic scales accurate to 0.01 g of each sample is weighed 50g

To study the kinetics of the drying process, convection drying with the working agent temperature (50ºC, 60ºC, 70ºC, 80ºC, 90ºC) and working agent speed (1.5 m / s), [6,7,8] and drying in the field electromagnetic with magnetron power (150W, 240W, 360W, 480W, 550W), ambient temperature (20-25ºC) and humidity 60-65%, [9,10,11]. Experiments carried out at the research facility, Figure 1. The drying product is loaded into the drying chamber 15, opening the lid 21.

For convection drying, it is necessary to connect the scale 19 to observe the decrease of moisture in the product during drying; to connect the inverter 6, which

connects the centrifugal fan 10, via the electric motor 8, to connect the heat generator 13 and the resistor 5; at the same time, the intermediate channel 9 is removed from the centrifugal fan 10. Thus, the air is taken from the outside by the centrifugal fan 10 and directed to the heat generator 13 where it is heated up to a certain temperature due to regulation with the resistor 5; entering the drying chamber 15, it takes up the moisture from the product, transports it through the recycle channel 17 through the condenser 12 and the intermediate channel 9 and evolves it outwards.

For microwave drying it is necessary to connect the scale 19 to monitor the moisture content of the product during drying; to connect the inverter 6, which connects the centrifugal fan 10, via the electric motor 8, to connect the microwave generator 14 and the processor 2; at the same time the intermediate channel 9 is likewise removed from the centrifugal fan 10. Thus, the air is taken from the outside by the centrifugal fan 10 and through the heat generator 13 enters the drying chamber 15 where the moisture outlet of the product takes place due to the generator the microwave 14 which is routed to the processor 2; the humidity is taken up by the air flow generated by the centrifugal fan 10 and conveyed outward through the recycle channel 17 through the condenser 12 and the intermediate channel 9.

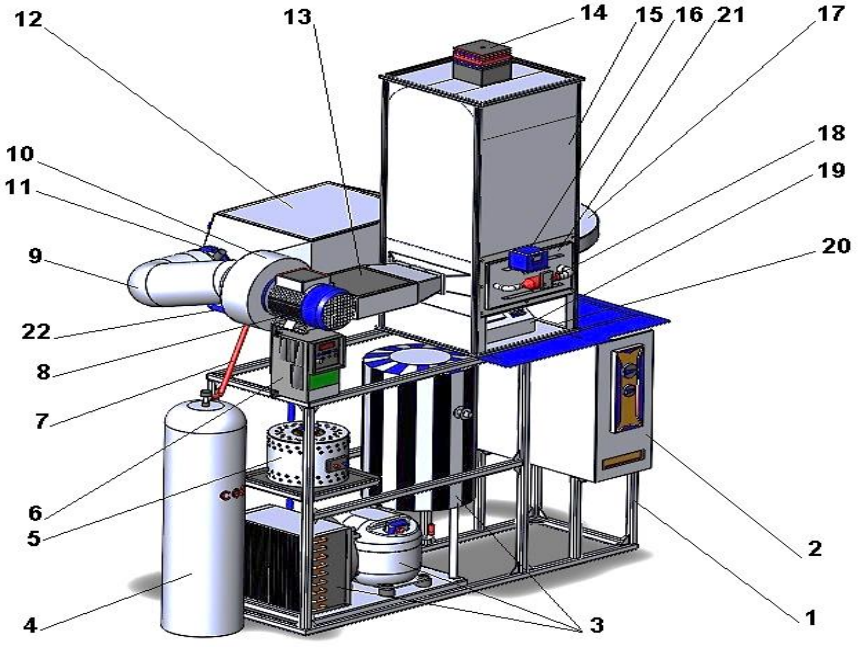

Figure 1. *Research facility:*
1 - metal housing, 2 - SHF processor, 3 - refrigeration plant, 4 - CO2 tank, 5 - resistor, 6 - inverter, 7 - hose, 8 - electric motor, 9 - intermediate channel, 10 - fan, 11 - nozzle, 12 - capacitor, 13 - heat generator, 14 - magnetron, 15 - drying chamber, 16 - CO2 indicator, 17 – recycling channel, 18 - the CO2 receptor, 19 - electronic weighing, 20 - intermediate chamber, 21 - cover, 22 - pipe.

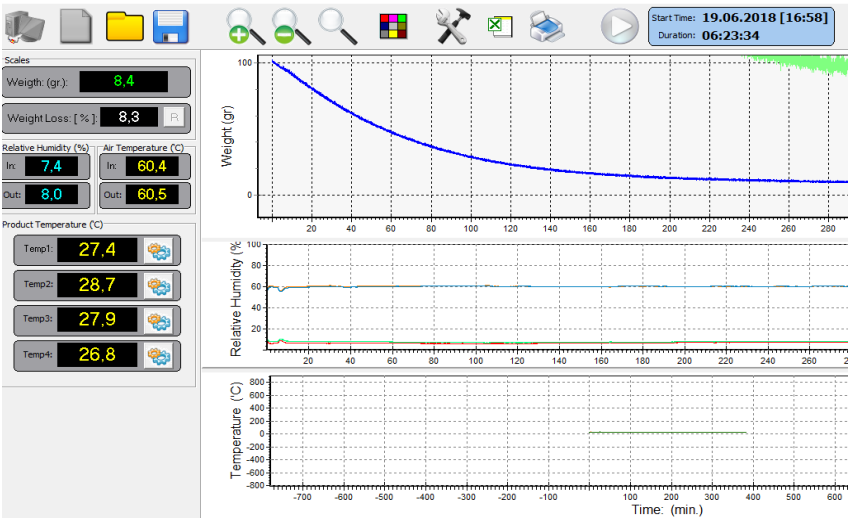

Figure 2. *Data electronic processing:*
1 – dial (indicates product's mass dropping curve), 2 – dial (indicates input and output drying agent temperature) 3 – dial (indicates input and output drying agent humidity)

Results and discussions

There are multiple, technological process (velocity, humidity, drying agent temperature, etc.) and drying product, the sugar sorghum properties (thermal conductivity, porosity, density, geometrical parameters, etc.) parameters that affect the drying process kinetics. [3, 4, 5]

Processed by convective method and different thermal agent temperatures, sugar sorghum drying curves shows a standard form, displaying stable moisture per time diminution Figure 3. From initial 76% to final 20% humidity drop duration depends on the drying agent temperature. Thus for the same 1.5 m/s drying agent velocity and initial humidity, but different temperatures, the drying period will be: for 50°C a 320 min length, 60°C a 250 min length, 70°C a 180 min length, 80°C a 110 min length and for 90°C a 80 min length.

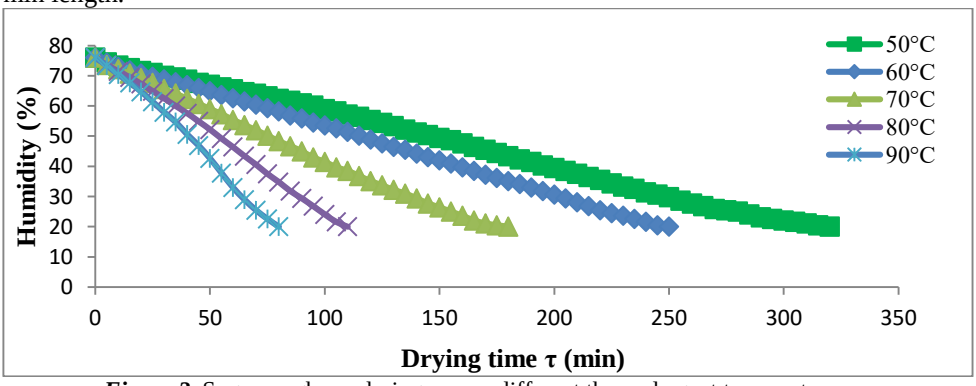

Figure 3. Sugar sorghum, drying curves different thermal agent temperatures
(Thermal agent velocity 1.5 m/s, and initial humidity 60.0%)

Figure 4 shows sugar sorghum's different thermal agent temperatures drying velocity curves. Their form also corresponds to the classic one, described in references [3, 4, 5]. There are as well presented the three drying periods, namely 1 – of product heating, 2 – of constant drying velocity and 3 – of decreasing drying velocity. For first period of product heating is characteristic decrease of humidity from 76% to 65%, for second period of constant drying velocity from 65% to 40% and for third period of decreasing drying velocity from 40% to 20% humidity. As shown in Figure 4 is observed the direct proportional dependence of the drying velocity on the working agent temperature for 50°C – 0.3 %/min; 60°C -0.4%/min; 70°C - 0.45%/min; 80°C – 0.55%/min; and for 90°C – 0.60%/min.

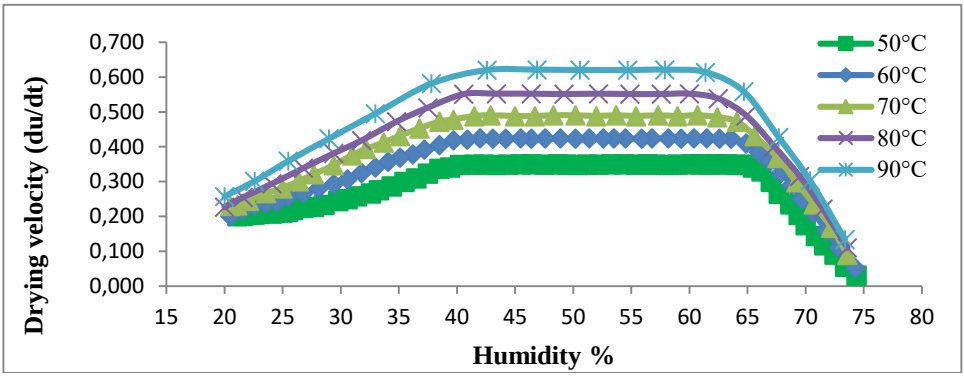

Figure 4. *Sugar sorghum different thermal agent temperatures drying velocity curves (Thermal agent velocity 1.5 m/s, thermal agent initial humidity 60.0%)*

The sorghum is famous for its high sugar content, so the purpose of drying the sorghum in such conditions is to get a maximum of sugar. For determining the sugar content the refractometry method was used and Bertrand method for comparison, the results are presented in Table 1, following the experiments it was found that at a temperature of 50 C persists a drying time too long 320 minutes which dispenses with an excessive energy consumption, Figure 5; at a temperature of 60°C total sugar content 52.04 g/100g, Figure 6; the total sugar content of 66.22 g/100g was obtained by thermal treatment of 70C, Figure 7; at 80°C and 90°C the caramelization phenomenon occurs, Figure 8 and 9; so the optimal drying temperature with a dry quality product is 60°C but with maximum contain of sugar at 70°C.

Table 1 *Determining the total sugar content*

Nr.	Fructose	Glucose	Sucrose	Total sugar content
1.	6.27	6.68	7.41	20.36
2.	12.87	17.42	21.75	52.04
3.	**15.74**	**21.29**	**29.19**	**66.22**

Where: 1 – fresh sugar sorghum, 2 – dry sugar sorghum at 60°C, 3 – sugar sorghum dried at 70°C.

Examples of dry sugar sorghum by convection method

Figure 5. *Temperature 50°C*

Figure 6. *Temperature 60°C*

Figure 7. *Temperature 70°C*

Figure 8. *Temperature 80°C*

Figure 9. *Temperature 90°C*

The kinetics of the drying of the sugar sorghum by application of the microwaves to different thermal regimes is shown in Figure 10. [9, 10, 11] Analyzing the drying curve with the use of microwaves we note that: at 550 W magnetron power, the product burns and an unpleasant odor occurs, Figure 16; at 480 W magnetron power, reaching 30 minutes. it smells burned and burns are present on the product, Figure 15; at the power of the magnetron of 360 W, reaching the time of 40 minutes, there is a smell of sugar and yellowish-orange colors appear on the surface of the product, Figure 14; at 240 W, the product humidity reaches 20% over 70 minutes, Figure 13; and in the final at 150 W magnetron power, product humidity reaches 20% over 95 min, Figure 12.

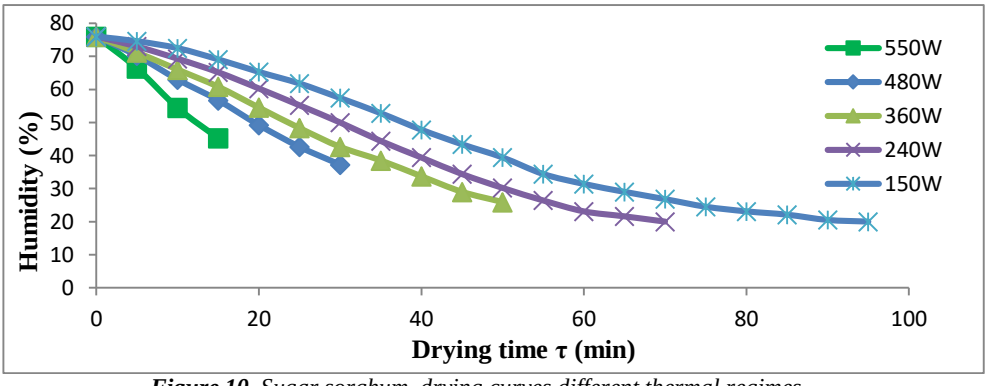

Figure 10. *Sugar sorghum, drying curves different thermal regimes*
(Thermal agent velocity 1.5 m/s, humidity 60.0% and microwave power 150W – 550W)

Figure 11 illustrates the curves of the drying velocity of sugar sorghum under the influence of three microwave regimes, or 150W, 240W, and 360W, because only these dry sorghum samples presents interest for research. Their form also corresponds to the classic one, described in references [9, 10, 11]. There are as well presented the three drying periods, namely 1 – of product heating, 2 – of constant drying velocity and 3 – of decreasing drying velocity.

For first period is characteristic decrease of humidity from 76% to 65%, for second period from 65% to 45% and for third period from 45% to 20% humidity. As shown in Figure 11 is observed the direct proportional dependence of the drying velocity on the working agent temperature for 150W – 0.9 %/min; 240W – 1.0 %/min; 360W – 1.1%/min., is observed compared to curve of convection drying curve the drying rate with SHF application is higher.

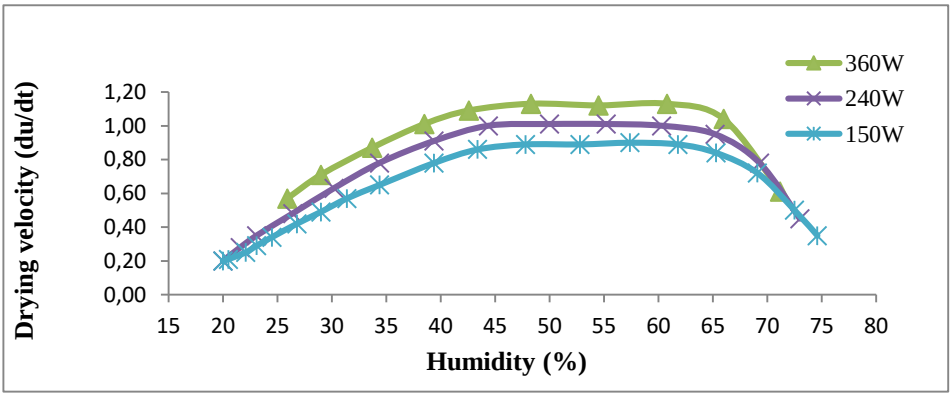

Figure 11. *Sugar sorghum different thermal regimes drying velocity curves (Thermal agent velocity 1.5 m/s, humidity 60.0% and microwave power 150W, 240W, 360W)*

The method of drying the sorghum in the electromagnetic field is optimal for 240W in terms of the obvious drying time and of the energy consumption and after the exquisite aspect of the dry samples Figure 12-16.

Figure 12. *150W*

Figure 13. *240W*

Figure 14. *360W*

Figure 15. *480W*

Figure 16. *550W*

Conclusion

The study of sugar sorghum convective and SHF drying kinetics at the temperature of the thermal agent in the range of 50÷90°C, and power in the range 150W – 550W, revealed that the increase thermal agent temperature end microwave power leads to an intensification of the process. However, convective temperatures above 70°C cause an acceleration of the undesirable sugar caramelization and browning phenomena. Therefore, for the convective drying of sugar sorghum, the temperature of 60°C - 70°C, and the speed of the heating agent is 1.5 m/s are recommended to get a quality product with a maximum quantity of sugar. The character of the draying curves is classic and does not differ from that of the fruits and vegetables described in the literature.

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SUPERCRITICAL CARBON DIOXIDE EXTRACTION OF LYCOPENE FROM INDUSTRIAL TOMATO WASTE

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Abstract: Cultivation of tomatos is an important agro-economic activity in the European Union (EU). Tomato processing industry entails the generation of large volumes of organic waste in the form of tomato seeds and skin. The tomato waste obtained from the manufacture of tomato juice was collected from "Orhei-Vit" JSC, Orhei, Republic of Moldova. Initially, tomato waste was dried from an initial humidity of 80.0% to a final moisture content of 6.5%. In order to increase the contact surface with carbon dioxide, the tomato waste was milled. Using the full factorial orthogonal experimental design method, was created the planning matrix in real variables, obtaining 15 extraction regimes by varying the parameters: temperature (36–73 °C), pressure (18–42 MPa) and time (24–96 min). Under laboratory conditions, samples of CO_2 extracts from tomato waste were obtained at different extraction parameters. The regression equation allowed the optimization of the response using the gradient ascension method, thus establishing the optimal extraction parameters of the bioactive compound – lycopene.
Key words: Tomato waste, supercritical CO2 extraction, lycopene

Introduction

With the increase in world trade of tomato products, the tomato processing industry is also expanding. As a consequence (result), the amount of by-products: tomato seeds and skin grows. At present, only a small amount of tomato by-products are sold at low prices and used as feed or fertilizer, but the remaining seeds are thrown away, thus wasting resources and polluting the environment.

Tomato seeds are an excellent source of macronutrients: 28% fat and 29% protein, and micronutrients: linoleic acid and other unsaturated fatty acids, high levels of essential amino acids such as lysine; without toxic ingredients or nutritional inhibitors. Therefore, the way of extracting nutrients from tomato by-products in order to obtain new products and greater economic value is a challenge [9].

Tomatoes and tomato waste, respectively, are highlighted by an increased content of lycopene, a powerful antioxidant. The lycopene molecule is the longest of all carotenoids, which like the β-carotene, the human body does not synthesize. Although it has a structure similar to that of the well-known antioxidant β-carotene, its antioxidant activity is at least 5 times higher. Lycopene protects cells against DNA damage and lipid peroxidation, and intervenes in reducing the risk of certain cancers (prostate, digestive, bladder, lung, skin) [10]. The antioxidant activity of lycopene is due to the capture of singlet oxygen from biological systems.

Lycopene is widely used in the alimentary industry as an antioxidant and natural colorant. As antioxidant it is active in non-polar environments, in oils, fats, foods with a lipid content. It has the ability to protect lipids from oxidative degradation by inactivating

the reactive forms of oxygen. Namely, the double bonds of the molecules ensure the addition of reactive oxygen [14].

According to the European Food Safety Authority (EFSA Journal 2011; 9 (4): 2031 Scientific opinion on the substantiation of health claims related to lycopene according to Article 13, paragraph 1 of Regulation (EC) No 1924/2006) the Dietary Reference Intake (DRI) of lycopene to have antioxidant effect or a normal cardiac function (in case of cardiovascular disease) is 5-15 mg / day. According to the recommendations of the Guidebook MP 2.3.1. 19150-04 of 2004, (Recommended levels of biologically active substances), the DRI of lycopene is 5-10 mg (the maximum daily dose is 15 mg) [8].

This paper presents the content of lycopene in CO_2 extracts from tomato waste, obtained at different extraction regimes. Based on the obtained data, it is determined the influence of the extraction parameters: temperature, pressure and time on lycopene concentration in the fat-soluble CO_2 extracts from tomato waste.

Materials and methods

Materials

Tomato waste was collected from the industrial scale production of tomato juice at "Orhei-Vit" JSC, Orhei, Republic of Moldova. With the purpose of being used as raw material, tomato waste with an initial moisture content of 80.09 % was dried by the conductive method in Biosec Domus B5 dryer to a final moisture content of 6.50 %. One of the basic criteria for carrying out the supercritical CO_2 extraction is that the raw material subjected to the extraction of the lipid fraction has a humidity of maximum 10…12% [4]. In order to increase the contact area with the carbon dioxide, to achieve a more efficient extraction, both quantitatively and qualitatively, the tomato waste was milled. The lipid content in dried tomato waste is 10.5% [4]. Carbon dioxide is intended for use in the food industry. The reagents used in analyzes: hexane, ethanol and acetone, meet the quality requirements.

Methods

The supercritical extraction with carbon dioxide from tomato waste was carried out under laboratory conditions at the HA 120-50-01C pilot plant within the Practical Scientific Institute of Horticulture and Food Technology. The technical parameters of the installation are: Pmax=50 MPa (500 atm), Tmax = 75°C, volume of the extractor vessel – 1.0 l and maximum extract volume – 0,6l [4].

From the storage tank, the carbon dioxide is pumped through the heat exchanger into the extractor vessel with raw material – tomato waste. Using the pressure and temperature control system the required extraction pressure and temperature are created in the extractor vessel. Once the supercritical CO_2 and the feed reach equilibrium in the extraction vessel, through the manipulation of pressure and temperature to achieve the operating conditions, the extraction process proceeds. The mobile phase, consisting of the superctitical CO_2 fluid and the solubilized components, is transferred to the separators I and II where the fluid is reduced by decreasing the pressure of the system. The extract precipitates in the I or II separator while thesuperctitical CO_2 fluid is either released to the atmosphere or recycled back to the extractor [1, 4].

Determination of Lycopene content

The lycopene from tomato by-products is extracted using hexane: ethanol: acetone mixture (2:1:1) (v/v) following the Sharma and Le Maquer method, exposed by Alda [5]. One gram of the homogenized samples, and 25 ml of hexane: ethanol: acetone mixture, which was placed into the rotatory mixer for 30 min, adding 10 ml of distilled water and the stirring was continued for another 2 minutes. The solution was then left to separate into two distinct layers, polar and non-polar. The absorbance was measured at 502 nm, using hexane as a reference sample. The lycopene concentration was calculated using its specific extinction coefficient (E 1%, 1 cm) of 3150 in hexane at λ=502 nm. The concentration of lycopene is expressed in mg/100 g product.

$$C = \frac{E}{3.15} \cdot \frac{20}{m} \quad (1)$$

C – lycopene content, mg/100g
m – mass of product sample, g
E – extinction coefficient.

Statistical analysis

Variance analysis of the results was carried out by least square method with application of Microsoft Office Excel program. Differences were considered statistically significant if probability was greater than 95% (q < 5%). All assays were performed at room temperature, 20 ± 1 ^{0}C. Experimental results are represented according to standard rules.

Results and discussion

In order to determine practical values of the process parameters, it is necessary to establish interdependencies capable of describing both the nature and the extent of the influences of the input factors, so it is foreseen to determine a mathematical model. For *the planned experiments*, to the influence factors were assigned two levels of variation: *a upper level* x_{sup} and *a lower level* x_{inf}. These two levels are chosen at equal distance from the *central level* x_0 of the influence factor, also called *base level* or *zero level*.

The zero level indicates the value of the influence factors around which experimental modeling was desired. The interval limited by the lower and upper values of the influence factors defines *the experimental field*. All influence factors can take values within this range of variation [3, 7].

During the supercritical-CO_2 extraction from tomato waste was examined the oscillation of three process parameters, namely temperature, pressure and time. Respectively, it was obtained the matrix in which the variable parameters of the process were encoded by X_1, X_2 and X_3 and were noted the minimum, center and maximum values that will be used in supercritical carbon dioxide extraction of liposoluble substances, including lycopene.

Table 1. *The classical matrix of assigning the values of influence factors*

Factor	Coding	Min. (-)	Center	Max. (+)
Temperature, *°C*	X_1	40	55	70
Pressure, *MPa*	X_2	20	30	40
Time, *min.*	X_3	30	60	90

Each input factor was assigned a coded variable. The variation range, from minimum (-) to maximum (+), was chosen in accordance with the characteristics of the CO_2-extraction plant, so that all experiments were achievable.

In order to have relevant results on the CO_2 extraction process of lycopene from tomato waste, two parallel experiments of the 15 regimes of extractions were performed, at temperature, pressure and time parameters to maximum, minimum and center values and combinations thereof. When selecting the extraction parameters, were taken into account the characteristics of the pilot plant type HA 120-50-01C, (P_{max} = 50 MPa, T_{max} = 75 ° C, V_{cel} = 1,0 l) [12], the parameters required to ensure the supercritical state of carbon dioxide (P_{cr} = 7.377 MPa, T_{cr} = 30.978 ° C, ρ_{cr} = 467.6 kg / m^3) [10, 13], but also that these parameters do not affect the quality of the extraction products. The lycopene concentration in the CO_2 extract of tomato waste, obtained with supercritical carbon dioxide, was taken as the output variable.

Knowing the factors that influence the CO_2 extraction process of lycopene from tomato waste, it can be chosen an optimum.

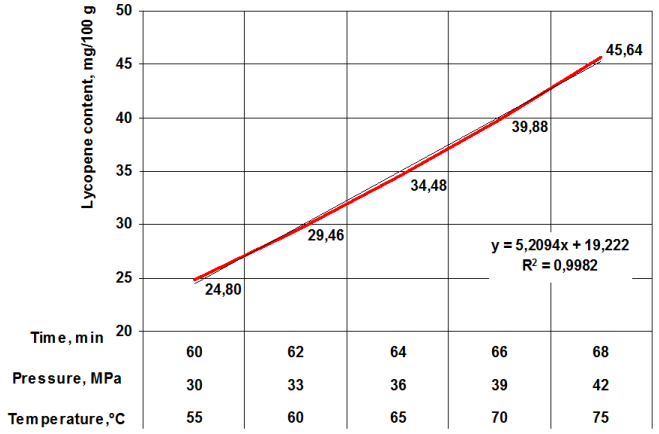

Fig. 1. *The calculated lycopene content according to the obtained equation at envisaged parameters with the recalculated step*

Analyzing the data from Figure 2, it is noted that increasing the temperature by 5.0°C, the pressure by 3.0 MPa and the extraction time by 2.0 minutes, the lycopene content increases with 4.66 to 5.76 mg/100 g of extract.

In order to obtain the graphs of response surfaces in the final form of regression equation: $\hat{Y} = 24,80 + 7,48X_1 + 6,29X_2 + 1,37X_3 + 1,66X_1^2$ the parameters X_1, X_2, X_3 are replaced with the expressions (2):

$$X_1=(T-T_0)/\Delta T;\ \text{or}:\ X_1=(T-55)/15$$
$$X_2=(P-P_0)/\Delta P;\ \text{or}:\ X_2=(P-30)/10 \quad (2)$$
$$X_3=(t-t_0)/\Delta t;\ \text{or}:\ X_3=(t-60)/30$$

Therefore, the final form of the second degree equation (3) describing the lycopene CO_2 extraction from tomato waste is:

$$\hat{Y} = 24,80 + 7,48(T-55)/15 + 6,29(P-30)/10 + 1,37(t-60)/30 + 1,66((T-55)/15)^2 \quad (3)$$

The plot of response surface of lycopene concentration in the CO_2 extracts from tomato waste, at 1 constant input factor (for minimum and maximum values) and 2 variable inputs were modeled.

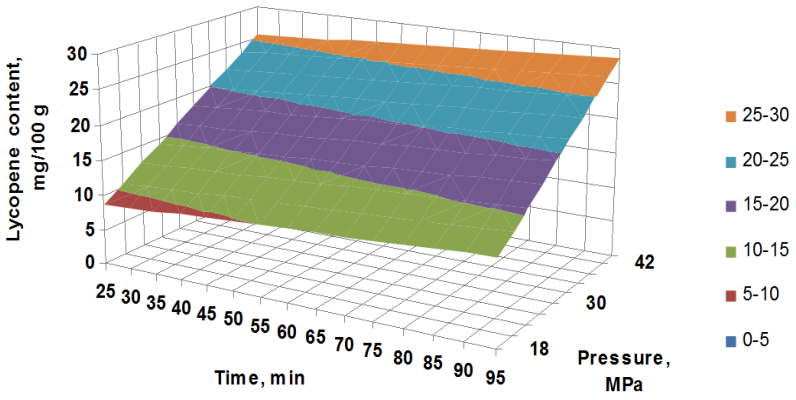

Fig. 2. *The response surface plot of tomato waste CO_2 extraction: lycopene content vs. extraction pressure and time at constant temperature 35 °C*

At constant temperature T = 35 °C (Fig. 2), the minimum and maximum lycopene content calculated by the obtained formula (4) is:

$$\hat{Y}_{min} = 8.63 \text{ mg/100 g, at P=18 MPa, t=25 min.}$$
$$\hat{Y}_{max} = 28.81 \text{ mg/100 g, at P=45 MPa, t=95 min.} \quad (4)$$

According to the mathematical model, at 75 °C a maximum lycopene content of 48.76 mg/100 g is obtained at P = 45 MPa and t = 95 min, and the minimum lycopene content of 28.58 mg/100 g at P = 18 MPa, t = 25 min. If the pressure is constant, namely for P_{min} = 15 MPa (Fig. 4), the minimum lycopene concentration is equal to 6.74 mg/100 g (35 °C and 25 min) and the maximum concentration is up to 29.89 mg/100 g (75 °C and 95 min).

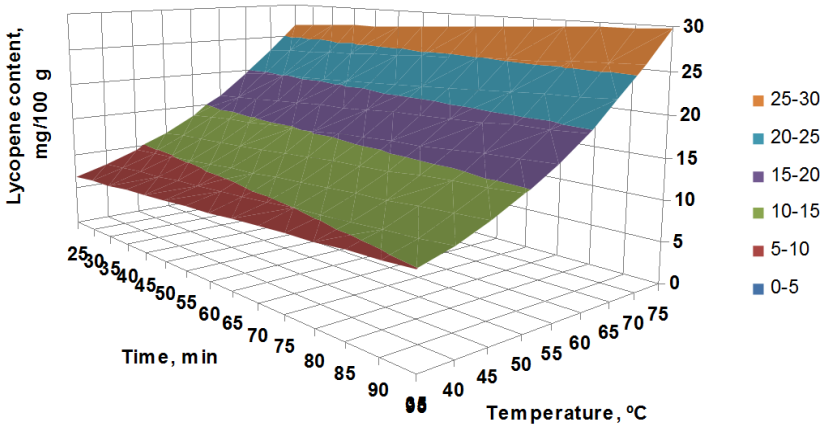

Fig. 3. *The response surface plot of tomato waste CO_2 extraction : lycopene content vs. extraction temperature and time at constant pressure 15 Mpa*

In the case when pressure is constant, for P_{max} = 45 MPa, the minimum lycopene concentration is 25.61 mg/100 g (35 °C and 25 min) and the maximum concentration reaches 48.76 mg/100 g (75 °C and 95 min). At a constant time of 25 minutes, the lycopene concentration would be at least 5.43 mg/100 g at 35 °C and 18 MPa, and at most 42.36 mg/100 g at 75 °C and 45 MPa (Fig. 4).

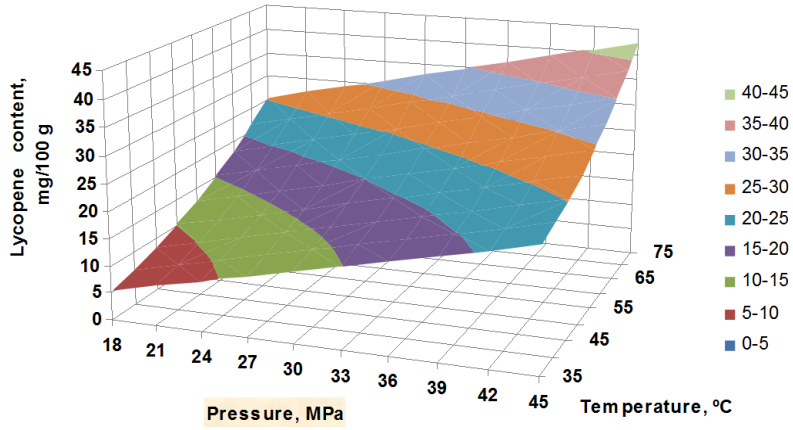

Fig. 4. *The response surface plot of tomato waste CO_2 extraction: lycopene content vs. extraction pressure and temperature at constant time 25 min*

For the duration of the 120 minute constant extraction, according to the response area obtained according to the final equation, the minimum concentration of lycopene is 18.45 mg/100 g at 35 °C and 18 MPa and the maximum concentration is 55.38 mg/100 g at 75 °C and 45 MPa.

The content of lycopene in the CO_2 extract from tomato waste varies between 10,80–47,12 mg/100 g, ie on average 28.96 mg/100 g of CO_2-extract, about 2–9 times higher than Recommended Daily Amount (RDA), 5–15 mg/day [8]. In order to provide

the human body with 15% of the RDA [6] of lycopene, a portion of the consumed product must contain at least 0.75 mg of lycopene.

Conclusions

Tomato waste can be used as a secondary raw material for the extraction of lycopene in liposoluble CO_2 extract. For supercritical CO_2 extraction parameters: T=36–73 °C; P=18–42 MPa and t=24–96 min, the lycopene content in CO_2 fatty soluble extracts from tomato waste varies in the range from 10.80 to 47.12 mg/100 g. The greatest influence on the extracting process of lycopene in CO_2 extracts from tomato waste has the temperature, followed by pressure, and the duration of the process has the least influence. The final form of the second degree equation describing the CO_2 extraction of lycopene from tomato waste has been established. The optimal parameters of supercritical CO_2 extraction of lycopene from tomato waste are temperature 60–75 °C, pressure 33–42 MPa and time 62–68 min. The untapped potential for industrial tomato waste is in line with the current zero waste sustainability concept (Directive 2008/98/EC).

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THE INVESTIGATION OF THE TEMPERATURE FIELD IN THE THICKNESS OF THE BASE FOOD INDUSTRY MATERIALS SPRAYED IN A PLASMA JET

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Abstract: This article presents the temperature field distribution outside and inside of the base material and the surface heating of the base material to the melting temperature. The high adhesion of the base material to the coating formed by plasma spraying is obtained in the case of a re-melting and subsequent crystallization of the superficial layers. Interaction of the molten particle with the re-melted surface of the base material ensures the high quality of the coatings. By suggesting values of the melting depth of the superficial layer of the base material, we determine the spent time under the action of the plasma jet.

Keywords: Powder, friction coupling, plasma jet, compatibility.

Introduction

The quality of the plasma-sprayed layers depends not only on the heat transfer conditions between the spray-dispersed particles and the plasma, but also on the direct heat exchange of the plasma-treated surface and the particles themselves. Previously, the heat exchange between particles and plasma was considered, also the heating and melting regime and the formation of a temperature field. Undoubtedly, the state of the dispersed particle before the contact with the surface of the base material greatly determines the quality of the applied layer [5,6].

This condition is necessary but not sufficient. In order to obtain a high quality of the deposited layers, a good adhesion of applied material on the surface is required. This is only possible if the upper layer of the base material passes into the liquid phase and the interaction between the powdery material and the upper layer forms a solution (melt) of the two materials and a subsequent crystallization of this melt will ensure good adsorption[5, 6, 7, 8].

Modeling the process

The question is only in the quantitative image of this process. In this regard, we set the task of determining the temperature field in the base material. The heat exchange process can be divided into two stages.

Heating the sample from the initial temperature T0 to the Tcr crystallisation temperature under the action of plasma and forming the solid-liquid phase transition zone. We admit the form of a plane surface, because the size of the pulverized material is much smaller than the characteristic size of the base material [2,3].

The second stage is the deepening of the phase action area in the thickness of the material. In order to solve the problem, we admit the thermo-physical coefficients constant and equal to the average value in the temperature range, their change occurs only in phase transformations.

In the first stage, we are dealing with the classic heat exchange for a semi-limited body [2,3].

$$\frac{dT}{d\tau}(x,\tau) = a\frac{d^2T}{d\,x^2}(x,\tau); \quad \tau>0; \quad 0<x<\infty, \tag{1}$$

$$T\,(x,\,0\,) = T0, \tag{2}$$

$$\lambda_1\frac{dT}{dx} = -\alpha[T_{\text{пл}} - T(0,\tau)], \tag{3}$$

$$T(\infty,\tau)=T0; \quad \frac{dT}{dx}(\infty,\tau) = 0, \tag{4}$$

For the second stage, the formulation of the problem becomes somewhat more complicated. The given system can be considered an infinite cylinder, surrounded by a thin coating. The role of the coat is played by the molten upper layer. The heat transfer between two bodies takes place after Newton-Richman's law. The thin coating of the melt will be considered flat. We admit that the second stage is similar to the first. Then our problem can be written as follows:

$$\frac{dT_2}{d\tau} = \alpha_2\frac{d^2T}{dR^2} \qquad (\tau > 0\,;\; R_1 \le r \le R_2) \tag{5}$$

$$\frac{dT_1}{d\tau} = \alpha_1\left(\frac{d^2T_1}{d\,R^2} + \frac{1}{R}\frac{dT_1}{dR}\right) \qquad \tau\ > 0; \qquad 0 \le R \le R_1, \tag{6}$$

$$-\lambda_2\frac{dT_2}{dR}(R_2,\tau) + \alpha[T_{\text{пл}} - T_2(R_2\tau)] = 0, \tag{7}$$

$$T_1(R,\tau) = T_2(R,\tau) = T_\xi\ , \tag{8}$$

$$\lambda_1\frac{dT_1}{dR}\Big|_{R=1} - \lambda_2\frac{dT_2}{dR}\Big|_{R=R_1} = L\rho\frac{d\xi}{d\tau}, \tag{9}$$

The problem solution for the first period is solved by the operational method [1.2.3] and written as:

$$\frac{T_1-T_0}{T_{\text{пп}}-T_0} = erfc\,\frac{x}{2\sqrt{a_1\tau}} - e^{\frac{\alpha}{\lambda_1}x+\frac{\alpha^2}{{\lambda_1}^2}a_1\tau}\cdot erfc\left(\frac{1}{\sqrt{a_1\tau}} + \frac{\alpha}{\lambda}\sqrt{a_1\tau}\right), \tag{10}$$

The Gauss error function

$$erfc\,\frac{x}{2\sqrt{a\tau}} = 1 - erf\,\frac{x}{2\sqrt{a\tau}} = \frac{2}{\pi}\int_x^\infty e^{-\frac{x^2}{2\sqrt{a\tau}}}\cdot d\left(\frac{x}{2\sqrt{a\tau}}\right), \tag{10.1}$$

There are two phases in the second stage: a melt and a solid product; the first sector constitutes the liquid surface and the second sector is represented by liquid-solid phase transformations. The temperature distribution in the liquid phase of the substance will be denoted by T2 and in the solid phase by T1. In our case, the equation is written as: (1) but the argument value is $0 < x \le \xi$. where ξ is the phase transformations coordinate, the boundary condition (2) will take the form:

$$\lambda_2\frac{dT_2}{dx}\Big|_{\,x=0} = -\alpha(T_{\text{пл}} - T_{\text{п}}), \tag{11}$$

$$T_2(x_1\tau_1) = T_\xi, \tag{12}$$

Where Tп – the surface temperature. Assuming that the melt thickness is $R2 - \xi \le R1$, the surface layer problem can be considered to be smooth. Therefore, the problem is formulated as follows:

$$\frac{dT_1}{d\tau} = a_1\frac{d^2T_1}{d\,R^2} + \frac{1}{R}\,\frac{dT_1}{dR}; \quad \tau > \tau_1; \quad 0 \le R \le R_1, \tag{13}$$

$$\frac{d\,T_2}{d\tau} = a_2\frac{d^2T_2}{d\,R^2}; \qquad \tau > \tau_1; \qquad \xi \le R \le R_2, \tag{14}$$

Taking into account the limit conditions (11), (12), (8) using the Laplace transformation [1.2.3.4], we obtain the temperature distribution as:

$$\frac{T_1(R_1\tau)-T_\xi}{T_{пл}-T_0} = 1 - \sum_{n=1}^{\infty} \cdot A_n \cdot I_0\left(\mu_n \frac{R}{R_1}\right) exp(-\mu_n{}^2\, F_0), \quad (15)$$

$$\frac{T_2(R_1\tau)-T_\xi}{T_{пл}-T_\xi} = 1 - \sum_{n=1}^{\infty} A_n \left\{ I_0(\mu_n) cos\left[\mu_n k_a^{\frac{1}{2}}\left(\frac{R}{\xi}-1\right)\right] - k_\varepsilon I_1(\mu_n) sin\left[\mu_n k_a^{\frac{1}{2}}\left(\frac{R}{\xi}-1\right)\right]\right\} exp(-\mu_n^2 F_0), \quad (16)$$

Where μn – The roots of the characteristic equation

$$I_0(\mu)\left[B_i\, cos\, k_a^{1/2}(k_R-1)\mu - k_a^{1/2}k_R\mu \sin k_a^{1/2}(k_R-1)\mu\right] - k_\varepsilon I_1(\mu)\left[B_i \sin k_a^{\frac{1}{2}}(k_R-1)\mu + k_a^{\frac{1}{2}}k_R\mu \cos k_a^{\frac{1}{2}}(k_R-1)\mu\right] = 0, \quad (16.1)$$

$$A_n = \frac{2Bik_\varepsilon\left[k_a^{\frac{1}{2}}(k_R-1)\mu_n + Bi\cdot tg\, k_a^{\frac{1}{2}}(k_R-1)\mu_n\right]}{\mu_n \cdot I_0(\mu_n)\sin k_a^{\frac{1}{2}}(k_R-1)\mu_n} \cdot \left\{ [k_\varepsilon^2 \cdot k_a(k_R-1)^2\mu_n^2 + Bi^2] ctg\, k_a^{\frac{1}{2}}(k_R-1)\mu_n + \frac{2k_a^{\frac{1}{2}}(k_R-1)\mu_n}{\sin 2k_a^{\frac{1}{2}}(k_R-1)\mu_n} \cdot [Bi^2 + k_a(k_R-1)^2\mu_n^2] + \left[k_a(k_R-1)^2\mu_n^2 + 2k_\varepsilon k_a^{\frac{1}{2}}(k_R-1)Bi + k_\varepsilon^2 Bi^2\right] tg\, k_a^{\frac{1}{2}}(k_R-1)\mu_n + k_\varepsilon k_a(k_R-1)^2\mu_n^2 + 2k_\varepsilon k_a^{\frac{1}{2}}(k_R-1)\mu_n Bi - 2k_a^{\frac{1}{2}}(k_R-1)\mu_n Bi - \frac{k_\varepsilon Bi^2}{\mu_n}\right\}^{-1}, \quad (16.2)$$

For large values of α, the solution (16) is simplified and written as:

$$\frac{T_2(R,\tau)-T_\xi}{T_m-T_\xi} = 1 - \sum_{n-1}^{\infty} \frac{2\cdot \sin\left[k_a^{\frac{1}{2}}\left(k_R-\frac{R}{\xi}\right)\mu_n\right] \exp(-\mu_n^2 F_0)}{\left[\frac{k_\xi^2-1}{k_\varepsilon}\ \sin^2 k_a^{\frac{1}{2}}(k_R-1)\mu_n - \frac{1}{2\mu_n} sin 2k_a^{\frac{1}{2}}(k_R-1)\mu_n + C\right]}, \quad (17)$$

$$c = k_a^{\frac{1}{2}}(k_R-1) + \frac{1}{k_\varepsilon}.$$

The speed of advancement of the transition phase is determined by replacing equation (17) and (15) in (9). The value of the k_a, k λ, k_ε parameters is defined as the following relation: $k_a = a_1 / a_2$ – characterizes the inertial properties of the first environment to the second; k λ = λ1 / λ2 is the relative thermal conductivity of the environment:

The thermal activity of the first environment compared to the second. Equations (16) or (17) differ from equation (10) not only through the material parameters but also the shape parameters, since in the latter case the solution is given for a body of limited size (the penetration area is small compared to the characteristic dimension of the object, solution for a semi-limited object.

The value of $I_0\left(\mu_n \frac{R}{R_1}\right)$ – is the Bessel function, of the first type, zero order:

$$I_0\left(\mu_n\frac{R}{R_1}\right)=I_0(U)=\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{U}{2}\right)^{2k}}{k!(k+1)} \quad (18)$$

In this sense, the speed of advancement of the transition phase area will be written as:

$$\frac{d\xi}{d\tau}=\frac{1}{L\rho}\left\{(T_{\text{пл}}-T_0)\lambda_1\sum_{n=1}^{\infty}\frac{A_n(-1)^k k\left(\frac{\mu_n R}{R_1}\right)^{2k-1}}{k!(k+1)}exp(-\mu_n^2 Fo)\Big|_{\xi}+\left(T_{\text{пл}}-T_{\xi}\right)\lambda_2\sum_{n=1}^{\infty}A_n\left\{I_0(\mu_n)\left[-\sin\mu_n k_a^{1/2}\left(\frac{R}{\xi}-1\right)\mu_n\frac{k_a^{1/2}}{\xi}-k_{\varepsilon}I_1(\mu_n)cos\mu_n k_a^{1/2}\left(\frac{R}{\xi}-1\right)\cdot\mu_n\frac{k_a^{1/2}}{\xi}\right]\right\}\Big|_{\xi}\exp(\mu_n^2 Fo)\right\} \quad (19)$$

$$I_1\left(\mu_n\frac{R}{R_1}\right)=I_1(U)=\sum_{k=1}^{\infty}\frac{(-1)^k\left(\frac{u}{2}\right)^{1+2k}}{k!(1+k+1)}; \quad (20)$$

Experimental research Experimental research has shown the following results presented in figures 1,2,3.

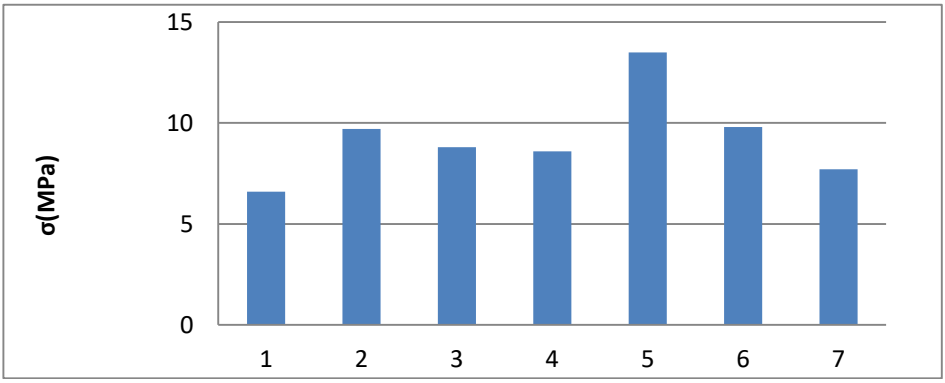

Figure 1. *Adhesion of the base material layer 12X18H10T.*
Layer: 1 – Al2O3+10%Al with intermediate layer ПН85Ю15; 2 – Steel P6M5K5 with intermediate layer ПН85Ю15; 3 – Al2O3+10% Al with intermediate layer ПТ-НА-01; 4 – gAl2O3+30%Al with intermediate layer ПТ-НА-01; 5 – ПС-12НВК-01 with intermediate layer ПТ-НА-01; 6 – 50%ПН55Т45-50% TiC without intermediate layer; 7 – ПТ-АН9 without intermediate layer.

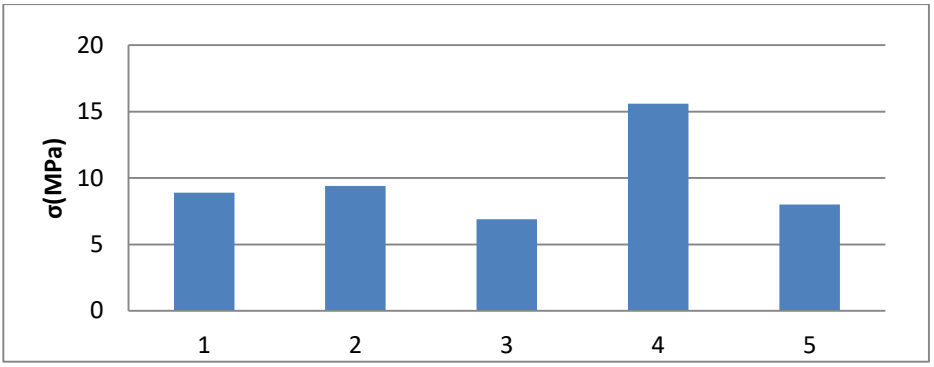

Figure 2. *Adhesion of the base material layer steel 3.*
Layer: 1 – 90%Al2O3+10%Al with intermediate layer ПТ-НА-01; 2 – 70% Al2O3+30%Al with intermediate layer ПТ-НА-01; 3 – СГ-Т(п) with intermediate layer ПТ-НА-01; 4 – ПС-12НВК-01 with intermediate layer ПТ-НА-01; 5 – ПГ-АН9 without intermediate layer

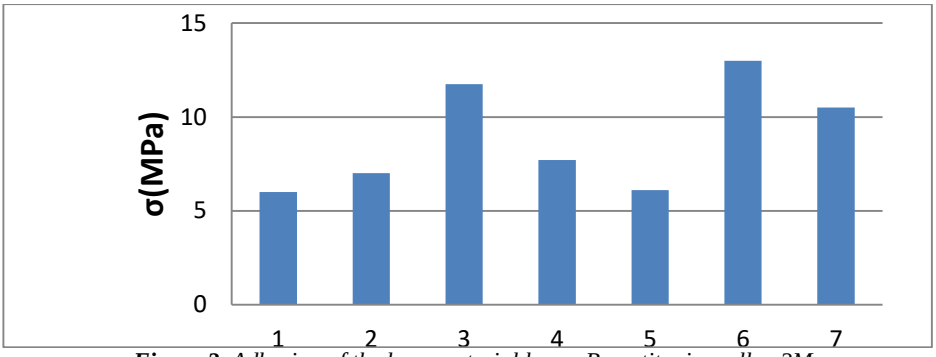

Figure 3. *Adhesion of the base material layer. Base-titanium alloy 3M.*
Layers: 1 – СГ-Т(п) with intermediate layer ПТ-НА-01; 2 – Al2O3+10%Al without intermediate layer; 3 – ПС-12НВК-01; 4 – ПТ-19Н-01 with intermediate layer ПТ-НА-01; 5 – Al2O3 without intermediate layer; 6 – ПН55Т45 without intermediate layer; 7 – 50%ПН55Т45+50% TiC without intermediate layer;

Conclusions

1. The materials sprayed with layers ПГ-СР2; ПС-12НВК 01; СНГН-50; ПН55Т45; СГ-Т (П); ПН55Т45 50% + 50% TiC; ТС-Т (Р) + 20% TiC and others on the base carbon steel 3 material, 12Х18Н10Т stainless steel, 3М titanium alloy is use-wear proof layers high adherence, provided at well-defined technological regimes at УПУ-3Д and ОВ-1955.
2. The adhesion of the base material to the plasma-spray coatings is achieved in the case of a retrieval and subsequent crystallization of the superficial layers.

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UHF DRYERS WITH LONGITUDINAL INTERACTION

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Abstract: Basing on the analysis of differential equations system using partial derivatives proposed by A. V. Lykov, one proposes the calculation of soft regime dryers, using temperatures lower than boiling one. For a rational take place of drying or heating process one should constantly heat the air to exclude water vapors condensation on the waveguide's surface and provide proper moisture elimination from evaporation zone. The calculation is based on specific thermo-physical properties of the processed product. The obtained correlations show the repartition of temperature and moisture content along the dryer length. Basing on the analysis of the common solution for the temperature repartition and specifying the values of the admissible temperature (using technological conditions or others), one can calculate the level of used UHF power.

Key words: dryer, UHF energy input, waveguide, thin layer product, temperature.

Introduction:

When processing products with UHF-moving energy input one notices a productivity augmentation. Often used rectangular energy waveguide, for thin materials thermal processing, could be inputted from both product incoming and outgoing ways.

In paperwork [1] was shown the correlations for microwave dryers calculus without environment convective heat transfer, which isn't showing the always truth. As usual we have combined convective and microwave heat input. For a rational take place of drying or heating process one should constantly heat the air to exclude water vapors condensation on the waveguide's surface and provide proper moisture elimination from evaporation zone.

Materials and methods

To solve the assigned task, dryer calculus, we could use A.V. Lykov equations system solution, considering that our product is processed in a quasi-stationary regime, i.e. replacing the correlation with a partial derivative with respect to time:

$$\frac{\partial}{\partial\tau} = V\nabla T : \left|\frac{\partial T}{\partial\tau} = V\nabla T\right.$$

Then the equations system of A.V. Lykov will have the form:

$$\begin{cases} \pm V\nabla T = a\nabla^2 T + \dfrac{Q_v}{c\rho} \pm \dfrac{r?\varepsilon\nabla u}{c} & (1) \\ \pm V(1-\varepsilon)\nabla u = a_m\nabla^2 u + a_m\delta\nabla^2 T & (2) \\ \pm V\dfrac{\varepsilon}{c\rho}\nabla u \pm V\nabla\rho = a_p\nabla^2 p & (3) \end{cases}$$

Where:

V – product movement velocity in waveguide-applicator, [m/s];

T – temperature, [°K];

a – thermal diffusivity (conductivity) coefficient, [m^2/s];
Q_v – inside source power, [m^3/h];
Q_0 – inputted power, [m^3];
c – specific heat capacity, [J/(kg·K)];
ρ – density, [kg/m^3];
u – moisture content, [kg/kg];
ε – evaporated moisture ratio without phase-transfer;
a_m – mass-conductivity coefficient,;
δ – thermal-moisture-conductivity coefficient, [1/K];
p – vapor phase pressure, [Pa];
a_p – convective diffusivity coefficient, [m^2/s];
r – latent heat of phase-transfer, [J/kg].

Considering product's propagation velocity higher than heat's one, because of heat conductivity, we'll have the next result for equation (1):

$$\frac{\partial T}{\partial z} = a\left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2}\right) + \frac{Q}{c\rho} + \frac{Vr}{c}\frac{\partial u}{\partial z} \tag{4}$$

The boundary conditions in our case could be written in the next form:

$$T(x,y,z)\big|_{z=0} = 0 \text{ for forward flow} \tag{5}$$

and

$$T(x,y,z)\big|_{z=4} = 0$$

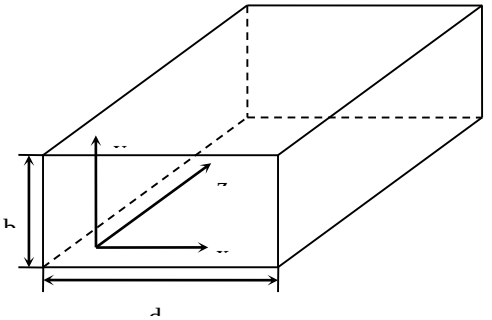

Fig. 1. *3D spacing of a longitudinal dryer*

Latent power

$$Q_v = \frac{2\beta Q_0 l^{-2\beta z}}{b \cdot d}$$

$$\frac{\partial T}{\partial x} = (x,y,z)\Big|_{x=d} = \pm\frac{\alpha}{\lambda}(T_п - T_c)$$

$$\frac{\partial T}{\partial y} = (x,y,z)\Big|_{x=b} = \pm\frac{\alpha}{\lambda}(T_п - T_c) \tag{6}$$

Considering $\frac{\partial u}{\partial z} = 0$, while heating the row material, the equation (4) could be written using the method of variables separation [2]:

$$T(x,y,z) = \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} A_{nm}(z)\left[\cos K_{ym} + \frac{\alpha}{\lambda K_{ym}}\sin K_{ym} y\right]\cdot \cos K_{xn} x \qquad (7)$$

where:

$$A_{nm}(z) = \frac{1}{V} e^{\pm\frac{aK_{nm}^2 dz}{V}} \int_0^z B_{nm}(z) e^{\pm\frac{aK_{nm}^2 z}{V}}\cdot dz$$

$$B_{nm} = \frac{8Q_0\alpha(z)e^{-2\int_0^z \alpha(z)dz}\cdot\frac{\sin\left(K_{xn}\frac{d}{2}\right)}{K_{xn}\frac{d}{2}}\left[\frac{\sin(K_{ym}b)}{K_{ym}b} + \frac{\alpha b \sin^2 K_{yn}\frac{b}{2}}{\alpha\lambda K_{yn}\frac{b}{2}}\right]}{bdc\rho\left[1+\frac{\sin(K_{xn}d)}{K_{xn}d}\right]\left[1+\left(\frac{\alpha}{\lambda K_{ym}}\right)^2 + 2\frac{\alpha}{\lambda b K_{ym}^2}\right]} \qquad (8)$$

and the transcendental equation to determine K_{xn} and K_{ym}:

$$-\frac{K_{xn}d}{2}\,tg\left(\frac{K_{xn}d}{2}\right) = \frac{\alpha d}{\alpha\lambda} : tg(K_{ym}l) = \frac{\frac{2\alpha}{\lambda K_{ym}}}{1-\left(\frac{2\alpha}{\lambda K_{ym}}\right)^2} \qquad (9)$$

if one ignores the heat losses from the both ends of the product, than temperature repartition can be written in next form:

$$T = T_0 + \frac{2Q_0}{b\cdot dc\rho V}\, e^{\pm\int_0^z \frac{2\alpha dz}{c\rho Vd}}\cdot\int_0^z \beta(z) e^{\pm\int_0^z\left[\frac{2\alpha}{c\rho Vd}-2\beta\right]dz}\cdot dz \qquad (10)$$

Moisture content repartition value, along the length of the co-current thin materials dryer (axe Z) (2) can be written in the form:

$$u = u_0\, e^{-\frac{2\alpha_n Z}{c_m\rho bV}} \qquad (11)$$

and for countercurrent

$$u = u_0\, e^{-\frac{\alpha_n(L_1 - Z)}{c_m\rho bV}} \qquad (12)$$

The obtained correlations show the repartition of temperature and moisture content along the dryer length.

Conclusion

Basing on the analysis of the common solution for the temperature repartition and specifying the values of the admissible temperature (using technological conditions or others), one can calculate the level of used UHF power.

As a result the resolution of equation (4) in adiabatic conditions can be written as:

$$T = T_0 + \frac{Q_0}{2\beta c \rho V b \cdot d}\left(e^{-2\beta z} - 1\right) + \frac{r}{c}\left(u_c - u_0\right) \qquad (13)$$

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ADVANCED OXIDATION PROCESSES USED IN FOOD DYES REMOVAL

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Abstract: AOP(s) – Advanced oxidation processes, are a set of chemical treatment methods and procedures used to remove organic and inorganic pollutants present in wastewater by oxidation through the reaction who involve hydroxyl radicals (OH^-) formation. Oxidative processes usually refer to a subset of chemical processes which employ hydrogen peroxide (H_2O_2), UV light and ozone (O_3). In order to total mineralization of synthetic dyes from food industries, the art proposes the use of catalytic oxidation processes. These processes are sensitive to variations in pH, temperature, ozone concentration used, dye concentration, the amount of catalyst used, and the duration of the oxidation dyes is high. In order to combat these disadvantages of the methods of oxidation, in this paper we propose the preparation of heterogeneous catalysts based on chemically modified cationic clays, and testing them to discolour toxic dyestuffs from food industry with emphasis on Sunset Yellow dye. This yellow dye is toxic to human health and is on the list of carcinogens. It is present in various foods, such as: juices, ice cream, snacks, various beverages, fish cans, puddings, etc. This dye is forbidden in Norway.

Keywords: oxidative processes, cationic clay, catalyst, food dyes

APPLYING OF INFORMATION ANALYSIS OF EXPERIMENTAL DATA TO OPTIMIZE THE EXTRACTION OF BIOACTIVE COMPOUNDS FROM BERRIES*

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Abstract: The informational analysis of the experimental data allows determining the influences between the different experimental parameters and is based on two main concepts: entropy and information. Information is the fundamental concept in prediction, and entropy characterizes uncertainty in the occurrence of an event. Mutual information provides the quantitative measure of reducing uncertainty, thus increasing prediction. The more mutual information has higher values, the lesser the uncertainties and hence the higher predictions [1]. In information theory, the unit of measure of information and entropy is the bit.

The aim of the research is to determine the influence of the ethyl alcohol concentration of the extracts from white sea buckthorn and dog rose (20, 40, 50, 60, 80 %) on the measured parameters: antioxidant activity of the hydrosoluble substances, antioxidant activity of the liposoluble substances, total polyphenol index; antiradical activity, DPPH, in the acid medium, antiradical activity, DPPH, in the alkali medium.

It was found that in both white sea buckthorn and dog rose, the concentration of ethyl alcohol influences to the highest degree the total polyphenols index (I = 0.82 bits in white sea buckthorn and I = 0.54 bits per dog rose). Also, in white sea buckthorn, the concentration of ethyl alcohol influences to the smallest extent the antioxidant activity of liposoluble substances (I = 0.17 bits), and in the dog rose, the concentration of ethyl alcohol influences to the least extent the antiradical activity in the acid medium and activity antiradical in the alkali medium (I = 0.37 bits). Thus, in the case of the dog rose, the values of the mutual information are less dispersed (maximum / minimum ratio of 1.46) than the white sea buckthorn (maximum / minimum ratio of 4.82), this means that in the case of the dog rose, the concentration of ethyl alcohol influences the measured parameters more evenly than to the white sea buckthorn.

**This work was benefited from support through the 16.80013.5107.22/Ro project, "The substitution of synthetic food additives with bioactive components extracted from natural renewable resources".*

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EFFECT PARAMETERS FOR WASHING WOOL SURFACE TENSION OF THE WASHING SOLUTION

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Abstract: We've found that the most influential factor in the wool washing process is the concentration of detergent. Concentrations of 1,5 g/dm^3 is enough to identify the washing action of detergent Sles 70.

Search of the rational parameters of wool washing is an actual task of the primary wool clearing. During wet cleaning the organic and mineral dirt are being removed from the wool. Upon completing the classic process of wet cleaning of the wool fiber they use the following proportions: 100-600 parts of water to one part of dirty wool (hydraulic kit). Output of the dry scoured wool is 40-60% of the original mass. Classic soap-soda washing solution has alkaline environment.

We've studied process of fine fleece wool cleaning at the stage of wool washing. Purpose of this study is studying ways of reducing the amount of water that is used during cleaning, replacement of classic washing solution with the solution with a neutral pH environment, and search of rational parameters of wool washing. Washing solution was prepared by dissolving of anionic detergent Sodium laureth sulfate (Sles 70).

We have investigated the effect of the concentration of detergent in the washing solution, hydraulic kit, temperature and washing duration on the surface tension of the washing waste solution obtained after wool washing. We determined the effect of concentration Sles 70 in the washing solution in range 0,5–3,5 g/dm^3, hydraulic kit 10–50, temperature 20–50 °C and duration of washing 2–32 minutes.

Search of the rational parameters of wool washing to reduce the use of detergent, to reduce ratio of water: wool (hydraulic kit) and to save material and energy resources - this is an actual task of the primary wool clearing.

It was determined that concentration of 1,5 g/dm^3 would be enough to identify washing effect of detergent Sles 70. Use of the specified concentration of the detergent will reduce the alkalic impact on the wool, and will help to efficiently use the detergent and water while washing wool in the primary wool cleaning.

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Key words: wool, washing, surface tension, washing solution, ranking

MICROWAVE COMBINED DRYING OF RED BEETROOT PUREE PRETREATED BY OHMIC HEATING

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Abstract: Ohmic heating is an advanced thermal food processing technique where heat is internally generated in a sample using the electric current. This provides rapid and uniform heating in the intire volume of the sample. This novel technique based on the electric field is resulting in less thermal damage in food. Ohmic heating has immense potential for achieving rapid and uniform heating in foods, providing microbiologically safe and high quality foods.
The influence of the ohmic heating pretreatment on combined microwave/convective drying of red beetroot puree was investigated.
The purpose of this study was to analize the effectiveness of combined microwave (MW) drying methods with the ohmic heating (OH) pretreatment at 17.5 V/cm on the physical and chemical properties of red beetroot powder. The effects of ohmic heating pretreatment and subsequent microwave-convection drying (525W+100°C, 420 W+100°C and 315 W+100°C) were studied, including phenolic content, antioxidant activity, betacyanins and betaxanthins content and color. This study was conducted to develop and optimize the drying process of red beetroot using hybrid drying methods.
The variation of microwave power had reduced the drying time from 15 to 10 minutes. By increasing the microwave power from 315W to 525W it was observed the drying process intensifying sustained by the polyphenols content enhancing from 240 mg GAE/100 g dried sample to 270 mg GAE/100 g dried sample.
Concluding, the ohmic treatment at low electric gradients (17.5 V/cm) results in incomplete damage of material, preserving the native pigments of red beet.

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Section II

Food Technology

ANTIOXIDANT TREATMENT OF APPLES AT THE DRYING PROCESS

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Abstract: The paper presents the results of researches on the use of antioxidants - ascorbic acid, citric acid and sulfur dioxide for the treatment of unpeeled apples, without seeds, cut plates at different thicknesses, different concentrations of solutions and treatment duration. It has been established that the most optimal concentration of SO2 solution is 0.075% at which the technological process can be organized and accumulates a minimum amount of SO2 in the dry product. The optimal parameters for SO2 solution treatment are: apple thickness - 6 mm; time of treatment - 8 min; concentration of the solution 0.075%; temperature of solution 23 ± 2 ° C.

Key words: Unpeeled apples, drying process, antioxidants, solutions, immersion.

Introduction

The food industry of the Republic of Moldova has a significant potential for the processing of the vegetable raw materials. One of the methods of processing that provides a stable preservation is the drying process, which can be carried out by various drying methods. The main problem in drying process, of cut, peeled apples and without seed box is the process of browning at the contact with oxygen with the surface of the cut apple.

Currently, branch companies use different antioxidants to prevent the process of oxidation-reduction (browning) of cut and dried apples. Residual concentrations of SO2 are used from 200 to 1000 mg / kg of dry product. The standards for dried apples used in the Republic of Moldova allow the SO2 concentration in the finished product - dehydrated with brown stains, insect attack, small dehydrated apple pieces, excessive residual of sulfur dioxide as a result of color preservation treatments, mineral impurities etc.

In this context, it is welcomed to solve the problem of processing of peeled apples without seeds, with the elaboration of the technological parameters of manufacturing, at each technological operation, the elaboration of preventive treatment regimes, the selection of the advanced machinery for drying, and elaboration of the technology and techniques for industrial processing of dried apples, and for obtains a quality products with certain properties according to the requirements of the consumer.

The aim of the research is to establish the optimal technological parameters of treatment at each technological process, by antioxidant treatment of cut and unpeeled apples, the analysis of the chemical and physico-chemical for quality indices, the organoleptic and rehydration properties of dried apples.

Materials and methods

For research, as raw material was used fresh apples - Iadared from the northern part of the Republic of Moldova in the baking and consumption era. During the research process the apples were stored in the refrigerator at a temperature of 0…1,5 °C and humidity 90 ± 2,0%. The apples were subjected to the washing process, water leakage, process of peeling and seeds removal, plate cutting, treatment with antioxidant solutions to stop the browning process and convective drying at 80 ± 2 ° C. As solutions of antioxidants was used ascorbic acid, citric acid and sulfur dioxide - SO2. The quality of

fresh apples - raw material, the quality of dried apples was determined by standard methods - the mass of dry substances, the total acidity and pH, the content of carbohydrates, color and amount of polyphenols - by the spectrophotometric method.

Results and discussions

For study the antioxidant treatment process, were selected 3 substances with antioxidant properties: ascorbic acid, citric acid, SO2. From these substances were prepared the solutions with concentrations specified in the table below.

Table 1. Preparation of acid solutions

Acid name	Concentration, %	Amount per 1 liter of solution		
		Acid, g	Sodium chloride, g	Water, g
Citric	2	20	1,5	978,5
ascorbic	2	20	1,5	978,5
	6	60	1,5	938,5

Treatment with 2% citric acid and 2% and 6% ascorbic acid at various time, from 4 to 20 minutes by immersion and drying of these apple samples, didn't show the expected effects, but the acidity of the dry product, preventively treated with 6.0% ascorbic acid solution is very high and causes sensation of discomfort in organoleptic tasting. Apples treated with solutions of 2.0% citric and ascorbic acids are white-brown and don't meet the requirements of quality for dried apples. These acids have been excluded from experimental research.

At present, in the processing industry, sulfur is used to obtain dried apples with a pleasant appearance, natural color and long-term storage. It can be used both in gaseous form and as solutions. Researching the bibliographic sources, it has been noticed that requirements for SO2 content in dried apples differ across countries. In Republic of Moldova, SO2 content of dehydrated apples must not exceed 0,1% (1000 mg / kg), in Romania - 0.02% (200 mg / kg). Since SO2 is a toxic substance that can have serious consequences for human health, it has been decided to carry out research into the reduction of residual SO2 content in the product - dried apples. In order to study the process of SO2 treatment of apple and cut apples, solutions of the concentrations specified in Table 2 were prepared with the addition of sodium chloride at the concentration of 2%.

Table 2. Preparation of SO2 solutions

Required concentration, %	Amount per 1 liter of solution		
	Sodium bisulfite, g	Sodium chloride, g	Water, g
0,050	2,085	2	995,92
0,075	3,127	2	994,87
0,100	4,170	2	993,83
0,150	6,255	2	991,75
0,200	8,340	2	989,66
0,250	10,425	2	987,58
0,300	12,510	2	985,49

Preparation of the solutions is done as follows: in the 1000 cm^3 flask is added the sodium bisulfite mass, containing 24% SO2. Is added distilled water at 20 - 25 °C to 3/4 of the volume of the flask. The compounds are mixed vigorously, then 2 g of NaCl is added to obtained solution and again vigorously mixed. After that is added the solution to distilled water and shake to completely dissolve the components.

In order to study the optimization of the sulphurization process of cut and peeled apples, first was studied the possibility of using SO2 solutions of different concentrations. Fruits cut to 6 mm thick plates were subjected to SO2 treatment solutions by immersion in the solution with hold time 8 min, then subjected to drying at a temperature of 80 °C heat. The positive effects of the solutions for all the studied samples were observed. A finely finished product with a pleasant appearance and an apple variety characteristic is obtained. No essential color changes occurred during drying and storage for 12 months. Treated apples at different concentrations (Table 2) of SO2 at one and the same time provide the various concentrations showed / SO2 content in the dried product. The results obtained are shown in Figure 1. An excess concentration of SO2 in the dry product can be noted for treatment in solutions with a concentration greater than 0.15%. By analyzing the residual SO2 content in the dried product (Figure 1) it can be noted that the concentration of the solution in the range of 0.05 ... 0.15% sulfur dioxide accumulation in the dried product is virtually proportional to the concentration of the treatment solution. At a concentration greater than 0.16% in the solution, the SO2 content in the final product is suddenly increased to a concentration of 0.2%, after which the accumulation of SO2 is slow within the range of 0.2 ... 0.3%.

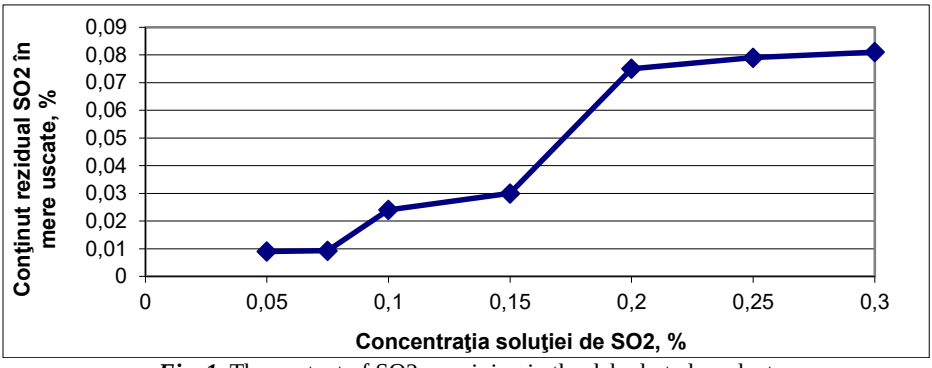

Fig. 1. The content of SO2 remaining in the dehydrated product

Also, the graph shows that only in the case of apples treated with solutions of 0.05 ... 0.15% concentrations of residual sulfur content meets the requirements of the regulation "Sanitary rules and regulations concerning food additives" of 0.06% and only dried apples treated in solutions with concentrations of 0.05 and 0.075% to 0.02% corresponds to the value set in the "norms on the nature, content, production, quality, packaging, labeling, storing and transport of dehydrated apples" of Romania. The retained content of SO2 in 0.05 and 0.075% solutions differs insignificantly.

Pre-treated dry apple samples at various concentrations of SO2 solutions have accumulated different amounts of sulfur dioxide. The product was stored in the desiccator for 1.5 months, after which the color was visually determined. An insignificant color in

dry apple at the concentration of 0.075% was found. Starting with the concentration of 0.075% and up to 0.3%, the apple color was identical and uniform throughout its surface and volume. For these reasons, the minimum optimal concentration required to treat 0.075% apples at the treatment time of 8 minutes was selected. In order to determine the optimal parameters in terms of thickness of the layer, were carried out researches on the drying apple plates of 4, 6, 8, 10, 12 mm, which were preventively treated with solution at the concentration of 0.075%. The dried apple plates were characterized by one and the same color - light cream, maintaining their natural appearance. In dry apples the residual SO2 content was determined, which is different depending on their thickness. The results obtained are shown in Figure 2. Analyzing the curve of the concentration of SO2 concentration in the dry product (Figure 2) it can be mentioned that the maximum residual sulfur dioxide content in the product is maintained in the plates with a layer thickness of 8 mm. The concentration distribution curve of SO2 is characterized by a maximum of 8 mm layer thickness.

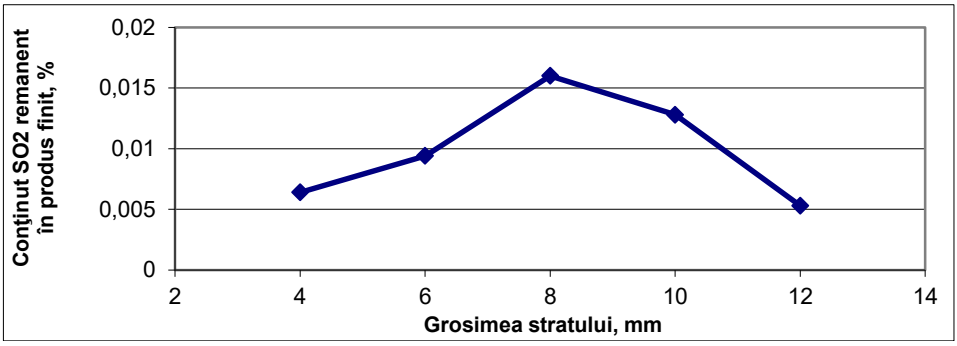

Fig. 2. Residual SO2 content in dehydrated apples treated with SO2 solution at the concentration of 0.075% and duration 8 min.

This process can be explained by the diffusion of the sulfur dioxide solution, which reaches the center of the slices to 8 mm in thickness for 8 minutes. For thicknesses greater than 8 (up to 12 mm) the diffusion does not reach the center of the product. The higher thickness of the layer, the greater amount of pulp of the plates is not treated with SO2. That is why in the finished product the amount of sulfur accumulated in a layer of 4 mm on one side and the other refers to the whole volume, which leads to the reduction of the SO2 quantity. In the thicknesses of 4, 6 and 8 mm, the SO2 diffusion occurs up to the center of the product, inactivation of the enzymes takes place under the action of SO2. In the case of 4 and 6 mm thick layers, most of the sulfur is removed during drying and storage, whereas in the 8 mm thick plates the sulfur is removed from the superficial layers but is maintained in larger amounts in the center of the product. In apple boards with a layer thickness of 10 and 12 mm, diffusion occurs only in the superficial layers. In their center, enzyme inactivation takes place only under the action of the drying agent temperature. Due to the large thickness of the layer, the sulfur can't penetrate to the center and is eliminated in large proportions during drying and storage. In order to study the optimization of the apple sulphiding process at various time exhibitions, researches were carried out with solutions of concentration of 0.075% and thickness of 6 mm layer. The cut apples were treated with SO2 in antioxidant solution for 2 ... 12 min. with the 2 minute

interval. The results obtained are shown in Figure 3. A linear increase of the SO2 content in the finished product is observed with the increase of the treatment time in the solution up to 8 minutes. In the samples exposed to antioxidant treatment for 8, 10 and 12 minutes, the SO2 content remains approximately constant.

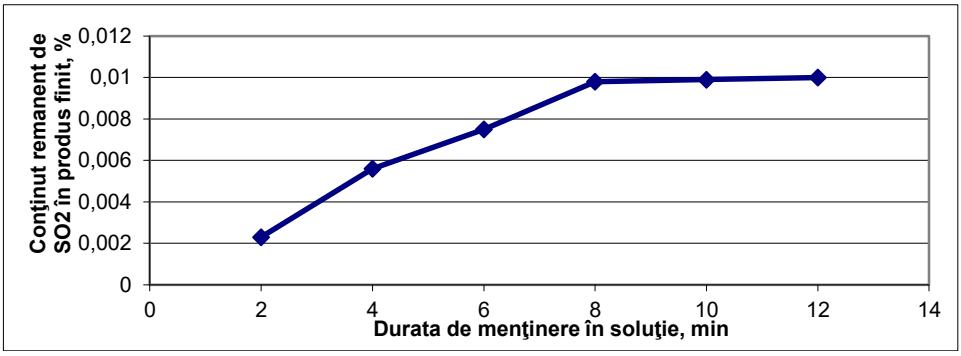

Fig. 3. Residual SO2 content in apple slices of 6 mm thickness depending on the duration of exposure in solution of 0.075%

The treatment of cut apples over 8 to 12 minutes practically doesn't influence the increase of SO2 concentration in the finished product. This situation can be explained by the small difference in the concentration of the solution and the sulphated product, which virtually stops the further accumulation of sulfur in the treated apples. This phenomenon has an advantage in the process of sulphation and drying because, in case of degradation of the treatment period, the SO2 accumulated by the apple doesn't adversely affect the quality of the dry product, which ensures a minimum SO2 concentration according to the sanitary norms and norms of food additives" in Moldova.

Conclusions

1. The research has demonstrated the efficacy of sulfur dioxide in the antioxidant treatment of plate, cut apples to ascorbic acid and citric acid.

2. In the antioxidant treatment of apples with SO2 solutions, the most optimal concentration is 0.075%, at which the technological treatment process can be organized, which leads to the accumulation of the minimum quantity of SO2 in the dry product.

3. The optimal parameters for SO2 solution treatment are: cut apples thickness - 6 mm; treatment time - 8 min; concentration of solution 0.075%; solution temperature 23 ± 2 °C.

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APPLE POLYPHENOLS AND THEIR CHANGES IN THE TECHNOLOGICAL PROCESS

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Abstract: This paper summarizes the information on the occurrence of phenolic compounds in appleand juice, with special reference to their health related properties. As phytochemical molecules belonging to polyphenols are numerous, we will focus on the main apples phenolic compounds with special reference to changes induced by apple cultivar, breeding approaches, fruit postharvest and transformation into juice.

Key words: apples, polyphenols, antioxidants, phenolic compounds, apple juice.

Introduction

One class of molecules that has significant health properties is that of polyphenols. In general terminology, they are considered as a: "*Structural class of mainly natural, organic chemicals compounds characterized by the presence of large multiples of phenol structural units*". Polyphenols are usually divided into several different groups (simple phenols, benzoic acids, phenyl propanoids, and flavonoids) on the basis of the number of carbon atoms in conjunction with the structure of the basic phenolic skeleton [4].

They originate from the plant aromatic pathway, starting with amino acids of the shikimate pathway and culminating in molecules produced by the phenyl propanoid and flavonoid pathways. The coordinated induction-regulation of these pathways leads to the production of several thousand different molecules. Their positive effects on human health were first proposed in 1936 [3], and the scientific consensus is now common as proven by the remarkable increase in the number of scientific publications where the "polyphenols" term appears (Fig. 1). The polyphenols are induced in plants under oxidative stress conditions and support the activity of other important cellular antioxidant compounds such as glutathione, α-tocopherol, ascorbic acid, and enzymes such as peroxidase, and superoxide dismutase. Phenolic compounds accumulated in plant organs (roots, stems, leaves, flowers, fruits, *etc*.), according to species characteristics, and are usually more abundant in the epidermal tissue of the organs, such as in the peel of fruit. This preferential localization is set in relation with effect of light on the phenolic metabolism, as well as, with the protective role of phenolic compounds against ultraviolet radiations and other abiotic and biotic stressors.

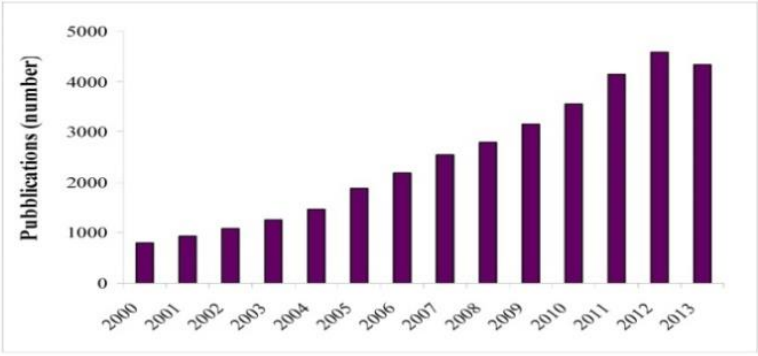

Fig. 1. *Number of publications, which include polyphenol research, since 2000.*
Publications registered in the ScienceDirect database where the keyword "polyphenols" is used. The 2013 data are related to the period of January–mid-July.

The aim of this article is to revise the scientific literature on the biochemical and antioxidant characterization of apple fruit at harvest, and the possible strategies and solutions for maintaining these properties. As phytochemical compounds could undergo relevant modifications during fruit storage and processing in juice, these aspects will be analyzed and discussed.

Apples – the object of study

Apples are one of the most commonly consumed fruits in the world. In 2017, world apple production was estimated at around 77 millions of tons according to Food and Agriculture Organization stats. Apple are eaten both raw and as processed products, such as cider, juice, and puree. Although apples are one of the most consumed fruits, the total phenolic contents of 62 fruits using the Folin-Ciocalteu method showed values ranging from 11.88 (*Pyruscommunis* L.) to 585.52 (*Ziziphusjujuba*Mill.) mg GAE/100 g of wet weight. In this wide range, apples belonging to green-delicious, red-delicious, and rose-red cultivars showed intermediate values of 68.29, 73.96, and 70.57 mg GAE/100 g of wet weight, respectively. Specific studies aimed at comparing total polyphenols in commercial and ancient apple cultivars were performed by P. Iacopini and A. Minnocci [1]. These studies showed that cultivar effects can be relevant as total polyphenol content range between 56 and 221 mg GAE/100 g of wet weight in Gala and Panaia red cultivars, respectively (Figure 2). These results prove that the genetic variability within apple germplasm can provide significant genetic variation for polyphenol traits.

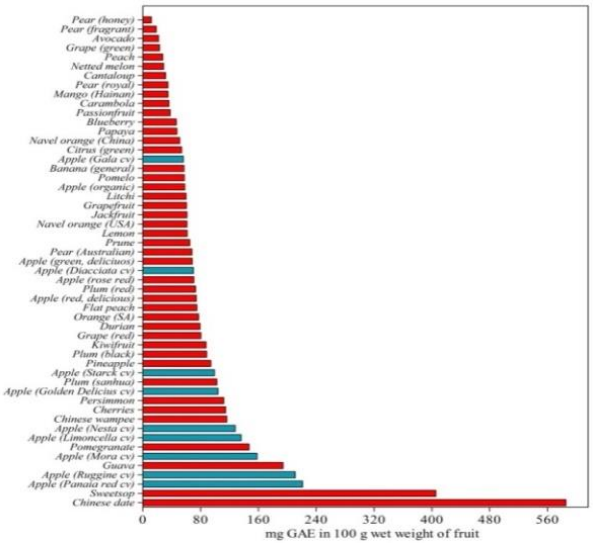

Fig. 2. *Total phenolic content in different fruits and apple cultivars.*

Phenolic Compounds in Apple

Apples contain a variety of phenolic compounds and, using liquid chromatography-mass spectrometry (LC-MS) or gas chromatography mass spectrography (GC-MS) analysis methods, it is possible to detect several polyphenolic molecules, such as (+)-catechin and (−)-epicatechin (flavan-3-ols or flavanols), phloridzin (dihydrochalcone glycosides), quercetin (flavonols), cyaniding (anthocyanidins), cyanidin-3-*O*-galactoside (anthocyanins), chlorogenicacid (phenolic acids), and hydroxycinnamates (p-coumaric acid). In general, the polyphenolic contents per fruit ranges between 19.6 and 55.8 (flavan-3-ols), 17.7–33.1 (flavonols), and 10.6–80.3 (chlorogenic acid) mg per 100g apple; the lowest values were recorded for phloridzin (1.0–9.3 mg per 100g apple) and anthocyanin (0.1–6.5 mg per 100g apple). Total phenolic, flavonoid, and anthocyanin contents in four apple varieties (Rome Beauty, Idared, Cortland, and Golden Delicious) were compared in flesh and peel . The total phenolic contents of the peel were highest in Idared and Rome Beauty (588.9 and 500.2 mg of GAE/100 g of peel, respectively) and drop to 75.7 and 93.0 (mg of GAE/100 g of flesh, respectively). For flavonoids, the Idared peel contains 303.2 mg of catechin equivalents/100 g, corresponding to six times higher concentrations than in flesh. Anthocyanins were detected only in peel, ranging from trace amount in Golden Delicious (yellow/green peel) to 26.8 mg of cyanidin 3-glucoside equivalents/100 g of peel in Idared.

Deeper characterization of apples polyphenol molecules associated with their localization in peel, flesh, and seeds, prove that peel, and also seeds, are rich in these compounds. A schematic representation of concentration ranges of specific polyphenols in peel, peel and flesh and seeds, is presented in Figure 3. In addition, seeds are usually discharged when eating apple fruit, the peel (which represents a small portion of the whole fruit weight) can provide a significant fraction of the phenolics, becoming an important

donor of these compounds as confirmed by the literature. Flesh and peel values for (+)-catechin, (−)-epicatechin, phloridzin, quercetin, cyanidin-3-*O*-galactoside ranges between 0.45–3.4, 5.18–18.40, 0.64–9.11, 0.10–0.22, and not detectable-3.11 mg per 100 g fresh weight, respectively [1].

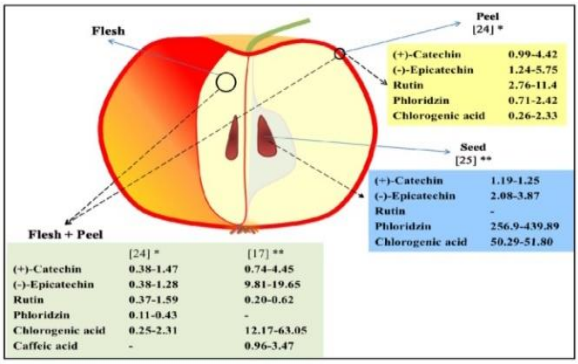

Fig. 3. *Polyphenol molecule concentrations ranges in seed, peel and peel + flesh*

Stability of Phenols in Apple Fruit during Postharvest and in Juice

The drying process together with the rise of temperature and processing time could diminish the phenolic compounds content and antioxidant activity of apples. High temperatures (especially 70 °C) destroy some of the phenolic compounds. The main phenolic compounds identified and quantified in dried apples (*Malusdomestica*) waschlorogenic acid, p-coumaric acid, phloretin-2'-O-glucoside, phloretin-2'-O-xyloglucoside, (+)-catechin, (-)-epicatechin, procyanidins. The total phenolics content in fresh apple was 224.82 mg/100 g of product. Procyanidins were the most predominant phenolic group and contributed to 73.68% of total phenolics content. The total content of procyanidins ranged from 165.64 mg/100 g product in fresh apple to 67.51, 44.05, and 32.26 mg/100 g product in dry apple after it was exposed to 14 h of hot-air drying process at 50°C, 60°C, and 70°C, respectively. p-Coumaric and chlorogenic acids during drying process were successively degraded. Dihydrochalcones content decreased with the rise of temperature and the time of processing. After 14 hours of drying at 60°C and 70°C, 100% loss of compounds belonging to dihydrochalcones occurred in apples.

Apple showed the lowest antioxidant which is attributed to vitamin C and phenolic compounds such as flavonoids and phenolic acids. Vitamin C was found to account for 65-100% of the antioxidant potential of beverages derived from the citrus fruits, but less than 5% of apple and other non-citrus fruit juices. The reaction of enzymatic browning is the major factor responsible for the loss (up to 83%) of the antioxidant activity in apple juice. Thermal treatment caused a significant decrease in antioxidant capacity and polyphenol concentration in apple juice (t = +105 ° C and +125 ° C). Apple jams and marmalades held at +4 ° C have a higher anthocyanin content and a total antioxidant capacity, than those stored at +20 ° C, while there is no significant difference between dark and light storage.

Freezing is an important method used to retain fruit quality during long-term storage. A storage temperature of –18ºC is typically used to reduce the chemical and

biological spoilage of foods and to extend their shelf life. However, freezing causes cell breakage, allowing enzymatic reactions to occur. Therefore, anthocyanins and other phenolic compounds can degrade during freezing and more extensively during thawing, due to their interaction with oxidative enzymes. The general loss of antioxidant capacity begins as soon as cell integrity is broken and enzymes such as esterases, glycosidases and carboxylates can catalyze transformations and degradation of phenolic compounds.

Among these treatments, blanching can be used to inactivate enzymes that cause detrimental changes during frozen storage. The blanching could prevent the oxidative degradation of phenolic antioxidants during storage. However, as water-soluble phenols may be leached into water during blanching, steam blanching is preferred. For processed apple products, the most popular is apple juice. During its production, only a fraction of phenolic compounds are extracted, while the other remains in the pomace. Due to the fact that peel and seeds are discharged during juice production, phenolic compounds such as quercetin glycosides and dihydrochalcones, are found in small amounts in apple juice, [2].

Materials and Methods

The main objective of the research was fresh apples, and namely the determination of polyphenols in apples (as raw material) and in apple juice (finished product), and total phenol content in different fruits and varieties of apples (Figure 2).

Apples are characterized by the following organoleptic indices:

External appearance and consistency – whole fruit, slices or fruit slices, elastic when pressed. **Color** - light red to dark red, with yellow tones. **Taste and smell** - specific to the fruit variety, with no foreign taste and smell.

Results

The total content of polyphenols according to the Folin - Chocolate method for apples belonging to green – delicious, red – delicious, red - red cultivars showed intermediate values of 68.29; 73.96 and 70.57 mg GAE / 100 g wet weight. The deeper characterization of apple polyphenol molecules, associated with their location in the peel, flash and seeds, demonstrates that the peel and seeds are rich in these compounds. According to consumers' needs, apples are processed into clear apple juice, but many components with high antioxidant potential are lost during this process. Freezing is a good method of preserving the physicochemical properties of products, using the blanching method in advance. Vitamin C also contributes to the inactivation of PFO by lowering the pH, chelation of Cu, Fe ions and reducing oxygen availability. Thermal treatment and drying process considerably reduce the phenolic compounds content and antioxidant activity of apples.

Discussions

The analysis of these results has shown that the total content of polyphenols largely depends on apple variety, maturation stage, environmental factors, production techniques and apple storage conditions. The deeper characterization of apple polyphenol molecules, associated with their location in the peel, flesh and seeds, demonstrated that the peel and seeds are rich in these compounds. In addition, seeds are usually thrown when apples are consumed, the peel which accounts a small part of the total weight of the fruit, can provide a significant fraction of phenols, becoming an important donor of these compounds.

According to consumers' needs, apples are processed into clear apple juice, but many components with high antioxidant potential are lost during this process.

Conclusions

Based on the apple polyphenol data we have reviewed in this paper; some schematic conclusion could be drawn:

• the total content of polyphenols depends on the storage conditions of apples and the factors that influence the process of browning.

• Phenolic compound characterization in whole apple fruit is well established, while their fate during transformation in juice need to be improved in order to better clarify the losses of these compounds and suitable strategies for their optimal conservation.

• genomic revolution and biotechnological applications will boost genetic improvement of elite apple genotypes by enabling the introduction of highly specific polyphenolic traits.

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AUTHENTIFICATION OF SOME LOCAL RAW MATERIALS WITH HIGH BIOLOGYCAL VALUE

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Abstract. The present study provides information about the composition of each investigated vegetal product. As working materials vegetable there used products with a significant content of biologically active compounds providing antioxidant effect and affordable for population. The products described below by the analysis of their composition and physicochemical properties, where selected and prepared so as to be easily analyzed. The reason of fruits choosing as investigated material was the fact, that they are used in our daily alimentation, and they have energy and antioxidant value, bringing real health benefits. Fruits that are growing on the territory of the Republic of Moldova, contains a lot of biologically active substances, that's why they represent a raw material for production of high nutritional foods [4,5].

Key words: fruits, physicochemical methods, biologically active substances, vitamin C, carotene, polyphenols

Introduction

In recent decades, appeared the necessity to find new sources of biologically active substances, which has led increasing interest in fruits rich in useful natural compounds. Using of natural compounds from vegetal products, have many advantages in contrast to chemical synthesis of biologically active substances; for growth of their sources, should not be created special conditions, and also their quantity is enough for extraction in industrial proportions. Nowadays, this type of resources is processed to obtain a small number of compounds, or aren't used at all. The reason is the inaccessibility or high costs of technologies for the whole processing of raw materials. In that situation, a large amount of valuable substances remains untapped. Thereat, there is a problem to elaborate and to implement new national technologies for processing of plant resources. There is a variety of vegetal sources containing biologically active substances, that could serve as raw material for food production. Whatever fruits and vegetables are not so rich source of energy than animal products, they are important for their intake of vitamins, minerals, dietary fibers, enzymes, aromatic volatile substances, and their contribution to regulation of metabolic processes. A problem of big importance is the great amount of fruits and vegetables used to ensure a satisfactory level of consumption, because it isn't that easy to maintain their quality during the whole year of storage [2].

Materials and methods

The following fruits have been described in terms of chemical composition and antioxidant activity: peach (*Prunuspersica*), apricot (*Prunusarmeniaca*, "Big Red" variety), raspberry (*RubusIdaeus*, "Gugutsa's hat" variety), blueberries (*Vacciniummyrtillus L*, "Duke" variety), strawberries (*Fragariaxananassa*, "Selva" variety), blackberry (*Rubusfruticosus* L., "Arapaho" variety), aronia (*Aroniamelanocarpa*, "Nero" variety), apple (*Malusdomestica*, "Golden" and "Gala" varieties), sea buckthorn (*Hippophaërhamnoides L.*), Goji (*LyciumBarbarum*, "Miracle" variety) were harvested between July and August 2018 from different parts of the

Republic of Moldova at full maturity. Fruits were harvested manually. After harvest, altered fruits and other impurities have been removed. Freshly harvested fruits were stored at 5 ± 2°C. The biologically active substances (%) in fruits were determined [8].

1. ***TitratableAcidity*** was determinateby method which consists in titration with a standard volumetric solution of 0.1N NaOH in the presence of phenolphthalein.

2. ***pH measurement*** was performed using a "Hanna Instruments" pH-meter, previously calibrated with buffer solutions having pH 4.0 and pH 7.0 respectively.

3. ***Dry matter determination*** was carried out using the PAL-1 digital refractometer.

4. ***Vitamin C*** according to GOST 24556-89.

5. ***β-carotene*** according to GOST 8756.22-80.

6. ***Total polyphenols*** was determinate by Folin-Ciocalteu method. The total polyphenols content of the fruit peel and pulp was expressed in gallic acid equivalents, mg GAE / 100 g FW (Sconta, 2012), the results being readable on the DR 5000 spectrophotometer, wavelength 750 nm.

7. ***Antioxidant capacity*** was determinate by the potentiometric method.

8. ***Anthocyanin's content*** was measured by spectrophotometric method at 540 nm, modified at the TPA department, UTM, extracted with a solution of 95% ethyl alcohol and 1.5 N hydrochloric acid 85:15 to discoloration [6, 7].

Results and discussions

Usually, fruit acidity is caused by the presence of several acids as well as their salts. The slightly acidic (sour) taste of fruits, represent an appreciated component of its organoleptic quality. Our knowledge about the acidity of a product, especially the acidity of fruits, allows us to appreciate better its evolution, starting with its harvesting to the time of processing. The amount of acids in the fruit is related in conventionally grams of malic, citric, or tartaric acid per 100 grams of product (Table 1). The obtained data are very different in comparison with those provided from bibliographical sources.

Table1. *Titratable acidity of fruits and berries*

Specie	Acid	g/100g	Bibliographic
Peach	malic	0,937	0,65
Apricot	malic	2,723	1,19
Raspberry	citric	0,810	2,18
Cranberry	citric	0,575	0,67
Strawberry	citric	0,437	1,09
Blackberry	citric	0,191	1,67
Aronia	malic	0,003	0,47
Green Apple	malic	0,002	0,47
Red Apple	malic	0,002	0,47
Sea Buckthorn	tartaric	0,025	4,5
Goji	malic	0,002	0,47

So, it was concluded, that the amount of an acid in a feedstock doesn't provide clear data. In Table 2 we show the experimental pH value of the analyzed fruit species, because namely pH is very important for the resistance of microorganisms during the conservation process. According to Table 2, it can be noticed that the lowest pH value was obtained for Sea Buckthorn (2.77) and the highest (4.96) was founded in Goji.

Table 2. *pH values of fruits and berries*

Specie	Experimental pH	Bibliographical pH
Peach	3,80	3,3-4,0
Apricot	3,89	3,3 - 4,0
Raspberry	3,38	2,9 - 4,0
Cranberry	3,14	2,0 - 3,8
Strawberry	3,82	3,2 - 3,8
Blackberry	4,17	3,2-4,5
Aronia	4,10	3,5-4,5
Green Apple	3,61	2,9
Red Apple	4,02	2,9
Sea Buckthorn	2,77	2,0-3,0
Goji	4,96	4,1-5,2

Vitamins are necessary for the vital activity of organisms. Their absence causes serious functional metabolic disorders. They form numerous redox systems that regulate the cellular redox potential and act as activators of enzymes [1,7]. The animals are unable to synthesize the necessary vitamins, and horticultural products are an important source of vitamins, and in the case of vitamin C, they are the unique source.Descendent order of vitamins quantity in fruits is following: vitamin C (0,5 – 40mg per 100g of raw material, can to achieve values of 150-300mg in Sea Buckthorn and Goji), provitamin A (0,02-0,09mg per 100g;but 1,531mg in raspberry,1,392mg in apricot)–Figure 1.

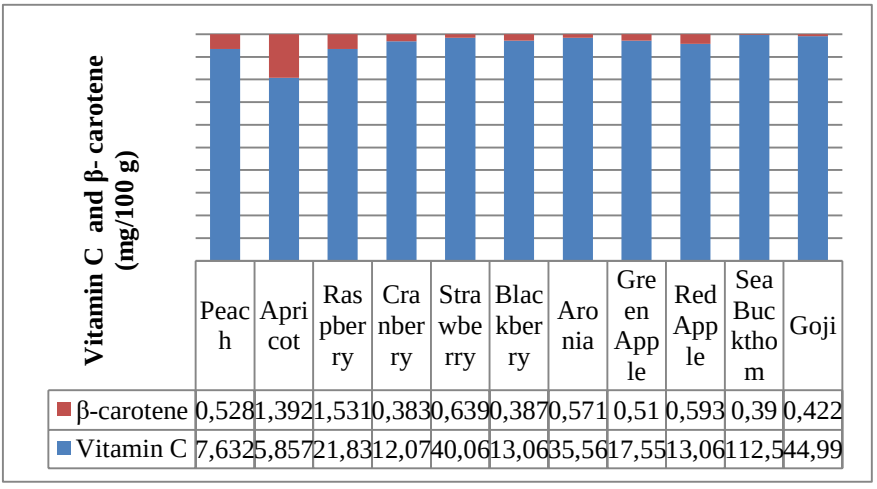


Fig.1. *Vitamin C and β-carotene content in fruits and berries*

Phenolic substances are compounds with the phenolic functional groups in their molecules. In fruits these substances are the determinants of color, taste and flavor. Phenolic substances are represented by derivatives of phenolic acids (benzoic, cinnamic etc.) and complex compounds such as tannins, polyphenols, anthocyanin's and flavones. Phenolic substances are involved in the breathing process, increase the resistance of plants to the attack of microorganisms. While the fruit grows, the amount of phenols in their

composition increases, and then decreases very slowly, usually maintaining a constant value.

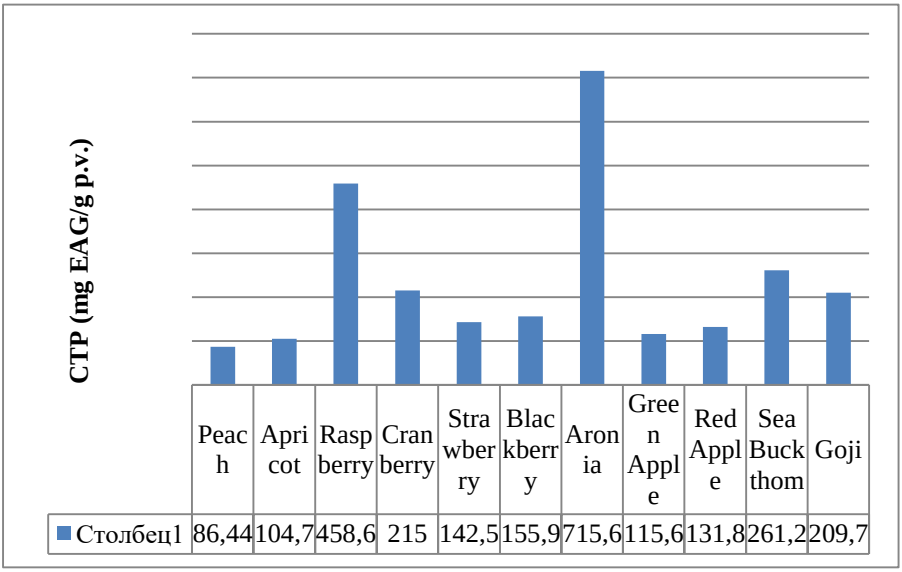


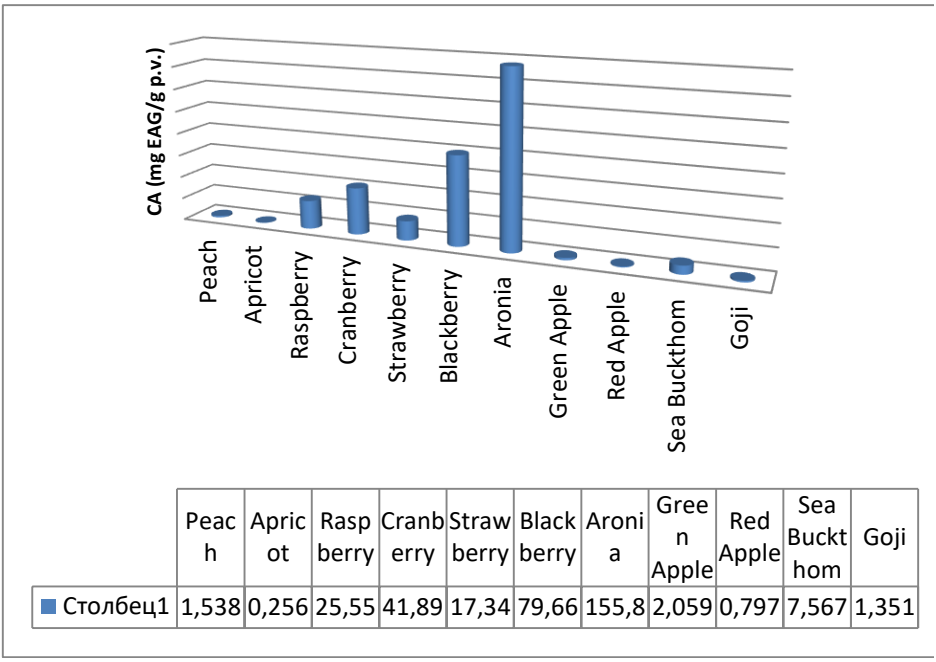
Fig.2. *Total polyphenol content of fruits*

In the Figure 2, can be easily observed that Aronia exhibits the highest amount of total polyphenols, being followed by raspberries, sea buckthorn, blueberries, goji, blackberries, strawberries, apples. Reduced amounts of polyphenols are founded in peaches and apricots.

Anthocyanin dyes are natural red pigments that can be founded in vegetal products. Their compounds with carbohydrates are relatively resistant to moderate temperatures, because carbohydrates protect anthocyanin's against degradation [4].

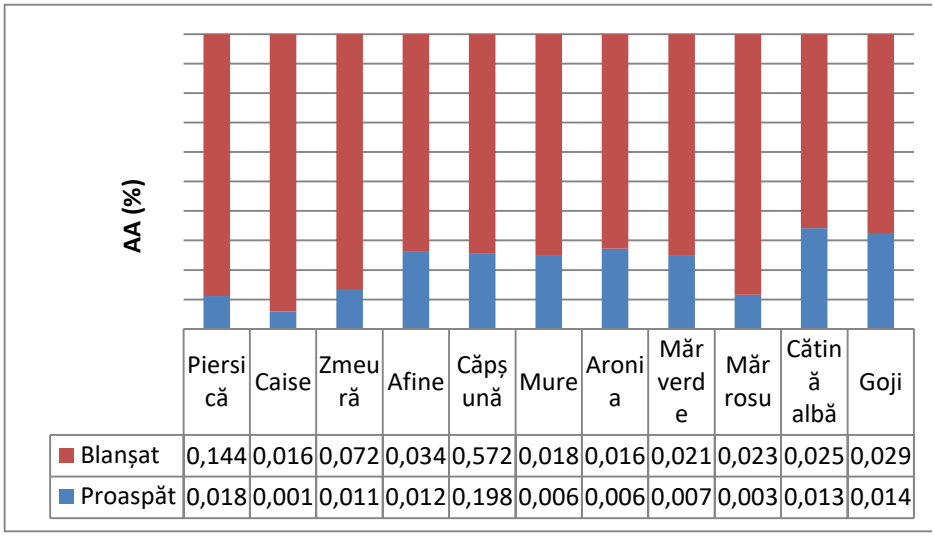
Analyzing data from Figure 3, it can be observed, that high quantity of anthocyanin's is in aronia (156,76mg / 100g fruits), followed by blackberries (79,66mg/ 100g), blueberries (41,89mg / 100g) and raspberry (25,55mg / 100g).

Antioxidants are biologically active substances that prevent the oxidation or inhibition of oxygen-promoted or peroxide-promoted reactions and thus protect cells from oxidative stress [6]. Regardless of their practical use, content and percentage of nutrients, all samples of the fruits studied have antioxidant activity, regardless of the degree of technological maturation or the area where they were harvested.



	Peach	Apricot	Raspberry	Cranberry	Strawberry	Blackberry	Aronia	Green Apple	Red Apple	Sea Buckthom	Goji
Столбец1	1,538	0,256	25,55	41,89	17,34	79,66	155,8	2,059	0,797	7,567	1,351

Fig.3. *Anthocyanin's content in fruits*



	Piersică	Caise	Zmeură	Afine	Căpșună	Mure	Aronia	Măr verde	Măr rosu	Cătină albă	Goji
Blanșat	0,144	0,016	0,072	0,034	0,572	0,018	0,016	0,021	0,023	0,025	0,029
Proaspăt	0,018	0,001	0,011	0,012	0,198	0,006	0,006	0,007	0,003	0,013	0,014

Fig.4. *Antioxidant activity of fruits*

Data presented in Figure 4 suggests that fresh strawberries present the highest antioxidant activity, being followed by peach, raspberry, goji, white sea buckthorn,

blueberries. Lower values have been obtained for apples, aronia, blackberries and apricots.

Conclusion

- Bioactive fruits are important sources of bio-elements that are used in nutrition and medicine.
- Fruits described in the paper represent a pure store of antioxidants, their rich content of phenols, anthocyanin's, vitamin C, β-carotene, being necessary to neutralize free radicals.
- By analyzing the biological value of fruits, can be noticed that the highest content of vitamin C can be founded in the sea buckthorn, the content of β-carotene in raspberries, the content of polyphenols and anthocyanins in aronia, and antioxidants in strawberries.

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BISCUITS WITH SEEDS AND RYE FLOUR

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Abstract: The biscuit market was one of the most dynamic markets due mainly to the desire to innovate and market new producers. In terms of nutritional value, these biscuits are net superior to other types of biscuits made from wheat flour. Proteins, vegetable fats, carbohydrates, microelements, mineral substances, vitamins B1, B2, E are preserved in this assortment. The product has been specially designed to meet the needs of those who prefer a sweet snack and can be enjoyed at any time of the day, representing the ideal alternative for a dessert consistent and savoury. Biscuits with seeds and rye flour are a product with a rich blend of sunflower seeds, pumpkin, linseed, sesame seeds and rye flour, which gives it a specific taste, particularly refined, long-lasting, without additives and with high fibre content. These non-digestible nutrients help regulate digestive processes and eliminate many undesirable components of the digestive tract. In addition to health issues, consumers are also aware of the positive effects: vegetable fibres practically do not have calories, and induce a feeling of satiety.

Rare flour from rye flour is used to remove bad cholesterol from the circulation to prevent thickening of the walls of blood vessels with adverse effects on the cardiovascular system. The taste, the texture, the ability to maintain freshness for a long time make rye flour products highly appreciated.

The aim of this research was to establish the evolution of nutritional value of biscuits with seeds and rye flour, during the storage.

Keywords: fibre content, rye flour, cardiovascular system

Introduction

Biscuits are recommended for all categories of people. They have the advantage of having a long storage life, a different composition that can be adapted to nutritional needs, and is an important energy source.

The composition of biscuits is optimally adapted to the needs of the body, is rich in dietary fibre more than 6% and contains valuable cereals and oil-rich seeds such as sunflower seeds, flaxseed and sesame seeds. It is known that rye flour is a natural source of vitamins, minerals (magnesium, phosphorus and potassium) and dietary fiber stimulating intestinal transit with beneficial effects on the body. The high rye flour is made by removing bad cholesterol from the circulation to prevent thickening of the walls of the blood vessels with adverse effects on the cardiovascular system. The amount of cellulose and plant fibres in rye flour is high compared to wheat flour, this work making it a "digestive product." The taste, the texture, the ability to maintain freshness for a long time make rye flour products highly appreciated. Many of the bakery products in Europe have the rye flour, which touches even 70%. [Esarom 2013]

Seed biscuits and rye flour have a pleasant, balanced, delicious taste due to the variety of seeds they contain [Esarom, 2013]. The seeds have health-friendly properties, which are also the richest plants in nutrients; they are a very good source of vitamin B1, manganese, phosphorus, copper and magnesium. Flaxen seeds can be used in the nausea treatments of many but they cannot be considered a good food but a beneficial food. In them, we find lignans, plant compounds that act as a weak estrogen. Lignani has a high percentage of in is the only plant that contains the richest content of lignans and fibres.

Lignans and fibres have a group of natural compounds found only in plants, having the chemical composition similar to estrogen (phytoestogen) and antioxidants. It is a highly appreciated property, which is the high fibre content. Lignans can help reduce cholesterol, in diabetes can reduce the severity of the disease and stabilize blood sugar. It is used since ancient times, it is also known as the "blessed plant", being used for the elimination of abdominal pain, cough, skin abscess and constipation. Studies and research on the benefits of flax seed:

Women who daily supplemented their daily diet for 4 weeks with 50g of wheat seeds in their daily diet lowered their total cholesterol to 9% and their LDL cholesterol levels by 18%. Insects reduce the signs of inflammation associated with the increased risk of heart disease A guinea pig study found that supplementary intake of flaxseed oil (rich in Omega 3) is beneficial in preventing colon cancer, while corn oil (which has more Omega 6 fat) has resulted in tumour growth.

Another pilot study in India has investigated the effect of flaxseed oil on the behaviour of children with ADHD (Defibrillation Attention Syndrome). Significant improvement in symptoms, expression in decreasing total symptoms of hyperactivity has been found.

Seeds of sesame – the most popular sesame seeds are ivory, open, but there are also brown, red and black sesame seeds. Have a taste of sweet nuts, which is accentuated if they are lightly roasted. Sesame black sesame seeds but they are stronger than flavour to others. One thing to know is that black sesame contains 60% more calcium than white. Since they are small, sesame seeds on so many benefits bring to the human body. It is an important source of calcium, fibre and other essential minerals for the health of the body. They also contain healthy fats, necessary for the proper functioning of the metabolism and the endocrine system.

The formation of acryl amide, a caragen agent likely formed in plant-derived foods, appeared 11 years ago [Tareke et al, 2002]. Learning about the mechanisms involved in the formation of acryl amide has been learned and methods have been developed to reduce its presence in food.

The Maillard reaction is the main pathway for acryl amide formation. It is responsible for many of the features associated with coped, fed and fried foods that consumer's demand, and which define in particular products and brands [Mottram et al., 202].

It is important that when measures are taken to attenuate the formation of acryl amide, aspects related to the responsible reaction for the production of colours, flavours and flavours are retained to ensure that the quality of the finished product is not impaired [Stadler et al., 2002]. Theoretically, one of the most effective methods of mitigating acryl amide would be to reduce the accumulation of acrylamide precursors in the plant material used for food production.

The identification of genetic and environmental factors affects precursor content is therefore an important approach [Halford et al.2012.].

Materials and methods

Rye flour was provided by local producers. The analytical flour quality was determined according to the international standard methods (ash content – ICC104/1, wet

gluten – ICC105/2, protein content – ICC106/2, hydration capacity with Pharinograph - ICC115/1 and Zeleny index – ICC116/1).

Table1. *Analytical parameters of Control flour*

Moisture %	Ash %	Wet gluten %	Protein %	Hydration capacity %	Falling Number sec
13.42	0.68	31.1	13,3	62.6	329

The Falling Number values for the experimental flours improved with rye flour were determined with AACC/No.56-81 method using a 1500 PERTEN Falling Number System. After baking, the samples were cooled 6-8 hours in controlled atmosphere (UV lamps). In order to be scoring (after 24 hours), the samples were sliced for packed in plastic bags.

The experiments are made in the research laboratory of "Ştefan cel Mare" University of Suceava, Faculty of Food Engineering

Results and discussion

In order to evaluate the technological behaviour of biscuits sample during the storage we made a set of phisico-chemical determination. The results are shown in the figure 1, 2, 3, 4 and 5 :

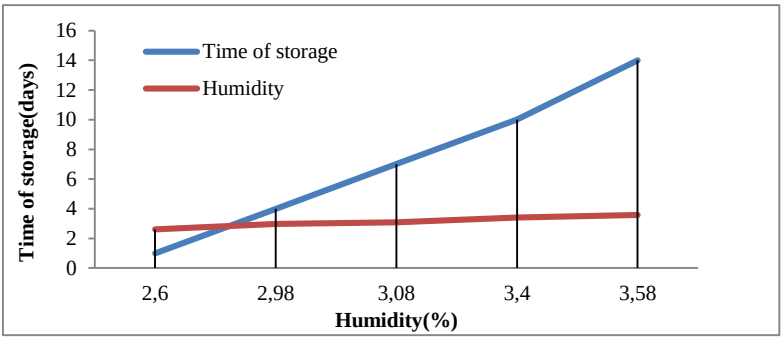

Figure 1. *The Humidity evolution during storage*

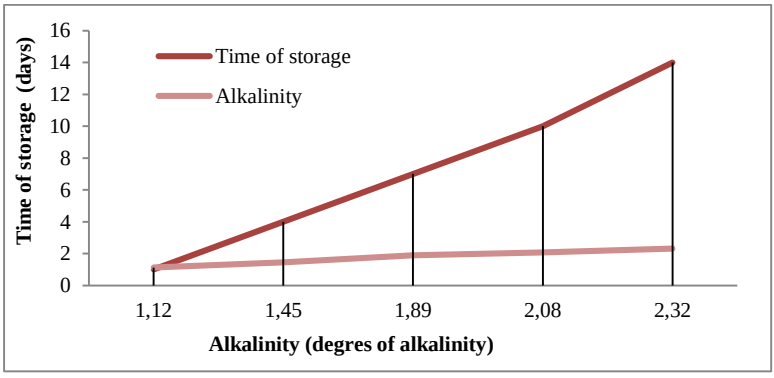

Figure 2. *Alkalinity evolution during storage*

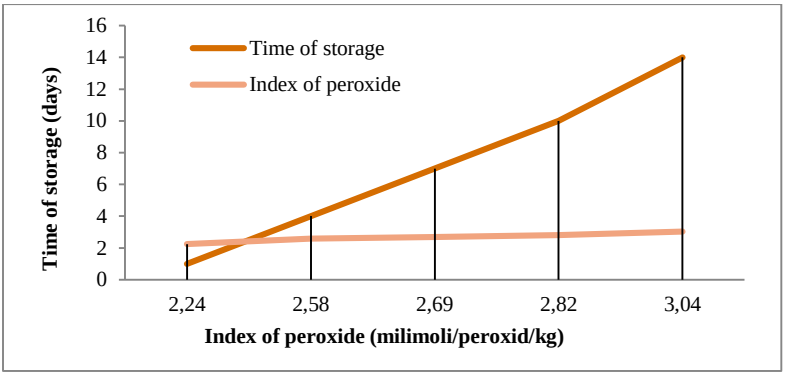

Figure 3. *Index of peroxid evolution during storage*

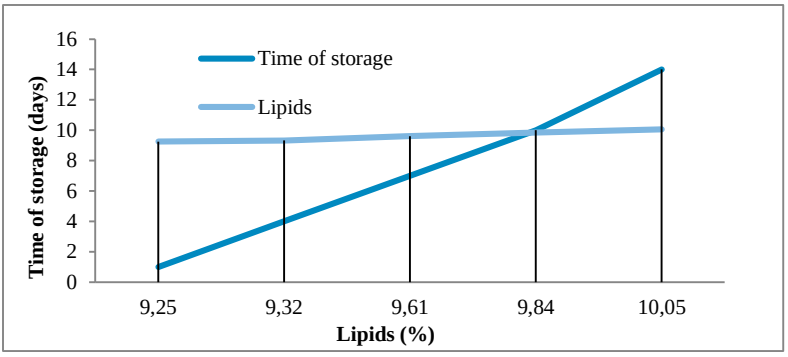

Figure 4. *Lipids evolution during storage*

The degree of sunscreen for high fat products is a decisive quality criterion.

The peroxide index is an important analytical means of testing the rays. Although it only indicates the rooting process in the initial stages, the presence of peroxides in the product suggests imminence of alteration.

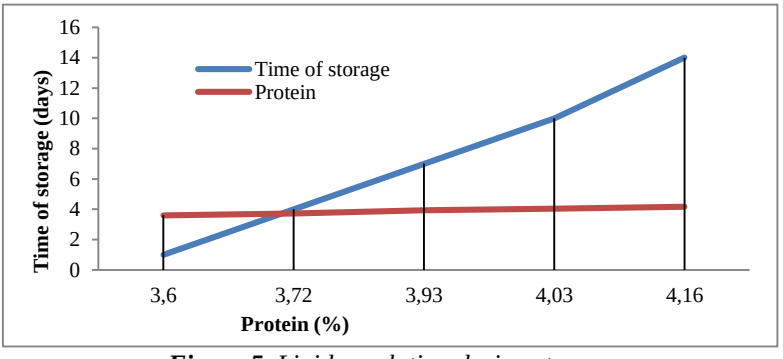

Figure 5. *Lipids evolution during storage*

Technologically, gluten proteins play an important role. In the presence of water and due to mechanical kneading, they form gluten, which is the structural skeleton of the

dough. Only gluten and gliadin in wheat flour have the property of forming gluten and this gives the wheat its unique bakery properties.

Conclusions

Biscuits with seeds and rye flour are a product with a rich blend of sunflower seeds, pumpkin, linseed, sesame seeds and rye flour, which gives it a specific taste, particularly refined, long-lasting, without additives and with high fibre content. These non-digestible nutrients help regulate digestive processes and eliminate many undesirable components of the digestive tract. In addition to health issues, consumers are also aware of the positive effects: vegetable fibres practically do not have calories, and induce a feeling of satiety. The high rye flour is made by removing bad cholesterol from the circulation to prevent thickening of the walls of the blood vessels with adverse effects on the cardiovascular system.

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CHEMICAL, PHYSICAL AND SENSORY CHARACTERISTICS OF PEANUT MILK

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Abstract: The objective of this paper was to evaluate the potential of using walnuts (Juglans Regia L.) in the form of vegetable milk. Thus, it has been developed the technology for obtaining walnut milk at different heat treatment regimes. In order to obtain a safe product in terms of physicochemical and sensory quality, research has been done on these milk samples. Physico-chemical, microbiological and color hints were determined for all the samples during storage. The results showed that vegetable walnut milk contain fats (2.5 g), proteins (0.77 g), lipids (2.2 g). Microstructure analysis showed that this beverage is an oil-in-water emulsion that is destroyed for 3 days.

Keywords: walnuts, milk, emulsion, microstructure.

Introduction

Walnut production is increasing globally. Walnuts have generated considerable interest in the last decade because the fatty acid profile found in walnut oil, in particular the presence of ω-3 and ω-6 PUFAs that are essential dietary fatty acids and to their favorable ratio in walnut oil (*Amaral, 2003*). Walnuts have a tremendous nutraceutical potential, they are the first food product mentioned by the US FDA as a health food and can be used extensively in nutrition to improve nutritional status and to diversify the range of foods in the food and catering industry. Due to the beneficial effects of walnut consumption on human health demonstrated by many research, there has been increasing interest in the development of new walnut-based foods such as nut milk, various pastry filling, walnut flour, etc. The most well-known products are made from roasted walnuts. Some researchers have tried to produce meat products containing oil cake (*Ayo, 2005; Cofrades, 2004*). Some studies have also been carried out on the production of walnut drinks and emulsions using walnut oil (*Boaghi, 2012; Gharibzahedi, 2012; Begum, 2009; Popovici, 2016; Yu, 2010*).

Since walnut-based food is virtually absent on the Moldovan market, the objective of the study was to study the possibility of obtaining walnut milk and its physico - chemical parameters changes when stored.

Lately more and more controversies have emerged about the effects of animal milk on the human body. There are many concerns about the allergic effect, hormonal disorders, diabetes and others. The truth is that milk has essential nutritional qualities, but it is an incomplete food - it may have too little magnesium in relation to calcium, it shows an imbalance in fat and contains too little vitamin to be beneficial (*Oh, 2017*). However, there are alternatives, different types of vegetable milk, with a diverse nutritional content and considered beneficial to humans (*Sethi, 2016*). In addition to being tasty and of high nutritional value, vegetable milk does not contain lactose, and can be consumed regardless of age or lactose intolerance.

Materials and methods

Materials

Performing research were used qualitative walnuts collected in 2016 which correspond to the GOST 16833-71 demands.

Methods

Sample Preparation and Storage

The technology for obtaining nut milk includes components and procedures necessary to form the sensory properties and nutritional value characteristic of the given product. The walnut core was soaked in water at 20-80 ° C for 6-16 hours. The walnut core was then separated from the excess water. After manual removal of the thin shell covering the core, it was mixed with potable water in different core: water ratios and shredded in the mixer for 5 minutes. The resulting suspension was filtered through a double layer cloth (cotton thin cloth) to obtain walnut milk. Walnut milk was pasteurized at 73 ± 2 ^{o}C for 15 minutes and dispensed in containers.

Lipid Content Determinations

The principle of the method. It consists in separating the fat with isoamyl alcohol (amyl) by centrifuging the milk, previously macerated with sulfuric acid.

Protein Content Determinations

The principle of the method consists in blocking the amyl groups of proteins with formaldehyde and liberating the carboxylic groups which are neutralized with 0.1 N NaOH solution.

Moisture determination

The moisture of the stored walnuts was determined, in triplicate, using the AOAC Official Method 925.40.

Determination of microstructure of nut milk

The microstructure and size of the fat cells in the vegetable milk were determined using the digital microscope of the "Motic Digital Microscope B1 Advanced Series" model. The study was carried out depending on the storage time of the walnut milk 3 days

Results

Evaluation of organoleptic indices

To the evaluation, commission 20 samples of walnut milk were presented as analysis objects, which were treated differently, depending on the hydration time and temperature.

Following evaluation of organoleptic indices, the samples were found to be pleasant to taste and smell, to have a consistency and color characteristic of the given product. No disturbances and sediments were observed. The highest score was obtained for sample when core was soaked for 12 hours at 40^{o}C. This sample was noted for a pleasant color and consistency, and an intense taste.

The chemical composition of walnut milk was also determined. The table below presents the chemical composition and physico-chemical indexes of nut milk.

Table 1. *Chemical composition of walnut milk.*

Nr.	Core: water ratio / Indicators	1:10	1:8	1:5	1:4
1.	**Dry matters, %**	6,73±0,12	8,92±0,13	14,02±0,30	17,22±0,58
2.	**Protein,g/100 g**	1,17±0,09	1,49±0,07	2,31±0,19	2,78±0,11
3.	**Lipid, g/100 g**	4,53±0,21	6,02±0,11	9,74±0,33	12,13±0,42

Analyzing the obtained data, it can be mentioned that the majority of components in walnut milk are lipids, their content being 12,13 g/100mL for samples prepared with wanut core: water ratio 1:4. Compared to cow's milk, the obtained walnut milk is poorer in protein (2.78 g/100 ml vs. 3.4 g/100 mL for cow's milk, however, referring to their quality, we can assume that protein intake of walnut milk is healthier.

Evolution of acidity in the stored walnut milk

The total acidity of walnut milk is determined to a small extent by the protein and gas content and to a greater extent by the presence of acids and acid salts, but also by the duration and temperature of core soaking medium. Figure 1 shows the results of the research showing that during the storage of milk, the titratable acidity of milk (A*) moderately increases (the results are shown for the milk obtained using the 1:4 core: water ratio, for all the other samples – trends were similar).

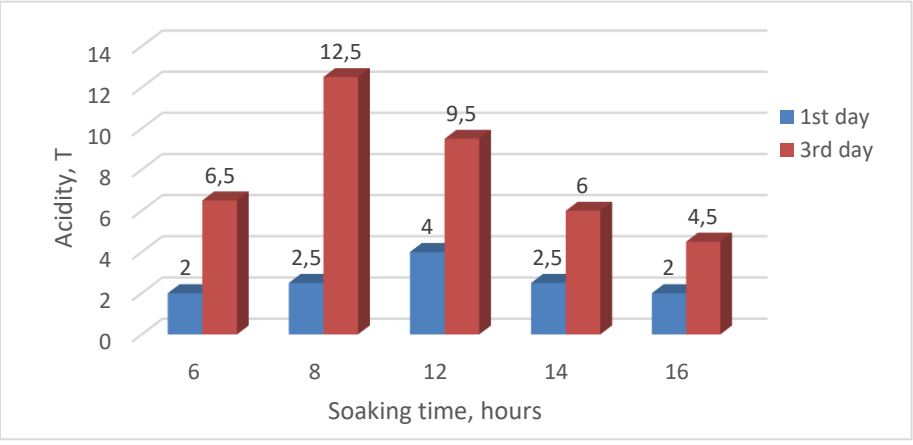

Figure 1. *Dependence of the titratable acidity of walnut milk on the core soaking duration* (A*=A±0,12).

When preserving milk, total acidity increases due to the action of lactic bacteria on sugars. In all cases, the titratable acidity value of nut milk does not exceed the maximum admissible value (17 ^{o}T) because the milk sugar content is relatively small (compared to cow's milk).

Granulometric analysis of walnut milk emulsion

Walnut milk is a complex fluid nature for both the physical and the diversity of molecular constituents of the protein, fat, and mineral origin. Lipids are the basic components and is found in the form of a fat globule emulsion. The size of the fat globules

is an important parameter for the stability and digestibility of the milk and may vary within fairly wide limits. The evolution of granulometric parameters and the size distribution of the stored walnut milk were analyzed. The obtained data are presented in Figure 2.

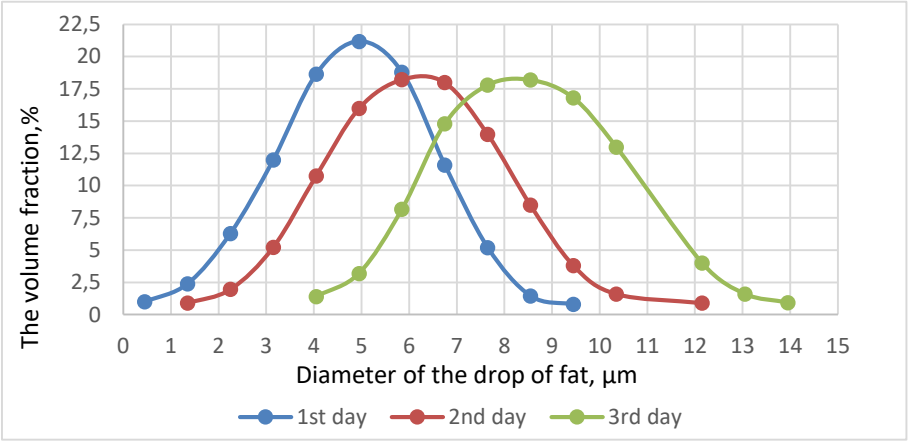

Figure 2. *Granulometric distribution of fat drops from nut milk*

The results show that emulsion destabilization occurs during storage. Two major phenomena are involved in the destabilization process:

- Migration phenomena through which the density difference between the phase continues and the dispersed phase leads to the gravitational separation of the phases (cremation);
- Increasing droplet size by flocculation (reversible process), aggregation and coalescence (irreversible process).

From the microstructure and size distribution of the fat globules it was found that their diameter varies within the range of 0.45 - 9.45 µm, with a bigger share being the droplets with a diameter of 4.95 µm. These values are commensurable with the diameter of the walnut oleosomes (1-30 µm).

Beginning with the second day some of the drops fuse, by increasing their size, their diameter varies within the range of 1.35 to 12.15 µm. For the sample preserved for two days, most drops have a diameter of 5.5-6.0µm. In the sample preserved for 3 days the diameter of the droplets prevailing in the emulsion structure is 8.55 µm and the maximum values are 13.95 µm. The structure of the emulsion is destroyed and partial phase separation occurs.

Therefore, walnut milk is an unstable product. The conditions that limit the cremation are the increase of the aqueous phase viscosity or the dispersion of the fat droplets. In fact, it is difficult to increase the viscosity of the aqueous phase without altering the composition and the milk's own characteristics, so it would be desirable to homogenize. At the same time, cremation is also accelerated by flocculation of fat droplets. In order to prevent flocculation, conditions should be created that favor the repellent of the drops of fat, i.e. the modification of the pH, the ionic composition of the aqueous phase and the nature of the emulsion stabilizers. By using exogenous emulsion

stabilizers (proteins), the elasticity of the emulsifier coating could also be increased, which would retain the emulsion coalescence.

Conclusion

The possibility and opportunity of producing nut milk has been demonstrated. Walut milk is produced as both highly complex multiphase physical nature (continuous aqueous phase, a colloidal suspension, emulsion and solution) constituents and the molecular diversity of protein, lipid and mineral origin. Analysis of the microstructure of walnut milk showed that the diameter of the fat globules, in the first day, varies within the range of 0.45 – 9.45 μm, and that this is commensurable with the size of the intracellular oleosomes of the walnuts. The obtained product has a low calorific value, exhibits organoleptic (sensory) properties and physico-chemical characteristics (pH, titrability, stability) specific to the used raw material, other than for dairy but acceptable for consumption.

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COMPARATIVE ANALYSIS OF LIPIDS FROM HEN AND QUAIL YOLKS

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Abstract: Structural lipid compounds of hen and quail egg yolks were extracted by solvent extraction procedure according to Folch method. The amount of triglycerides, lecithin and cholesterol which were extracted was to be 18.35, 10.73, 4.66 g/100g yolk for wet hen yolk and 19.93, 7.51, 4.38 g/100g yolk for wet quail yolk. Triglycerides extracted from the yolk look like a solid mass, with substantially white color, non-malleable consistency, that are estimates as 18.35 g/100 g wet hen yolk and 19.93 g/100 g wet quail yolk. Hen egg yolk lecithin has emulsifying qualities more evident than in quail egg yolk lecithin. Lecithin extracted from hen egg yolk formed the milk creaminess structures with high stability, where agglomerations are well fixed and distributed uniformly.

Keywords: egg yolk, lipidomics, triglycerides, lecithin, cholesterol, spectral characteristics, technological properties, instrumental testing.

Introduction

Egg lipids are concentrated in yolk. 70% of the dry substances of egg yolk are represented by lipids. In general the yolk of various strains of hen eggs is 30% to 33% lipid comprising about 65% triglycerides, 28.3…30% phospholipids, 4.0…5.2% cholesterol and 1% other lipids [4, 7, 10].

Triglycerides of egg yolk have the following fatty acid in composition: myristic (14:0), palmitic (16:0), stearic (18:0), oleic (18:1), linoleic, 52.4% (18:2) and clupadonic acid (22:5).

The total amount of saturated fatty acid is approximately 40% of the fatty acids. Major unsaturated fatty acids are oleic, linoleic, and linolenic with a small quantity of $C_{20}\omega6$, $C_{22}\omega6$ and $C_{22}\omega3$ polyunsaturated fatty acids [4].

The polar lipids (namely phospholipids, PL) are represented by several classes: lecithins (79%), cephalins (17%), sphingomyelins (2.5%) and others. The main components of egg-yolk lecithins are phosphatidylcoline (PC) with a presence of 80.5%, and phosphatidylethanol-amines (PE) – 11.7%. Phosphatidylcoline (PC) is the major component of phospholipids of egg yolk (66.7% of total phospholipids), that is more than phospholipids in soybeans (only 33.0%) [7].

The extraction of total lipids and lecithin from yolks is desirable because of the unique properties and valuable applications of these products.

In recent decades lecithins have been developed for use in a wide variety of products including chocolate, confectionery and bakery preparations, dairy products and low fat products [7, 11].

Both lecithin and cholesterol have multiple physiological functions. Lecithin is responsible for elasticity and integrity of vascular and cellular membranes. Cholesterol contributes to the synthesis of steroid and sexual hormones [6].

In some studies was established that solvent composition had a small effect on the extraction of predominant lipid classes (triacylglycerides, cholesterol esters, and phosphatidylcholines). In contrast, extraction of less abundant lipids

(phosphatidylinositols, lyso-lipids, ceramides, and cholesterol sulfates) was greatly influenced by the solvent system used [8].

For the removing the main classes of lipids from animal tissues are using the solvent system chloroform:methanol (2:1, v/v) or Folch method [3]. For the removing the secondary lipidic compounds is required a two-phase system, where initially is preparing a mixture of chloroform:methanol:water, which after mixing, is separated into two layers with the following composition: the upper layer - 3:48:47 and the lower layer - 86:14:1, with high extractability for apolar lipids.

Overall, the Folch method is most effective for the extraction of a broad range of lipid classes, although the hexane-isopropanol method is best for apolar lipids and the MeOH-TBME method is more suitable for lactosyl ceramides [8].

Materials and methods

The research was conducted for egg yolk obtained from hen eggs produced by hens species *Leghorn* on poultry ferm Valea Perjei, Taraclia and *Japanese* quail from SRL Cristilmar, Ungheni. For each sample used in the investigation the average mix was obtained from six egg yolks from a homogeneous batch of eggs. The yolk acidity was determined by titration with NaOH 0.1N, being used phenolphthalein as indicator.

The total lipids were extracted by the Folch method, the solvent used was a mixture of chloroform:ethanol (2:1). Yolk proteins were previously hydrated with sol. NaCl, 0.9%, denaturated by treatment at 65-70 °C for 15-20 min. and then proteins have been removed by centrifugation at 3000 rpm for 10 min. [4]. For the separation of major lipid classes - triglycerides, phosphatidilcoline and cholesterol have been used different solvent systems. So, were separated triglycerides (with ethyl alcohol) and lecithin from lecithin and cholesterol mixture with ethyl alcohol:cyclohexane (2:1) solvent. For better separation of cholesterol, which is contained in the yolk plasma, there was used a pectin gel, 1%.

For the quantitative assay of cholesterol have been used certain identification and quantification reactions, Lieberman-Burchard test [5]. Spectral characteristics of preparations of the major classes of lipids of yolk were recorded in the range 190-1000 nm, using for this the UV-VIS spectrometer, model Hach Lange DR 5000.

Statistical analysis on the extractability and proportions between the classes of lipids was performed using ANOVA simultaneous component analysis (ASCA) [9].

Results and discussions

Phisico-chemical characteristics of egg yolk. Hen eggs weight 66.30±3.27 g (weight category L [1]), while egg yolk was 17.18±1.35 g. Quail eggs weight 11.90±0.62 g, while egg yolk was 4.34±0.78 g. Vitteline index was 0.43 for hen egg yolk and 0.35 for quail egg yolk, which shows the presence of higher surface-performing forces and interactions in hen egg yolk than in quail. Acidity of hen egg yolk was of 12.5 degree of acidity, while of quail egg yolk – 10.3, quail egg yolk is less acid than hen yolk. The intensity of the yellow color was estimated to 5 units for hen yolk and 8 units for quail yolk (according to Roche Fan Yolk scale). Dry substances are forming 48.03±2.87 % by weight for hen yolk, and 46.06±1.59 for quail egg yolk. Yolk:albumen ratio was higher for quail yolk (1/1.28 opposite 1/1.94).

Extraction of total lipids from yolk. Yolk represents an oil-in-water emulsion with very thin structure [2]. Many lipids of yolk formed complex structures with proteins

or carbohydrates. Therefore it is relatively deficient to separate lipids with a high yield and in a pure form. The prior preparation of the sample was initial by the hydration of yolk protein in saline solution, then denaturation of them at moderate temperatures of native, factors that increased the breaking of links between proteins and lipids. The amount of total lipid extracted from egg yolks was higher for hen yolk than in quail yolk (Figure 1).

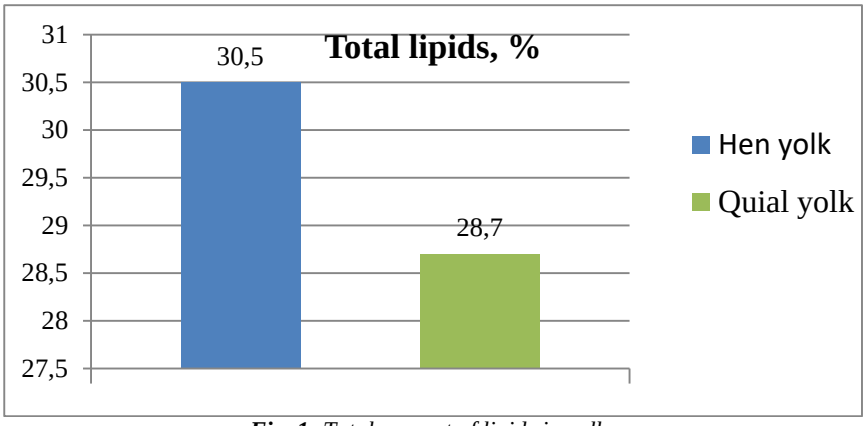

Fig. 1. *Total amount of lipids in yolks*

Separation of major lipids classes. Using a few mixtures of solvents was allowed the effect of separation of major fractions of triglycerides, and then was carried out the separation of cholesterol from lecithin. Triglycerides extracted from the yolk look like a solid mass, with substantially white color, non-malleable consistency, possessing an acidity number equal to 2.0 mg KOH /100 g fats (Figure 2). The lecithin fraction was present in the form of a solid mass of malleable consistency, with strong yellow color.

Fig. 2. *Neutral fats, triglycerides extracted from yolk fats*

Cholesterol, which has a low molecular weight, was separated at last, experimental sample being treated at low temperatures. Quantitative data on the presence of egg yolk lipid fractions are shown in Table 1.

Table 1. Lipid fractions of egg yolk

Lipid fraction	Hen yolk		Quail yolk	
	% of total lipids	g/ 100g yolk	% of total lipids	g/ 100g yolk
Triglycerides	60.16±1.28	18.35±0.45	69.44±1.14	19.93±0.36
Phospholipids	35.18±0.47	10.73±0.17	26.18±0.13	7.51±0.08
Cholesterol	4.66±0.06	1.42±0.03	4.38±0.04	1.26±0.02

Spectral characteristics of the major lipids classes. The UV-VIS absorption spectrum of solution of lecithin in chloroform shows a few peaks shaped as a cascade in the wave band of 250-350 nm, and a shoulder peaks between 400-550 nm (Figure 3).

Experimental investigation for the test samples with cholesterol shows that the absorption spectrum in UV-VIS has the following absorption peaks: at 240 nm (A=2.451), 250 nm (A=2.583), 416 nm (A=0.306). There is a shoulder peak between 450 and 500 nm, whose central wavelength is 460 nm. In actual testing practice absorption peak at 416 nm is used to determine the cholesterol concentration [2].

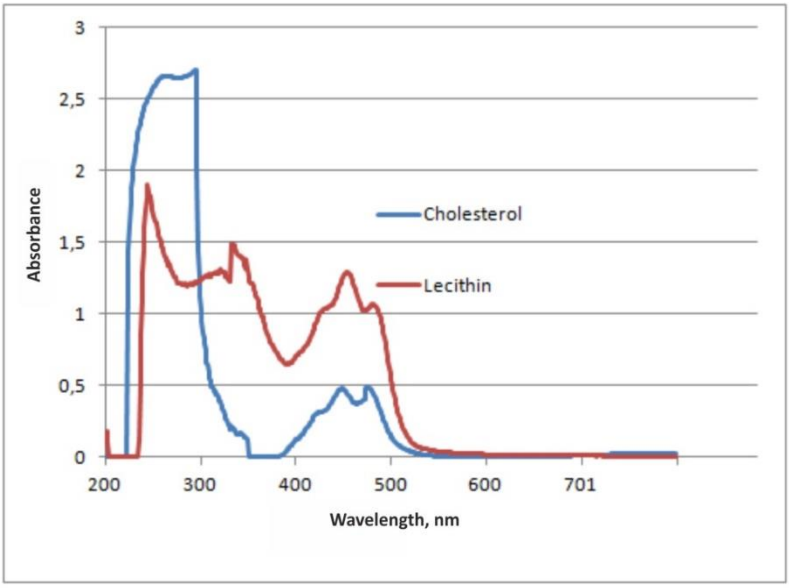

Fig. 3*. Absorbance profile of cholesterol and lecithin in the range of 200-700 nm.*

Technological properties of lecithin from yolk. Lecithin extracted from hen egg yolk was used as a foaming agent in the technology of preparing of the whipped cream. Egg yolk lecithin and milk β-casein are two classes of compounds that have a strong tendency at the air-liquid interface in food creaminess structures. Lecithin extracted from

hen yolk denoted a stronger property for the formation, stabilization and better rheological qualities of milk creaminess structures, which is due to the ability of lecithin to displace β-casein from the cream droplet surface.

Conclusions

1. The egg yolk is a source of multiple compositional ingredients with high technological and nutritional value.

2. Triglycerides extracted from the yolk look like a solid mass, with substantially white color, non-malleable consistency, that are estimates as 18.35 g/100g hen yolk and 19.93 g/100g quail yolk.

3. Both lecithin and cholesterol have a representative profile of UV-Vis spectrum.

4. Hen egg yolk lecithin has emulsifying qualities more evident than in quail egg yolk lecithin.

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COUNTERFEITING DETECTION OF FERMENTED MILK PRODUCTS

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Abstract. About the appearance on the market of unqualified milk products, within Practical Scientific Institute of Horticulture and Food Technology (Food Technology Directorate) were initiated research and development works to establish counterfeit milk products and detection methods of them. Physico-chemical quality indices of fermented milk products were determined with the use of instrumental methods, Reichert-Meissl and Polenske method. In result of the investigation was established the existence of the Republic Moldova market – nonconforming fermented milk products and counterfeit, by substitution of lactic fat with vegetable fat (falsification of content). The absence of respective information on the product label is assigned to the category of informational falsification.

Key words: index of quality, fermented milk product, identification indices, monitoring

Introduction

The volume of counterfeit dairy products in many countries in recent years was 30-50% and it is assumed that in Republic of Moldova has created a similar situation so that the absence of a state system of dairy products quality control, as well as deficiency of qualified specialists, able to capitalize the materials and quality standards of EU countries.

This problem, unfortunately, not had an approach in some state programs involving scientific institutions in developing quality standards and methods for identifying counterfeit food, so the elaboration of authenticity/deceleration criteria of falsified food and representative index determination, specific besides those who are established in the standards for dairy products, is a vital issue at the moment with a significant economic and social impact, including on health [1].

In the production of fermented milk products are conventionally two groups: obtained only as a result of lactic fermentation (sour cream and cottage cheese) and obtained as a result of mixed fermentation (kefir and acidophilus, yogurt). We investigated the identification indicators of fermented milk products obtained as a result of lactic fermentation (sour cream and cottage cheese and).

Materials and methods

Was conducted the quality monitoring of fermented milk products (cottage cheese and sour cream), selected from the markets, manufactured in some industrial enterprises from Romania, Russian Federation, Ukraine and Belarus. In order to respect the confidentiality of information, may bring some harm producers/ importers, samples are coded without their names.

Laboratory investigations were carried out on the basis of physical and chemical indicators, which are: fat content, dry lactic skimmed residue, protein content, titratable acidity [2]. The lactic fat extracted in the milk samples was determined fatty acid composition by Reichert-Meissl and Polenske methods.

The Reihert-Meissl Index characterizes the content of lower fatty acids (capric and butyric acid). In dairy fat it is 20 to 30, and in sunflower, corn, soy and coconut oils the indices range from 0 to 8. Polenske characterizes the amount of lower insoluble fatty acids (caprine and caprylic) in 5 grams of fat. In dairy fat it is from 1.9 to 5 [3].

Results and discussions

The markets of the Republic of Moldova sale a sour cream with a fat fraction of 10-30%, as well as sour cream product with a fat fraction of 10%. Import sour cream has a longer shelf life, being pasteurized. We selected 8 samples from the market (different producers), 1 sample of control (from country farms) and 1 sample of sour cream product, see table 1.

Table 1. *The quality monitoring of sour cream placed on Rep. of Moldova markets*

Nr.	Country	Product name	Fat content, %	Shelf-life	Storage temp.
1.	R. Moldova	1.sour cream 2.sour cream product	15,20,25,30 10	7 days	up $+1^0$C to $+6^0$C
2.	R. Moldova	Sour cream	10,15,20,30	8 days	up 0^0C to $+4^0$C
3.	R. Moldova	Sour cream	15,20,25	7 days	up 0^0C to $+6^0$C
4.	R. Moldova	Sour cream	10,15,20	15 days	up 4^0C to $+6^0$C
5.	R. Moldova	Sour cream	10,15,20,30	7 days	up 4^0C to $+6^0$C
6.	Belorusia	Sour cream	15, 20, 26	25 days	up 2^0C to $+4^0$C
7.	România	Sour cream	20, 30	36 days	up 2^0C to $+6^0$C
8.	Ucraina	Sour cream	15, 20	15 days	up 0^0C to $+6^0$C

Counterfeiting of sour cream is frequently used by manufacturers. This is usually diluted with kefir, cottage cheese or water. Starch, egg white, chalk, various additives, vegetable oils and even hydrogenated fat can be added to the cream (table 2).

Table 2. *Tests used to detect the sour cream falsification*

Nr. d/o	Samples	Fat content, %	Sour cream presence of:			
			Amidone (color)	Cottage cheese	mineral substances	Egg white
1.	Sample nr.1	10	yellow	protein flakes in all volume	without precipitation	on the filter are no traces of egg white
2.	Sample nr.2	30	yellow	a dense circle to the surface, formed by protein flakes	without precipitation	
3.	Sample nr.3	15	yellow	Protein flakes on 1/4 surface	without precipitation	
4.	Sample nr.4	10	yellow	Protein flakes on 1/3 surface	without precipitation	
5.	Sample nr.5	30	yellow	a dense circle to the surface, formed by protein flakes	without precipitation	
6.	Sample nr.6	-	yellow	omogenious solvation in water	without precipitation	
7.	Sample nr.7	15	yellow		without precipitation	

Nr. d/o	Samples	Fat content, %	Sour cream presence of:			
			Amidone (color)	Cottage cheese	mineral substances	Egg white
8.	Sample nr.8	15	yellow		without precipitation	
9.	Sample nr.9	15	yellow	protein flakes on surface	without precipitation	
Conclusions	-amidone is not added to a sample (lack of blue color); -in all types of sour cream there are elements which do not dissolve in water, except for samples no. 6, 7, 8; - Mineral substances lacking; - egg white is not present in the samples studied.					

Table 3. *Physical and chemical indices in the sour cream samples, selected from the market*

Nr.	Sample	Fat mass content,%	Mass content, %			Acidity ^{0}T
			fat	protein	Dry lactic skimmed residue	
Norm according RT „Lapte și produse lactate”			**min 10,0**	**min 1,2**	**min 3,6**	**60-100**
1.	Sample nr.1	10	10,0	2,8	6,0	72
2.	Sample nr.2	30	30,0	2,4	4,0	60
3.	Sample nr.3	15	15,0	2,9	5,2	76
4.	Sample nr.4	10	10,0	2,9	5,1	84
5.	Sample nr.5	30	30,0	2,4	4,4	60
6.	Sample nr.6	-	28,0	2,5	8,0	67
7.	Sample nr.7	15	15,0	2,7	5,3	76
8.	Sample nr.8	15	15,0	2,8	5,2	74
9.	Sample nr.9	15	15,0	2,8	5,0	78

According to the research of the physico-chemical indices, the studied samples correspond to the norms stipulated in the Technical Reglementation of R. Moldova.

The composition of fatty acids in milk fat (Reihert-Meissl and Polenski index), extracted from the samples examined, was studied. The results of the analyzes are presented in Table 4.

Table 4. *Reihert-Meissl and Polenske indices in sour cream samples from milk enterprises of Republic Moldova*

Nr.	Sample	Fat mass content,%	Indice Reihert-Meissl	Indice Polenski	lactic fat /veg. fat ratio
1.	Sample nr.1	10	10,96	1,3	50/50
2.	Sample nr.2	30	17,6	2,2	90/10
3.	Sample nr.3	15	16,3	2,0	80/20
4.	Sample nr.4	10	14,9	1,9	70/30
5.	Sample nr.5	30	17,8	2,3	90/10
6.	Sample nr.6	-	22,1	2,7	100/0
7.	Sample nr.7	15	21,9	2,5	100/0
8.	Sample nr.8	15	22,0	2,6	100/0
9.	Sample nr.9	15	15,1	1,9	70/30
Milk fat substituent SRL „Vegetal-Org			4,65	0,8	100 Vegetable fat

The results of the analyzes show that sample no. 6 (house cream) contains only pure dairy fat, but samples no. 1-5 have a substitute for lactic fat or vegetable oils.

In the Republic of Moldova only one producer manufactures the cream product, which is used in the culinary industry and in the preparation of the sauces. All investigated samples contain from 10% to 30% vegetable fat.

Table 5. *The quality monitoring of cottage placed on Republic of Moldova markets*

Nr.	Country	Cottage type	Fat content %	Package and weight	Storage temperature and shlef-life
1.	R. Moldova	1. Granulated	4, 6,0, 5	Plastic box 200g,400g	up $+1^0$C to $+6^0$C, 96 hours
		2. Brick	2, 5, 18	paper 250g	
		3. Fresh cow cheese	18	polyeth.500g	
2.	R. Moldova	1. Granulated	4	plast. cup 350g	up 0^0C to $+4^0$C, 6 days
		2. Fresh cow cheese	0, 5. 9	box 350g	
		3. Brick	5, 9, 18 0, 5, 9	paper 250g polyeth.500g	up 0^0C to$+4^0$C, 96 hours up 0^0C to$+4^0$C, 6 days
3.	R. Moldova	Brick	5	paper 250g	up 0^0C to $+4^0$C,96 days
4.	R. Moldova	Fresh cow cheese	0, 9	box 250g	up 0^0C to $+4^0$C,96 hours
5.	R. Moldova	Fresh cow cheese	0, 9, 18	polyeth.500g	up 0^0C to $+6^0$C,96 hours
		Brick	5, 18	paper 250g	
6.	R. Moldova	Brick	2	paper 250g	up 0^0C to $+6^0$C,96 hours
7.	România	Granulated	15	pastl.cup 300g	up 2^0C to $+6^0$C,25 days
8.	Rusia	Granulated	1	box 220g	up 2^0C to $+6^0$C,34 days
9.	Belorusia	Granulated	5	plast.cup 250g	up 2^0C to $+6^0$C,25 days
10	Ucraina	Brick	0, 2	Box, 250g	up 2^0C to $+6^0$C,34 days

The Moldovan market sale cottage cheese with a fat mass fraction of 0% to 18% with the shelf life of 96-144 hours (4-6 days) at 0 ° C to +6 ° C. The import cheese has a longer shelf life of 25-34 days at a temperature of + 2 ° C to + 6 ° C.

Table 6. *Physical and chemical indices in the cottage samples, selected from the market*

Nr.	Sample	Fat mass content,%	Mass content, %			Acidity ^{0}T
			Fat,	Protein,	Dry lactic skimmed residue	
Norm according RT „Lapte și produse lactate”			**0,1-35,0**	**min 8,0**	**min 13,5**	**200-270**
1.	Sample nr.1	4	4	17,0	21	220
2.	Sample nr.2	4	4	16,4	24	240
3.	Sample nr.3	5	6	21,5	26	200
4.	Sample nr.4	5	5	15,0	25	200
5.	Sample nr.5	2	2	18,5	26	220
6.	Sample nr.6	-	17	15,5	18,5	220
7.	Sample nr.7	15	15	16,0	21	200
8.	Sample nr.8	5	5	15,0	25	200
9.	Sample nr.9	0,2	0,2	12,5	28	220

8 cheese samples from the trade network (different producers) and 1 house sample (from country farm) were selected.

The composition of fatty acids in milk fat (Reihert-Meissl and Polenske index), extracted from the samples examined, was studied. The results of the analyzes are presented in Table 7.

Table 7. *Reihert-Meissl and Polenske indices in cottage samples from Moldovan enterprises*

Nr.	Sample	Fat mass content, %	IndiceReihert-Meissl	Indice Polenski	lactic fat /veg. fat ratio
1.	Sample nr.1	4	16,2	2,1	90/10
2.	Sample nr.2	4	16,8	2,3	90/10
3.	Sample nr.3	5	12,9	1,8	70/30
4.	Sample nr.4	5	15,4	1,9	85/15
5.	Sample nr.5	2	14,7	2,0	75/25
6.	Sample nr.6	-	22,1	2,7	100/0
7.	Sample nr.7	15	21,9	2,4	100/0
8.	Sample nr.8	5	21,2	2,2	100/0
9.	Sample nr.9	0,2	13,8	1,8	75/25
Milk fat substituent SRL ,,Vegetal-Org			4,65	0,8	100 Vegetable fat

The results of the analyzes show that sample no. 6, 7, 8 contains only pure dairy fat, but samples no. 3, 5, 9 are substituted for lactic fat or vegetable oils.

Conclusions

1. The monitoring of fermented milk products produced in the Republic of Moldova and imported (sour cream and cottage cheese) placed on the market, have been made.

2. According to the physical and chemical indices were found added foreign substances in sour cream samples 1-5, was replaced the lactic fat by vegetable fat.

3. According to the physical and chemical indices was found in cottage cheese the substitution of lactic fat by vegetable fat in sour cream samples 3, 5, 9.

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EFFECT OF THE WHEY CONCENTRATION DEGREE ON THE ELECTRICAL PROCESSING WITH THE AIM TO ISOLATE ORGANIC ACIDS

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Summary: The purpose of this study assumes the production of more concentrated solutions of whey and organic acid preparations, since further processing of the acid with the aim of concentrating by traditional methods is energy-intensive and long-lasting.

Key words: whey, condensate, electric treatment, organic acids.

Introduction

The problems of environmental protection, development of wasteless technologies and techniques for their realization greatly increase and become more acute in recent years. One of the spheres of primary importance is food production and especially food stuff processing, which sometimes causes an enormous damage to the environment. The production sphere re-examines ecological requirements, and such a rebirth occurs in the dairy industry, namely, in the use of secondary dairy products.

Development of wasteless technologies of whey processing is a global-scale urgent problem.

Materials and methods

The experiments related to the whey condensation in a vacuum evaporator with an ejector were performed. The condensation allowed us to obtain the whey with the dry matter content from 7 % to 10.6, 12, 13 % in the condensate. The regime was maintained with the condensation temperature up to 40 ^{0}C and the pressure of the heating medium in the evaporator up to P = 6 kPa.

The preliminary studies indicate that some content of dry matter (12 %) in the whey provides cleaner organic acid solutions.

For this purpose a laboratory bench for whey condensation has been developed in accordance with the following requirements: it allows us to evaporate 50% of moisture, maintain the desired evaporation temperature and the condensed whey volume [1]. Practically the whey is concentrated to the dry matter content of 12 and 13 % [2].

The characteristic parameters that determine the condensation process by evaporation of free moisture from the whey are the temperature and the process duration. To maintain the native whey properties it is desirable to maintain the condensing temperature below 40 ^{0}C [3]. Further we describe the process of separation of organic acids generated in the diaphragm electrolyzer.

To reduce the energy consumption, the whey can be considered as pasteurized to the end of condensation in the vacuum evaporator.

Results and discussion

The results are presented in the spectrograms:

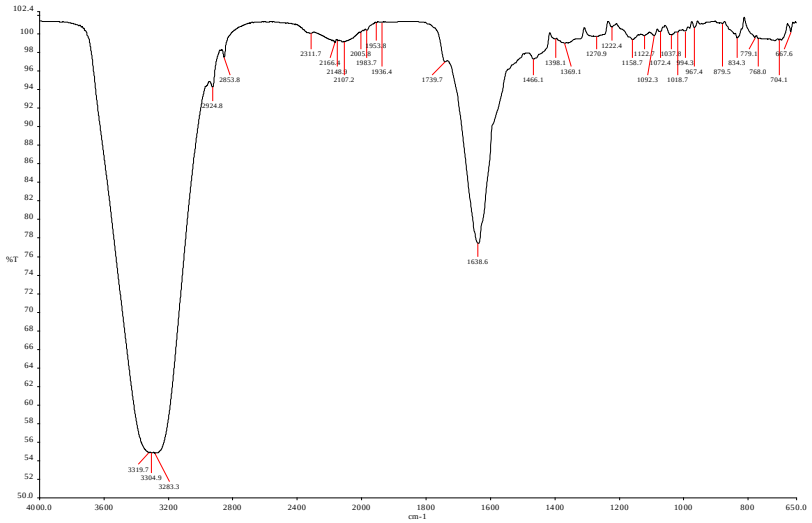


Fig. 1. *Spectrogram of the initial whey*

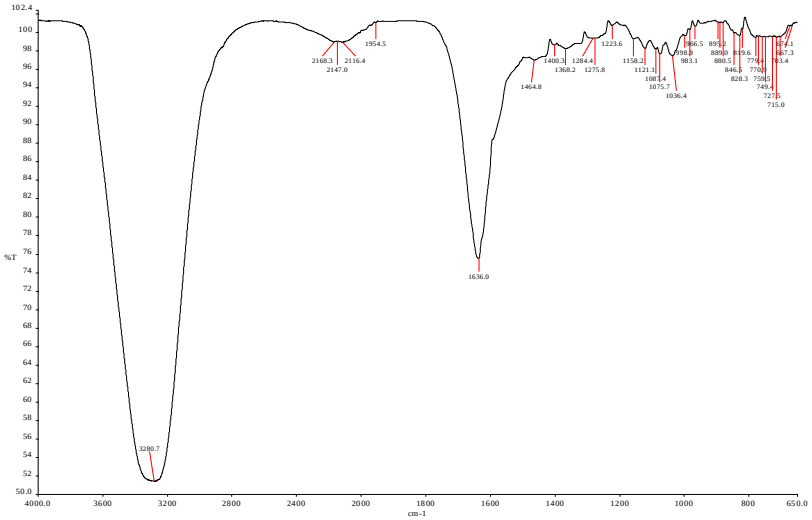


Fig. 2. *Condensed whey spectrum (dry matter content 13 %)*

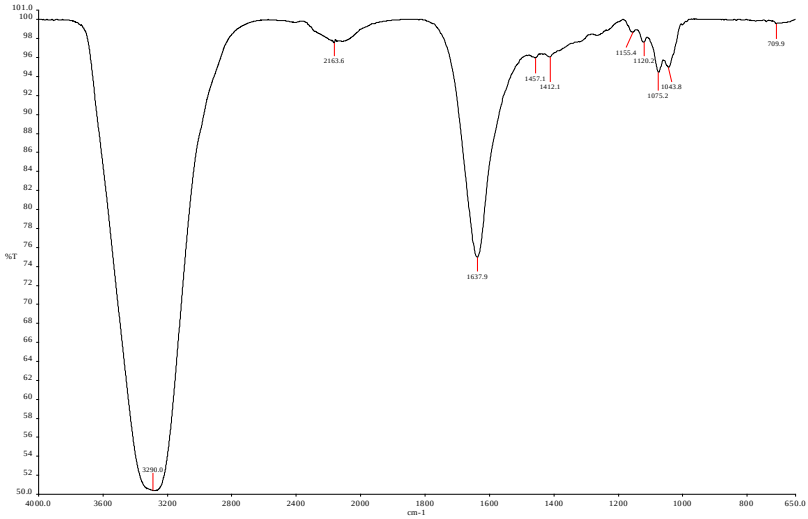


Fig. 3. *Condensed whey spectrum (dry matter content 12 %)*

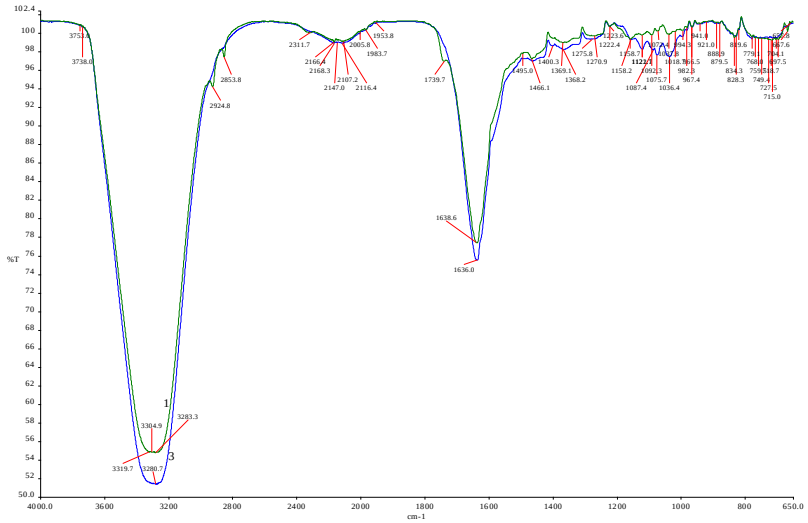


Fig. 4. *Spectrogram of the initial and condensed whey*

The comparison of the spectral peaks presented in Fig. 4. shows the changes in the qualitative composition of the resulting solutions related to the content of lactic acid, acetic acid, ethanol, acetaldehyde, etc.

The whey is concentrated to the dry matter content of 12 % (Table 1.) and 13 % (Table 2).

After electrolysis of the condensed whey (12 %) for one hour in the cathode chamber, the content of the dry matter decreased to 10%. While treating whey, the Oxidation Reduction Potential (POR) is positive (Fig. 5.) for fermented whey and

indicates the possibility of acid separation under the electric current action (from 1.2 to 0.5 A).

In this case, a longer process duration and a low processing temperature is used.

The results after the electric current treatment are presented in Tables 1 and 2.

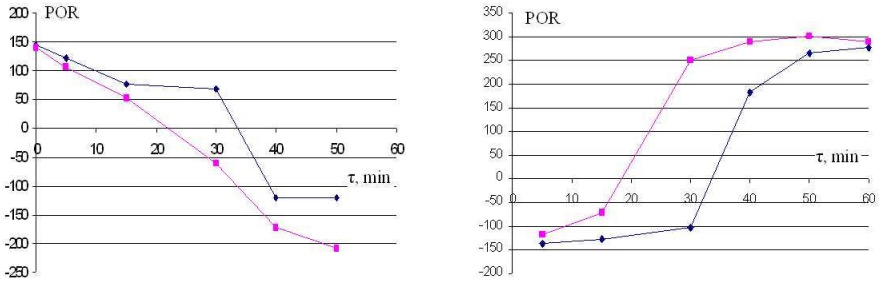
Table 1. *Processed whey with the dry matter content of 12 %*

τ, min	I, A	U, V	pH
10	*1,2*	*29*	*8.9*
20	*0,9*	*29*	*8.14*
30	*0,8*	*29*	*2.5*
40	*0,7*	*29*	*1.91*
50	*0,5*	*29*	*1.71*

Table 2. *Processed whey with the dry matter content of 13 %*

τ, min	I, A	U, V	pH
10	*1,4*	*29*	*9.1*
20	*1,6*	*29*	*8.69*
30	*1*	*29*	*3.67*
40	*0,6*	*29*	*2.28*
50	*0,4*	*29*	*2.04*

On the basis of the results related to the whey processing we conclude: when we treat the whey with an initial content of dry matter of 7 % to the dry matter content of 12% the current does not exceed 1.2 A at a constant voltage of 29 V. When the whey is treated to the dry matter content of 13 %, the current in the electrolytic cell increases up to 1.6 A.



Cathode chamber Anode chamber

Fig. 5. *Oxidation-reduction potential at the electrolysis of the concentrated whey. Dry matter content in unfermented whey ■ 12 %, ♦ 13 %*

While processing more concentrated whey we observe greater current intensities and increasing of the temperature in the electrolyzer cell; this negatively affects the organic acid production.

Infrared spectra are unique for each chemical compound, as well as for atomic groups. Thus, the group of unsaturated carbohydrates $-C-H$ is identified by the frequencies 3100-3000 cm^{-1} and 3340-3280 cm^{-1} and the carbonyl group $-C=O$ by

absorption at 1800-1540 cm^{-1} [4]. Each class of carbonyl compounds exhibit specific absorption bands within the frequency range.

For example, the carbonyl group of saturated acid esters is characterized by absorption bands 1750-1735 cm^{-1}, fatty acid aldehydes of 1740-1720 cm^{-1}. An important class of compounds - amino acids - exhibit absorption bands characteristic of the two functional groups $-C=O$ in the 1600-1560 cm^{-1} region and NH_2- in the 3130-3030 cm^{-1} region, but no one group is fully isolated.

This results in some changes in the frequencies and band intensities depending on the chemical environment of the functional group. Introduction of more donor alternates into the molecular structure leads to a decrease in the frequency of oscillations, which are more acceptable - to increase them. This is observed when the whey is evaporated under vacuum. From the initial whey spectrum, we note the presence of ethanol in the group $-CH_3$, the 2936 cm^{-1} absorption band, glycerine in two defined bands $-CH_2$ and $-CH$ groups (2922 cm^{-1} and 2852 cm^{-1} bands). On the other hand, glycerine has three groups OH in its structure. This manifest itself by a more intense band 3299 cm^{-1}. In the condensate we observe an absorption band at 1156 cm^{-1} corresponding to ethyl phosphate, which contains a respective group $P-O-C_2H_5$.

The bands at 1464 cm^{-1} and 1378 cm^{-1}, which are present in the parental whey spectrum, belong to different types of vibration and deformation groups. Note that in the spectra of the concentrate, these bands changed slightly at 1958 cm^{-1} (decrease in the oscillation frequency) and 1381 cm^{-1} (increase), respectively. The 1378 cm^{-1} lines are found in nitrates (NO_2^+, NO_2^-), for example, in ammonium nitrate. If the concentrations are not high, the bands do not exceed the dimensions of 1410-1345 cm^{-1}. For the initial and concentrated whey, we notice the presence of ionized nitrates.

In the spectrum of the concentrate, an absorption band corresponding to an amino acid containing the group NH_3^+ - 2004 cm^{-1} appears. The latter is not present in the compounds with the group NH_2^+. In the initial whey spectrum, the absorption band of 1416 cm^{-1} indicates the presence of succinic acid (symmetrical vibration in the group).

A 1638 cm^{-1} band belonging to the carbonyl group ($-COOH$) of the carboxyl group of lactic acid is observed in the spectra for both the initial and the concentrated whey. Its intensity in the both samples is roughly the same. The deformation vibrations of the group are responsible for the 1638 cm^{-1} band [5]. Also in the original whey spectrum, we have a second frequency range; when comparing it is possible to obtain the data, which confirm the existence of a group $-COOH$.

Acetic acid absorbs at 1250 cm^{-1}, but it is not observed in the condensed whey. Absorption of COO^- remains close to 1600 cm^{-1}. The absorption bands of the carboxyl group depend on the modification of the optical form of the molecules [6].

Thus, the optimum content of dry matter in whey for electrolytic treatment with the aim of separation of components is 12%. The established regularities of these processes are necessary to develop and implement effective and environmentally friendly processes for the production of organic acid.

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IMPACT OF DECORTICATION OF SORGHUM ORYZOIDUM ON GLYCEMIA

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Abstract: The glycemic index (GI) of foods rich in carbohydrates characterize on a scale from 0 to 100 so far as they raise blood glucose levels after their consumption. Foods with high glycemic index (> 70) are digested and easily absorbed into the body, causing a sudden increase and high blood glucose levels. Frequent states of hyperglycemia can lead to metabolic disorders, diabetes and obesity. The paper presents results of experimental determinations of glycemic index of boiled soriz grains and groats compared with glucose.

It was found that the samples investigated aren't aliments with high glycemic index. Obtained data complete bibliographic information available with new varieties of cereal products and their glycemic index to be useful and necessary in developing food rations for different population groups.

Keywords: boiled beans and hulled soriz, glycemic index, glycaemia, glucose.

Introduction

It's known that the human body uses the carbohydrates in the form of glucose as an energy source easily available. For a normal vital activity of human body is indispensable permanently maintaining of the level of blood glucose in physiological limits of 70-100 mg/dl or 3.9-5.6 mmol/l [1; 2]. The accessible glucose use by cells may be food or can be readily available from the reserves of glycogen.

The glycemic index of foods rich in carbohydrates is an important parameter to define the energetic availability of carbohydrates and characterized on a scale from 0 to 100 which raises the level of glucose in the blood after their consumption [3]. With the help of this index are classified as foods containing carbohydrates according to the impact that they have on blood glucose. Foods with high glycemic index (> 70) digest and quickly absorbed in the human body, generating a sudden rise and high glucose levels in the blood. The frequent states of hyperglycemia can lead to metabolic disorders, diabetes mellitus, obesity [4].

Foods with a low glycemic index (<50) leads to gradually increasing blood sugar and insulin levels because they are difficult to digest and absorb the blood. They are also effective in maintaining body weight as controls appetite and offers a feeling of satiety.

Knowing GI for each food separately allows us to choose the ones that cause a moderate increase in blood glucose level, which is the guarantee correct and long vascular functionality [5].

Sorghum Oryzoidum or soriz is an indigenous perspective autochthonous cereal culture whose IG has not been determined so far. The results obtained will complete the existing bibliographic information with new varieties of cereal products and their glycemic index, which will be useful and necessary in the preparation of food rations for different categories of population.

Materials and methods

As research materials were used:

- Soriz grains "Alimentar" boiled (about 120 min);
- Soriz groats (obtained by grinding during 3 minutes) boiled (about 40 min);
- Glucose – GOST 975-88;

The glycemic index of samples tested was determined in vivo by monitoring the level of glucose in the blood of the participants at the experiment before and after the consumption of researched food products, according to ISO 26642: 2010. Glycemic response after the consumption of each product was compared with the stimulated glucose consumption as reference substance [6].

Data obtained were used to build curves glycemic response of participants after drinking samples tested. Surface area under the curve was determined by mathematical method using AutoCAD through the program "Inquiry" that calculates the exact surface area. Finally, glycemic index was calculated as:

$$IG = \frac{Sa}{Sg} 100 \quad (1)$$

where:
GI – glycemic index of the food analyzed;
AS – surface area under the glycemic curve of studied food;
GS – surface area under the glycemic curve of glucose;

Capillary blood sugar of the subjects experiment was determined by method glycosidase -final point to biochemical analyzer "STAT-FAX 1904"[7].

Principle of the method: Glucose, under the action of glycosidase, turns into gluconic acid. H_2O_2 resulting will be decomposed by peroxidase, resulting the reaction involving and pointer Trinder (phenol and 4- amino antipyrine), resulting in a product of condensation in the red coloring with the absorption maximum at $\lambda = 505$ nm. Extinction is directly proportional to the concentration of glucose [8].

Results and discussions

The average glycemic response of the participants at the experiment before and after the consumption of equivalent amounts of carbohydrates (50 g) with glucose, cooked soriz grains or groats are presented in Table 1.

Table 1 *Evolution of glycemia after glucose, soriz grains and groats consumption*

	Time, min							
	0	**15**	**30**	**45**	**60**	**90**	**120**	**180**
Sample	**Glicemia, mmol/l**							
Glucose	3,8±0,8	5,6±1,1	6,8±1,2	5,6±0,9	4,5±0,7	4,9±0,9	4,4±0,6	3,7±0,4
Soriz grains	3,8±0,6	4,8±0,6	5,9±0,9	5,0±0,4	4,6±0,4	4,4±0,4	4,1±0,6	3,9±0,6
Soriz groats	3,8±0,6	4,9±0,8	6,5±0,9	5,5±1,0	4,5±0,5	4,3±05	4,2±0,5	4,0±0,5

The average pre-prandial glycemia of participants in the experiment was in the optimal range of 3.8 ± 0.8 mmol/l. After consuming the samples examined maximum glycemia was reached over 30 minutes. In relation to glucose, cooked soriz groats have determined a higher glycemic response (6.5 ± 0.9 mmol/l.) than boiled soriz grains (5.9 ± 0.9 mmol/l). In the following period was ascertained a slower decrease of blood glucose level participants after eating cooked soriz groats compared with that of the grains. This can be explained by the presence in higher quantities of fibres in integral soriz grains compared with groats, due to digestion and absorption of carbohydrates in blood occurs more slowly [9; 10]. Over 3 hours after consuming the samples studied blood glucose values have come down approximately at the level of initial values.

The glycemic index of cooked soriz grains and groats in relation to glucose is presented in Figure 1.

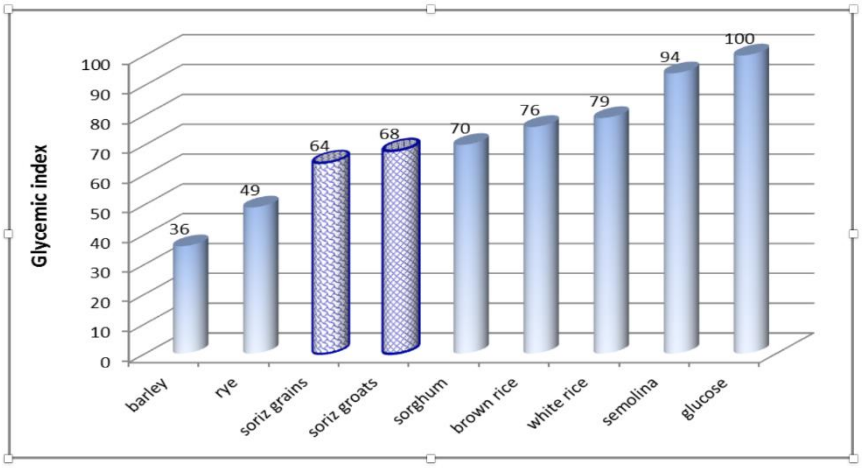

Fig.1 *GI values of sorize grains and groats compared to other cereals*

Thus, the integral soriz, being a hybrid of sorghum, had it close values of IG- respectively 64 and 70. The glycemic index of cooked grains and soriz groats was lower than of cereals as: brown rice (IG = 76), white rice (IG = 79), semolina (IG = 94), belonging to the category of foods with high glycemic index, but higher than that of barley (36) and rye (49), which belong to the group of foods with low GI [11, 12]. Theoretically this can be explained by the different composition of the carbohydrate complexes of cereals, including starches (the degree of gelatinization, the ratio of amylopectin and amylose content etc.), that influences their speed of digestion and absorption [13].

Conclusions

This study for the first time relates the information about glycemic index of soriz grains and groats *(Sorghum Oryzoidum)* and glycemic response after their consumption. The experimental results have shown that the boiled integral soriz caused a slower dynamics of blood glucose in the human body in relation to groats, which allows them to be more effective in reducing the risk of diabetes and cardio-vascular diseases.

Also, the determined values of the glycemic index of cooked soriz grains (64) and groats (68) in relation to glucose demonstrates their class membership food with moderate GI (55-70). Those, even in moderation, are recommended by nutritionists in a healthy diet, unlike foods with high glycemic index (GI > 70) [14].

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INFLUENCE OF THE EDIBLE COATINGS' VISCOSITY ON ORGANOLEPTIC CHARACTERISTICS OF WALNUT KERNELS

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Abstract: Walnut (Juglansregia L.) is widely distributed throughout the world. In this research work compares the effect of viscosity of coating solutions, based on whey protein isolate and gelatin, on organoleptic characteristics of walnut kernels. At the same time, it is possible to note the relationship between the viscosity of the coating solutions and the thickness, uniformity, as well as the appearance of the covered kernels.

Keywords: walnut kernels, viscosity, coatings, whey protein isolate, gelatin.

The walnut has gained popularity because of its specific attractive organoleptic properties and high levels of essential fatty acids and bioactive components such as antioxidants. Walnut production is widely distributed all over the world and currently it ranks third in terms of global nut production after cashews and almonds (Pereira et al., 2008) [1]. The theme of extending the shelf life and improving the quality of walnut kernels for sale will always be relevant. (Ernest H. Wiegand, 1927; Linda J. Harris, 2013) [2,3].

Recently, more and more scientists are working to develop new type of edible coatings, which wouldn't change the physico-chemical and microbiological parameters of walnuts during storage, but rather improve them. (L. Atarésetal., 2016) [4].

High quality walnuts ("Juglans regia") of "Cogalniceanu" variety of the harvest year 2017 were selected for the study. The quality of walnuts corresponded to the normative document UNECE STANDARD DDP-01: 2013 [5].

Studied walnut kernels were covered with two types of edible coatings. The first type of coating is developed on the basis of the method given in the article by the authors Wang L. and others, Elsevier (2010) [6]. The main component of this coating is whey protein isolate.

The second type of covering is developed on the basis of the patent of authors Nikolaenko N. S. and others [7]. The main component of this coating – food-grade gelatin.

Analyzing the overall assessments of each of the samples, we can say that kernels with gelatin coating (1 and 2 layers) have the best results, because these samples are most similar in all respects to natural walnuts without coating. The best overall assessment in such indicators as appearance and color was received by the sample covered with gelatin coating in 1 layer, while nuts with whey coating received a low score on these indicators due to their unnatural color, white inclusions and unsightly appearance. The samples with gelatin coating also have the highest score for the kernel peel integrity. The whey-based coating significantly influenced the integrity of the peel, damaging it in some places. But judging by the estimates for the uniformity and thickness of the coating, it follows that the gelatin coating in one layer looks better than the same coating in two layers. We can

also note that the samples covered with whey-based solution in one layer look more attractive than those that covered with two layers.

The results of the experiment revealed that the organoleptic qualities of the coated walnut kernels directly depend on the viscosity of the coating solutions. Experiments have determined that gelatin solution has the optimal viscosity for the coating at 20 C, because the samples in gelatin coating are rated higher than the samples in whey-based coverage as a result of organoleptic analysis. At the same time, 1-layer gelatin-based coating was more uniform than the same coating in two layers during visual inspection. Perhaps it is due to the fact that the solubility of the substances that make up the gelatin coating isn't the maximum, which requires a more detailed study.

The viscosity of the solution based on whey protein at 20 C is lower than the viscosity of the gelatin solution, and therefore, it penetrates into the upper layers (under the peel) of the kernel and changes the product at the physico-chemical level. Whey-based coating lay unevenly on the surface of the walnuts kernels, because of what, in places of its accumulation white plaque forms, which had a negative impact on the organoleptic assessment of appearance. From the work done, it can be concluded that for further research it is desirable to use a gelatin-based coating.

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INFLUENCE OF THE LIQUID PHASE COMPOSITION ON THE GLYCEMIC INDEX OF BOILED RICE

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Abstract: The present study aimed to explore the influence of the composition of the liquid phase (water, water-milk, milk) used for the boiling of rice groats on the GI value of the finished product. The results obtained proved that the rice boiled in the milk is a product with moderate glycemic index (IG 57), and the rice boiled in water or in a mixture of water and milk with a ratio of 1:1 - products with high glycemic index -respectively GI 95 and GI 85. The data obtained match with the result of researchers regarding the overboiling coefficient and the swelling degree of boiled rice samples, as well as with results regarding the satiety period after the consumption of the products. The understanding of the GI is important for the prevention of diabetes and obesity.

Key words: boiled rice groats, milk, glycemic index, volume overboiling coefficient, swelling degree.

Introduction

Rice is one of the most consumed foods in the world, and, being placed after the wheat, stands one of the main sources of carbohydrates in nutrition. From a nutritional perspective, it is a complete food product: containing about 80% carbohydrates, in the form of starch, 10% of plant proteins, the rest being shared between fats and other elements. Rice starch is easily digestible and is almost completely absorbed in the intestine, resulting in significant fluctuations in terms of the level of glucose (sugar) in the blood. Due to this, cooked rice is ranked in the category of foods with high glycemic index (GI > 70) and dietitians do not recommendit in a healthy diet [1].

The glycemic index of a food can be modified, depending on the mode of cooking and the association with other products [1, 2]. In this respect, the determination of the GI of the boiled rice in different aqueous medium (water, water-milk, milk) represent a great interest.

In terms of physical-chemistry, the milk representsan oil-in-water emulsion containing dissolved substances (lactose, mineral salts, water-soluble vitamins). Quantitatively, the milk represents 9/10 from the water. The other components constitute the total dry matter (protein, fat, lactose and mineral salts) is found in relatively large amounts, easily quantifiable, and others (vitamins, enzymes, etc.) -at a very low rate [3].

In the context of the use of milk as a boiling medium, the presence of Ca^{2+} ions is relevant since it represents good electrolytes. The research on the influence of calcium ions on the properties of starch have demonstrated that they are increasing the temperature of gelatinization of the starch [4]. The addition of proteins and lipids in food products containing high content of carbohydrates, also, influences the GI, by decreasing it in a particular way [1].

Material and Methods

The material used in this study was: round grain rice "Bunetto" purchased in the supermarket "Green Hills", Chisinau City, Republic of Moldova, purified still drinking

water "OM", pasteurized cow milk "Tetra Classic" with 2.5% fat content, glucose, boiled rice, water-milk (1:1, w/w) boiled rice and rice boiled in milk [6].

In order to determine the level of sugar in the blood after eating foods the optical methodhas been used: glucosoxidase-endpoint, using the Fit For Life Wellness Analyzer [5]. Measurements were made on 11 healthysubjects every 15 min. after consumption, within 2 hours. The results were obtained in the form of glycemic curves. AutoCAD software was used in "Inquiry mode" in order to calculate the areas under the curves. GI values of the studied samples were calculated according to the formula [1].

$$IG=Y/X \times 100, \quad (1)$$

Where:
GI – the glycemic index,
Y – the area under the glycemic curve of the studied food;
X – the area under the glycemic curve of the glucose.

The satiety period after the consumption of the investigated samples was calculated for each participant in the experiment by setting the time from the end of serving the boiled rice portion until the emergence of a persistent hunger feeling. Based on the data obtained, the average amount of the satiety period after the consumption of each boiled rice sample was calculated.

Physical changes of boiling rice were appreciated by the volumic coefficient of overboiling and the boiled rice swelling degree.

The volumetric coefficient of overboiling of the rice was calculated with the formula [2], by measuring the volume of 100 g of rice before and after boiling by using a graduated cylinder:

$$K_V=V_{boiled\ rice}/V_{rice\ cereal} \quad (2)$$

Where:
Kv – the volumetric coefficient of overboilingof the rice;
$V_{boiled\ rice}$ – the volume of the boiled rice, mL;
$V_{rice\ cereal}$ – the volume of the rice cereal, mL;

For determination of the extent of swelling of the boiled rice the following method has been applied: the boiled rice was placed into two 250 mL centrifugation vats. The vats were then centrifuged for 15 minutes at 1000 RPM sec. In order to obtain the solubility of the starch, 50 mL of supernatant was transferred to a Petri dish and dried overnight at 105°C. The dry matter has been cooled in the desiccator and weighted for the determination of the content of the soluble starch. In order to determine the extent of the swelling of the rice, the rice surface solution was separate, and the vat was weighted to determine the weight of the swelled rice cereal [7]. Calculation of the results:

$$Swelling\ degree\%) = \frac{m_{sp}\times 100}{m_{p.u.}\times(100-\%S)} \quad (3)$$

Where: m_{sp} – the sedimented rice probe, g;
m_{dm} – the dry matter probe, g;
S (%) – the starch solubility, %

Results and discussion

Figure 1 shows the mean GI values obtained for each of the boiled rice samples examined. The experimental results demonstrated that the GI the rice boiled in water had the highest values (on average 95). Boiling rice in water and milk with a ratio of 1: 1 has reduced the GI value by 10 units, but has not influenced the product's ranking. Thus, both the rice boiled in milk and the rice boiled in a mixture of water and milk are eating with high GI (> 70) and cannot be recommended for frequent consumption. The rice boiled in milk recorded the lowest value among the investigated samples (average 57), which put this product in the category of products with moderate glycemic index (GI 55-70) and can be recommended, though with moderation, for more frequent consumption. An additional advantage is that the rice boiled in milk has a GI close to the lower limit of the GI 55-70 for products with moderate glycemic index.

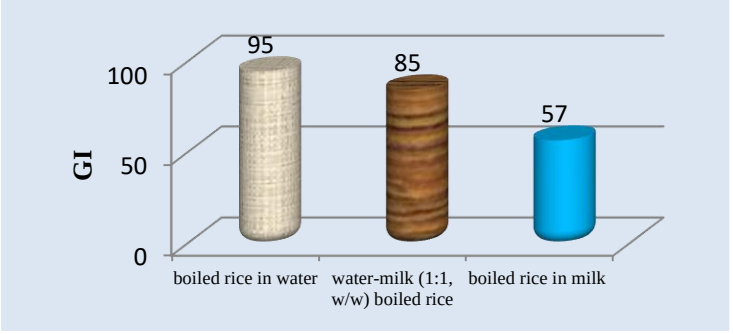

Fig 1. *The influence of composition of the liquid medium on the glucemic index of boiled rice groats*

The significant decrease in the GI value of rice boiled in milk can be explained, as mentioned above, by the fact that calcium ions influence the properties of starch, raising the gelatinization temperature and reducing the water binding capacity. Indirectly this has been confirmed by determining the volumetric coefficient of overboiling of the rice and the degree of swelling of the boiled rice for each sample.

The results obtained are shown in Fig. 2 and Fig. 3. The highest overboiling coefficient (4.64) and the highest degree of swelling (4.37) were recorded for the rice boiled in water.

The rice boiled in a 1:1 mixture of water and milk had average values for both parameters – respectively 4.04 and 3.63, and the rice boiled in milk - the lowest values of the overboiling coefficient (3.27) and of the degree of swelling of the rice (3,12). This can be explained by the dehydration effect of the calcium salts in the milk on the polar groups of the starch and the polysaccharides of the rice cell walls [7].

It is known that after consumption of foods with high GI, the satiety is shorter compared to that resulting from the consumption of meal with low GI (<55) or medium GI (55-70) due to significant fluctuations in blood glucose levels [1].

The results obtained confirmed this correlation. Therefore, after eating a portion of the rice boiled in milk, the satiety period was about 140 ± 10 minutes, and after consumption of the rice boiled in water - only 100 ± 10 minutes.

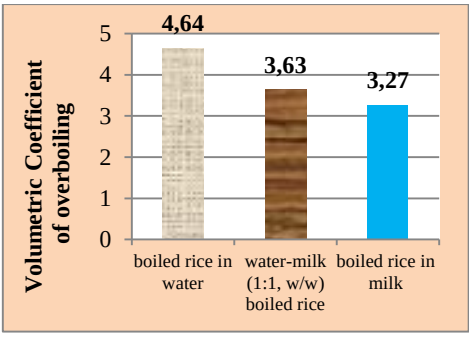

***Fig 2**. Volumic coefficient of overboilling of boiled rice groats in various composition of the liquid phase*

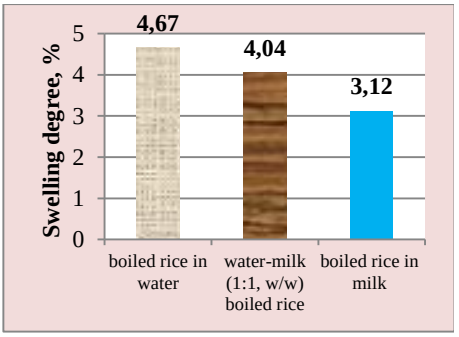

***Fig 3.** Swelling degree of overboilling of boiled rice groats in various composition of the liquid phase*

The satiety period after consumption of the rice boiled in a mixture of milk and water with 1:1 ratio had intermediate values – about 120 ± 10 minutes. The data concerning the satiety period after the consumption of samples correlate with the respective values of overboiling and swelling coefficients of boiled rice: as the values of the respective coefficients increase, the satiety period after the consumption of rice is reduced and vice versa. Thus, the swelling and the lower overboiling of rice boiled in milk slow down the digestion and thus low emptying of the stomach reduces blood glucose fluctuations in the human body, lowers the product's GI, and extends satiety after the product consumption.

Conclusion:

The use of milk as a liquid medium for boiling rice significantly reduces the GI of the product (GI 57) compared to the rice boiled in water (GI 95) or in a mixture of water and milk with a ratio of 1:1 (GI 85), classifying it from a high glycemic index (GI>70) to a moderate GI (GI 55-70). These results correlate with the decrease of the swelling degree and the reduction of the overboiling coefficient of the rice boiled in the milk, as well as the significant increase in the satiety period after consumption of this product compared to the other samples.

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INFLUENCES TO DIFFERENT EXTENTS ON THE QUALITY OF THE FINISHED PRODUCT OF SPARKLING WHITE WINES

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Abstract: Currently winemaking sector highlighted the necessity of investigating and promotion of the grape varieties of new selection and classic european varieties to produce high quality sparkling wines. Therefore, it was necessary to specify the optimal composition of blends based on raw white wines using classic european varieties and varieties of new selection. In this paper in capacity of blend components classical european varieties: Chardonnay, Riesling, Aligote, Sauvignon, Pinot blanc, Pinot gris and varieties of new selection: Muscat de Ialoveni, Floricica, Viorica, Hibernal were studied. It was determined, that the use of raw wines from classic european varieties and varieties of new selection as a blend component influences to different extents on the quality of the finished product.

Keywords: Sparkling wine, blend components, classic varieties, varieties of new selection.

Introduction

Over the past decades obvious changes in organoleptic parameters and physico-chemical composition of raw material of white wines, aimed for sparkling wines production, were remarked, due to microclimate changing in wine growing areas as result of global warming. Produced wines are characterized with higher alcohol content and deficiency of total acidity, also they lose organoleptic typicality as young fine wine, therefore is more difficult to guarantee quality of final product [1,3].

Formation of typical properties at sparkling wines production depends of a numerous factors as: ecological, paedological, climatic conditions, the physico-chemical composition of the grapes in the defined winemaking regions, technology of raw white wines production, methods of technological treatment and processing of assemblage and blends of raw white wines and their physical-chemical composition and biocatalytic properties of used yeast strains, secondary fermentation etc. [1,3].

Therefore, for satisfaction of customer demand appears the necessity to diversify and improve quality of produced white sparkling wines, also is need to study the potential of use of new selection vine varieties as blending partners at white sparkling wines production. For this purpose, is necessary to ensure that obtained blends will provide production of new original and high quality sparkling wines, highly competitive on national and external wine market [1, 2, 3].

Materials and methods

The research was conducted in the laboratory of "Biotechnology and Microbiology of Wine" and section of "Microvinification" from Scientific-Practical Institute of Horticulture and Food Technologies (SPIHFT).

As objects of research the dry white wines produced from different new selection varieties of SPIHFT (Viorica, Floricica, Muscat de Ialoveni, Hibernal) and white European varieties (Chardonnay, Aligote, Riesling, Sauvignon, Pinot gris, Pinot blank),

coupages of different raw material white wines, various yeast strains from the collection of microorganisms of SPIHFT and other winemaking materials were used.

In this research work physico-chemical methods of analysis recommended by the International Organization of Vine and Wine and those elaborated or modified at the SPIHFT were applied.

Results and Discussion

For achieving the main objectives of optimization of blending components for white sparkling wine production, experience was performed in the following directions:

1. Production of white sparkling wines by blending of raw white wines from European varieties.

2. Production of white sparkling wines by blending of raw white wines from European and new selection varieties.

Analysis of physico-chemical parameters (Table 1), indicate that all produced raw white wines correspond to basic quality parameters. Alcohol content ranges from 10.1 up to 13.0% vol., in dependence of the blend composition. Mass concentration of titratable acidity, pH index and oxidation-reduction potential is within acceptable limits, for this category of wines. Mass concentrations of volatile acidity in investigated samples have values ranging within the limits set for raw white wines for sparkling wines production, and not exceed 0.7 g/dm³. The concentration of sugars in the wine also does not exceed allowable limits.

Table 1. *Physicochemical indices of wines obtained by blending of raw white wines from European varieties (h.y. 2017)*

Name	Alcohol content, % vol.	Total acidity, g/dm³	Volatile acidity, g/dm³	pH	OR, mV	Reducing sugar, g/dm³	Reducing extract, g/dm³	Organo leptic note, points
Coupage 1 Chardonnay (50%) + Pinot gris (50%)	13,0	5,3	0,66	3,2	217	2,8	16,5	7,85
Coupage 2 Chardonnay (50%) + Pinot blanc (50%)	12,4	5,6	0,66	3,13	220	2,4	15,9	7,9
Coupage 3 Chardonnay (50%) + Aligote (50%)	12,8	5,6	0,56	3,16	219	1,9	16,6	7,90
Coupage 4 Pinot Gris (25%) + Pinot blanc (25%) + Aligote (50%)	11,9	6,1	0,59	3,06	225	1,6	16,9	7,85
Coupage 5 Sauvignon (50%) + Riesling (50%)	11,2	6,8	0,53	2,9	234	1,2	17,1	7,95
Coupage 6 Riesling (70%) + Aligote (30%)	10,9	7,6	0,63	2,87	236	1,3	17,2	7,95

Name	Alcohol content, % vol.	Total acidity, g/dm³	Volatile acidity, g/dm³	pH	OR, mV	Reducing sugar, g/dm³	Reducing extract, g/dm³	Organo leptic note, points
Coupage 7 Riesling (40%) + Sauvignon (40%) + Aligote (20%)	10,1	6,8	0,53	2,93	233	1,2	16,2	7,95
Coupage 8 Riesling (40%) + Sauvignon (40%) + Chardonnay (20%)	11,7	6,4	0,66	3,01	228	1,9	16,4	7,90
Coupage 9 Sauvignon (50%) + Chardonnay (50%).	12,4	5,5	0,53	3,2	216	3,3	16,3	7,85

In order to appreciate the potential of new selection varieties for use in the production of white sparkling wines five blends in combination with European varieties were formed. The obtained results of the physico-chemical parameters are presented in Table 2.

Table 2. *Physico-chemical and organoleptic indices of blends obtained by mixing of white wines from European varieties and new selection varieties*

Name	Alcohol content, % vol.	Total acidity, g/dm³	Volatile acidity, g/dm³	pH	OR, mV	Reducing sugar, g/dm³	Reducing extract, g/dm³	Organo leptic note, points
Coupage 10 Viorica (50%) + Chardonnay (50%)	12,3	6,5	0,53	3,04	226	3,8	16,3	8,0
Coupage 11 Viorica (50%) + Muscat de Ialoveni (50%)	10,8	7,4	0,60	2,79	241	1,5	19,1	7,95
Coupage 12 Floricica (50%) + Chardonnay (50%)	12,6	7,1	0,60	2,99	229	4,0	16,3	7,9
Coupage 13 Floricica (33%) + Muscat de Ialoveni (33%) + Hibernal (33%)	11,7	7,8	0,59	2,86	237	1,6	19,5	7,95
Coupage 14 Hibernal (50%) + Chardonnay (50%).	13,0	6,5	0,66	3,14	228	2,4	16,4	7,90

Analyzing the results from Table 2 we can conclude that coupages obtained by blending of raw wines produced in base of new selection varieties with raw wines from european varieties, are high qualitative which is confirmed by physico -chemical indices. Alcoholic concentration in obtained wine varies depending on the blend composition.

Blend 14 (Hibernal + Chardonnay) is characterized by increased alcohol concentration 13.0% vol. and the lowest value of this parameter is observed in blend 11 with 10.8% vol. of alcohol. Concentration of titratable acidity also varies in depending of the blend composition and ranges from 6.5 g/dm³ up to 7.8 g/dm³. Mass concentrations of volatile acidity have values that vary in the limits for raw white wines for sparkling wines production and don't exceed 0.7 g/dm³.

According to the organoleptic evaluation of obtained blends we can highlight blends obtained by mixing of the raw wines Riesling + Sauvignon, Riesling + Aligote and Riesling + Sauvignon + Aligote, that accumulated 7.95 points and were appreciated with balanced, typical taste and with floral nuances in aroma. And the lowest marks have obtained blends produced from Pinot Blanc + Pinot Gris + Aligote, Chardonnay + Pinot Gris and Chardonnay + Sauvignon, but all blends have accumulated enough points and can be used for production of white sparkling classic wines.

Organoleptic evaluation of obtained wines allows to highlight wines produced in base of Viorica, Floricica and Muscat de Ialoveni varieties which were used as partners in blends 10, 11 and 13 and have accumulated the highest organoleptic notes. Generally, all blends of wines were rated as qualitative, and correspond to the basic technical requirements and can be used in white sparkling wines production.

Conclusion

After technological, physical-chemical and organoleptic appreciation of optimal blends composition were highlighted blends 5,6,7 produced from raw wines in base of european varieties and blends 10,11,13 obtained by mixing wines from european varieties with new selection varieties elaborated at SPIHFT and can be recommended for production of high quality white sparkling wines.

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INVESTIGATION OF CONVECTIVE-THERMORADIATION DRYING OF PRODUCTS FROM APPLES IN TWO STAGES

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Аннотация: В процессе исследования конвективно-терморадиационной сушки продуктов из яблок опытным путем было встановлено оптимальные параметры сушки. Сырьем для сушки избраны яблоки сорта «Голден Делишес». Подготовка сырья включала мытье, очистку, резку на части и бланширование в сахарном сиропе с добавлением лимонной кислоты и антиоксиданта. С целью интенсификации процесса сушки и получения продукта с высоким содержанием биологически активных веществ была выполнена двухступенчастая сушка с понижением температуры во втором периоде до 55 ° С. Среди представленных на рынке Украины продуктов из яблок были избраны: сушеные яблоки, снеки и цукаты. На примере этих продуктов изучали интенсивность и динамику процесса сушки, так как эти продукты отличаются предварительной подготовкой и начальным содержанием сухих веществ.

Ключевые слова: бланширование, двухступенчастая сушка, сушеные яблоки, снеки, цукаты, коэффициент теплообмена, коэффициент массоотдачи.

Introduction

In Ukraine there is a growing tendency of proper nutrition of the population. Most snacks presented on the market relate to unhealthy food, because they contain butter, preservatives, various flavor boosters and a significant amount of sugar (chocolate bars). Among natural products, consumers prefer nuts (pistachios, peanuts), but their price is higher than average, and not everyone can afford them. Dried apples are in demand, but the monotony of their assortment needs to be expanded. Apples are a common product, but due to the insignificant term of implementation and special storage conditions (temperature, regulated gas environment, relative humidity), there is a need for their processing, that is, the development of an innovative product made from apples.

Materials and Methods

The material for drying is selected autumn variety of apples "Golden Delicious" with high content of initial dry substances and sugar-acid index (more than 8). The pecularity of this variety is the large size of the fetus and the ratio of the seed chamber to the pulp, this particular indicator characterizes the amount of waste. The activity of peroxidase in fresh apples was determined by a photoelectrocolorimeter (FEC). The mass fraction of dry matter was determined by refractometric method; moisture content according to the accelerated Chizhova method; the content of organic acids was determined by titration of alkali (in terms of malic acid), the content of sugars - using the Permanganate method; the content of mineral impurities (ash) - the irrigation of a batch weight; content of pectin substances - with the help of calcium pectates, vitamin C content - potentiometric titration of 2,6-dichlorophenolidophenol.

Results and Discussion

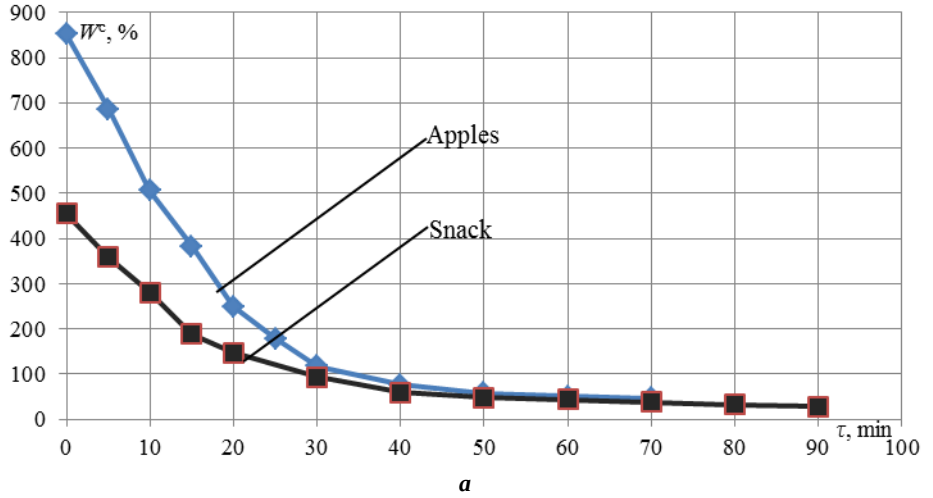
The production of prospective products from apples is characterized by preliminary preparation of raw materials. For the preparation of dried apples, the preliminary preparation consisted of: calibration, inspection, washing, cleaning from inedible parts (peel and seed chamber), cut into pieces of 3-6 mm and blanching in hot water at a temperature of 96-100 ° C, after cooling and drying semi-finished products to a solids content of 85%.

In the production of snacks, the technological scheme is analogous to the production of dried apples until blanching, after which the cut apples with the size of 3-5 mm were blanched in 30% sugar syrup by a ratio of apples and syrup as 1: 2 with the addition of citric acid and antioxidant, and then were cooled during 6 minutes in 30% concentrated sugar syrup at a temperature of 18 ... 20 ° C with addition of 0.1% of citric acid and 0.01% of ascorbic acid. Such an operation is necessary in order that the particles of apples do not lose their shape and absorb a part of sugar with citric acid. This provides an acceptable sugar-acid index of raw materials and a pleasant taste.

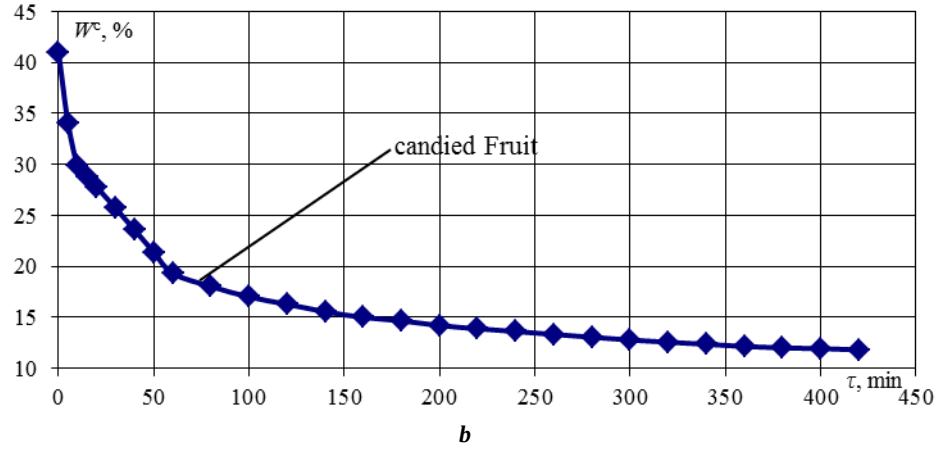
In the production of candied fruits, apples also undergo preliminary preparation: sorted, inspected, washed, peeled and seedless apples were cut into slices 15-20 mm thick and 35 mm long. After cutting, they were blanched in hot water (95-98 ° C) for 1 minute, then cooled under cold running water. Then they were boiled in sugar syrup in 3 stages with equal regimens: they were cooked for 30 minutes, then cooled to room temperature, so that the sugar was absorbed into the fruit and in order to avoid parting of apple fuits. The cooking was finished when the solids reached 78% in syrup and 70-72% in fruits. After that, the jam was cooled at room temperature (18-20 ° C) and the fruits were separated from the syrup. The separated fruit were washed off with water and were sent to a dryer to blow the surface of the fruit in order to remove excess moisture for 10 minutes. The next and main technological operation was drying.

Drying of products were carried out upholding following parameters: in the first drying period, where the moisture was removed more intensively, the temperature was 70-75 ° C, and in the second period was 50-55 ° C in order to avoid caramelization of sugars and local browning of the product; the velocity of the coolant in the chamber was 5.5 m/s; specific load - 8.8 kg/m^2; the amount of radiation irradiated by thermoradiation heating elements - 8 kW/m^2, the wavelength of tubular "dark" thermoradiation generators - 2.0-4.0 μm; air heating that was carried out from an external heating element - 2.5 kW/m^2; the distance between the thermoradiation heating elements and the product was 14 cm.

Based on obtained results, drying curves (Fig. 1) were plotted to characterize the change in the moisture content of W^c, with relation to time τ. The figure shows that the heating period for all samples is minimal, and the rate of dehydration was directly proportional to the increase of sugar concentration in products.



a



b

Fig. 1. *Curves for drying products from apples*

Analyzing *Fig. 1 b*, it shows a rapid removal of moisture for 10 minutes, which is typical for blowing from the semi-finished product in order to remove excess moisture, which remained after the fruit was washed off the sugar syrup.

Approximating the data of the first and second drying periods, we derived the equation of the dependence of the moisture content W^c on the drying time τ (Table 1).

Table 1. *The equation of the moisture content W^c (%) from the drying time τ (min)*

Product:	1 period	2 period
dried apples	$W^c = -30{,}162\tau + 836{,}95$ at $R^2 = 0{,}99$	$W^c = 14611\ \tau^{-1{,}39}$ at при $R^2 = 0{,}99$
snacks	$W^c = -17{,}544\tau + 452{,}56$ at $R^2 = 0{,}99$	$W^c = 3418{,}2\ \tau^{-1{,}07}$ at $R^2 = 0{,}99$
candied fruits	$W^c = -0{,}213\tau + 32{,}04$ at при $R^2 = 1$	$W^c = 55{,}57\ \tau^{-0{,}26}$ at $R^2 = 0{,}99$

where W^c - moisture content,%; τ - time, minutes; R^2 - correlation coefficient.

Based on the drying curves, the obtained dependences of apple products drying rate on moisture content (Fig. 2), allow us to analyze the dynamics of drying variation of samples. In deriving the equation of drying kinetics of the experimental dependences $dW^c/d\tau$ on W^c, it was established that in the first stage the drying rate can be approximately considered constant. And since the second drying period, there has been a growing dependence with a different characteristic of the sugar concentration.

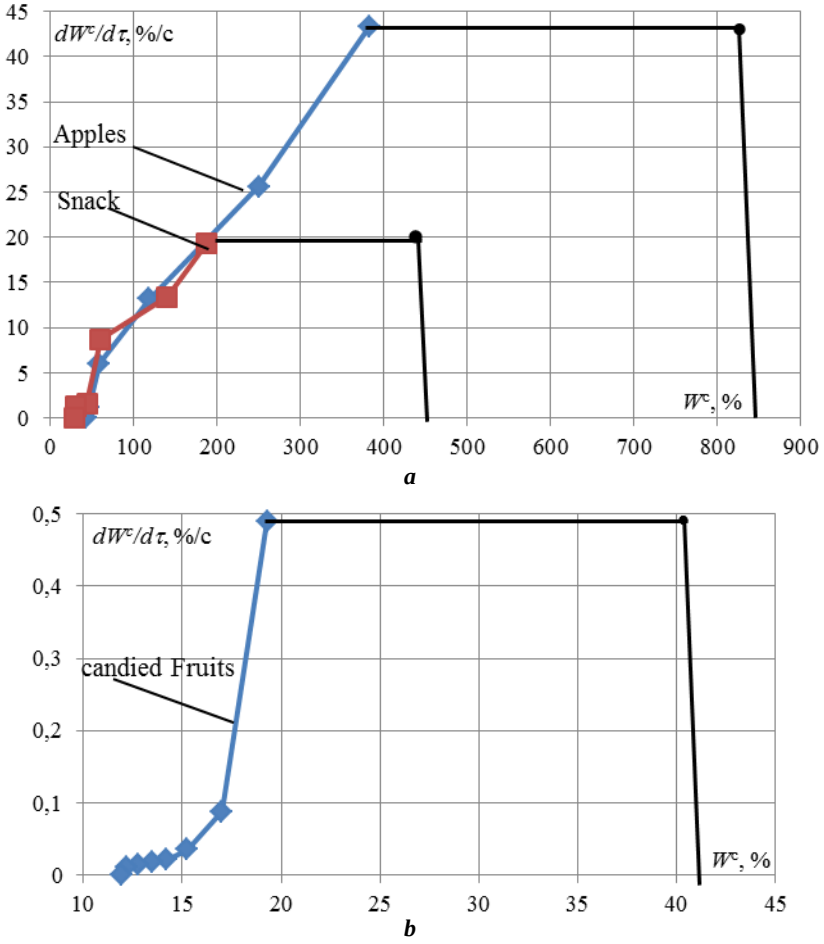


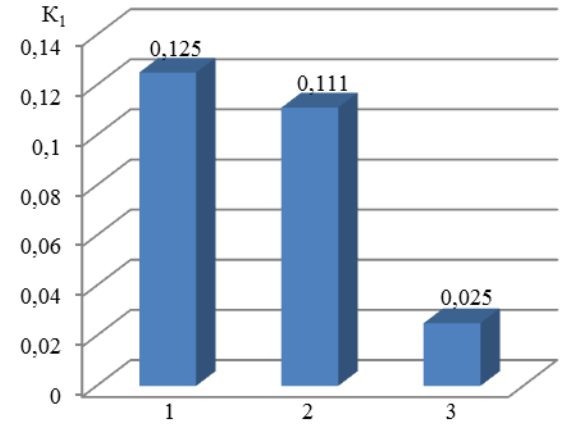
Figure 2. *Curves of apple products drying speed*

Based on the second drying period, the approximation equations of dependences $dW^c/d\tau$ for W^c for each product were derived (Table 2).

Table 2. *Approximation equations for the second drying period*

Product:	Approximation equations
dried apples	$dW/d\tau = 16{,}55\ln(W) - 62{,}87$ at $R^2 = 0{,}98$;
snacks	$dW/d\tau = 8{,}46\ln(W) - 28{,}34$ at $R^2 = 0{,}96$;
candied fruits	$dW/d\tau = 0{,}0073\ W^2 - 0{,}2 + 1{,}29$ at $R^2 = 0{,}99$.

Based on the processing of the drying curves and the drying rate curves, the dependences of drying rate coefficients in the first and second periods for all product samples were determined (Fig. 3).



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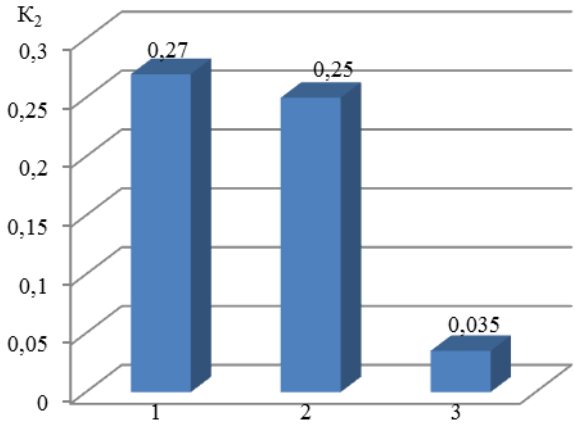


b

Fig. 3. *The coefficients of drying speed in the first (3 a) and the second drying periods (3 b) for all products:*
1 – dried apples; 2 – snacks; 3 – candied fruits

With *Fig. 3*. it follows that the drying coefficients are directly proportional to the sugar content of the products: the higher is the sugar concentration in the product, the lower is the drying factor.

The photos of the obtained apple products samples are shown in *Fig. 4*. For each product, an organoleptic and physicochemical analysis was performed, which is presented in Tables 3 and 4.

a. dried apples

b. snack

c. candied fruits

Fig. 4. *Photo of finished samples obtained by drying in two stages*

Table 3. *Organoleptic analysis of products obtained in two-step drying method*

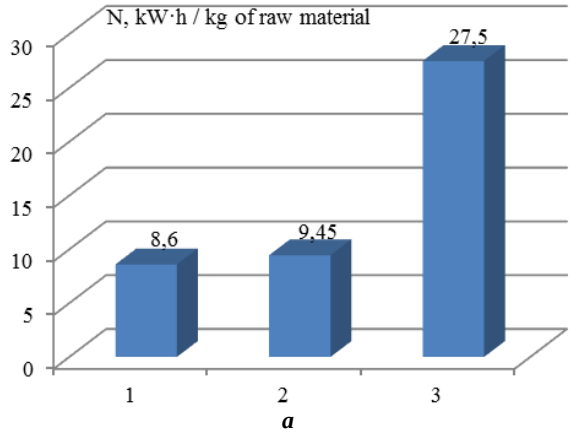
Organoleptic indices	Dried apples	Snacks	Candied fruits
Appearance	parallelepipedal pieces of equal size	parallelepipedal pieces of equal size	equal pieces in the form of cubes
Consistence	Elastic, the product does not stick together during compression	Elastic, the product is glued together when compressed	Dense, elastic, the product can stick together, but when pressed crumbles
Color	Light Brown	Yellow	Brown
Scent	Pleasant, proper for used raw materials	Pleasant, expressed, proper for used raw materials	Pleasant, proper for used raw materials
Taste	Sweet, pleasant, proper for used raw materials	Sour-sweet, pleasant, proper for used raw materials	Sweet, pleasant, proper for used raw materials

Table 4. *Physicochemical analysis of products obtained in two stages drying method*

Indicator	Product:		
	dried apples	**snacks**	**candied fruits**
Dry matter of fresh apples,%	12,5		
Dry substances of apples, %	87	84,5	85,5

Indicator	Product:		
	dried apples	snacks	candied fruits
Mono- and bi-sugars, %	65,2	63	76,9
Organic acids, %	2,4	2,3	0,5
Pectin substances, %	4,9	4,1	0,7
Dietary fiber, %	4,2	3,8	0,4
Mineral substances, %	3,7	2,6	0,7
Vitamin C, mg %	2,4	8,3	6,3

Based on the data obtained, the energy costs for all product samples in kW·h in kg of feedstock (Fig. 5 a) and in MJ/kg evaporated moisture (Fig. 5 b) are shown in Fig. 5.



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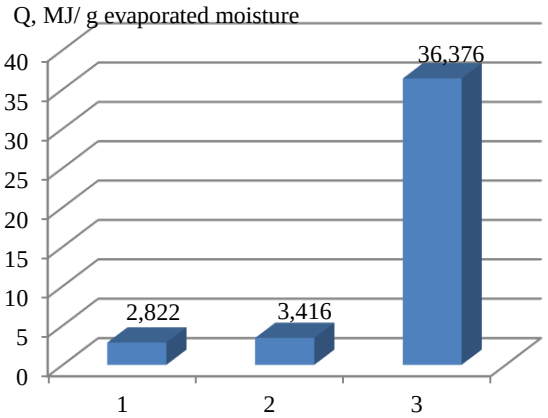

b

Fig. 5. *Electricity consumption per 1 kg of feedstock (5a) and 1 kg of evaporated moisture (5 b) for:*
1 – dried apples; 2 – snacks; 3 – candied fruits

Analyzing *Fig. 5* we can conclude that the content of sugars in semi-finished products is of significant importance. The lowest energy costs were 8.6 kW·h / kg (2.82 MJ/kg evaporated moisture) for dried apples, and the largest energy costs for candied fruit were 27.5 kW·h /kg (36.37 MJ/kg evaporated moisture). This phenomenon is explained by the fact that significant concentrations of sugar prevents the removal of moisture from the semi-finished product, keeping it in the product by osmotic and chemical bonds.

In connection with the significant influence of the sugar concentration in the products on the various parameters of the drying process, it is expedient to establish optimum values for it. The amount of heat that is expended on the evaporation of moisture during the apple products drying is presented in Table 5.

Table 5. *The amount of heat that is expended on evaporation of moisture from apple products*

Coolant Temperature t, °C		**Product:**	**Drying Time τ, s**	**Quantity of heat, Q:**		
1 period	**2 period**			**(kW·h)/kg moisture**	**MJ/kg moisture**	**(kW·h)/kg of raw material**
75	55	dried apples	70	846,5	2,82	8,6
		snacks	90	768,5	3,42	9,45
		candied fruits	420	210	36,38	27,5

Internal surface area of a kilogram of dried product for dried apples and snacks, provided that the raw material is cut into parallelepipedal pieces with dimensions of 30 × 3 × 15 mm, is:

$$F = 2 \cdot (a \cdot b + a \cdot h + b \cdot h) \cdot n, \text{ m}^2/\text{kg of feedstock}, \quad (1)$$

where *a, b, h* – are the length, width and height of the snack particle, m, respectively; *n* – is the number of particles per m^2.

External surface area of a kilogram of the dried product for candied fruits, provided that the raw material is cut into pieces in the form of cube with dimensions of 15 × 15 mm, is:

$$F = 6a^2 n, \text{ m}^2/\text{kg of feedstock}, \quad (2)$$

where *a* – is the side of the cube, m^2.

The coefficient of heat transfer is calculated by the formula:

$$\alpha = Q/ \Delta t_{cp} \cdot F, \quad (3)$$

where $\Delta t_{cp} = t_п - t_{cp}$;

t_{cp} – arithmetic-mean air temperature in the drying chamber; $t_п$ – is the temperature of the material (in the first drying period it is equal to the temperature of the wet thermometer). The results of the calculations are given in Table 6.

Table 6 *External surface area of a kilogram of dried product and the heat transfer coefficient for products from apples*

Coolant Temperature t, °C		The Speed of air in the Chamber *w*, *m*/s	Product:	External surface area of a kilogram of dried product *F*, m^2/kg of feedstock	Heat transfer coefficient α during drying
1 period	2 period				
75	55	5,5	dried apples	2,633	362,98
			snacks	2,633	398,86
			candied fruits	8,438	362,13

Through studies of drying periods, the speed of the drying process was determined by the state of the environment and the drying conditions, and the total moisture flux was expressed in terms of the volume mass transfer coefficient:

$$J = dW^c/d\tau = \beta(x_г - x) = \beta(x_1 - x), \quad (4)$$

where $x_г$ – is the moisture content of air (kg/kg) at the particle boundary, which is considered to be equilibrium; $x_г = x_1$ - moisture content of air at a constant speed (the first period) of drying (kg/kg) was found by a psychrometer. Molar mass of water $M_в = 18$, air $M_п = 29$, relative air humidity φ = 64%. The partial pressure of the saturated water vapor P at the temperature t was found from the tables, and the mole fractions of m from the ratio $m_1 = Pt_1/(1-Pt_1)$, $Pt_1 = Pt/760$. At 21 °C, $Pt_{21} = 18.66 / 760 = 0.025$. The molar fraction at 21 °C $m_2 = Pt_{21}\varphi / (1-Pt_{21}) = 0.016$. The moisture content of air in the first period was found by the formula:

$$x_1 = (M_в/M_п)(m_1/(1-m_1)). \quad (5)$$

Moisture content

$$x = (M_в/M_п)(m_2/(1-m_2)) = 0,01. \quad (6)$$

The results of moisture flux determinations $J = dW^c/d\tau$ and the mass transfer coefficient $\beta = J/(x_1-x)$ for each apple product are shown in Table 7.

Table 7. *The moisture flux during drying and the mass transfer coefficient for apple products*

Coolant Temperature t, °C		The Speed of air in the Chamber *w*, m/s	Product:	Moisture flow during drying	Masstransfer coefficient β, m/s
1 period	2 period				
75	55	5,5	dried apples	43,27	1138,68
			snacks	19,37	509,74
			candied fruits	0,5	98

With the mass-transfer coefficients (Table 7), it is evident that the higher is the sugar content in the product, the worse and slower the moisture is removed.

Conclusions

Food products manufactured in the process of scientific work are suitable for sale in trade networks. Dried apples can be used as raw materials for compotes. Apple snacks, like a quick snack. Candied fruits are offered for industrial processing in the confectionery sphere as fillers for cupcakes, Easter cakes, fancy cakes and pies. The proposed technology of candied fruits can be improved by derging sugar (or powdered sugar) or covering with chocolate glaze and sell in retail trade.

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KINETICS OF INFRARED RAY DRYING OF PEELED APPLES

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Abstract: The paper presents data on the study of the antioxidant treatment of cut, unpeeled apples. Were studied a number of antioxidant solutions from which were selected and proposed 3 compositions, which have a beneficial effect on the treatment process. We studied the process of drying of Idared apples with infrared rays at temperatures of 80 ... 120 ºC. It has been demonstrated that the temperature in the drying process should not exceed 90 ºC. The processing of the experimental results allowed the mathematical equation to determine the drying time.

Key words: apples, antioxidants, infrared rays, drying kinetics, chemical solutions.

Introduction

A healthy lifestyle first starts from eating. At present, Western consumer preferences are geared towards high-nutrition rich in biologically active and low-calorie substances. The main sources of high biological activity are fruit and vegetables consumed fresh. Most of them are only available during the short harvest season. One of the conservation methods, which allow the preservation of native substances and their concentration in the finished product, is preservation by dehydration. Drying helps make natural products accessible for consumption at any time of the year and under all circumstances. Removing water from fruits and vegetables ensures not only the risk of microbiological alteration, but also optimizing transportation costs, keeping dry products. Dried fruits are rich in dietary fiber that ensures normal and healthy functioning of the gastrointestinal tract. Iron, calcium, potassium, selenium, concentrated A, B and C vitamins protect the body from the harmful action of free radicals that are the source of cardiovascular, neurodegenerative, and cancerous diseases.

The production of dried fruit presents an opportunity for the processing industry in the Republic of Moldova because it has the necessary raw material, the technical-scientific basis and the possibility to compete on the market of organic products. From variety of dried fruit produced, a high demand is recorded for dried quality apples – unpeeled and without free-wooden fascicle, without significant traces of fermentative browning. They may be present on the market in the form of plates, slices, rings or cubes. The biggest problem encountered in the process of drying apples is the process of browning. The brown appearance declares the dried apples of the quality category. To prevent browning resulting from the fermentative oxidation of polyphenolic substances, it is necessary to apply thermal or chemical treatments that would combine the effective action of inhibiting browning processes with harmlessness to the human body. For these reasons, it is necessary to study the processes of oxidation of polyphenols and their inhibition by using different aqueous solutions of stabilizers and antioxidants.

Materials and methods

As a research object, were used Idared apples, approved in Moldova, rich in carbohydrates, organic acids, minerals, vitamins, pectic substances, etc., which represent high interest as a research object in the technology of drying. Preventing browning during

drying and storage can be achieved by treating of cut, peeled apples, with bleaching agents and antioxidants.

In the paper, the following solutions were used for dry treatment: SO2 + NaCl; citric acid + NaCl; KCl; NaCl; SO2, citric acid + NaCl + CaCl2 + sugar with varying concentrations, duration of treatment from 4 to 40 minutes. Treated apples with solution were subjected to the infrared ray drying exposure to the MAC-210 humidity analyzer, which provides the dehydration of the sample under infrared irradiation. The analyzer is equipped with a balance which, during drying, measures and records the change of the dried sample. The maximum capacity of the balance is 210 g. The sample is weighed to an accuracy of 0.001 g. The maximum drying temperature is 160 ° C. It is possible to change the drying temperature within 60 to 160 °C with the unit step. The end of the drying process can be applied manually or automatically.

Methods of research. For determination of physic-chemical properties, were used the following methods of analysis:

Table 1. *Analysis methods*

Indicator	Method of determination	Standard
Soluble dry substances	Refractometric method	GOST 28562-90
Total dry substances	Standard method	GOST 28561-90
Sugars	The Leina and Ainona method	GOST 8756.13-87
Total acidity	Titrimetric method	GOST 25555.0-82
Active acidity	Potentiometric method	GOST 25555.0-82
Sodium chloride content	The Mohr method	GOST 26186-84
Index of Browning	Spectrophotometric method	According [3]

Methods and discussions

Initial research has been geared to selecting the preventive treatment solution of apples, effective in blocking fermentative browning and harmless processes for consumer health. The condition was to replace sulfur dioxide with solutions of citric acid, NaCl, CaCl2, KCl used separately and in combination. The samples treated with solutions of sulfur dioxide and salt (0.075% and 0.2%, respectively) were used as control samples against which the selected composition and concentration of the other aqueous solutions.

Before the drying, the apples were subjected to the processing according to the technological scheme: Washing → Weighing → Removal of the seed box → Peeling → Cutting → Weighing → Treatment with antioxidants or solutions to prevent browning fermentation.

The solutions used and their concentration, as well as the results and appreciation of the appearance and taste of dried apples, are presented in Table 2.

Table 2. *Substances of preventing browning used at treated, peeled apples*

Variety	Nr. of sample	Antioxidant used	Concentration of the solution	Duration of treatment, min	Color	Taste
Idared	**1.**	SO_2+NaCl	0,075+0,2	8	light yellow	sweet
	2.	SO_2+NaCl	0,075+0,2	10	yellow	sweet
	3.	SO_2+NaCl	0,075+0,2	6	yellow	sweet

Variety	Nr. of sample	Antioxidant used	Concentration of the solution	Duration of treatment, min	Color	Taste
	4.	SO_2+NaCl	0,075+0,2	4	light yellow	sweet
	5.	Acid citric+NaCl	5+0,4	40	cream	acid taste
	6.	Acid citric+NaCl	0,7+0,3	10	cream	lightly acidic taste
	7.	Acid citric+NaCl	6,5+0,2	20	light cream	Foarte acide
	8.	Acid citric+NaCl	5+0,4	20	light brown	Acid
	9.	KCl	0,4	8	cream	sweet
	10.	Acid citric+NaCl	0,7+0,3	6	light cream	balanced
	11.	NaCl	0,4	8	light cream	balanced

The analysis of the results in Table 1 shows that, within the limits of the studied concentrations, the best sensory characteristics are obtained when treating apples with 0.9% citric acid solution and salt NaCl - 0.4%. The scientific results obtained in the laboratory were tested in the production units of the company "UNIFERAX - GRUP", Ungheni city. The inspection of the preventive treatment parameters with this solution under industrial conditions ensured excellent quality, with the production of dried apples Idared of Extra quality.

Apples Drying with infrared rays (IR). To study the drying process with IR rays, was selected the Idarea variety of apples, treated with aqueous solution of 1% citric acid, 0.4% NaCl and 0.6% CaCl2 for 6 minutes. Apples were dried with IR rays at different temperatures - 80 °C, 90 °C, 100 °C, 110 °C and 120 °C, up to 18% humidity. The high temperature of the drying process with IR rays of 90 - 120 ºC, accelerates the dehydration of the product, but causes a number of negative changes in the color of the dried apple rings. At these high drying temperatures, the apple rings are browning on the surface as a result of non-fermenting browning reactions - Maillard reactions and the process of carbohydrate caramelization. At low drying temperatures (lower than 90 °C), the drying time practically doubles.

Figure 1 shows the irradiation drying curve of peeled Idared apples, without the seed box, cut in rings to a thickness of 8 mm. Drying takes place at 80 ºC.

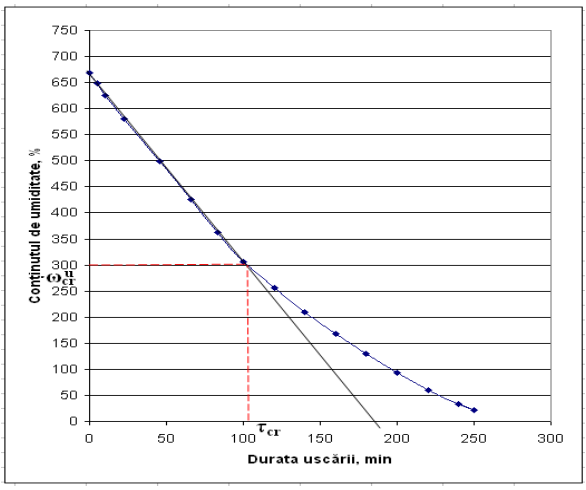

Fig. 1. *IR irradiation curve of Idared apples at t = 80 °C*

Analyzing the graph of the drying curve (Figure 1), it found that the critical humidity is reached a moisture content of 300% and the drying time 108 min. The drying rate in the second period is 140 minutes. The variation of the drying rate (with IR rays) of apple rings at 80 °C is shown in Figure 2.

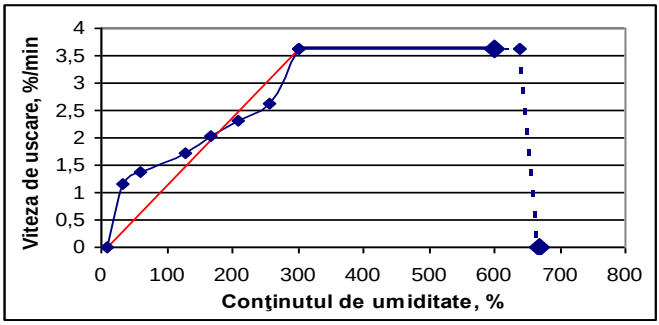

Fig. 2. *Speed Curve of drying irradiation of Idared apples at t = 80 °C*

The maximum drying speed, which is maintained during the first drying period, is 3.62% /min. For determining the drying time for the entire period, differentiating the drying curve in a second period and the ratio to the drying rate N in the first period. The data obtained are recorded in Table 2 below.

Table 3. *Experimental calculations for the drying apples with of IR-ray during II period*

Nr. Points of II period	**ω^u, %**	**τ, min**	**$\omega_{cr} - \omega_2$**	**$\tau_2 - \tau_{cr}$**	$\frac{\tau_2 - \tau_{cr}}{\omega_{cr} - \omega_2}$	**M^1**
a	300,00	103				
1	255,6	120	44,4	17	$382{,}9 \cdot 10^{-3}$	$9{,}00 \cdot 10^{-3}$
2	209,8	140	90,2	37	$410{,}2 \cdot 10^{-3}$	$10{,}00 \cdot 10^{-3}$

Nr. Points of II period	ω^u, %	τ, min	$\omega_{cr} - \omega_2$	$\tau_2 - \tau_{cr}$	$\frac{\tau_2 - \tau_{cr}}{\omega_{cr} - \omega_2}$	M^1
3	167,7	160	132,3	57	$430{,}8 \cdot 10^{-3}$	$11{,}22 \cdot 10^{-3}$
4	129,3	180	170,7	77	$451{,}1 \cdot 10^{-3}$	$12{,}81 \cdot 10^{-3}$
5	60,4	220	239,6	117	$488{,}3 \cdot 10^{-3}$	$18{,}96 \cdot 10^{-3}$
6	33,0	240	267,0	137	$513{,}1 \cdot 10^{-3}$	$27{,}67 \cdot 10^{-3}$

M – is calculated only for the second period based on the formula below

$$M^1 = \frac{2{,}3}{\omega_{cr} - \omega_2} \lg \frac{\omega_{cr} - \omega_e}{\omega_2 - \omega_e} \tag{1}$$

Using the values of the M1 expression in Table 3 we can determine the coefficients A and β, constructing the graph of dependence:

$$\frac{\tau_2 - \tau_{cr}}{\omega_{cr} - \omega_2} = f(M) \tag{2}$$

For this purpose, in the figure nb. 3, the points of relation of formula 2 are recorded. Through these points draw a straight line, which intersects the ordinate from point A, which corresponds to the critical humidity of the product in the drying process. From point A it goes horizontally to the C-coordinate intersection. The ABC triangle is obtained.

In the ABC triangle, the angle α can be expressed by the following relationship:

$$tg\alpha = \frac{BC}{AB} = a \tag{3}$$

According to experimental data for different products, the M dependency graph $\frac{\tau_2 - \tau_{cr}}{\omega_{cr} - \omega_2}$ has a straight line that intersects Oy. Moving the points above the line indicates that the value of the m coefficient was chosen too low. Conversely, the points below the line show that the m value was chosen too high. From Figure 3 we can select the value of b = 320 · 10-3, but *a* is considered:

$$a = \frac{(521 - 320) \cdot 10^{-3}}{25 \cdot 10^{-3}} = 8{,}04 \tag{4}$$

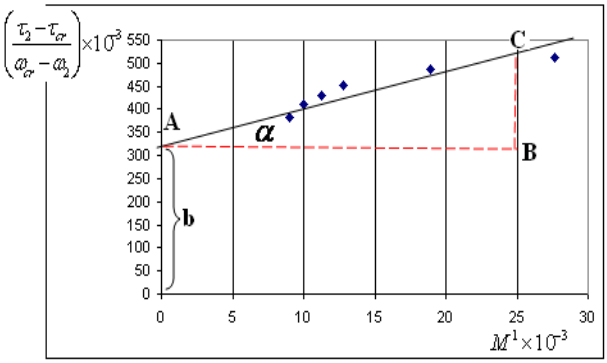

Fig. 3. *The dependency graph* M^1 *of* $\frac{\tau_2-\tau_{cr}}{\omega_{cr}-\omega_2}$

So a = 32.5 and b = 265 ·10^{-3}. The coefficients in the formula for determining the drying time are correspondingly equal to:

$$A = a \cdot N = 8{,}04 \cdot 3{,}62 = 29{,}1 \qquad \beta = b \cdot N = 320 \cdot 3{,}62 \cdot 10^{-3} = 1{,}158$$

Determine the drying time of the product at each point of the second drying period in which the differentiation was carried out. For the exponent m = 1 the duration in each point is determined by the formula 5:

$$\tau = \frac{1}{N} \cdot \left[(\omega_1 - \omega_{cr}) + 2{,}3A \cdot \lg \frac{\omega_{cr} - \omega_e}{\omega_2 - \omega_e} + \beta(\omega_{cr} - \omega_2) \right] \qquad (5)$$

Conclusions

1. The production of dried apples should be directed to quality products, harmless to the human organism with the possibility of launching into organic production.

2. Following the study of the antioxidant treatment process 3 compositions were selected which ensure high quality of dried apples: 1% a. Citric + 0.4% NaCl + 0.5% CaCl2; 1% citric acid + 0.4% NaCl + 0.5% CaCl2 + 12% sugar; 0.7% a. Citric + 0.3% a. ascorbic + 0.4% NaCl + 0.5% CaCl 2.

3. The study of the kinetics of infrared drying allowed the elaboration of the drying regime and the obtaining of the mathematical equation for determining the drying time of the peeled apples, cut and without the seed box

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L'ARGUMENT EN FAVEUR DE LA PRODUCTION DE VINS MOUSSEUX CLASSIQUES AVEC UNE APPELLATION D'ORIGINE "CRICOVA"

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Abstract: This study highlights the efforts made over the last decades by the oenologists of Cricova S.A. to produce high quality sparkling wines by conventional technology, specific to the wine region and the production method. It is supported the need to protect the brewing Cricova for the production of sparkling wines with a label of origin "CRICOVA".
Keywords: sparkling wine, coupage, tirage, sepage, AOP

Introduction

Alors que la production totale de vin est en baisse depuis 2005, le marché mondial des vins effervescents est en expansion : en 1990 2 milliards de cols sont produits, en 2010 2,5 milliards de cols sont fabriqués, soit 7 % de la production mondiale de vin. La France (26 % de la production mondiale de vins effervescents) est le premier producteur mondial en 2010, soit environ 10 % de sa production totale de vin, le Champagne représentant 50 % des volumes de vins effervescents produits [1]. L'Italie est le deuxième producteur mondial mais le premier exportateur avec le Prosecco qui représente environ 25 % des volumes, puis viennent l'Allemagne (30 % de sa production en vins effervescents) et l'Espagne [2].

Vin associé aux fêtes, sa consommation est soumise à une forte saisonnalité. L'Allemagne est le premier pays consommateur en 2010 avec 480 millions de cols devant la France (460 millions de cols). Rapporté au nombre de bouteilles par habitant, cette dernière se classe première avec une consommation moyenne de 7 bouteilles par an, devant l'Allemagne (6 bouteilles par an), l'Espagne (3 bouteilles par an), l'Italie (3 bouteilles par an). L'Allemagne est le principal importateur en 2011 avec 27 % des volumes, devant le Royaume-Uni (16 %) et les États-Unis (12 %)[5] [3].

Les vins mousseux obtenus par la technologie traditionnelle "champenoise" ont commencé à être produits au "Cricova" en grand tirage depuis les années 1970. Pendant la période soviétique, les œnologues moldaves ont essayé différents coupages pour obtenir finalement des vins pétillants comme les vins français.

À partir des années 2000, une échange d'expérience a été réalisée avec des œnologues français et espagnols qui ont tenté de partager leur savoir-faire avec les collègues moldaves.

L'objectifs de la présente étude consiste dans l'analyse des essais des œnologues moldaves de Cricova pour obtenir de vins mousseux par la technologie traditionnelle "champenoise" à partir des cépages autochtones.

Analyse de l'expérience de production des vins mousseux blancs

Une étape très importante dans ce processus technologique est la création de coupages, qui seront ensuite soumis à une fermentation secondaire dans des cylindres spéciaux pouvant supporter une pression allant jusqu'à 5 atmosphères. En France, les

cépages à partir desquels sont produits les vins mousseux blancs selon la méthode champenoise sont le pinot noir, le pinot meunier et le Chardonnay. Divers cépages, moins traditionnelles, ont été testées dans la cave "Cricova".

Les vins mousseux blanches classiques sont généralement les plus recherchées, ce qui explique pourquoi le consommateur a un plus grand choix, raison pour laquelle les tasses blanches sont plus diversifiées.

En 2006, ont été atteints trois types de coupages avec des proportions suivantes:

- Pinot Franc 40%, Chardonnay 40%, Sauvignon 20% - deux coupages différentes selon les qualités organoleptiques, soit 7 tirages au total;
- Pinot Franc 40%, Chardonnay 40%, Aligoté 20% - 2 coupages différentes selon les paramètres organoleptiques, au total 6 tirages;
- Pinot Franc 26%, Chardonnay 13%, Aligoté 61% - 2 coupages, soit 13 tirages.

La teneur en sucre dans le mélange de tirage a été d'environ 24-25 g / l.

Les éditions les plus réussies sont celles avec 20% de Sauvignon, qui ont légèrement mûri et ont été appréciées par leur fraîcheur et finesse.

En 2007, il y avait encore trois types de coupage, dans lesquels les mêmes cépages prédominaient, mais les proportions de cette époque étaient différentes:

- Pinot Franc 50%, Chardonnay 28%, Sauvignon 22% - 6 tirages;
- Pinot Franc 24%, Chardonnay 42%, Aligoté 33% - 6 tirages;
- Pinot Franc 24%, Chardonnay 36%, Sauvignon 40% - 7 tirages.

La teneur en sucre dans le mélange de tirage a été d'environ 23-25 g / l.

A partir des éditions de cette année (2007), on peut citer à nouveau les coupages avec le cépage Sauvignon, mais il faut mentionner que si celui-ci est présent en faible quantité, on réussit à mieux façonner le mousseux, il est donc important que les variétés tels que Pinot Franc et Chardonnay prédominent.

En 2008, seuls deux types de coupage ont été créés et l'un d'entre eux était totalement différent, étant formés par 4 variétés:

- Pinot Franc 38%, Chardonnay 38%, Sauvignon 12%, Aligoté 12% - 21 tirages;
- Pinot Franc 40%, Chardonnay 60% - 6 tirages.

La teneur en sucre dans le mélange de tirage a été d'environ 23-24 g / l.

Les coupages de l'année 2008 étaient sujets aux cassages oxydatifs (en particulier le premier maintenu ci-dessus). Ce fait a entraîné un double traitement avec de la polyvinylpolypyrrolidone sous l'appellation commerciale Divergeant, assurant ainsi la stabilité. Les coupages du Pinot Franc et du Chardonnay ont présenté des bons qualificatifs, ont bien évolué avec le temps et les vins mousseux classiques obtenus étaient hautement appréciés.

En 2009, plusieurs types de coupage ont été tentés, même un assemblage, une expérimentation intensive avec des proportions et des variétés. Pour la première fois, dans le cépage a été introduite la variété géorgienne Rkaţiteli:

- Rkaţiteli 60%, Chardonnay 10%, Pinot Franc 30% - 6 tirages;
- Pinot Franc 43%, Chardonnay 43%, Sauvignon 14% - 16 tirages;
- Pinot Franc 100% – 5 tirages, dont 2 prévus pour la série Prestige, mais l'évolution de ces vins mousseux dans le processus de maturation a permis de présenter l'un de ces tirages dans la catégorie Grand Vintage;
- Chardonnay 75%, Pinot Franc 25% – 3 tirages;
- Chardonnay 60%, Pinot Franc 40% - 5 tirages.

Ainsi, on constate une tendance à créer de plus en plus des coupages innovants. La teneur en sucre dans le mélange de tirage était d'environ 24-25 g / l.

Pendant cette année (2009), les plus marquant étaient le coupage avec 14% Sauvignon, qui a également contribué au maintien de la couleur verte jaunâtre. Un tirage exceptionnel s'est avéré celui de 100% Pinot Franc, qui a évolué au fil des ans, sans teintes d'oxydation, souvent caractéristiques pour le vins mousseux classiques.

En 2010, une variété inhabituelle pour la production de vins mousseux classiques a été présentée à nouveau:

- Pinot Franc 45%, Chardonnay 39%, Aligoté 16% – 10 tirages;
- Pinot Franc 40%, Chardonnay 39%, Riesling de Rhein 21% – 9 tirages;
- Pinot Franc 44%, Chardonnay 26%, Aligoté 18%, Riesling de Rhein 11% – 13 tirages.

Teneur en sucre dans le mélange de tirage était d'environ 22 à 24 g / l.

Cette année (2010), le coupage Aligoté à 16% a montré un grand intérêt en raison de son évolution. Une arôme complexe avec des nuances florales après le vieillissement a été hautement appréciée.

En 2011, des variétés traditionnelles et Sauvignon ont été utilisés pour créer des coupages:

- Pinot Franc 50%, Chardonnay 50% - 6 tirages;
- Pinot Franc 30%, Chardonnay 50%, Sauvignon 20% – 3 tirages;
- Pinot Franc 15%, Chardonnay 78%, Sauvignon 7% – 7 tirages;
- Chardonnay 100% – impression unique.

La teneur en sucre dans le mélange de tirage était d'environ 24-25 g / l.

Un tirage marquant a été celui de 100% Chardonnay, qui a mûri dans le temps avec nuances de maturation nobles, digne d'un mousseux extra brut. Le mélange traditionnel de 50% Pinot Franc

En 2012, des coupages avec plusieurs variétés européennes ont été fabriqués à nouveau:

- Pinot Franc 28%, Aligoté 8%, Sauvignon 19%, Rkaṭiteli 17%, Chardonnay 28% – 15 tirages;
- Chardonnay 49%, Sauvignon 33%, Rkaṭiteli 18% – 14 tirages;
- Pinot Franc 61%, Chardonnay 39% – 5 tirages attendues pour la série classique des vins mousseux Prestige.
- Pinot blanc 100%, attendu pour la série Grand Vintage.

La teneur en sucre dans le mélange de tirage était d'environ 23-25 g / l.

Une année spéciale (2012) avec des idées intéressantes, qui auraient pu être mises en pratique car les coupages ont été créées avec beaucoup de talent et de compétence. Il est important de noter que les coupages avec la variété géorgienne Rkaţiteli a été très apprécié par les œnologues de l'Institut Œnologique de Champagne.

En 2013 les assemblages ont été créés selon le modèle français:

- Chardonnay 60%, Pinot Franc 40% – 12 tirages;
- Pinot Franc 50%, Chardonnay 50% – 4 tirages;
- Chardonnay 100% – 2 tirages;

La teneur en sucre dans le mélange de tirage était d'environ 23 g / l.

Les plus marquants était les tirages de Pinot Franc et Chardonnay 50/50, mises en valeur pour la série Prestige - une série réussie et très expressive.

En 2014, la tendance de l'année précédente a été maintenue:

- Chardonnay 50%, Pinot Franc 50% - deux coupages différentes selon les qualités organoleptiques - 11 tirages au total, dont 6 sont attendus pour la série Prestige;
- Pinot Franc 100% – 3 tirages;
- Chardonnay 100% – 3 tirages.

La teneur en sucre dans le mélange de tirage était d'environ 22 à 24 g / l.

Pour la première fois, les éditions ont été lancées sur la nouvelle ligne d'embouteillage. Une partie de la production de cette année (2014) a été placée dans la bouteille lourde, ce qui garantit une meilleure évolution à l'étape de la maturation.

En analysant ces dernières années, on constate une tendance à la diminution de la concentration en sucres dans le mélange de tirage, car les vins de la matière première pour la production de vins mousseux classiques ont une forte concentration en alcool.

Les mélanges de levures a vins avait une densité constante, les souches utilisées pour le préparer, à partir de 2008, étaient d'origine française, développée par l'Institut de Champagne, France, à savoir le CIO 18- 2007, Actiflora PM, OenoFress ou Chardonnay Divine. Les nutriments à base d'azote ont également été utilisés pour développer des cellules de levure.

La fermentation secondaire en bouteilles était toujours surveillée et tous les 10 jours, dans les bouteilles vérifiaient la pression accumulée. Celle-ci augmentait généralement progressivement: 10 jours - environ 1, 5 atmosphères, 20 jours - environ 2,5 à 3 atmosphères et pendant 30 les jours dans la bouteille ont été enregistrés 4.5-5 atmosphères. Des exceptions ont été remarquées dans les années 2012 et 2014, lorsque la fermentation secondaire a été tumultueuse dès le début, et une pression d'environ 3 atmosphères a été enregistrée durant ces 10 premiers jours.

Le suivi du processus de maturation du mousseux classique visait l'évolution dans le temps. Une tendance à l'oxydation des coupages ou le Chardonnay étant la variété principale a été observée, bien qu'il y a également d'autres facteurs passibles d'intervenir comme le millésime, les variétés, etc.

Expérience de production de vins mousseux rosées

Les mousseux rosés classiques sont une catégorie spéciale qui nécessite une attention particulière et la gamme de couleurs varie en fonction de la technologie de vinification des raisins et de la composition des mélanges. Au fil des ans, les œnologues de CRICOVA ont beaucoup travaillé sur les coupages, en commençant par ajouter environ 5% de Cabernet-Sauvignon vinifié en rouge et en finissant avec des mélanges de raisins rouges, vinifiés en blanc.

En 2006 deux coupages totalement différentes pour la production des vins mousseux roses ont été mises en place:

- Cabernet Sauvignon vinifié en blanc 72%, Chardonnay 17%, Aligoté 11% et Cabernet-Sauvignon 5% vinifie en rouge - 1 tirage;
- Cabernet-Sauvignon vinifié en rouge 5% et Chardonnay 95% - 1 tirage.

La teneur en sucres dans le mélange de tirage était d'environ 25 g / l.

Parmi ces deux essais, les meilleures qualités présenté le deuxième, mais il y avait des lacunes dans la couleur rosée.

En 2009, après une pause de plusieurs années, de nouvelles idées ont été mises en pratique, cette fois en plusieurs tirages, mais en deux variantes compositionnelles:

- Pinot Franc vinifié en blanc 93%, Cabernet-Sauvignon vinifié en rouge 7% - 3 tirages;
- Pinot Franc 70% et Chardonnay 23% vinifiés en blanc, Cabernet-Sauvignon vinifié en rouge 7% - 2 tirages.

La teneur en sucres dans le mélange de tirage était d'environ 24-25 g / l.

Parmi les deux variantes, l'intérêt majeur a présenté le premier coupage, qui a développé des qualités organoleptiques intéressantes.

En 2010, un nouvel essai a été tenté:

- Pinot Franc 37% et Riesling de Rhein 40% vinifié en blanc, Cabernet-Sauvignon vinifié en rouge 5% plus 13% du vin blanc de cette année (Pinot Franc, Chardonnay, Aligoté, Riesling de Rhein).

La teneur en sucre dans le mélange de tirage était de 24 g / l.

Un coupage très intéressant, révélé par son caractère unique.

En 2012 on a poursuivi les recherches pour obtenir un coupage parfait pour une mousseux rosé classique:

- Pinot Franc 13%, Aligoté 31%, Chardonnay 50% vinifiés en blanc et Cabernet-Sauvignon 5% vinifies en rouge - 4 tirages.

La teneur en sucres dans le mélange de tirage était de 23-24 g / l.

Ce coupage pourrait certainement être considéré comme l'un des rosés les plus réussis, car sa couleur distinctive, sa fraîcheur, sa variété de qualités organoleptiques le rendent spécial. Avec ces éditions, le rosé extra brut est également apparu, ce qui rend un caractère particulier pour un vin mousseux noble.

En 2013, un coupage spécial, qui présentait beaucoup d'intérêt au cours de la période de maturation a été créé:

- Pinot Franc 48,7%, Feteasca blanc 48,7% plus 2,6% du coupage rouge (Cabernet-Sauvignon de qualité mature, année 2011, Cabernet-Sauvignon année de collecte 1993) - 5 tirages.

La teneur en sucres du mélange était de 23 g / l.

C'est un coupage rosé marquant du point de vue organoleptique, mais la couleur présente des lacunes, il faudra apporter une correction avec la liqueur d'expédition.

Expérience de production de vins mousseux rouges

Les vins mousseux rouges classiques sont également élaborées avec beaucoup de soin. On cherche toujours à développer quelque chose d'extraordinaire, qui surprendra pendant le processus de maturation.

En 2006, un mousseux classique rouge a été créé à partir d'une seule variété de raisins:

- Cabernet-Sauvignon 100% issu du vendange 2005, de la région de Gagaouzie, 6 tirages.

La teneur en sucres dans le mélange de tirage était de 25 g / l.

À première vue, un vin au potentiel de maturation important, mais lors de la maturation il a perdue progressivement ses qualités et surtout son goût, qui n'a pas évolué avec le temps.

En 2009, après un délai de 3 années a été décidé de créer un nouveau coupage pour la production de vins mousseux rouge classique:

- Cabernet-Sauvignon 78% et Merlot 22% - 3 tirages.

La teneur en sucres dans le mélange de tirage était de 22 g / l, car le taux d'éthanol était de 12,1% vol.

Cette fois-ci, un produit inhabituel, voire expressif, a été obtenu grâce à la variété Merlot, qui a imprimé une sensation de onctueux et douceur, si appréciée dans les vins mousseux classiques.

En 2011, il a été décidé d'obtenir un coupage rouge de vins matures et jeunes pour la production de vins mousseux, afin de pouvoir suivre leur évolution lors de la maturation:

- Cabernet-Sauvignon 2010 - 50%, Cabernet-Sauvignon maturé pendant 2 ans, vendange 2008 - 50% - 4 tirages.

La teneur en sucre dans le mélange de tirage était d'environ 24-25 g / l.

L'expérience de cette année (2011) montre qu'un vin mousseux rouge classique évolue différemment: quand il est basé sur un vin maturé depuis plusieurs années, il devient exceptionnel.

En 2013, un mélange unique a été créé, qui nous montre qu'un vin mousseux classique rouge peut être intéressant à chacune de ses étapes de production:

- Cabernet-Sauvignon maturé, vendange 2011 -76%, Cabernet-Sauvignon de collection, vendange 1993 24% - 2 tirages.

La teneur en sucres de coupage était de 22,5 g / l.

Du fait qu'un vin de collection a été introduit dans le coupage, le vin mousseux obtient de la notoriété lors de sa maturation. Même si aucune nouvelle variété n'a pas été introduite, les nuances de vieillissement d'un vin de collection confèrent au produit des qualités organoleptiques particulières.

Conclusions

Ces efforts, réalisés depuis près d'un demi-siècle, montrent que les vins mousseux moldaves ont le droit d'exister et pourraient faire l'objet de vins mousseux de l'Appellation d'Origine Contrôlée (AOC). Les appellations d'origine contrôlée identifient un produit, l'authenticité et la typicité de son origine géographique. Elles sont garantes de ses qualités et de ses caractéristiques, de son terroir d'origine, du savoir-faire du producteur, de l'antériorité et de la notoriété d'un procédé et de son nom qui sont trop anciens pour faire l'objet d'un brevet. C'est la combinaison d'un milieu physique et biologique avec la spécificité du produit AOC, avec définition dans un cahier des charges.

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MICROSTRUCTURE AND RHEOLOGICAL BEHAVOR OF EMULSIONS WITH IMPROVED NUTRITIONAL VALUE

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Abstract: Food emulsions occupy a special place in the diet and are characterized by high taste and nutritional qualities, which are determined by a specific structure of emulsions. In the paper are studied sunflower and walnut oils with lipid fraction content in a balanced ratio of ω-3 and ω-6 polyunsaturated fatty acids and natural extracts of leaves and green nut shells (*Juglans regia* L.). Experimental data on microstructure of emulsions have shown that natural extracts positively influence the structure, size and arrangement of fat cells, increasing the degree of dispersion of vegetable oils in the aqueous phase. The analysis of rheological behavior shows that balanced ratio emulsions of polyunsaturated fatty acids and natural extracts have effective viscosity values and better Power Law parameters compared with the control sample. These results offer new interesting expectations to continue with this research line and demand the application of oil mixtures and natural extracts to provide improved nutritional value and better quality of food emulsions, being the main challenge to be faced in future studies.

Key words: walnut oil, natural extracts, emulsion, microstructure, rheology

Introduction

The knowledge of the microstructure and rheological properties of food emulsions is important because of many reasons. Sensory attributes and shelf-life of emulsions are directly related to their properties, and also, the information about the microstructure and rheology is necessary to design more rational technological processing operations [1].

Microstructure and rheological measurements are frequently used as an analytical tool to provide fundamental insights about the structural organization and interactions of the components within emulsions, for example, measurements of viscosity versus shear rate can be used to provide information about the strength of the colloidal interactions between droplets [2].

Food emulsions of "mayonnaise" type are "oil-in-water" finely dispersed emulsions, prepared from vegetable oil with the addition of emulsifiers, stabilizers, thickeners, flavorings and spices [5]. Modeling the mayonnaise recipe by introducing nutritionally valuable supplements is a perspective direction. A precious lipid product is walnut oil *Juglans regia* L. Walnut oil is rich in antioxidants (tocopherols, polyphenols), but also in polyunsaturated fatty acids ω-3 and ω-6 [6]. Partial substitution of sunflower oil with nut oil in mayonnaise will allow balancing of fatty acids, increasing of the biological and taste qualities, and the diversification of the raw material base for the production of improved nutritional value mayonnaise.

The objective of this study was to investigate the microstructure and rheological properties of food emulsions of "mayonnaise" type with improved nutritional value by using the lipid fraction (sunflower and walnut oil) with a balanced ratio of ω-3 and ω-6 polyunsaturated fatty acids. Natural extracts of leaves and green nuts have served as a stabilizing component of possible oxidation processes.

Materials and methods

Materials

The following raw vegetable oil was used for experimental research: double-refined and deodorized sunflower oil "Floris" (HGM434 / 2010) and extra virgin Greek walnut oil. Primary raw material harvested in the years 2012-2013 was also used: leaves and green walnut shell *Juglans regia* L.

Chemicals and reagents

Ethanol (99.9%), chloroform, glacial acetic acid, potassium hydroxide, phenolphthalein, potassium iodide, sodium thiosulfate (Na2S2O3 × 5H2O) and starch were supplied by Eco-Chimie Ltd. (Chisinau, Moldova). All used chemicals were of HPLC or analytical grade. Distilled water was used throughout.

Microstructure and particle size distribution

The microstructure of food emulsions was determined using an optical digital microscope of advanced series, model "Motic DMB" (China). For this purpose a drop of the investigated sample of food emulsion was placed on subject glass, covered with its integumentary glass and then established in a microscope. Photos of food emulsion samples were obtained by digital camera connected to a microscope. Obtained photos of food emulsions were analyzed and particle size distributions were calculated.

Rheological properties

Rheology measurements were performed with a rheometer TA Instruments AR-2000 ex UK. The flow properties of food emulsion samples at 20°C were determined by using a cone-plate geometry having a diameter of 40 mm. The increase of the thixotropy area was initially achieved by increasing the shear rate speed from 0 to 300 s^{-1} and then decreasing the shear rate speed from 300 to 0 s^{-1}. A mathematical model based on the experimental data and suitable for shear flow for food emulsion samples was established to quantify the samples. The power law was used as a consecutive shear flow model that establishes the relationship between shear stress and shear rate $\left(\gamma^{-n}\right)$. The power law equation is indicated below:

$$\tau = K\left(\gamma^{-t} \cdot n\right) \quad (1)$$

Where:
τ – the shear stress,
K – the consistency index ($Pa.s^n$),
n – flow index.

The oscillatory tests were performed in the frequency range 0-100 Hz, using strain values comprised in linear viscoelasticity (0.5%). Data was collected and rheological parameters had been calculated using a TA software program tool. The collected data included the storage module (G') and the relaxation module (G "). Delta components and complex viscosity were, also, measured. The curves G", G, and delta were plotted according to frequency. All rheology measurements were performed at 20°C using a 1000 μm gap [7, 8].

Statistical analysis

Variance analysis of the results was carried out by least square method with the application of Microsoft Office Excel program. The differences were considered statistically significant, because the probability was greater than 95% ($q < 5\%$). All assays were performed at room temperature, $20 \pm 1\ ^0C$. The experimental results are represented according to standard rules.

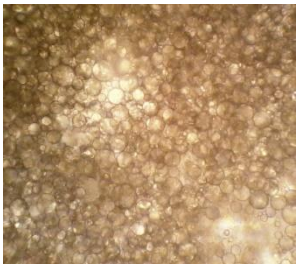
Results and discussions

Microstructure of food emulsions

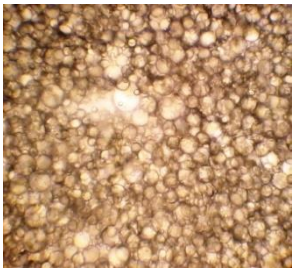
A current trend in the development of the food lipid industry is the production of food emulsions based on the mixture of vegetable oils of various types, taking into account their fatty acid content. This direction is a priority because none of the individual vegetable oils provide the correlation of ω-3 and ω-6 fatty acids recommended by specialists, so for the production of food emulsions with improved nutritional value, it is necessary in the first line, to create a balanced product in terms of fatty acid content [1, 2, 5].

The quality of any finished food product is closely related to its structural properties. The study of the influence of incorporated natural extracts on the quality of food emulsions can not be completed without analyzing the influence of these factors on the emulsion structure, the parameters of the fat globules dispersed in the aqueous phase. This index shows the dispersion degree of fat, which is the dominant factor in determining the degree of assimilation of finished product, its structural, oxidative and rheological stability.

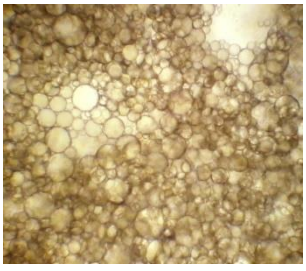
The microstructure of food emulsion samples was studied by microscopic analysis using the digital optical microscope. The microstructure images of the investigated samples are shown in figure 1.



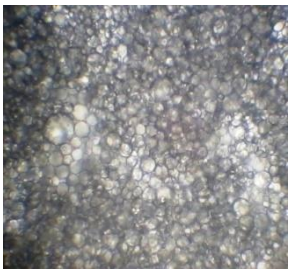
Control emulsion 100% sunflower oil



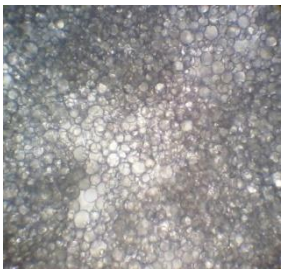
Emulsion with 25% extra virgin walnut oil *Juglans regia* L.



Emulsion with 25% extra virgin walnut oil *Juglans regia* L. and BHT 0,1%



Emulsion with 25% extra virgin walnut oil *Juglans regia* L. and natural extract of green walnut leaves



Emulsion with 25% extra virgin walnut oil *Juglans regia* L. and natural extract of green walnut shell

Fig. 1. *Food emulsion microstructure with improved nutritional value*

As can be seen from the presented images, the microstructure of the emulsions with the addition of natural extracts differs considerably from the structure of the control emulsions. The radius of fat cells is characterized by much smaller dimensions, which is significantly highlighted in the microscopic images of the investigated samples.

It should be noted, that in most samples of emulsions with extracts, the radius of fat cells is much smaller than in other samples. The structure of these emulsions is characterized by the dense and compact arrangement of fat globules. The dispersion degree of vegetable oils is maximal for such emulsions, which ensures homogeneity and fineness of the product. It should be noted, that emulsions with natural extracts showed more stable values compared to the sample with added 0.1% BHT synthetic antioxidant [4, 5].

Analyzing the experimental data on the microstructure of the investigated emulsions, one can say that natural extracts have a significant influence on the structure, size and arrangement of fat globules, increasing the dispersion degree of vegetable oils in the aqueous phase, stabilizing the structure for a long time.

Rheological behavior of food emulsions

A particularly important problem is that of making the emulsions, of their correct formulation, so as to obtain the desired viscosity under specified working conditions. Rheological knowledge of emulsions represents a number of difficulties that are related to the greater complexity of these systems.

Highlighting the factors which are influencing the viscosity of emulsions and knowing their mode of action are important for emulsion formation. Rheological studies performed with emulsions have shown that their viscosity depends not only on the shape and size of the particles, but also on the distribution of their size. It was shown, that the mean particle size exerts a considerable effect on the viscosity of the emulsions.

The flow curves of the food emulsion samples are shown in figure 2. All food emulsion samples have been subjected to shear-flow behavior of immersion, characterized by increased shear stress and decreased apparent viscosity by increasing the shear rate speed in the ascending rate shear speed 0-300 s^{-1}. The data for the initial samples of the food emulsion samples is shown in the investigated rheorgrams.

The dipping characteristics were dependent both on shear speed and time, and on the type of food emulsion samples. These characteristics are specific to non-Newtonian pseudoplastic fluids.

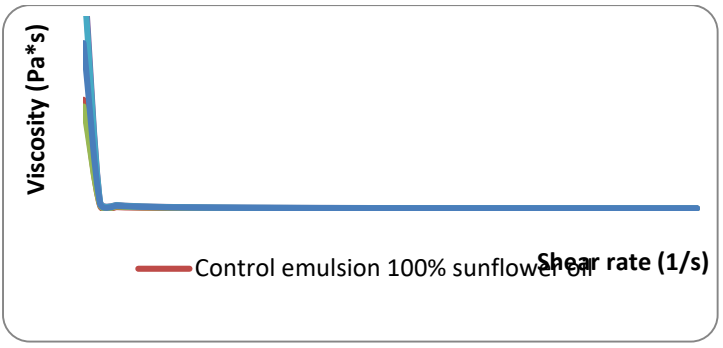


Fig. 2. *Viscosity change of food emulsion samples depending on shear rate*

It has been observed that the actual viscosity is directly dependent on the nature and composition of the investigated food emulsions.

Analyzing the obtained rheograms, it has been found that the viscosity of the emulsions decreases significantly at the shear rate, which can be explained by the destruction of their structure.

It is necessary to mention that, on the downward branch of shear velocity between 300 – $0s^{-1}$, the emulsion behavior was inversed. The samples of the tested food emulsions showed thixotropic characteristics, thixotropy being dependent on the type food emulsion samples. All fresh samples returned to their original point. Table 1 lists the flow emulsion parameters (Power Law) for food emulsion samples.

Table 1. *Power Law parameters and the thixotropy of food emulsions with improved nutritional value*

Nr.	Sample name	Viscosity, Pa·s	Power index	Standard error, %	Thixotropy, Pa/s
1.	Control emulsion 100% sunflower oil	14.85	0.1377	31.91	413.4
2.	Emulsion with 25% extra virgin walnut oil *Juglans regia* L.	13.39	0.4203	8.671	2567.0
3.	Emulsion with 25% extra virgin walnut oil *Juglans regia* L. and BHT 0,1%	10.4	0.3135	22.23	1727.0
4.	Emulsion with 25% extra virgin walnut oil *Juglans regia* L. and natural extract of green walnut leaves	9.75	0.2942	24.13	1783.0
5.	Emulsion with 25% extra virgin walnut oil *Juglans regia* L. and natural extract of green walnut shell	8.09	0.3512	25.24	-193.3

The analysis of the experimental data has shown that the observations made are in line with those previously found by [7]. In concentrated emulsions, like mayonnaise, oil droplets, proteins and emulsifiers interact, which leads to the formation of a three-dimensional cluster of droplets. If shear rate increases, the hydrodynamic forces cause the deformation of aggregates and, eventually, ruptures, which leads to reduced viscosity [8]. The hysteresis loop was obtained for each sample by successive growth and decreasing the

shear speed. The surface area between the two curves, known as the hysteresis loop, differs depending on the type of mayonnaise and the storage period. It is worth mentioning, that the value of this index is minimal, for some samples practically equals "0".

According to the data presented in table 1, the control sample with 100% sunflower oil, as well as the samples with natural extracts, showed a much lower thixotropy than food emulsion with the addition of walnut oil and those with no antioxidant added. As thixotropy growth corresponds to a progressive degradation of the product's structure during high shear [1], it results that the given samples underwent the smallest structural changes during application of the shear stress.

Conclusions

In the paper, it was justified the opportunity of using the walnut oil Juglans regia L. as a lipid component for obtaining food with improved nutritional value due to its important content of polyunsaturated fatty acids (ω-3, ω-6), tocopherols and polyphenols, which exhibit enhanced antioxidant activity.

The research of the microstructure of the investigated emulsions has shown, that natural extracts have a significant influence on the structure, size and arrangement of fat globules, increasing the dispersion degree of vegetable oils in the aqueous phase, stabilizing the structure for a long time.

The analysis of the influence of incorporated natural extracts on rheological characteristics (effective viscosity and Power Law parameters) proves that food emulsions with natural extracts manifest better rheological characteristics.

Acknowledgements

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MULTIVARIATE SPECTROSCOPY ANALYSIS FOR CALSSIFICATION OF MOLDAVIAN MATURED WINE DISTILLATES

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Abstract. It was demonstrated one of the possible ways for solving the authenticity problem of matured wine distillates. Using as a reference spectral information about wine distillates of transmission spectra, angular dependence of scattering spectra will significantly improve the quality of classification and increase the correlation between the values of chemical parameters and principal components. It is proposed to use the methods of PCA (principal component analysis), classification trees and PLS (projection on latent structures) to determine their efficiency in the process of classification of wine distillates.

Key words: wine distillates, transmission spectra, principal component analysis, classification tree, projection on latent structures.

Introduction

Currently an increasing number of consumers care about their health and want to buy natural and authentic food. Authenticity (originality) is an inherent constituent part of a food quality. It defines by a set of physical, chemical and biological parameters, whose absolute quantitative values and change intervals are validated by the natural properties of raw materials and an acceptable technological influence at the ready food manufacturing. Authentication is rather critical in manufacturing and quality control of cognacs and brandies produced from matured wine distillates. The main factors preventing falsification and manufacturing the low-quality product are the control of distillates' age and geographical origin and an identification of the manufacturer.

The only conventional optical characteristics of cognacs and brandies are optical densities at wavelengths 420 nm and 520 nm [1]. However, there are different substances with similar optical properties in wine distillates. It impedes to infer about the quality and features of considered objects on the base of spectral measurements at a little number of assigned wavelengths. In this paper we apply the multivariate spectroscopy analysis to solving the problems of classification of Moldavian matured wine distillates.

Materials and methods

We have created an array of data on the physical and chemical composition of wine distillates' samples of different ages produced in Moldova by various manufacturers. The volatile components were determined by gas-liquid chromatography on the chromatograph GC HP 4890D with FID-detector, the decomposition products of lignin (aromatic aldehydes and acids) were determined on the liquid chromatograph Shimadzu LC-20A.

The typical example of distillates' transmission spectra is presented in Fig.1. It is registered by double-beam spectrophotometer Shimadzu PC 3101. Spectral resolution is

0.5 nm in the range from 190 to 480 nm and 1 nm in the range from 480 to 2600 nm. 1 mm optical path cuvette is used for spectral ranges from 190 to 480 nm and from 1100 to 2600 nm. 10 mm optical path cuvette is used for spectral range from 480 to 1100 nm. Spectra have been smoothed by 9-point cubic polynomial Savitzky-Golay filter after registration [2].

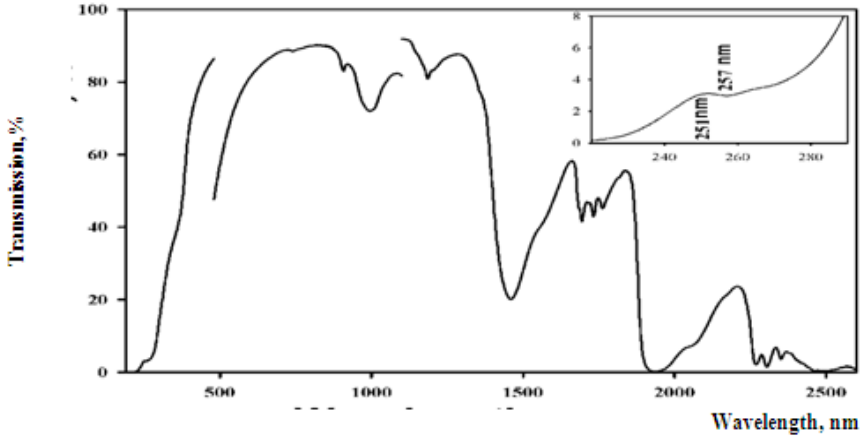

Fig.1. *Typical spectrum of matured wine distillate. Spectral region of "cognac maximum" is shown in the inset*

In the seventies of the twentieth century the appearance of high-performance computers led to the possibility of effective multivariate data processing. Traditional analytical methods demand the great time expenses, high-priced equipment and consumed materials. It was found that they can be replaced by cheap formal and indirect methods operating the multivariate data. The real breakthrough was done in infrared spectroscopy, particular in the near infrared region. Formerly this region was of little use because of the intrinsic high noise. It is caused by intense water absorption and scattering in reflection spectra. The earliest applications of multivariate data processing methods were devoted to modeling the spectroscopic data by principal component analysis (PCA) and projection on latent structures (PLS).

PCA [3] is designed to transform the original variables describing the considered set of samples in to new, uncorrelated variables called the principal components that are linear combinations of the original variables. The direction of the first principal component lies along the maximum variance in the original variables. Each subsequent principal component describes smaller variance of original data than preceding ones. In terms of matrix notation the principal components are the eigenvectors of the covariance matrix of the original variables. Depending on the field of application, it is also named as the discrete Karhunen–Loève transform, the Hotelling transform, singular value decomposition and so on. In realization through singular value decomposition the *I*-by-*J* matrix $\boldsymbol{X}$ of initial data is decomposed to product of matrices $\boldsymbol{U}$, $\boldsymbol{S}$ and transposed $\boldsymbol{P}$:

$$\boldsymbol{X = USP^t} \qquad (1)$$

Here I is the number of samples in the set, J is the number of original variables, $\boldsymbol{U}$ is the matrix from orthonormal eigenvectors $\boldsymbol{u}_r$ of the matrix $\boldsymbol{X}$ multiplied by the transposed matrix $\boldsymbol{X}$:

$$\mathbf{X}\mathbf{X}^{\mathbf{t}}\mathbf{u}_{\mathbf{r}} = \lambda_r \boldsymbol{u}_r \tag{2}$$

λ_r are the corresponding eigenvalues. $\boldsymbol{P}$ is the matrix from orthonormal eigenvectors $\boldsymbol{p}_r$ of the transposed matrix $\boldsymbol{X}$ multiplied by the matrix $\boldsymbol{X}$:

$$\mathbf{X}^{\mathbf{t}}\mathbf{X}\mathbf{p}_{\mathbf{r}} = \lambda_r \boldsymbol{P}_r \tag{3}$$

$\boldsymbol{S}$ is the diagonal matrix with square roots from λ_r in descending order. The classical presentation of PCA is $\mathbf{X} = \mathbf{T}\mathbf{P}^{\mathbf{t}}$, where matrix $\boldsymbol{T}$ of scores in PCA is the product of matrices $\boldsymbol{U}$ and $\boldsymbol{S}$ in singular value decomposition. This matrix contains the information about the samples. Matrix $\boldsymbol{P}$ of loadings contains the information about the original variables. The main purpose of PCA is to represent the location of the samples in a reduced coordinate system where instead of J-axes (corresponding to J original variables) only A principal components ($A<J$, I) can usually be used to describe the set with maximum possible information:

$$\boldsymbol{X} = \sum_{a=1}^{A} \boldsymbol{t}_a \boldsymbol{p}_a^t + \boldsymbol{E} = \boldsymbol{T}\boldsymbol{P}^t + \boldsymbol{E} \tag{4}$$

Here $\boldsymbol{t}_a$ are the principal components. Matrices $\boldsymbol{T}$ of scores and $\boldsymbol{P}$ of loadings have dimensions I-by-A and J-by-A. E is I-by-J matrix of remainders that contains irrelevant information.

PCA has been applied to the spectra of 42 samples of mature Moldavian wine distillates from 6 different manufacturers. Each spectrum consists of 2698 spectral data counts. PCA decomposes the multidimensional spectral counts space to low-dimensional space of principal components. Total explained variance of distillates' transmission spectra is shown to be as much as 94.5% for 4-dimensional space of principal components.

The first aim of application of PCA to the studied spectra was the identification of distillates' age. PCA cannot find the apparent dependency of scores on age of samples considered. But the great value of the total explained variance allows suggesting the presence of another factor that is modeled by PCA. Fig. 2 presents the score plot where 6 manufacturers are marked differently. You can see that our hypothesis is confirmed. PCA models the belonging to the manufacturer in the first place.

The classification trees making [4] can be applied in 3-dimensional space of principal components for identification of manufacturers. It is one of the kinds of supervised machine learning. The best results are presented in Fig. 3 and are obtained for the algorithm considering all possible combinations of 3-level predictor. Using 3 principal components this classification tree can identify 5 manufacturers from 6 ones considered.

As you could see earlier PCA cannot identify the distillates' age. We use PLS for this purpose. PLS [5] is the bilinear statistical method in contrast to the linear PCA. It projects predictors (spectra in our case) and a response (sample age) into a new low-dimensional space of latent structures simultaneously.

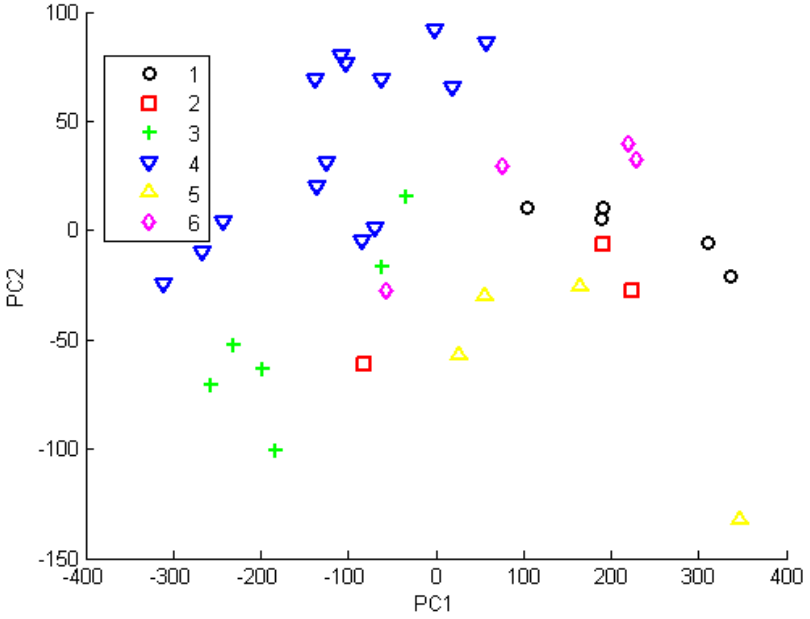

Fig. 2. *Score plots in PC1-PC2 space, distillates manufacturers are marked by different signs.*

21 latent structures give the regression factor of 0.98 on 42 samples of distillates. Results obtained by PLS are presented in Fig. 4 and show the unambiguous definition of distillates' age with relative errors being within 8% limits.

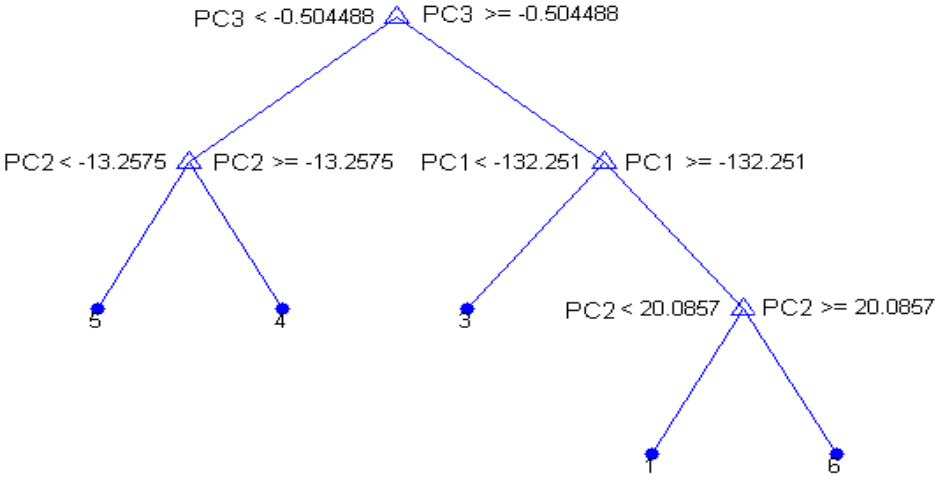

Fig.3. *Identification of distillates' manufacturers by classification tree in 3-dimensional space of principal components*

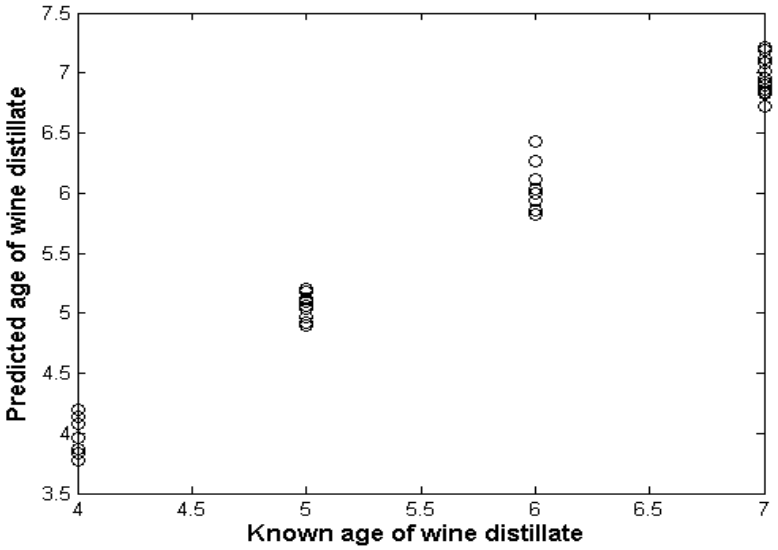

Fig. 4. *Known age of wine distillates versus predicted age as the result of application of PLS to transmission spectra.*

Conclusions

In the result of these studies it was shown the possibility of using multivariate spectroscopy analysis for identification and classification of matured wine distillates. So the application of principal component analysis, classification trees and projection on latent structures to broadband transmission spectra allows defining the manufacturer and age of wine distillates. One of the possible ways is demonstrated for solving the authenticity problem of quality cognac and brandy manufacture. These analyses, along with the physical and chemical parameters and sensory evaluation of the product, can improve the accuracy of the results of the expert opinion in arbitration disputes.

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NATURAL ACIDIFIER PRODUCED FROM APPLES IN THE EARLY RIPENING PHASE

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Abstract. It is proposed the apple acidifier obtaining technology, a non-alcoholic natural product that manifest superior nutritional advantages for chemical food additives: acidifiers, sweeteners, widely used in canned. Process apple acidifier obtaining, according to the invention, includes primary apple processing, crushing, heating up to temperature of 50°C and treatment with pectolytic + amylotic enzymes for 1 hour, pressing, deburring, clarifying and filtering, heat treatment at 60 °C for 20 min., packing and sealing, in case of concentrated acidifier production it must be evaporated at the 55°Brix, then packaging and sealing, followed by pasteurization and cooling. The acidifying agent possesses good organoleptic characteristics and balanced nutritional value, conditioned by the optimal ratio of organic acids / carbohydrates / polyphenolic substances.

Key words: apple, natural acidifiers, non-alcoholic products.

Introduction

The Republic of Moldova has over 70 thousand ha with plantations grown with 20 apple varieties, the most famous being Golden, Gala, Red Chief, Idared, Jonald [1]. Total annual production is about 400 thousand tones [3], of which 50% are exported fresh, 26% are directed to industrial processing for concentrated juice, and 24% are sold on the local market [2]. Apples are the third product with highest value in agriculture, being a strategic product for the northern area of the republic, where the largest plantations are located.

However, agricultural companies also have difficulties: on the Russian Federation market there are restrictions on exports of fresh apples and the export quotas of the EU market are insufficient for the marketing of indigenous production.

A pressing problem for Moldovan processing enterprises is the huge storage of concentrated apple juice and sales are below expectations because of the high production costs compared to the costs of Chinese processing enterprises that place on European market the concentrated juice from apples at lower prices.

Another aspect is at the early maturation stage of apples, in the years with insufficient soil humidity, about 25-30% of the expected fruit is removed from the plantations, which is not used for food purposes but is converted into green mass as a fertilizer. At the same time, most cans of vegetables and fruits are made using citric and acetic acids, chemical origin or products of selected microorganisms, which is not to the liking of many consumers.

Significant apple volumes in the early maturing phase, which are obtained in adjusting the harvest load, as well as the need for natural acidifiers for the production of canned and refreshing beverages, require the basic task of the proposed process to obtain apple products with significant content native organic acids and other valuable nutrients.

Materials and methods

In July-August 2016-2018 was harvested apples of 4 grape varieties at different stages of their maturation, on the experimental ground of the Scientific-Practical Institute of Horticulture and Food Technologies. Acidifiers have been obtained.

The content of soluble solids was determined by refractometer.

The titratable acidity expressed in g/dm 3 of tartaric acid was determined by titration with 0.1 N alkaline solution of NaOH to the low pinkish tint.

The content of polyphenol substances is determined by UV-VIS spectrophotometry selon MA-MD-AS 2-10 INDFOL Quantitative analysis was performed at the diode matrix detector (DAD) at wavelengths 192, 208, 210 nm.

The pH value was determined in accordance with MA-AS MD-313-15-pH.

Results and discussions

The procedure for obtaining experimental apple acid samples

Example 1 Natural apple acidifier from apples

10 kg Rewena variety apples, containing 11.2% water-soluble dry substances and 3.0% titratable acidity recalculated to malic acid, were received, inspected and sorted. Washing with drinking water under 1.2bar was performed. and by crushing, a must have been obtained. This was heated to 50°C and treated at this temperature with pectolytic enzyme preparations at a dose of 30 mg/kg and amylotic at a dose of 10 mg /kg for 25 minutes. The enzymatically treated mash was pressed, then deburred and clarified with Klarsol Super 0.5 ml/dm3 and 0.1 ml/dm3 Erbigel for 30 minutes.

The heat treatment regime was performed at 60°C for 20 minutes. The process was completed by casting the hot acidic acid in the jars and twisting off with Twist off caps.

Organoleptic indices: The apple acidifier Rewena containing 11.0% soluble dry substance is a clear, golden yellow opalescent liquid. The taste is intensely acidic and pleasant, slightly sweet; the aroma is pleasant, specific to the green apple, moderately expressed.

The physicochemical indices for apple acidifying agent are shown in Table 1.

Table 1. *The characterization of physical-chemical indices of apple natural acidifier*

Type of indices	Natural acidier
Dry soluble substances, °Brix	11,0
Carbohydrates, % :	7,0
Fructose, %	4,5
Glucose, %	2,0
Organic acids, % :	3,0
Polyphenolic substances content, mg/dm^3	350
Sugar/acidity ratio	2,33

Example 2. Concentrated acidifying agent from apples

The 10 kilograms of Coredem variety, containing 12.5% water-soluble dry substances and 2.5% titratable acidity recalculated to malic acid, were received, inspected and sorted. Washing with drinking water under 1.5 bar was performed. and by crushing, a must have been obtained. This was heated to 50°C and treated at this temperature with pectolytic enzyme preparations at a dose of 28 mg/kg and amylotic at a dose of 10 mg/kg for 30 minutes. The enzymatically treated mash was pressed, then deblocked and clarified

with Klarsol Super preparations 0.4 ml/dm3 and Erbigel 0.1 ml/dm3 for 30 minutes. The heat treatment regime was carried out at 60°C for 20 minutes, followed by concentration in the evaporator at 50°C and a pressure of 0.95 bar until the water-soluble content reached 55°Brix. The concentrate acidifier was poured hot in jars, sealed with Twist off caps and pasteurized at 70°C for 15 min.

Organoleptic indices: 55°Brix Apple Concentrated Acid is a clear, viscous and opaque, brownish-brown liquid. Taste and aroma are characteristic of Coredem variety.

The physicochemical indices of the apple concentrate are shown in Table 2.

Table 2. *The characterization of physical-chemical indices of apple concentrated acidifier*

Type of indices	Concentrated apple acidifier
Dry soluble substances, Brix	55,0
Carbohydrates, %:	35,0
Fructose	22,5
Glucose	10,0
Organic acids, % :	2,1
Polyphenolic substances content, mg/dm^3	1500
Sugar/acidity ratio	3,6

Therefore, it can be shown that the production of acidifier is sufficient that the apple contain from 10,0% to 13,9% soluble substances, at this stage they have 7-12,2% sugars and have titratable acidity of 1,7 to 3,0%, polyphenolic substances accumulate 200 mg/dm^3 in white varieties and 500 mg/dm^3 in red varieties.

Conclusions

1. Were studied 4 apple varieties during their maturation, and were established optimal characteristics for natural acidifier.

2. The proposed process allows apples to be processed in the early maturation phase, previously unsolicited in the food industry, to obtain natural and concentrated apple acidifier.

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NUTRITIONAL AND BIOLOGICAL POTENTIAL IN MODERN USE OF GOJI FRUITS

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Abstract: The paper represents a study of the biological and nutritional potentials of Goji fruits. In our country, Goji fruits aren't as well-known as sea buckthorns and rose hip cultures, that's why there should be performed a better study of them. The reason of such highlighted attention for these berries is well-known by 6000 years of exploitation by Chinese, Tibetan and Indian phytotherapists, though there wasn't made any scientific researches. This work contains bibliographic studies of Goji berries composition and nutritional effect. Those are consumed in row and dry form and are highly requested in our country and are imported from foreign ones. Although for a better understanding of the effect of these fruits there must be performed a detailed study of the composition and the quality of this product in relation to the national and international standards.

Keywords: Goji berries, constituents, nutritional potentials, antioxidant levels

Introduction

In the food pyramid, fruits and vegetables, together with cereals, are represented as the basis of balanced nutrition, calling them the "basis" for proper nutrition and health. This group of foods is considered as the main source of vitamins (provitamin A, vitamins of group B, C, E etc.) and minerals, carbohydrates in the form of simple sugars (glucose, fructose, sucrose), polysaccharides, hemicelluloses), gums and pectic substances, in varying proportions, food fibers, micro and macronutrients, but also high water content, up to 94%.

Due to the fact that fruits and vegetables have a seasonal character but also the chemical composition they present, fruits and vegetables have a high degree of alteration. For these reasons, it is necessary to conserve fruits and vegetables [1].

For the normal exercise of daily activity and health, the body needs a certain amount of energy and complete nutrients (proteins, carbohydrates, lipids, vitamins, minerals, water), so different technologies have been developed for their conservatism for as long as possible in different forms so that they are available throughout the year. The preservation of food products through certain techniques and processes has generated human ingenuity

Goji is known for over 2000 years in Tibet and used in traditional medicine because of the many benefits to curative. Locals who drink different forms - as dried fruit, juice, tea or as an ingredient in dishes - live longer, healthier more energetic and even over 100 years.

It has been statistically proven that in this region the number of people older than 100 years is 16 times higher than in other regions of the world!

Although so many years was known properties of goji berries have been recognized only recently modern medicine.

Scientific research confirms the truth known 2000 years. Introduced to the US

market in 2007 only very briefly becomes super fruit of consumption Madonna, Elizabeth Hurley, Mischa Barton and other stars.

Goji fruit is the red berry obtained from two closely related plants, *Lycium chinense* and *Lycium barbarum*, naturally occurring in Asia, primarily in northwest China. The fruits from these species are considered interchangeable, though larger fruits are preferred and are more often found on plants of *L. barbarum*. *Lycium* is in the Solanaceae family that yields numerous foods, including some that are yellow to red fruits, such as peppers, tomatoes, and the cape gooseberry (a Peruvian species of *Physalis*) [2].

The Chinese name for the lycium plant is *gouqi* and for the fruits is *gouqizi* (*zi* is used to describe small fruits); the common name "wolfberry" comes about because the character *gou* is related to the one that means dog or wolf. The spiny shrub has also been called matrimony vine, for reasons long lost. Carl Linnaeus provided the genus name *Lycium* in 1753. He is responsible for the species name *barbarum*, while botanist Philip Miller described *Lycium chinense* just 15 years later. Lycium is extensively cultivated, especially in Ningxia Province, a small autonomous region formerly part of Gansu, with several production projects initiated since 1987. China now produces over 5 million kilograms of dried lycium fruit each year, most of it for domestic use. The fruits are dried with or without sulfur to yield the market herb, or the fresh fruits may be squeezed for their juice that is then concentrated to preserve it for future use in making various beverages.

Traditional and modern uses

Lycium fruit is depicted by Chinese doctors as having the properties of nourishing the blood, enriching the yin, tonifying the kidney and liver, and moistening the lungs, but its action of nourishing the yin of the kidney, and thereby enriching the yin of the liver, is the dominant presentation. It is applied in the treatment of such conditions as consumptive disease accompanied by thirst (includes early-onset diabetes and tuberculosis), dizziness, diminished visual acuity, and chronic cough. As a folk remedy, lycium fruit is best known as an aid to vision, a longevity aid, and a remedy for diabetes. With the intensive research work done in recent years, reliance on descriptions of centuries-old use of the herb is less important than for many other Chinese herbs, since much is now known about the chemical constituents and their potential health benefits.

Constituents and Actions

The secret of longevity that gives goji fruit consists of its high content of vitamins and minerals. Among the vitamins that are found in goji berries include: vitamin C, in very large quantities; vitamin A, is an excellent source of vitamin A; Vitamin E, which is found rarely in fruits, with a strong antioxidant effect; vitamins B1 (thiamine), B2 (riboflavin) and B6 are vital metabolic processes and help convert food into energy.

Goji fruits contain high amounts of carotenoids, which have a strong antioxidant effect and solar photoprotection. The most important carotenoids that are found in goji berries are: beta carotene which form vitamin A carotene content is higher than any other food known to date zeaxanthin that protects the retina; lutein important for the regeneration of DNA and all cells;

Goji berries have in their composition important micronutrients such as iron, calcium, potassium, copper, magnesium, phosphorus and germanium.

They are rich in selenium, a mineral element that reduces the toxicity of the drug and has antioxidant. Clinical studies have shown that goji berries, selenium and germanium by content are particularly useful in cancers.

Goji berries contain amino acids and proteins, including 8 essential amino acids that can not be synthesized by the body when food prosecutors.

What effect have goji berries? Antioxidant – Goji berry is the most powerful antioxidant of all existing food in the world. Antioxidants are substances that protect the body from the damaging effects of molecules called "free radicals" that accumulates in the body. Free radicals are true "enemies" of the organization, are unstable molecules derived either from metabolic processes essential, normal occurring in body or body from exposure to X-rays, smoke, toxic gases resulting from combustion. Due to the unstable free radical attack on healthy cells of the body. The chemicals capable of neutralizing free radicals called antioxidants.

Level of Goji berry antioxidants measured ORAC scale (ability to absorb oxygen free radicals) is 30,500 units, almost 20 times more than the oranges. Antioxidants reduce the aging
process.

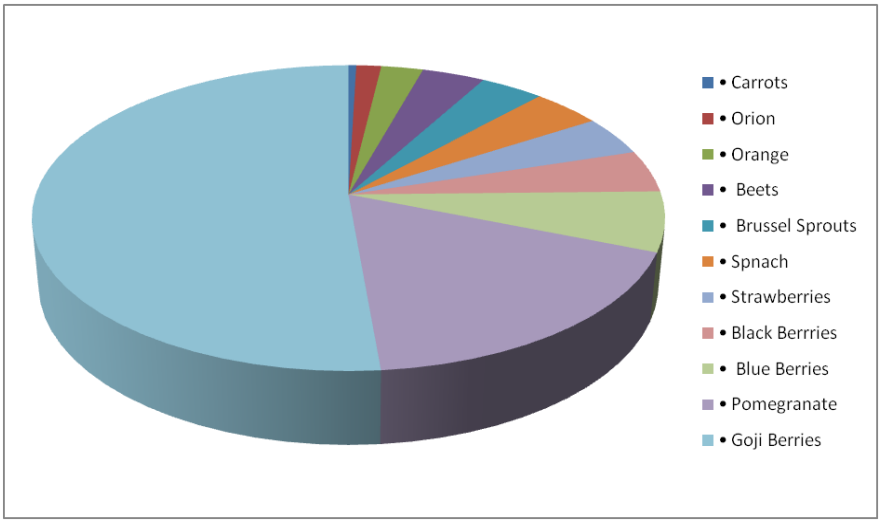

Fig. 1. *Food antioxidant levels*

Table 1. *Food antioxidant levels*

Nr. Ord.	Food type	Antioxidant levels
1.	**Carrots**	275
2.	**Orion**	875
3.	**Orange**	1475
4.	**Beets**	2210
5.	**Brussel Sprouts**	2225

Nr. Ord.	Food type	Antioxidant levels
6.	**Spinach**	2450
7.	**Strawberries**	2475
8.	**Black Berries**	2650
9.	**Blue Berries**	3750
10.	**Pomegranate**	10450
11.	**Goji Berries**	30500

The color components of lycium fruit are a group of carotenoids, which make up only 0.03–0.5% of the dried fruit [3]. The predominant carotenoid is zeaxanthin (see structure below), which is present mainly as zeaxanthin dipalmitate (also called physalien or physalin), comprising about one-third to one-half of the total carotenoids. Lycium fruit is considered one of the best food sources of zeaxanthin.

Zeaxanthin is a yellow pigment (an isomer of lutein and a derivative of β-carotene) produced in plants. It contributes to the color of corn, oranges, mangoes, and egg yolks (from dietary carotenoids), and it is also the main pigment of another medicinal fruit recently popularized in China: sea buckthorn (hippophae). When ingested, zeaxanthin accumulates in fatty tissues, but especially in the macula, a region of the retina. It is believed that by having a good supply of this compound, the macula is protected from degeneration, which can be induced by excessive sun exposure (UV light) and by other "oxidative" processes (2–4). Lutein, another yellow carotenoid that accumulates in the macula and provides similar protection, is an ingredient of yellow chrysanthemum flowers (*juhua*) that are often combined with lycium fruits in traditional Chinese herb formulas to benefit the eyes, including deteriorating vision that occurs with aging and may, in some cases, correspond to macular degeneration. The effective daily dose of these two carotenoids, from food and supplements, has been estimated to be about 10 mg.

The red carotenoids of lycium have not been fully analyzed. It is believed that part is due to lycopene, the major red pigment in tomatoes and capsicum fruits. The red portion of lycium has been designated as renieratene; the red color overwhelms the yellow of zeaxanthin and the small amount of β-carotene, though the fruits often display an orange tinge due to the yellow components.

Benefits of carotenoid intake are thought to mainly arise from prolonged use. Therefore, lycium fruit, as a source of zeaxanthin and other carotenoids, would be consumed regularly to complement dietary sources, boosting the amount of these components available from fruits and vegetables and egg yolks.

Another component of lycium is polysaccharides, chains of sugar molecules with high molecular weight (several hundred sugar molecules per chain). It is estimated that 5-8% of the dried fruits are these polysaccharides, though measures of the active polysaccharides are difficult to undertake, since differentiating functional long chains versus non-functional short chains is challenging; this figure for polysaccharide content is likely on the high side. Studies of the polysaccharides have indicated that there are four groups of them, each group having slightly different structures and molecular weights. Although referred to as polysaccharides, the functional immune-regulating substance is actually a polysaccharide-peptide mixture; the amino acid chains maintain a critical

structure for the polysaccharide.

The immunological impacts of polysaccharides have been the primary focus of study (10). One of the primary mechanisms of action for these large molecules may be that they appear to the immune system as though they were cell surface components of microorganisms, promoting activation of a response cascade involving interleukins (such as IL-2) that impact immune cells (such as T-cells). Since the plant polysaccharides are not the same as the structures on particular pathogens, but have a more poorly defined quality, the response is non-specific. It is possible that repeated exposure to large amounts of polysaccharides might result in a lessened response, so that this method of therapy is probably best suited to relatively short duration (e.g., a few weeks). Low dosage exposure may result in no immunological responses, since these polysaccharides are present in several foods in small amounts, and the immune system would be protected from reacting to ordinary exposure levels.

Extraction and isolation of polysaccharides in low concentration is simple, as they are soluble in hot water that is used as an extracting agent. Getting a high concentration of polysaccharides is a more significant task. The easiest method is to first produce a hot water extract of the herb (using more than one extraction to get most of the polysaccharides into solution), and then force the polysaccharides out of solution by adding alcohol, in which they are not soluble; then, the liquid is separated off and the residue is dried to produce the finished polysaccharide product. This method will also condense other large molecules. Although small amounts of highly purified polysaccharides can be produced for laboratory and clinical studies, at this time, commercial extracts containing 40% polysaccharides represent the highest concentration available, while 10–15% polysaccharide content from simple hot water extraction is more common.

A third constituent of interest is the amino-acid like substance betaine, which is related to the nutrient choline (betaine is an oxidized form of choline and is converted back to choline by the liver when it is ingested). Betaine was shown to protect the livers of laboratory animals from the impact of toxic chemicals; other pharmacologic studies have shown that it is an anticonvulsant, sedative, and vasodilator. It has been suggested that betaine could aid the treatment of various chronic liver diseases, such as non-alcoholic fatty liver disease. Betaine is found also in capsicum, silybum (the source of the liver-protective flavonoid silymarin), and beets (*Beta vulgaris*, from which betaine gets its name). The amount of betaine in lycium fruit, is about 1% (10), so to get a significant amount, a large dose of lycium fruit would need to be consumed (e.g., 20–30 grams).

The mild fragrance of the fruits is attributed to a small amount of volatile oils, mainly two sesquiterpenes: cyperone and solavetivone. The amount present does not have significant pharmacological functions when lycium is consumed in ordinary amounts. The fruit also contains about 0.15% flavonoids, including rutin and chlorogenic acid.

Typical Dosing of Lycium Fruit

Lycium fruit is most often incorporated into complex herb formulas, in which its dose is in the range of 6–18 grams. Since other herbs in the formula could contribute significant amounts of compounds such as carotenoids and polysaccharides, this dose may be insufficient if lycium is used as a single herb remedy instead. There have been a few reports of using lycium fruit as a single herb or as a major component in a small

recipe. For example, in the treatment of atrophic gastritis, one of the recommended therapies is to consume lycium fruits, 10 grams each time, twice daily. In folk medicine, for diabetes it is recommended to consume 10 grams each time, two or three times daily [4]. As a food therapy for strengthening the elderly or debilitated, it is cooked with lean pork, bamboo shoots, and typical Chinese flavorings, and the daily dose would be 15–30 grams . As a dietary supplement for eye health [3] a dose of 15 grams per day was deemed beneficial in supplying adequate zeaxanthin (estimated at 3 mg/day). A simple tea for decreased visual perception is made from 20 grams lycium fruit as a daily dose. Thus, the dose in complex formulas of 6–18 grams shifts to a dose of 15–30 grams when it is the main herb, or about a 2.5-fold increase in the dose.

Comparing this juice to the lycium fruit described in traditional Chinese medicine is somewhat difficult. The manufacturer indicates: "One liter of Himalayan Goji Juice contains the polysaccharides equivalent of 2.2 pounds [1 kg] of fresh goji berries." Typically, a dried berry is about one-sixth the weight of a fresh berry (that is, the moisture content of the fresh fruit is about 83%), so a dose of 2–4 ounces of the juice would correspond to 10–20 grams of the dried fruit, which is in the correct dosage range in accordance with traditional recommendations, though higher doses have been used in some applications. Dried lycium fruit can be eaten whole (sold most in one pound bags, about 23–46 doses of 10–20 grams), and can be obtained at a lower cost because it is in crude form. The makers of this juice, and other similar products, proclaim unique benefits to the juice, mainly because of specific selection of berries, compared to the dried lycium fruits readily available from Chinese herb and grocery stores. The juice is a convenient form of administration and also provides other juices (that yield a more acceptable flavor), so the extra expense may be considered worthwhile, while there is little evidence that would support a contention of differing therapeutic effect if similar amounts of the lycium fruit are obtained from drinking the juice or from eating the dried fruits or taking supplements made from lycium extracts.

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OPTIMIZATION OF THE COMPOSITION OF FILLINGS WITH HEAT-STABLE PROPERTIES

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Summary: The studies belong to a food industry and apply for the determination of composition, parameters quantitative and functional technological of the composition for the heat-stable fillings, which are used in fabrication of bakery and confectionery products. Criterion of heat-stability will be represented by BI (bakery index), which should be in interval 90-100 units for the heat-stable fillings, 80-90 units for the fillings with average heat-stability and under 80 units for heat-unstable fillings. Food fibers like a pectin, starch, gums and other may give heat-stable properties to fillings.

Key words: fruit filling, heat-stable, gellan gum, starch

It is known a composition of filling heat-stable which included raw materials from fruits and vegetables, sugar, starch, gellan gum and citric acid [1]. Difficulty of this invention there is impossibility in determination the optimal amounts of the ingredients introduced and necessity to establish these amounts by numerous experimental pulping. Missing of a theoretical version to establish the optimal amounts of raw materials for the production of fillings heat-stable can lead to economical losses of the producer due to the excess of the number of stabilizing introduced, as well as the deterioration of the quality of the final product.

The objective of the invention consists in the possibility of choosing the optimal quantity of ingredients stipulated in recipe for heat-stable fillings to the achieve the heat-stable and rheological properties necessary to obtain the finished product of high quality.

Utilization of mathematical models will solve two problems: first of all, from the wide range of raw materials to determine the optimal quantities of stabilizers for proposed heat-stable fillings, as well as to check the possibility of obtaining heat-stable filling for concrete values of stabilizers.

The heat-stable filling can be used in the baking process at high temperatures in the products of bakery and confectionery closed, as well as in the open products.

Through to the mathematical models developed, it will be possible to select the mass fraction of the required dry substance of the filling ready for the use, to choose the optimal quantity of stabilizers in the predeterminated range, ensuring heat-stable, rheological characteristics and high quality of the finished product.

Creation of the heat-stable filling in the wide range of dry substances with predetermined properties according to the invention provides establishing of the composition according to the optimal quantity of ingredients introduced. Not only the quality of the finished product will be controlled, taking into account the rheological parameters of the filling, but also will be supervising all technological processes of the produce of the fillings with the desired qualities.

The proposed objective is solved by using mathematical models applied to optimize composition of heat-stable fillings containing raw materials like a fruits, berries or vegetables, sugar, starch, gellan gum and citric acid.

For the elaboration of the technology of heat-stable fillings of fruits, berries and vegetables was used the planned experiment 2^3 [2]. The realization of this experiment allowed to obtain mathematical models with the presentation of the variables in natural values, for the search for the optimal solution that would ensure minimal material expenses for the production of heat-stable fillings.

The initial matrix of the mathematical form of the connection between the response functions Y (BI - the bakery index, V - viscosity) and the inputs investigated X (SU - dry substance content, G - gellan gum content and A – starch content) is given by the following formula:

$$Y = b_0 + \sum_{i=1}^{k} b_i x_i + \sum_{i \neq j} b_{ij} x_i x_j + \sum_{i=1}^{k} b_{ii} x_i^2 + \ldots\ldots \quad (1),$$

where:

Y – response function;

x_i – inputs investigated;

b_0, b_i, b_{ij} – coefficients of the equation.

For the determination of the possibility of selecting the optimized filling composition with established properties are investigated the following response functions - the heat-stable and the viscosity of the filling as response functions that depend on three input factors: the dry substance content of filling, the starch content and gellan gum content introduced into the filling composition:

$$BI = f\,(A, G, SU);$$
$$V = f\,(G, A, SU).$$

Based on the planned experiment on developing the technology of heat-stable fillings from fruits, berries and vegetables, in order to search for the optimal solution that would ensure minimal material consumption, adequate regression models with 5% significance were obtained, subsequently transformed into interpolation formulas with the presentation of the variables in natural values, which are presented by the following mathematical formulas 2 and 3:

$$BI = 59{,}65 - 4{,}76 \cdot A - 85{,}26 \cdot G + 0{,}33 \cdot SU + 49{,}19 \cdot A \cdot G + 0{,}12 \cdot A \cdot SU + 0{,}22 \cdot G \cdot SU - 0{,}82 \cdot A^2 \cdot G \cdot SU + 290{,}87 \cdot G^2 - 189{,}69 \cdot G^3 - 0{,}0087 \cdot SU^2 \quad (2)$$

$$V = -86{,}43 - 39{,}5 \cdot A + 774{,}62 \cdot G + 1{,}40 \cdot SU + 422{,}96 \cdot A \cdot G + 0{,}65 \cdot A \cdot SU - 8{,}26 \cdot G \cdot SU - 6{,}96 \cdot A \cdot G \cdot SU \quad (3)$$

where
BI – bakery index, units;
G – gellan gum content, kg, in the interval 0,1…1,0;
A – starch content, kg, in the interval 0,5…1,0;
SU – dry substance content, %, in the interval 30...65;
V – dinamic viscosity of filling, Pa·s (at shear speed s^{-1}).

At the following ratio per 100 kg of finished product,% by weight: raw material of fruits, berries or vegetables from 45.0 to 50.0; sugar from 20.2 to 57.1; starch from 0.5 to 1.0; gellan gum from 0.1 to 1.0 and citric acid from 0.1 to 0.3.

In the filling proposed like an agglutinant, gelling and stabilizing agent are used gelan gum (E 418) and starches (E1400-E1405, E1411-E1414) which are approved for use in the world and native practices for production of food, including jams, jellies, fillings, etc.

The recipe of the composition allows to create heat-stable fillings over a wide range of soluble dry substances - from 30% to 65%.

The developed mathematical model allows to determine the mass fractions of the components, which ensure their established value in the recipe for the production of heat-stable fillings, as well as determination the heat-stable of the fillings knowing values of the initial components of the recipe in the proposed ranges.

Additionally, the fillings may also contain ascorbic acid, which will allow to raise the nutritional value of the finished product.

The result of the invention is the creation of a mechanism for optimizing the composition of fillings with guaranteed heat-stable properties due to the mathematical models elaborated on the calculation of the bakery index, taking into account the interactions of the ingredients as well as the dynamic viscosity of the finished product. Mathematical models have a graphical interface of user that allows the initial data to be entered within the declared range to obtain the optimal result.

The criterion of heat-stable is the BI index, which is determined by known methods which involve measuring the increase in relative dimensions of the filling sample after baking in open form on a dough or dense filter paper.

Knowing the value of viscosity is a very important thing for food industry specialists in solving technical tasks in the production of fillings and choosing the optimal variant of technological equipment.

The significance of the correlation coefficients of the developed models is verified according to the standard criterion t -Student. The adequancy of the models is confirmed by the criterion Fisher.

Table 1 presents the results of comparative determinations of the heat-stable of the fillings obtained experimental, as well as their values calculated according to the developed models BI = f (A, G, SU) in the wide range of technological parameters investigated.

Table 1 *Results of comparative determinations of heat-stable fillings*

Nr. exp.	Content		SU (dry substance), %	BI (bakery index), units		Deviation of the values calculated by the experimental ones	
	gellan gum, %	starch, %		calculated	experi-mentally	absolut error, units	relativ error, %
1.	0,67	0,3	30	90,59	90,60	0,01	0,01
2.	0,1	0,5	40	55,66	55,56	0,1	0,18
3.	0,1	1	40	55,68	55,56	0,12	0,22
4.	1	0,5	40	100	100	0	0
5.	1	1	40	100	100	0	0
6.	0,44	1	60	59,01	58,82	0,19	0,32
7.	0,9	0,5	65	89,46	89,66	0,20	0,22
8.	0,1	0,5	70	38,7	38,46	0,24	0,62
9.	0,1	1	70	38,67	38,46	0,21	0,54
10.	0,45	1	70	50,24	50	0,24	0,48
11.	0	1	70	43,76	43,48	0,28	0,64
12.	1	0,5	70	83,51	83,33	0,18	0,22
13.	1	1	70	66,87	66,67	0,2	0,3

The obtained data denotes a high degree of correlation of the experimental data with those calculated using the developed regression equation, which allows to establish the necessary quantities for the true range of the technological parameters regarding the production of fillings with guaranteed thermostable properties.

Table 2 presents the experimental and theoretical results regarding determination of viscosity of fillings V = *f* (G, A, SU) with heat-stable properties established in the wide range of technological parameters studied.

Table 2. *The experimental and theoretical results regarding determination of viscosity of fillings*

Nr. exp	Content gellan gum, %	Content starch, %	SU, %	Dinamic viscosity of filling, Pa·s (at shear speed s^{-1})		Error, %	
				experimental	calculated	absolut, units	relativ %
1.	1	1	40	545,0	544,9	0,15	0,02
2.	1	0,5	40	479,4	479,3	0,08	0,02
3.	0,1	1	40	15,3	15,0	0,35	1,96
4.	0,1	0,5	40	14,7	14,5	0,2	1,36
5.	1	1	70	150	149,8	0,2	0,12
6.	1	0,5	70	179	178,9	0,1	0,06
7.	0,1	1	70	31,4	30,8	0,6	1,91
8.	0,1	0,5	70	31,4	31,0	0,4	1,27

Absolute errors are in the range of 0.08 ... 0.6 units and the relative errors do not exceed 2%, but the higher the viscosity - the error margin of the results is less.

The results show the coincidence of the obtained values, which indicates the adequacy of the model received and the possibility of using it to optimize the composition of the fillings.

Examples for determining the composition and technological parameters of heat-stable fillings:

Example 1

Initial data: heat-stable apple filling with bakery index BI = 90 units, starch content A = 0.6% and content of dry substance SU = 30%.

It is necessary to determine the concentration of gellan gum G,%.

According with formula 2 we determine the content of gellan gum G,%:

when BI = 90 ⇨ G = 0.6%.

Respectively, when the starch content is 0.6% and the content of gellan gum 0.6% - the heat-stable of the filling with the mass fraction of dry substance 30% will be 90 units.

The viscosity of the prepared filling is determined according to formula 3:

$$V(G=0.6) = -86{,}43 - 39{,}5\cdot0{,}6 + 774{,}62\cdot0{,}6 + 1{,}40\cdot30 + 422{,}96\cdot0{,}6\cdot0{,}6 + 0{,}65\cdot0{,}6\cdot30 - 8{,}26\cdot0{,}6\cdot30 - 6{,}96\cdot0{,}6\cdot0{,}6\cdot30 = 336{,}8 \text{ (Pa·s)}.$$

Therefore, when the starch content is 0.6% and the content of gellan gum 0.6%, the viscosity of the filling with the content of dry substance 30% will be 337 Pa·s.

Example 2

Initial data: heat-stable apricot filling with bakery index BI = 90÷100 units, starch content A = 1.0% and content of dry substance SU = 40%.

It is necessary to determine the concentration of gellan gum G, %.

According with formula 2 we determine the content of gellan gum G, %:

- when BI = 90 ⇨ G = 0.64%.
- when BI = 100 ⇨ G = 0.80%.

Respectively, when the starch content is 1.0% and the content of gellan gum 0.64% - 0.80% the heat-stable of the filling with the content of dry substance 40% will be in interval 90...100 units.

The viscosity of the prepared filling is determined according to formula 3:

$V_{(SU\ 40\%)} = 332{,}9$ (Pa·s).

$V_{(A=0{,}65)} = 427{,}1$ (Pa·s).

Therefore, when the starch content is 1.0% and the content of gellan gum from 0.64% to 0.80%, the viscosity of the filling with the content of dry substance 40% will be in the limits 337...427 Pa·s.

Example 3

Initial data: heat-stable plum filling with content of dry substance SU = 65.0%, content of gellan gum G = 0,9 and starch content A = 0.5%

It is necessary to determine the heat-stable of filling by determining of bakery index BI.

According to formula 2 we determine the index BI: BI = 90

Respectively, when the content of gellan gum is 0.9% and the starch content of 0.5% - the filling with the content of dry substance 65.0% will have heat-stable properties.

The viscosity of the prepared filling is determined according to formula 3:

$V_{(A=0,5)} = 206,6$ (Pa·s).

Therefore, when the content og gellan gum is 0.9% and the starch content will be 0.5% the viscosity of the filling with the content of dry substance 65% will be 207 Pa s.

The mathematical models obtained allow to quickly and accurately select the optimal option from a wide range of options to determine optimal values of the ingredients in the composition of fillings, which ensures the economy in fabrication of finished product with declared established properties.

The developed methodology of determination the optimal composition of heat-stable fillings received a patent - MD 821 Z 2015.05.31. The authors of the patent were awarded with a Diploma and the Gold Medal in recognition of high scientific contribution and loyalty to the XXII –th International Salon of Research, Innovation and Technological Transfer INVENTICA 2018, Iasi, Romania, 27-29 June 2018

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POSSIBILITIES OF WALNUT VALORISATION THROUGH WALNUT MILK ACIDIC BEVERAGE OBTENTION

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Abstract: The purpose of the paper was to obtain the walnut milk fermented beverage using as addition kefir and yogurt. It has been demonstrated the possibility of producing fermented beverages based on walnut milk. The obtained products have a low energetic value, sensory properties and physico-chemical characteristics specific to raw material and used additions different from those of fermented cow's milk products but acceptable for consumption.

Keywords: walnuts, fermentation, kefir, yogurt, acidity, syneresis.

Introduction

The so-called vegetable milks are in the spotlight thanks to their lactose-free, animal protein-free and cholesterol-free features that fit well with the current demand for healthy food products (*Bernat et al., 2014)*. There is an increasing demand for non-dairy probiotic foods (both fermented and non-fermented) including fruit and vegetable juices, soy and certain cereal products due to vegetarianism, lactose intolerance and dairy allergies, as well as interest in low cholesterol foods. (*Ranadheera et al., 2017).* The value of fermented foods is largely associated with the presence of probiotic bacteria [*Ruas-Madiedo et al., 2002*]. They are beneficial in that they favor the balance of intestinal microflora, inhibit the growth of harmful bacteria, promote digestion, stimulate immune function and increase resistance to infection (*Ruas-Madiedo et al., 2002)*.This is why the objective of this study was to enlarge the variety of plant-fermented beverages, using walnut milk as raw material. The development and further increase in demand of such products would have an extra advantage, which could be of economic interest for many countries: the raw material they derive from (nuts, soy, etc.) do not generally require specific soil nor climatic conditions, they are able to adapt to different climates although, of course, the productivity might change (*Osca, 2007; Coniglio, 2008*). For example, walnut is one of the oldest fruit species present in the Republic of Moldova and it always had special economic and social significance. It is also appreciated for its high nutritional and biological value. A diet rich in walnuts will provide our body with qualitative fats, essential amino acids and phytochemicals as polyphenols (*Bernic et al. 2007; Popovici C., 2013; Pintea et al., 2015, Jiménez-Colmenero et al., 2010*).

Materials and methods

Materials

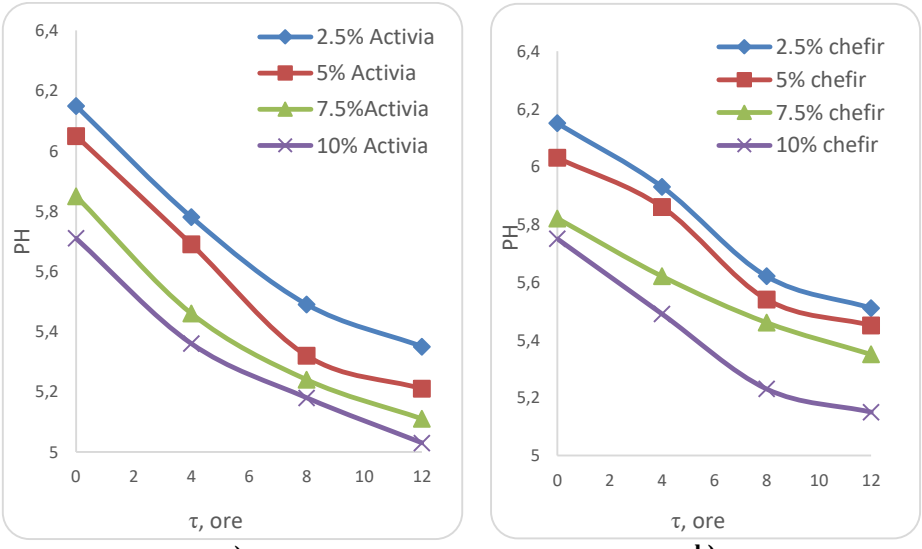
For the production of fermented beverage based on walnuts milk, as a fermenting agent was used the complex *7 Bacterii lactice,* containing such bacterial species as *Lactobacillus casei, Lactobacillus rhamnosus, Lactobacillus acidophilus, Bifidobacterium Bifidum, Streptococcus thermophylus, Bifidobacterium longum, Lactobacillus bulgaricus*, as well as yogurt and kefir lactic bacteria.

Methods

Since the carbohydrate content in the walnut core is low, and for the fermentation processes the carbohydrate substrate is necessary, a new addition of yoghurt / kefir has been also added to the recipe. Samples of walnut milk fermented beverage were prepared in duplicate by addition to walnut milk of 2.5; 5.0; 7.5 and 10.0 g of Activia yogurt or, respectively, kefir. At a volume of 100 mL of walnut milk, a probiotic bacteria mixture capsule was also added. The fermentation process was performed at 37 ° C for 12 hours. In the initial samples and during fermentation (after 4, 8 and 12 hours of fermentation) the pH values were determined, and the titratable acidity (g lactic acid / 100 mL). After 12 hours of fermentation, samples were stored at + 4 + 6 ° C for 14 days. The evolution of pH and titratable acidity was monitored throughout the storage period.

Results

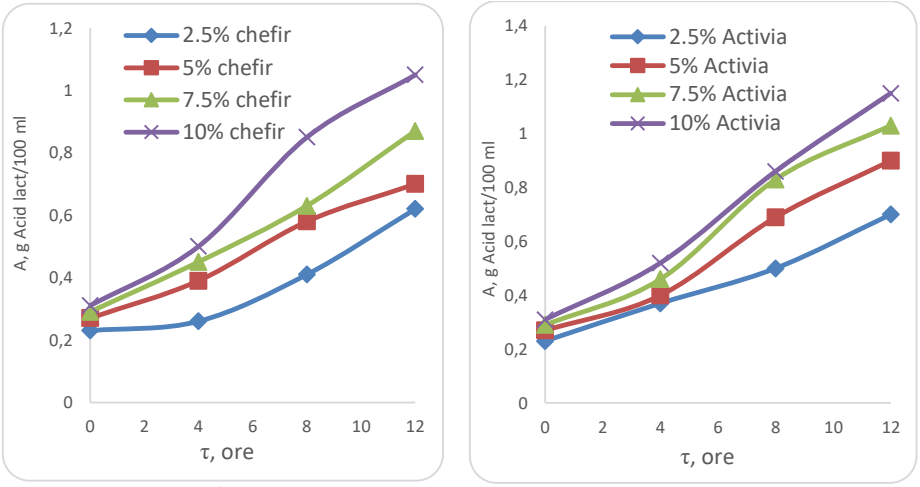
As shown in Figure 1, the fermentation of the "Activia" yogurt addition samples resulted in a higher pH reduction compared to the samples fermented with kefir. After 12 hours of fermentation, the final pH values were virtually similar (pH 5.15 for fermented samples with kefir and pH 5.03 for those fermented with yogurt "Activia").



a) **b)**

Figure 1. *Product pH change during fermentation of walnut milk with (a) "Activia" yogurt and (b) with kefir*

Increasing the dose of added yogurt has led to increased acidity and decreased pH. Titratable acidity of the samples fermented with added yogurt "Activia" is comparable to samples fermented with the addition of kefir. After 12 hours of fermentation, the titratable acidity was 1.05 g lactic acid 100 mL^{-1} for the beverage with 10.0% added kefir and 1.15 g lactic acid 100 mL^{-1} for the same fermented beverage with added yogurt "Activia" (figure 2).



a) **b)**

Figure 2. *Variation of the product titratable acidity during the fermentation of walnut milk with addition of (a) kefir and (b) "Activia" yoghurt, g acid lactic 100 mL^{-1}*

Organoleptic examination of fermented walnut milk

Sensory evaluation was performed after 24 hours of storage at 4 ° C. Fermented beverage samples were evaluated in a sensory laboratory in natural light. The attributes of color, flavor, taste, texture and global acceptability have been appreciated. The mean scores for the texture of the samples of fermented products with 10% added Activia/kefir yoghurt were significantly higher and had the highest acceptability compared to the low-yield fermented sample (2.5%) of the same additions.

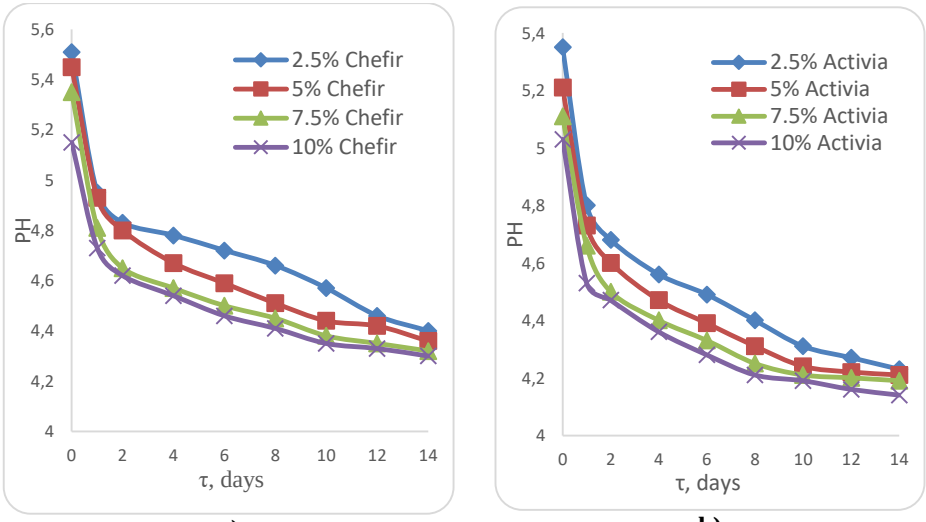
Evolution of physicochemical characteristics of walnut acidic beverage samples during cold storage

After 14 days of storage at 4 ° C, the pH values (Figure 3) and titratable acidity (Figure 4) changed more pronounced in the first two days of storage and less essential in the next days. At the same time, these changes are not major, probably due to the buffer effect of proteins, sugars and other components present in the nut core and in the fermented beverage.

Evolution of the syneresis.

Fermented dairy products are dispersed systems structured as gels. Their chemical composition reflects their physicochemical properties only at constitutive subunits distributed in assemblies with varying degrees of order.

Sineresis is a complex biochemical and physicochemical phenomenon, still little known, and is a thermodynamic property of the gels, which consists in reducing the volume of the gel caused by the expulsion of a quantity of the solvent with its aging. The intensity and depth of syneresis acidic dairy products depends largely on the internal surface of the solid phase, and porosity (space occupied by whey) and gel permeation (*Mahaut et al., 2000*). The results characterizing the values of the syneresis indexes of the analyzed product samples are shown in Figures 5 – 6.



a) **b)**

Figure 3. *pH variation during walnut acidic beverage storage ((a) – with kefir addition, (b) – with added Activia yogurt)*

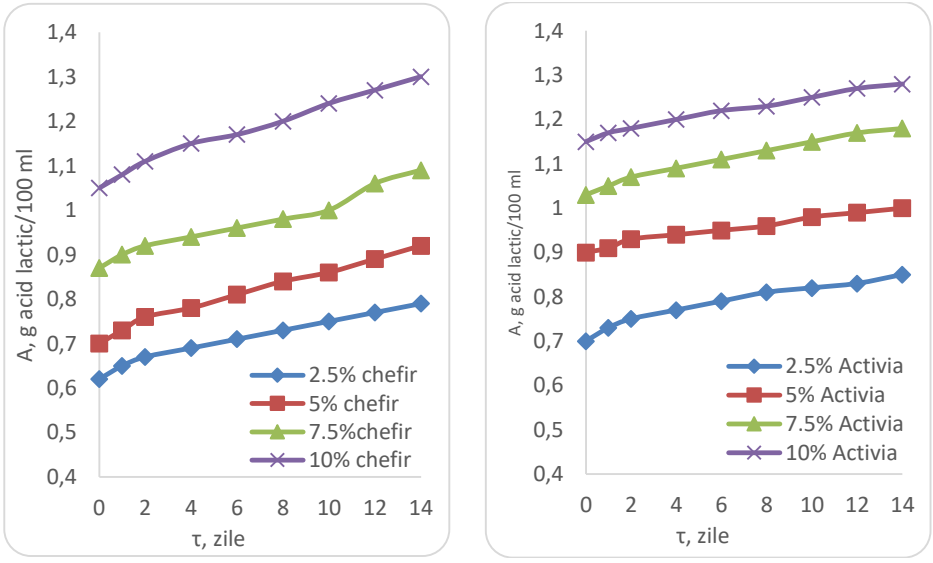


Figure 4. *Titrable acidity variation during walnut acidic beverage storage ((a) – with kefir addition, (b) – with added Activia yogurt)g acid lactic/100 mL*

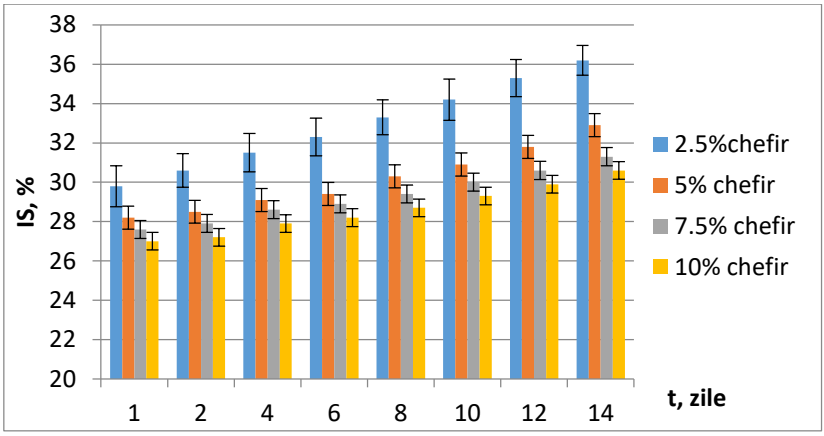


Figure 5. *Variation in the syneresis index of fermented walnut milk with added kefir during storage*

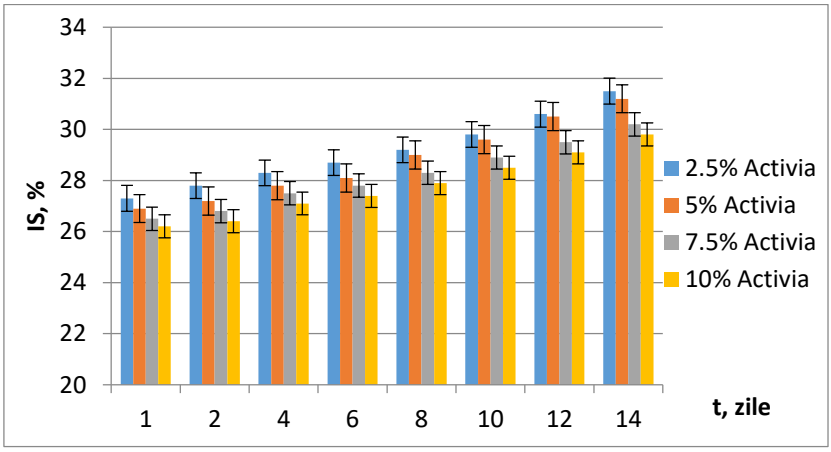


Figure 6. *Variation in the syneresis index of fermented walnut milk with added Activia yogurt during storage*

In all cases, the value of the syneresis index of fermented walnut milk products is directly related to their storage period and in inverse relationship with the administered dose. At the same time, the syneresis process is more pronounced for fermented products with added kefir and lower for those fermented with *"Activia"* yogurt.

Conclusion

The development of walnut products, fermented by means of probiotic bacteria, fully meets the current trend towards an increased consumer demand for healthier products. During the studies it has been demonstrated the possibility of using walnut kore in the obtention of plant fermented beverage. During the obtention technology of these products, there are some issues, mainly related to the product's physical stability during its entire shelf-life. Concerning this it is recomended to continue the studies in the direction of in the direction of improving the stability of these products.

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QUALITY INDICATORS OF SEMI-PRODUCTS FROM MEAT WITH VEGETABLE COMPONENTS

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Summary: This paper includes the results of the study of replacing mutton and poultry meat with oilseeds grots of walnuts, pumpkin, sesame and wheat fiber, for the production of semi-products of meat preserved by cold. They were determined quality indicators: organoleptic and physico-chemical experimental evidence. It has been found that replacing meat with vegetable component – oilseeds groats and wheat fiber enrich the semi-products with nutrients due to high content of protein and fat, which increases the nutritional value of the finished product; reduces the moisture content and water-binding capacity. Quality indicators during preservation does not change. Organoleptic indicators improve by combining the taste and smell of the semi-products.

Key-words: semi-products of meat, vegetable ingredients, oilseeds groats, organoleptic indicators, physico-chemical indicators.

Introduction

Human diet characterized by protein insuficients, vitamins, macro- and microelements. To maintain efficiency in this conditions is important to pay attention to the contribution of different nutritional substances in everyday nutrition [1]. It is important to develope new recipes and food technologies.

Growing production of combinated products in many countries is not only linked with raw materials of animal origin, but also rational use of proteins from vegetable raw materials. At present, a new idea in use of proteins is the production of meat products based on raw materials combined for meat and vegetable protein, received from various sources, provided that their mutual enrichment compositions, a combination of functional and technological properties, increase the biological improve organoleptic parameters of the finished products, reducing the cost of production [2].

Scientific and patent literature studied was found in recent years in many countries has increased the demand for sheep meat. Mutton is produced in large quantities in the following countries: Australia, New Zeilandă, Turkey, USA, Argentina, France, CIS [3, 4, 5, 6, 7].

Manufacture of mutton on an industrial scale is not yet adequately developed. One reason for this is the limited range of products of sheep. While in Moldova there is every reason and can expect a sharp rise in production assortment of meat products from sheep and lambs [7].

In this respect, technological development and recipes for new types of meat products from sheep becomes current.

The purpose of this study is to examine the quality indicators of a range of semi-finished products from mincedmeat sheep and poultry of „mici" with vegetable components namely oilseeds from different seeds.

Materials and methods

The research has been used domestic raw materials of animal origin meat mutton (yearling) - and poultry meat (chicken breast).

As vegetable components were used: oilseeds groats from walnuts (FTA UTM), pumpkin and sesame (SRL Rozavena.Doctor Oil) and wheat fibers Unicell®WF 200 (Ingredient Ltd.).

Based on the previous research conducted in 2015, have been developed recipes minced meat- sheep and paultry type sausage' "with the addition of nut seeds in the amount of 7% and 2% dietary fiber from wheat Unicell®WF 200 [8]. The ratio of mutton and poultry meat, the amount of added oilseeds groats has been determined in our previous research [8, 9].

In the paper, the manufacturing recipes were proposed of „mici" from mutton meat (70%) and poultry meat (30%) with added 7% oilseeds walnuts and 2% wheat fibers Unicell®WF 200. According to these recipes experimental samples of „mici" from mutton and poultry meat were prepared.

Therefore, the experimental batch of „mici" from mutton and poultry meat has been prepared containing: Control sample („mici" from mutton and poultry meat) without oilseeds groats and wheat fibers and three variants containing 7% with oilseeds groats of walnuts, pumpkin, sesame and 2% wheat fiber Unicell®WF 200.

The prepared samples packed in polystyrene casserole and foil sealed with stretch were put in the refrigerator for storage of food biotechnology laboratory (Public Institution Scientific-Practical Institute of Horticulture and Food Technologies) to the next regime: refrigerated temperature 0 ... + 4 ° C, Waer = 75 ... 78%, for 5 days.

The sensory analysis of "small sheep and poultry" samples with the addition of oilseeds groats from walnuts, pumpkin and sesame followed by maturation for 24 hours at 0 ... + 4 °C. Then the samples were subjected to heat treatment by roasting in an electric oven and popped for sensory analysis.

Based on elaborated recipes, 4 variants of samples of mutton meat (70%) and poultry meat (30%) with 7% oilseeds groats and 2% wheat fibers were prepared.

In the semi-products with vegetable components were determined according to standard methods the following indicators: organoleptic indicators: the exterior aspect, the aspect in section, smell and taste, consistency and succulence (table 1 and 2, figure 1); physico-chemical indicators: the content of protein by the Kjeldahl method (GOST 25011), the content of fat by the Soxhlet method (SM SR ISO 1444), the content of salt by Mohr's method (GOST 9957), the moisture content by drying in the oven (SM SR ISO 1442), the ability of binding water by pressing [10] (tab. 3, fig. 2).

Results and discussions

Indices organoleptic in the experimental samples were evaluated by the method described in quality (tab. 1), by the method of assessment points, applying the scale of 5 (tab. 2) and by means of the profile in the form of profilograme (fig. 1).

As a result of sensorial evaluation of the obtained experimental samples (tab. 1), it can be concluded that the samples with different grits of the blank. Samples with a meal taste and odor, pleasant. Also, nut seeds experimental sample has a fine consistency, oily, smell and taste noble, particularly other samples.

Table 1. *Organoleptic indices of experimental samples - „mici" of mutton and poultry meat with 7% oilseeds groats and 2% wheat fiber*

Indicators	Characteristic. Sample			
	Control sample	**Sample with oilseeds groats from walnuts and wheat fibers**	**Sample with oilseeds groats from pumpkin and wheat fibers**	**Sample with oilseeds groats from sesame and wheat fibers**
The exterior aspect	Round cylinders 8-10 cm in length with a diameter of 3 to 3,5 cm. Smooth surface without cracks and broken edges			
The aspect in section	Composition kneaded thoroughly and evenly mixed			
Smell and taste	Raw - in accordance with quality raw material used			
	Able roasted smell characteristic of this product,			
	with pleasant aroma of spices	Fragrant specific meal nuts	Pumpkin grits with specific nice smell	There is a weak specific smell expressed
Consistency	Raw			
	Elastic, dense	Elastic	Elastic	Elastic
	Able roasted			
	The farm	Delicate, oily	Thick	Thick
Succulence	Able roasted			
	Reduced succulence	Succulents	Succulents	Succulents

Table 2. *Sensory analysis of the semi-products - „mici" of mutton and poultry meat with added 7% oilseeds groats and 2% wheat fibers*

№	The name of the sample	The exterior aspect	The aspect in the section	Smell and taste	Consistency	Succulence	Overall average note
1.	**Control sample**	4,83	4,90	4,80	4,81	4,49	4,77
2.	**Sample with oilseeds groats from walnuts and wheat fibers**	4,89	4,91	4,91	4,91	4,74	4,87
3.	**Sample with oilseeds groats from pumpkin and wheat fibers**	4,89	4,90	4,87	4,84	4,70	4,84
4.	**Sample with oilseeds groats from sesame and wheat fibers**	4,87	4,87	4,84	4,79	4,54	4,80

The results (tab. 2) after heat treatment (roasting) finds that all the samples have good organoleptic characteristics. But the best are samples containing 7% oilseeds groats from walnuts and 2% wheat fiber, with overall average notte 4,87. We note that the tasting committee appreciated the best organoleptic characteristics for the sample „mici" of mutton and poultry meat with the addition of oilseeds groats from walnuts.

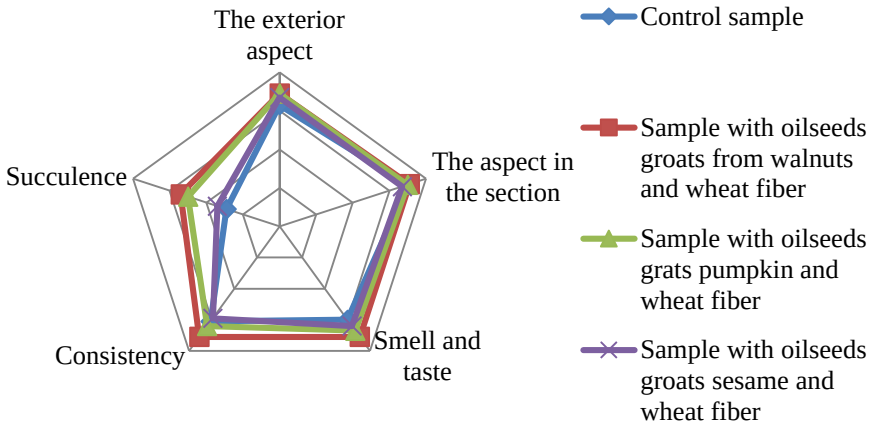

Fig. 1. *Profilograme of semi-products - „mici" of mutton and poultry meat with oilseeds groats - 7% and wheat fibers - 2% after heat treatment*

From profilograme it is clearly observed that all samples with the addition of nuts and pumpkin seeds is juicier, has a more elastic texture, taste and smell more pronounced appearance more attractive.

Table 3. *Changing the physico-chemical indicators „mici" of mutton and poultry meat with 7% oilseeds groats and 2% wheat fiber*

№	Name of sample	The mass fraction of moisture, %				The mass fraction of salt, %	The mass fraction of protein, %	The fat mass fraction, %
		0 hours	24 hours	48 hours	72 hours	0 hours	0 hours	0 hours
1.	**Control sample**	86,6± 0,1	84,2± 0,1	79,5± 0,1	76,9± 0,1	1,2 ± 0,1	16,3 ± 0,3	6,1 ± 0,2
2.	**Sample with oilseeds groats walnuts and wheat fibers**	76,4± 0,1	76,3± 0,1	76,2± 0,1	76,2± 0,1	1,2 ± 0,1	17,6 ± 0,3	7,7 ± 0,3
3.	**Sample with oilseeds groats pumpkin and wheat fibers**	77,7± 0,1	77,7± 0,1	77,1± 0,1	76,7± 0,1	1,1 ± 0,2	18,4 ± 0,3	6,5 ± 0,5
4.	**Sample with sesame seedsoil and dietary fiber**	76.5± 0.1	76.4± 0.1	76.3± 0.1	76.1± 0.1	1.2 ± 0.1	18.8 ± 0.3	6.8 ± 0.2

Analysis of experimental data in tab. 3 allow the grist finding that the addition of oilseeds groats from walnuts, pumpkin, sesame and wheat fibers in the mincemeat a „mici" reduces the mass fraction of moisture with 11,8%, 10,3% and 11,7% compared with the control sample.

Storage of semi-products of meat - „mici" of mutton and poultry meat kept to 0 ... + 4°C for 72 hours resulting in a reduction of moisture in the product value of 11,2% for the control sample, the sample with the oilseeds groats from walnuts 0,3%, the sample with

the oilseeds groats from pumpkin 1,3%, the sample with oilseeds groats from sesame 0,5%, based on the initial value. Therefore, replacing the starting material of animal origin plant components reduce altering the moisture content during storage and retain quality finished product.

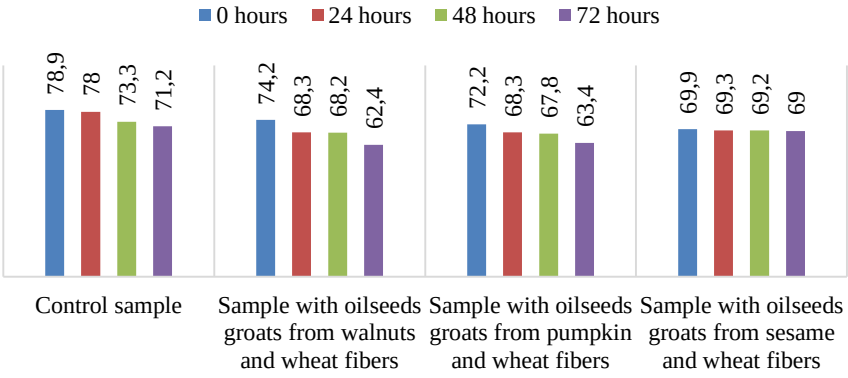

Fig. 2. *Changing the water binding capacity in the „mici" of mutton and poultry meat with 7% oilseeds groats and 2% wheat fibers*

Addition of oilseeds groats taken in the research of the water-binding capacity in the „mici" of mutton and poultry meat in different measures. The addition of oilseeds groats and wheat fibers to water-binding capacity decreases with 6% for the sample with oilseeds groats from walnuts, 8,5% for the sample with oilseeds groats from pumpkin and 15,2% for the sample with oilseeds groats from sesame (fig. 2).

Storing samples of („mici" and poultry meat) refrigerated for 72 hours show decrease the water binding capacity value in all samples. The level of decrease in the water binding capacity ranges from 9,8% for the witness sample, nutmeg 15,9%, 12,2% oilseeds groats from pumpkin, and 1,3% oilseeds groats from sesame, compared to the initial.

The mass fraction of salt for food does not change and remains at the level of the amount used according to the recipe of manufacturing – 1,1 ÷ 1,2%.

Oilseed proteins (albumins, globulins, gliadins, glutelins) during operations of extracting the fatty materials in the grist passes almost entirely. Because of this oilseeds groats rich minced meat semi-products with nutrients. Of the types of oilseeds groats used, the highest protein content has 15% more the samples with oilseeds groats from sesame compared to the control sample.

Samples with oilseeds groats with walnuts differ in high fat content, since laboratory-produced oilseeds groats has been used, and thus a higher amount of fat remains in comparison with industrial scale oilseeds groats.

Conclusions

The use of oilseeds groats from walnuts, pumpkin and sesame in the composition for semi-products of mutton and poultry meat with the addition of wheat fibers enrich the sensorial characteristics of the finished product.

Sensory assessment analysis carried out by three methods found that performs with the addition of oilseeds groats from walnuts and pumpkin have an appearance, smell, taste, juiciness and better texture than the control sample.

The studied oilseeds groats contribute to reducing the moisture content and water binding capacity; increases the protein and fat content of the finished product.

Rational use of these components in the form of flour of oilseeds groats is one of the promising ways to create meat products combined with vegetable raw material with a functional orientation.

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SAUSAGES FOR CHILDREN'S NUTRITION: INFLUENCE OF LOW CONTENT OF FATS ON ORGANOLEPTIC CHARACTERISTICS

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Abstract: This article represents an experimental and bibliographic scientific study of meat products for children nutrition with a low content of fat. With physical and chemical methods have been analyzed fat content in the raw material, finished products and with sensory methods were studied the influence of low content on the organoleptic characteristics of sausages for children 's nutrition.

Key words: sausages for children, low content of fat, analyzes, 15 %.

Introduction

According to the existing technical normative documents (TND) in the Republic of Moldova [1], the European Union [3, 4], the Russian Federation and other states, it is required to reduce the lipid content in products intended for children's nutrition. These requirements have arisen as a result of the significant increase in the number of children suffering from obesity, which has become a global problem. Thereby, the fat content of meat products for children's nutrition should not exceed 15%, according to the EU's TND. Knowing the importance of fat in the nutrition, such as: the concentrated energy source (when burning 1g of lipids in the body releases 9.0 kcal), which is twice as high as the energy released by the burning of proteins, influences the assimilation of mineral salts (Ca, Mg), influences the function of the endocrine system - it inhibits the function of the pancreas, the thyroid, diminishes the motility of the stomach and intestines (long-lasting feeling of the satiety) etc. From a technological point of view, lipids have a very important function such as ensuring a more pleasant taste of foods, especially in meat products.

Decreasing fat content in children meat products has questioned the quality of these products and their organoleptic characteristics. In order to answer these questions, several methods of analysis were used: physico-chemical (Mohr method, drying in the oven until the constant mass, the Soxhlet method of determining the total fat content in the product), and sensory methods (organoleptic characteristics analysis of the products).

Methods of analysis

In the analyzed samples realized for research and in raw material was analized several indicators, such as:

- Content of NaCl by Mohr method; [6]
- Content of humidity in products by the method of drying in the oven until the constant mass [5];
- Determination of total fat content by Soxhlet method [5];
- Analysis of organoleptic indices using the 5-point scale.

Results and discussions

Several samples of sausages for children nutrition were performed in the laboratory. The basic criterion for obtaining a conformable product was the reduction of fat content up to a value of less than 15 %.

In order to obtain reliable results and to make a preliminary theoretical calculation, driven by mathematical calculus formulas, the raw material was analyzed from both organoleptic and physico-chemical point of view. Thus the raw material used was of high quality, satisfying the GD 696 of 04.08.2010 "Meat - raw material. Production, Import and Marketing "[2].

The type of raw material and auxiliary materials used for elaboration of sausages for children nutrition recipe are presented in tabel 1.

Table 1. *Meat sausages for children nutrition*

Products name	Recipe
Antianemic sausages [7, 9]	Edible blood (27%), bovine meat (40%), fatty or semi-fatty porcine meat (25%), whey protein concentrate, melange, onion, salt, sodium nitrite, aromatic pepper, nutmeg, ascorbic acid and others.
Poultry meat sausages [8, 9]	Chiken meat (65%), fatty porcine meat (20%), dairy butter, melange, wheat flour, Milk, sugar, salt, sodium nitrite, ascorbic acid, nutmeg, white and black pepper.

Table 2. *Physico-chemical indicators of sausages for children nutrition*

Physico-chemical indicators	Indicator value					
	Antianemic sausages			Poultry meat sausages		
	V-I	V-II	V-III	V-I	V-II	V-III
pH	6,04	6,03	5,97	6,53	6,62	6,30
Mass fraction of humidity, %	76,28	77,21	69,02	59,06	73,31	66,97
Mass fraction of fat,%	12,85	2,68	9,28	21,16	7,05	15,0
Mass fraction of NaCl, %	1,4	1,4	1,4	1,45	1,45	1,45
a_w	0,945	0,944	0,946	0,938	0,943	0,944

Acording to the data from Table 2, we notice a deviation of fat content in finished products. In the V-I of antianemic sausages was used fatty pork meat (acording to the hematogenic sausages), obtaining a result of 12,85 %, a good one, but the high content of blood in this sample, made the consistency and exterior appearance, not an attractive one. Thereby in V-II of antianemic sausages occurred the change of fatty meat with semi-fatty porc meat, a quantity of blood was replaced with high quality beef meat, also other essential modifications. The final result of total fat content is 2,68 %, a small amount that has influenced considerable organoleptic indices in fish product, hat served like a reason for repeating the test.

In V-III of the antianemic sausages, semi-fatty porcine meat was replaced with fatty meat, but with respect of the amount of raw material and balanced auxiliary materials for obtaining the antianemic V-II sausages recipe. Thus, the result obtained is 9.28%, an optimal result for the given product type, which imprints the necessary organoleptic characteristics. Due to the fact that antianemic sausages are a functional product that

provides 75% of the daily iron requirement, the increase in lipid levels by up to 15% would remove the product from the functional list.

The classic recipe - the V-I of the poultry sausages, consists of poultry, porc fat and spices. This combination of raw material gave a result of 21.16% fat, which does not correspond to national and international technical normative documents. To reduce lipid content, the porc fat was replaced with dairy butter and the amount of poultry used was increased - chicken breast.

Thereby, version II of poultry meat sausages gave a result in a total fat content of 7.05%, which for this product type is not enough.

In the V-III of poultry meat sausages, the fatty meat, butter and poultry meat were added to the recipe. Because of the combination and the consistent ratio of raw material, we obtained a 15.0% fat content - the result that meets the EU requirements.

The analyzed samples were performed under laboratory conditions, respecting the parameters and working conditions, obtaining harmless products.

In the organoleptic analysis, the 5-point scale was used, looking at the commercial appearance, the color and appearance in the section, the aroma and the smell, the taste, the consistency and the succulence. The data of the sensory analysis are presented in Table 3.

1) Antianemic sausages

V-I: The cold state is unattractive, brownish-brown, sweet taste, slightly spiced, unsalted, mild consistency, grainy, without pronounced juice eliminations, aroma and odor characteristic of the type of product (blood sausages).

V-II: small sticks with clean, dry surface, without stains and membrane rupture, without adhesion, broth and grease. The composition of red to dark brown colour, finely chopped. The taste and smell characteristic of the type of product that is not spicy, less salted, without taste and foreign smell.

V-III: small sticks with clean, dry surface, without stains and membrane ruptures, without adhesion, broth and grease leakage. Composition of dark red to dark brown colour, finely chopped. The taste and smell characteristic of the given product type, slightly spicy and salted, without taste and foreign smell.

2) Poultry meat sausages

V-I: With the low marks was appreciated the flavor and smell, consistency which was determined to be less fine. Due to the fact that in recipe is included poultry meat that has a law level of myoglobin and pork fat, the color of finished products was gray, less appealing. The product taste was one of pronounced meat, thereby diminishing the flavor of seasonings.

V-II: The product obtained low marks on consistency and taste. The consistency was determined to be a little succulence. The taste is much more harmonious, comparing with V-I of poultry meat products, which is due of adding milk and dairy butter in the recipe, these components harmonized the taste of products, in the same time emphasizing the seasoning flavor.

V-III: The sample was manifested by well-defined organoleptic characteristics, satisfying all the characteristics. They are small sticks with clean, dry surface, without stains and membrane rupture, without adhesion, broth and grease leakage.

Thus, from all the prepared samples, the third variant of the poultry meat sausage obtained the best result, having a lipid content of 15.0%. What has to be demonstrated, the amount of fat in the product influences the sensory characteristics of the product, improving them.

Table3. *Tasting list of quality appreciation of sausages for children nutrition*

Organoleptic appreciation of products with the 5-point scale							
Nr. sample	**Commercial appearance**	**Color and appearance section**	**Aroma and the smell**	**Taste**	**Consistency**	**Succulence**	**General mark**
1)	Antianemic sausages						
V-I	4,25	3,88	4,46	4,28	4	3,91	4,13
V-II	4,83	4,83	4,83	4,83	4,83	4,75	4,82
V-III	5,00	5,00	5,00	5,00	4,86	4,70	4,93
2)	Poultry meat sausages						
V-I	5,00	4,00	4,23	4,50	3,90	4,33	4,33
V-II	5,00	4,95	5,00	5,00	5,00	5,00	4,99
V-III	5,00	5,00	5,00	5,00	5,00	5,00	5,00

Conclusions

Scientific research has shown that fat content influence taste and consistency, so products with a low lipid content are giving up in front of organoleptic properties.

Optimal lipid content in meat products for children should not exceed 15%.

In antianemic sausages case, the optimal lipid content, obtained according to experimental research is 9-10%, because this meat product for children nutrition is a functional one, and must provide 75% of the daily iron requirement.

The value of fat content in poultry meat sausages for children nutrition is 15%, which meets EU regulations.

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SPELT CRISP BREAD - HEALTH FOOD PRODUCTS

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Abstract: The article deals with the role of nutrition on human health and the main lines of development of food production for health purpose. The urgency of the development of the enriched food products based on spelt grain is proved. Complex trade analysis of quality of spelt crisp bread with the inclusion of enriching herbal supplements (rose hip, holy thistle, ashberry, green tea extract) is presented.

Key words: health food, crisp bread, spelt, consumer properties

Health of the population is the highest value, an essential component of the development and socio-economic prosperity of the country. That is why the creation of optimum conditions for the realization of the potential of every citizen throughout the life and the achievement of adequate standards of quality of life and well-being of the population is one of the main tasks of the government of each country [1].

The modern stage of development of human society is characterized by a sharp deterioration of the environmental situation in the world, a constant shortage of time, changes in the nature of the rhythm of life and diet. Today human health is determined by two important factors such as nutrition and lifestyle [2]. But the first place in the social needs of any country of the world take priority needs in food, non-satisfaction of which results in disastrous consequences (reduction of population, decline in the working ability, emergence of social conflicts). A sufficient level of food consumption is a necessary condition for the existence and development of modern society. The United Nations (UN) represented by its most important unit – WHO – put nutrition in the first place in the list of indicators of the level of life of modern people [1].

Through poor nutrition 4.5% of healthy years of life are lost due to premature mortality and disability. Unhealthy diet results in significant economic losses due to the costs of treatment, diagnosis, care and rehabilitation of patients in medical institutions, loss of production due to diseases, as well as loss of income for families [3]. Research of nutritionists indicate that only traditional food inevitably results in certain kinds of nutritional deficiency in modern society. The reasons for this are well-known – protein deficiency, lack of vitamins and other macro-and micronutrients, the use of refined food, widespread use of various food additives without biological value [4].

To optimize nutrition, ensure the receipt of a wide list of physiologically active substances in the required amount the most effective way is the enrichment of food, increasing their physiological properties by additional inclusion in the formulation of functional ingredients, which allows you to adjust and optimize the usual diet of each person, to provide him/her with a certain orientation. This method is considered more appropriate to 60% of respondents in Europe, 54% - in the USA and 82% - in the CIS countries [2-5].

Creation of enriched products based on grain is one of the progressive lines in the development of manufacture of products, because due to the relatively low cost of raw

materials they are available to the broad segments of the population, are traditional and are able to compensate for the lack of biologically active substances (BAS) in diet, increase the body's resistance to adverse environmental factors, and, consequently, increase the life time of the population [6]. Moreover, a special interest among consumers is aroused by ready-to-use products – crisp bread, which has good consumer properties, shelf life, is convenient for transportation and consumption, is in demand among different segments of the population, including children, adolescents and elderly people.

Grain crops are the most suitable raw material for the production of crisp bread (wheat, rye, buckwheat, rice, etc.). This is due to the fact that grain is a starch-containing raw material and starch is the main component that affects the processing conditions and the quality of finished products. Taking into account the required properties, technological capabilities, as well as on the basis of our marketing research of the potential consumers and the application of the QFD methodology, it was decided to use spelt as the main raw material for the production of crisp bread. Spelt is a type of soft wheat, which, unlike traditional wheat, is characterized by a high content of proteins, dietary fibers, minerals, vitamins and other BAS [7].

The goal of the development of the enriched food stuffs is to fill with them the deficit of essential nutrients and BAS in the human body. To achieve this goal, we have analyzed the actual nutrition of the population, identified its shortcomings and it was also determined what deficiency of any nutrients and BAS is observed in the diet. It was established [4, 5] that there is a shortage of minerals, vitamins of B group and other BAS in the diet of the population of Ukraine in the first place. Therefore, it was decided to introduce holy thistle powder, ashberry, rose hips and green tea extract into the composition of crisp bread as enriching additives. These herbal supplements are characterized by a high content of BAS and have preventive properties [8]. On the basis of mathematical modeling methods the optimum composition of new spelt crisp bread was determined and experimental batches of products were produced under industrial conditions of production that were analyzed by the main indices of the chemical composition (Table. 1). For a more objective assessment we have also produced a control sample of crisp bread under industrial conditions on the basis of the common wheat variety in Ukraine - the Kuyalnik variety (control 1). Comparative analysis of indices of food value of experimental samples based on spelt and control 1 showed that the developed crisp bread has an increased nutritional value in comparison with a control sample – crisp bread made on the basis of wheat of Kuyalnik variety (control 1). Thus, the protein content in enriched crisp bread is 15.21...16,1 (depending on kind of the enriching additive) that is on average 1.5 times more in terms of the control 1. The fiber content of the crisp bread produced on the basis of spelt exceeds the control sample 1 (based on wheat of Kuyalnik variety) on the average 1.4 times within the corresponding decrease of the starch content. As a result, the ratio of starch to protein is 3.5...4.0: 1.0 (for control 1-6.6: 1.0), which is more in line with the recommendation of the theory of balanced nutrition.

The developed crisp bread is rich in mineral elements. The largest quantity is phosphorus: in rosehip crisp bread (sample 1) - 394 mg/100 g, in ashberry crisp bread (sample 2) – 393 mg/100 g, in holy thistle crisp bread (sample 3) – 441 mg/100g, in green tea extract crisp bread (sample 4) - 405 mg/100 g. Its content in control 1 is 340 mg/100g. The best indicator regarding the control of 1 new spelt crisp bread has on iron content (in

the control of 1-4.1 mg/100 g, and in crisp bread - 5,1…5,8 mg/100 g). This is confirmed by the literature data [9] according to which spelt compared with wheat has on average 30 - 60% higher content of Fe, Cu, Mg, P, K, Zn, Se. The degree of satisfaction of the daily needs of the diet with the consumption of 100 g of the enriched crisp bread relating to magnesium is 32.0...37 %, relating to iron - 34...38.6 % (Table 1).

Introduction of herbal supplements to the composition of crisp bread results in increase of the content of some vitamins, so the content of ascorbic acid in sample 1 is 20.5 mg/100 g due to the introduction of rosehip powder. The degree of satisfaction of the daily needs of the diet with the consumption of 100 g of the enriched crisp bread on thiamine is 22...26.7 %, folic acid - 20.2...21,6%, niacin - 42...43,3%.

Amino acid composition of proteins of new crisp bread is shown in Table 2. As evidenced by the results, the control sample of spelt crisp bread (control 2) is characterized by the improved amino acid composition in relation to crisp bread made on the basis of wheat of Kuyalnik varieties (control 1). Thus, the total content of indispensable amino acids in spelt crisp bread is 1.6 times higher in relation to control 1 (wheat crisp bread). The inclusion of additives in the composition of crisp bread (samples 1-4) causes insignificant decrease in the amino acid composition. But it should be noted that the amino acid content of the experimental samples is much higher than the amino acid composition of the control sample, which is produced on the basis of wheat of Kuyalnik varieties. All this confirms the relevance of the production of new products based on spelt, which is characterized by a high content of protein, dietary fiber, minerals, and other BAS. Each of the amino acids plays a role in the human body. Lysine is very important. Lysine deficiency disrupts the process of hematopoiesis and calcification of bones. Experimental samples of spelt crisp bread (samples 1-4) are characterized by the higher content of this amino acid in relation to the control sample produced on the basis of wheat (control 1), so the use of spelt allowed to increase the content of this amino acid in 1,3-1,4 times (according to the sample). The content of sulfur-containing amino acids (methionine and cystine) in spelt crisp bread is increased on average 1.8 times as compared to control 1. Methionine regulates metabolism of fats and phospholipids in liver, plays a certain role in the prevention of atherosclerosis; phenylalanine is involved in the formation of thyroxine and adrenaline hormones; leucine and isoleucine affect the growth processes. Deficiency of valine may cause a disorder of coordination of movements [3]. There is an increase in the listed indispensable amino acids by an average of 1.6 times in the experimental samples with regard to control 1. The obtained results are correlated with the literature data, thus, according to the results of I. A. Bazhenova (2004) the content of valine, leucine, isoleucine in spelt, the sum of methionine+cysteine, lysine in spelt is more than in wheat and maize [9].

Not only presence of indispensable amino acids is important on study of amino acid composition but also of dispensable amino acids, since on their lack indispensable amino acids are consumed in the human diet in an increased amount. This indicates that not only the presence and balance of indispensable amino acids is of importance, but also their ratio with dispensable amino acids in the product. In this regard we calculated the index ($\sum_{IAA}/\sum_{o}$) – ratio of indispensable amino acids to the total amino acid content. The obtained results (Table 2) indicate that the new spelt crisp bread with the inclusion of enriching additives is characterized by increased biological value in relation to the control sample, which was developed on the basis of wheat Kuyalnik variety.

Nutrients	Daily demand	Wheat crisp bread (control 1)		Spelt crisp bread (control 2)		Spelt with wheat crisp bread (example 1)		Spelt with ashberry crisp bread (example 2)		Spelt with holy thistle crisp bread (example 3)		Spelt with green tea extract crisp bread (example 3)	
		a	b	a	b	a	b	a	b	a	b	a	b
Proteins, g	80	10.43	13.04	15.84	19.8	15,31	19.14	15.21	19	16.1	20.13	15.46	19.1
Fats, g	80	1.64	2.05	1.83	2.29	1.74	2.17	1.75	2.18	2.34	2.92	1.80	2.33
Starch, g	400	68.8	17.2	62.6	15.65	60,1	15.03	59.9	14.98	59.5	14.88	62.3	15.3
Mono- and disaccharides, g	70	2.48	3.54	2.6	3.7	3,30	4.7	3.1	4.42	2.46	3.51	2.5	3.57
Fiber, g	25	2.0	8	2.4	9.6	2.8	11.2	2.6	10,4	3.3	13.2	2.35	9.4
Vitamins, mg/100 g:													
Thiamine (B_1)	1.5	0.43	28.7	0.36	24	0.33	22	0.34	26.7	0.33	22	0.34	22.7
Riboflavin (B_2)	2.0	0.14	7	0.11	5.5	0.12	6	0.10	5	0.10	5	0.11	5.5
Ascorbic acid (C)	70	0	0	0	0	20.5	29.3	2.6	3.71	0.12	0.17	0.1	0.14
Niacin (PP)	15.0	4.8	32	6.6	44	6.5	43.3	6.48	43.2	6.3	42	6.5	43.3
Folic acid (B_9), ug	200	37.4	18.7	44.8	22.4	41.6	20.8	41.4	20.2	41.0	20.5	43.1	21.6
Mineral substances, mg/100 g:													
Potassium (K)	2,500	323	12.9	357	14.28	340	13.6	346	13.8	344	13.76	350	14
Calcium (Ca)	1,000	50	5.0	44	4.4	42.2	4.22	42.1	4.21	103.6	10.36	43	4.3
Magnesium (Mg)	400	111	27.8	134	33.5	128	32	128	32	148	37	131	32.8
Phosphorus (P)	1,200	340	28.3	414	34.5	394	32.8	393	32.8	441	36.7	405	33.7
Ferrum (Fe)	15	4.1	27.3	5.4	36	5.7	38	5.1	34	5.8	38.6	5.35	35.6

Note:

a) – content in100 g of product, g (mg);

b) – degree of satisfaction of daily needs according to basic nutrients of balanced diet formula, %

Table 2. *Amino acid composition of proteins of new crisp bread (mg/ 100 g of product)*

Amino acids	Wheat crisp bread (control 1)	Spelt crisp bread (control 2)	Spelt with wheat crisp bread (example 1)	Spelt with ashberry crisp bread (example 2)	Spelt with holy thistle crisp bread (example 3)	Spelt with green tea extract crisp bread (example 3)
Indispensable amino acids						
Valine	252.0	414.7	395.2	389.9	401.2	411.8
Isoleucine	197.0	325.7	310.1	308.5	316.5	323.2
Leucine	586.4	971.5	923.6	921.2	931.3	966.4
Lysine	248.2	359.9	342.1	339.0	346.8	357.4
Methionine +cystine	200.4	355.0	338.3	335.6	341.0	353.6
Threonine	272.1	414.1	394.7	391.1	396.4	411.0
Tryptophane	139.0	213.2	203.0	200.3	204.1	209.6
Phenylalanyl+ tyrosine	630.4	1,076.3	1,022.0	1,020.4	1,029.3	1,071.1
Total indispensable amino acids. $\sum_{IAA}$	**2,514**	**4,130.4**	**3,929**	**3,906**	**3,966.6**	**4,104.1**
Dispensable amino acids						
Alanine	372.2	545.7	518.2	515.2	520.1	543.2
Arginine	374.2	600.3	570.1	568.4	578.6	597.0
Asparlic acid	430.4	630.2	603.6	601.3	610.0	627.3
Histidine	188.0	325.6	310.0	307.0	315.3	324.5
Glycine	423.9	600.7	573.3	570.4	581.4	597.6
Glutaminic acid	3,193.4	5,318.5	5,053.2	5,050.1	5,061.0	5,293.7
Proline	1,068.0	1,686.1	1,602.0	1,506.2	1,603.0	15,86.2
Serine	527.0	802.2	762.5	760.0	771.2	797.0
Total dispensable amino acids. $\sum_{DAA}$	**6,577.1**	**10,509.3**	**9,992.9**	**9,878.6**	**10,040.6**	**10,366.5**
Total amino acids. $\sum_{O}$	**9,102.5**	**14,629.6**	**13,921.9**	**13,784.6**	**14,007.2**	**14,470.6**
Correlation ($\sum_{IAA}/\sum_{O}$)*100 %	**27.7**	**28.2**	**28.2**	**28.3**	**28.3**	**28.4**

On the basis of the organoleptic analysis carried out by the method of tasting, it is established that the introduction of herbal supplements into the composition of crisp bread results in the improvement in the organoleptic characteristics of the finished products. The products are characterized by a crisp, porous structure, uniform, attractive colour, harmonious taste and a strong smell

To confirm the preventive properties of new crisp bread we have performed a biomedical evaluation in animals - rats under "in vivo" conditions. The results showed that the new spelt crisp bread with the inclusion of enriching herbal supplements has a

hepatoprotective effect, therefore it can be recommended both within the mass and preventive nutrition for consumption by people suffering from disease of the endocrine system, metabolic disorders and obesity. As a result of the performed studies it is established that new spelt crisp bread with inclusion of herbal supplements is characterized by high consumer properties, namely the improved organoleptic indicators, the increased content of fiber, vitamins and minerals that allows to create the balance of nutrients in products adequate to the requirements of diet and preventive nutrition.

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TECHNOLOGY DEVELOPMENT FOR PRODUCTION OF RED DRY WINES WITH ADVANCED CONTENT OF BIOLOGICAL ACTIVE COMPOUNDS

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Summary: In the article the results regarding the content of biological active compounds (BAC) in different red dry wines obtained at "Purcari Winery" were presented. The dynamic of BAC evaluation during the maturation of Cabernet Sauvignon grapes and development of new technological processes for production of red dry wines with advanced BAS content was studied.

Keywords: red dry wines, proanthocyanidins, biologically active compounds

Introduction

Red dry wines are distinguished from white wines with more valuable compounds content, the major fraction of them are phenolic substances, significant quantities of them passage into the must from peel, seeds and bunches, which imparts new biochemical, organoleptic and physiological properties to the wine. Due to its advanced content of phenolic substances, red wine possesses curative, antioxidant, anti-inflammatory and antibacterial properties. Phenolic substances, anthocyanins, proanthocyanidins, routine, quercetin, resveratrol, ascorbic and gallic acids are part of the biologically active compounds that are currently being studied in countries with wine traditions (Italy, France, Germany, Portugal, Romania, R. Moldova). Content of phenolic and coloring compounds depends on grape variety, the red wine production technology, as well as the structure and composition of the soil [1].

The specialized literature presents different technological processes elaborated in order to intensify the processes of BAC extracting from the solid parts of the grape. Traditional technology of red dry wines production provides the pulp maceration and fermentation at 28-32°C within 8-10 days with the cap mixing 3-4 times per day [2]. The use of thermovinification process of the pomace at 70°C within 30 minutes, with subsequent fermentation of the must, allows to intensify the technological process of BAC extraction, but does not allow to obtain high quality red wines [3].

Furthermore, technological processes for the production of BAC-rich red dry wines were elaborated, which requires fermentation-maceration during 10-30 days as well as fermentation-maceration under the pressure of released CO_2 at the pressure value of 300-500 kPa, but for a number of reasons, they did't come in a common use [4,5].

The aim of the study consists in scientific arguing and development of technology for red dry wines production containing advanced BAC, phenolic substances, anthocyanins, resvaratrol, rutin, quercetin and proanthocyanidins.

Research methods and objects

As the research subjects grapes of Cabernet Sauvignon variety, raw material for red wine of Cabernet Sauvignon, Malbec, Feteasca Neagra, Pinot Noir, Rara Neagra, Saperavi, produced at "Purcari Winery" LLC (r.y. 2017) were used. Different technological schemes for the production of dry red wines: traditional fermentation-maceration method, fermentation-maceration process up to 28 days, addition of fresh grape seeds during fermentation-maceration process of pomace and others were studied. The dynamic of BAC concentration in dry red wines was studied, depending on grapes maturity in the range of 180-220 g/L of sugars. Determination of the concentration of the phenolic substances was carried out by the Colorimetric method with the Folin-Ciocalteu reagent, the concentration of the anthocyanins was determined using spectrophotometric method with acidification of sample. Identification of resveratrol, quercitin, routine, ascorbic and gallic acids content was performed using HPLC method [6]. Content of proanthocyanidins in red wines was identified by the spectrophotometric method according to OIV requirements.

Results and discussions

The concentration of BAC depends on the grape variety used for the production of red wines. In order to argue the opportunity of using a grape variety in the production of red wines with advanced BAC content, concentration of this compounds were determinated in various wines produced at "Purcari Winery" LLC in 2017.

Concentrations of phenolic substances, anthocyanins, routine, quercetin and resveratrol in different red wines are presented in Table 1.

Table 1. *Concentration of BAC in dry red wines produced at Purcari Winery.*

№	Wine	Phenolic compounds, mg/dm^3	Anthocyanins, mg/dm^3	Resveratrol, mg/dm^3	Routine, mg/dm^3	Quercetin, mg/dm^3
1.	**Cabernet-Sauvignon**	2480	377	5,8	17,5	2,5
2.	**Merlot**	2184	324	4,2	7,8	1,6
3.	**Pinot Noir**	1896	229	2,9	7,5	2,1
4.	**Malbec**	2860	376	3,2	4,5	0,6
5.	**Saperavi**	3020	588	4,3	4,0	1,3
6.	**Rară-Neagră**	1790	210	2,4	6,1	0,6
7.	**Fetească-Neagră**	2089	248	4,7	4,7	0,8

According to the data presented in Table 1, Cabernet-Sauvignon and Saperavi varieties are distinguished by higher concentrations of phenolic substances, anthocyanins, resveratrol compared to other dry wines. The lowest concentrations of phenolic substances and anthocyanin's, resveratrol were determined in wines obtained from grape varieties Rara Neagra and Pinot Noir. According to obtained results and the available surfaces, Cabernet-Sauvignon variety was selected as object of research. The purpose of the research is to develop a technology for the production of dry red wines with a high content of BAC, including phenolic substances and anthocyanin's and rich in tannins which imparts a rich aroma of dried fruits and full velvety taste. For this purpose technological procedure for the production of dry red wine was elaborated and includes the following operations: crushing and destemming of well-matured grapes (sugar content

must be more than 22%), from obtained crushed grapes a part of must (10-20%) is eliminated, after which maceration-fermentation of the pomace is carried out during 5-10 days. After completion of the fermentation-maceration process, the wine is removed from the yeast sediment and directed to post-fermentation and preservation. Technological result of this process for the production of wines with advanced content of BAC, is due to the fact that:

- In the production process red grape varieties with a high content of phenolic compounds and with advanced seed content are used;
- Red grape varieties accumulate high concentrations of sugars (over 22%) and the grain seeds must be ripened;
- The elimination of 10-20% of the must contributes to a considerable increase of rapport between must and crushed grapes, which intensifies process of the extraction of the proanthocyanidins from seeds as well as the anthocyanins in the grape skin. The result is the enrichment of red wine with oligomeric phenolic compounds, with the predominance of catechins and monomeric epicatechins (from 2 to 5 catechin molecules), which make up the basic component of proanthocyanidins, which are the main phenols with antioxidant properties;
- After completion of the fermentation process, the wine is required to be removed from the yeast sediment to avoid absorption of BAS's by yeast cells.

One of the essential conditions of the technological process is the use of grapes of red varieties rich in phenolic compounds: catechins, epicatehins, proantocianidines, anthocyanins and others whose concentration depends on the amount of sugar in the must. The higher maturity of the grapes, the higher the BAC concentration in the must and in the obtained wines.

In Table 2 the results of phenolic compounds content in red wine Cabernet Sauvignon (h.y. 2017), harvested at different maturity level of graped (fermentation-maceration process during 5 days) are presented.

Table 2. *Physico-chemical indices of dry red wines obtained at different concentrations of sugars in grapes (Cabernet Sauvignon h.y. 2017)*

Nr.	Physico-chemical indices	Unit of measurement	Concentration of sugars in must		
			18%	20%	22%
1.	**Alcohol**	%vol	10,50	11,90	13,10
2.	**Sugars**	g/L	1,60	1,65	1,82
3.	**Titratable acids**	g/L	8,5	7,4	6,5
4.	**Volatile acids**	g/L	0,36	0,38	0,42
5.	**pH.**		3,15	3,21	3,35
6.	**Phenolic substances**	mg/L	1650	1964	2450
7.	**Anthocyanins**	mg/L	208	256	324
8.	**Proanthocyanidins**	mg/L	306	384	465
9.	**Organoleptic note**	point	7,8	7,9	8,1

From the data presented in Table 2, it is to be noted that increase of the sugars content in grapes contributes to essential increase of phenolic and color compounds

concentration in obtained red dry wines, as well as of the proanthocyanidins, which have strong antioxidant properties.

In 2017, Cabernet Sauvignon grapes with 22% sugar content of 10 tonnes were processed by crushing and destemming. The sulphitated-crushed grapes where transported to a tank equipped with a recycling and extraction system, from which a part of the must is separated, which is used in the production of rosé wines. Must enriched with the solid phase was subjected to fermentation-maceration process with mixing 3-4 times per day.

After the completion of the fermentation process, the wine has reached a good structure, a pronounced extraction and intense color, the pomace was pressed and sulphited and directed to preservation. The physico-chemical indices of the Cabernet Sauvignon wine obtained according to elaborated technological scheme are shown in Table 3.

Table 3. *Physico-chemical and organoleptic indices of dry red wines from Cabernet - Sauvignon variety with advanced BAC content.*

Nr.	Physical-chemical and organoleptic indices	Variants				
		Control	Elimination of must from crushed grapes,%			
			5	10	20	30
1.	**Alcohol,% vol**	13,0	13,0	12,90	12,8	12,6
2.	**Sugar, g/dm³**	1,78	1,68	1,64	1,64	1,56
3.	**Titratable acids, g/L**	8,5	8,0	7,5	7,2	7,2
4.	**Volatile acids, g/L**	0,33	0,38	0,40	0,40	0,46
5.	**pH.**	3,20	3,24	3,28	3,30	3,30
6.	**Phenolic substances, mg/L**	2300	2500	2750	3000	3000
7.	**Anthocyanins, mg/L**	510	520	540	560	530
8.	**Resveratrol, mg/L**	5,4	5,6	5,8	6,5	5,7
9.	**Routine, mg/L**	6,1	7,2	8,5	9,2	8,4
10.	**Quercetin, mg/L**	0,4	0,6	1,2	1,4	1,4
11.	**Proanthocyanidins, mg/L**	680	720	780	830	800
12.	**Organoleptic note, points**	7,8	7,85	8,0	8,10	7,80
13.	**Color**	Ruby	Deep ruby	Deep ruby	Ruby dark, intense	Dark Ruby, very intense
14.	**Flavor**	Clean, typical	Rich, composed, with typical nuances	Rich, intense, expressive	Rich, intense, expressive	Simple, vegetal shades
15.	**Taste**	Clean, light, slightly astringent	Clean, light, little tan	Full, extract, soft, tan, pleasant with typical shades	Full, extraction, soft, with typical tanning shades	Astringent, plant tones, simple, rough

The data in Table 3 confirms the positive result of the developed technology, according to obtained results, red wines after the removal of a portion of must from the pomace (optimally 10-20%), contribute to a significant increase of BAC, including phenolic substances (2750 and 3000 m /L in the optimal variants), colorants (540 and 560 mg / dm³ respectively) and proanthocyanidins (780 and 830 mg/L) in comparison with the control sample (phenolic substances 2300 mg/L, colorants 510 mg/L and proanthocyanidins 680 mg /L).

Conclusions

Elimination of the part of the must from obtained crushed grapes contributes to the production of dry red wines with advanced content of biologically active compounds. The optimal amount of must removed varies from 10 to 20%, which is confirmed by the content of studied chemical compounds: high levels of phenolic substances, anthocyanins, proanthocyanidins, resveratrol, routine and quarcitine.

The organolpethical properties of the red wines obtained using the elaborated technology of elimination of must from pomace in quantity of 10-20% have been appreciated with notes 8.00 and 8.10 compared to control sample -7.8 points.

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THE IMPACT OF HAWTHORN LIPOPHILIC EXTRACT ON OXIDATIVE STABILITY OF FOOD PRODUCTS

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Summary: Lipid oxidation may cause a rancid odor, texture and color change of high lipid foods. In order to extend the storage term synthetic antioxidants are mostly used. Nowadays more and more research is performed to find the way to replace the synthetic additives with the natural ones. The aim of this study is to analyse the impact of biologically active compounds on physico-chemical characteristics of lipophilic extracts and their oxidative stability. The results obtained by physico-chemical analysis methods have allowed to explain the importance of replacing synthetic antioxidant compounds with natural antioxidants in the process of producing food products with a high lipid content.

Keywords: oxidation, hawthorn, lipophilic extract, antioxidants.

Introduction

Food industry more and more tend to replace the synthetic compounds in foods with natural ones. A safe and effective possibility would be to use biologically active compounds extracted from local natural berries such as hawthorn (*Crataegus)*.

There is an increased interest in berries because they are characterized by a large area of cultivation and they are rich in nutritionally important antioxidants, vitamins and minerals [1,2]. In this research, we studied mainly hawthorn (*Crataegus)*.

Food products oxidation is caused by lipid oxidation process and as a result may occur a color change, rancid odor and texture of food may be modified which negatively influences the sensory qualities of foods. Natural plant extracts are a good alternative for synthetic food additives, also enriching the nutritional value of the food [3].

In complex foods, the impact reduction of lipid oxidation can only be ensured by appropriate packaging and antioxidants that block the propagation or decomposition of the hydroperoxides and is manifested by the inhibition of the oxidation process. The industrially manufactured complex food products usually contain antioxidants of synthetic origin (propyl gallate - E-311 or octyl-E-312, butylhydroxyanisole (BHA) - E-320, etc.) and their effect on health human is not very beneficial [4].

The aim of this study is to analyze the physico-chemical characteristics of hawthorn lipophilic extract against deodorized sunflower oil and to evaluate its oxidative stability in high lipid food products.

Materials and methods

Hawthorn berries *(Crataegus)* were harvested in the north area of Republic of Moldova in 2016. Reagents sulfuric acid solution H2SO4 (2M), hydrogen peroxide solution H2O2 (0.1 M), ammonium molybdate solution (3%); potassium iodide KI (1.8 M), sodium thiosulfate N2S2O3 (5.09 mM), concentrated nitric acid HNO3; hexane, 70% ethyl alcohol, phenolphthalein, glacial acetic acid were purchased from Merck, Germany. The hawthorn berries were air dried, then ground and sieved.

The extraction was carried out in deodorized refined sunflower oil with a solvent ratio of 1 g plant: 10 ml of oil. The extraction process was carried out by 2 shaking at 22 ° C for 24h. The extracts were decanted and stored in dark glass bottles at + 4 ° C.

Determination of Peroxide Value (PV) [5,6]

Peroxide Value determination was performed by the volumetric method and the results obtained were calculated according to the following relationship:

$$\boldsymbol{PV = \frac{(S - B) \times N \times 1000}{mass\ of\ sample, g}} \quad \text{, [mEq O2/kg]} \qquad (1)$$

where:
B – volume of titrant, [ml of blank],
S – volume of titrant, [ml of sample],
N – normality of sodium thiosulfate solution,

The antioxidant capacity of lipophilic extracts [7]

For the determination of HPSA, in the titration flasks, 1 ml of sample was mixed with 1 ml of hydrogen peroxide solution H2 O2 (0.1 mM). Then 2 drops of ammonium molybdate, 10 ml of H2SO4 (2M) sulfuric acid and 7 ml of KI potassium iodide (1.8 M) were added. The obtained solution was titrated with sodium thiosulfate N2S2O3 (5.09 mM) until the yellow color disappeared. The volume (V1) of sodium thiosulfate Na2S2O3 (5.09 mM) used for titration was recorded.

Determination of acid value (AV) [8]

Determination of AV was performed by the volumetric method and the results obtained were calculated according to the following relationship:

$$\boldsymbol{AV = \frac{V_{KOH} \cdot N_{KOH} \cdot 5.611}{m}} \quad \text{, [mgKOH/g]} \qquad (2)$$

where:
VKOH – volume of potassium hydroxide, [ml]
NKOH – concentration of potassium hydroxide, [mol/dm3];
m – mass of sample, [g]

Sensory evaluation [9]

A sensory evaluation of sauce samples was conducted after preparation. Sensory characteristics: taste, flavor, color, consistency and overall acceptability were evaluated by a 20-member panel on 5-point scale, with 1 being the lowest and 5 the highest according to (Juyun Lim, 2011).

Results and discussions

Results obtained through analysis of different methods of research have found that oxidation process can be slowed down by using lipophilic extracts fortified with biologic active compounds. Was determined that lipophilic extract samples enriched with natural antioxidants are characterized by a greater antioxidant capacity compared to samples that were not enriched with natural antioxidants and the values are shown in table 1.

Table 1. *Phisico-chemical characteristics of hawthorn extract.*

Nr.	Characteristics	Blank sample (sunflower oil)	Hawthorn extract
1.	**HPSA, %**	46,7 ±1,2	47,1 ±1,2
2.	**Acid Value, mg KOH/g**	0,48 ±0,04	0,42 ±0,04
3.	**Peroxide Value, m_{echiv} O_2/kg**	4,68 ±0,13	3,68 ±0,13

As shown above the peroxide value of hawthorn lipophilic extract is within acceptable limits according to normative documents (max. 10 m_{echiv} O2/kg according to [5]). The value for hawthorn extract (PV=3,68 ±0,13 m_{echiv} O2/kg) is lower than the blank sample which fact shows that due to biologically active compounds in analyzed lipophilic extract the oxidation process is slowing down. Acid value for hawthorn extract (AV=0,42 ±0,04 mg KOH/g) also indicates a decrease compared to blank sample which is explained by the oxidative degradation decrease.

Besides that, the antioxidant capacity of hawthorn lipophilic extract (HPSA=47,1 ±1,2%) is higher than the blank sample which is explained by the concentration of biologic active compounds extracted which naturally can be found in hawthorn berries.

To investigate further the oxidative stability of the lipophilic extract in foods were prepared samples of mayonnaise type sauces according to a preset recipe [10].

In order to analyze the organoleptic parameters was made a sensory evaluation and the results are shown below (fig. 1)

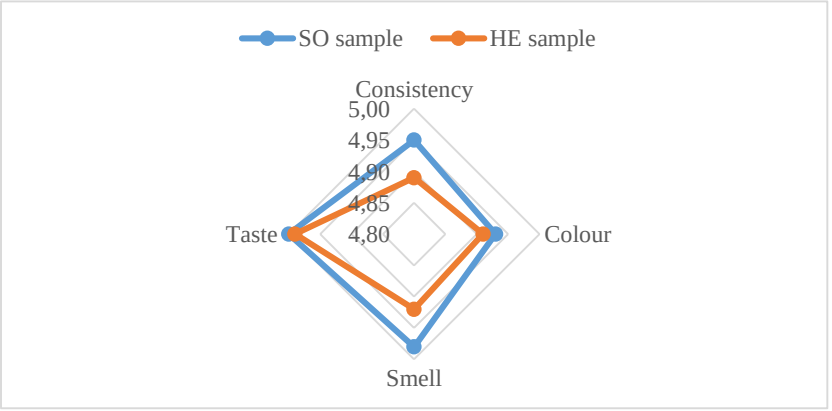

Fig. 1. *Sensory analysis of mayonnaise type sauce (SO sample – sunflower oil sample, HE sample – hawthorn extract sample)*

It was carried out that the sample prepared with the addition of hawthorn extract is characterized by its pleasant taste and odor characteristic for mayonnaise close to the blank sample. Consistency is homogeneous, creamy and very good. The color is yellowish cream characteristic for mayonnaise sauce.

Further to ensure the oxidative stability of the extracts were determined the phisico-chemical characteristics of the mayonnaise type sauces and the results are shown below (Table 2.).

***Table 2**. Phisico-chemical characteristics of mayonnaise type sauces*

Nr.	Characteristics	Blank sample (sunflower oil mayonnaise)	Hawthorn extract mayonnaise
1.	**Acid Value, mg KOH/g**	0,38 ±1,2	0,35 ±1,2
2.	**Peroxide Value, mechiv O_2/kg**	2,33 ±0,04	1,0 ±0,04

The peroxide value for mayonnaise sauce is within acceptable limits (max. 10 m_{echiv} O2/kg) [5]. It was found that mayonnaise samples enriched with hawthorn extract showed a considerably lower peroxide value compared to the blank sample, which is due to the fact that the peroxides formation process is slowing down.

It was established that hawthorn extract is characterized by the lower value of Acid Value (0,35 ±1,2 mg KOH/g), which is explained by the slowing down of free fatty acids formation and the oxidation process of the product itself. The values for both samples remain within the permissible limits according to the normative documents [5].

Conclusions

The results obtained from the determination of the phisico-chemical characteristics of hawthorn lipophilic extracts are within the permissible limits of max. 10 m_{echiv} O2 active / kg for Peroxide Value and max 0,6 mg KOH/g for Acid Value. The hawthorn extract is characterized by a higher antioxidant activity (HPSA=47.1%) compared to the blank sample which fact is explained by a higher content of biologically active compounds in local berries like hawthorn. The sensory evaluation of high lipid food samples showed that the mayonnaise type sauce enriched with hawthorn extract is characterized by a pleasant taste and flavor and a characteristic consistency and color for a mayonnaise sauce. Also the quality parameters of the investigated samples are within the maximum permissible limits according to the regulations and protocols.

This research demonstrates the possibility to use hawthorn lipophilic extract in the food products production. An important benefit is the possibility to use natural antioxidants obtained from local resources in order to substitute the synthetic ones. This way food products enriched with natural antioxidants will be safe and healthier for consumption.

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THE IMPACT OF THE VARIOUS TECHNOGICAL PROSESSES ON THE PHENOLIC COMPLEX OF RED WINES

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Abstract: Phenolic compounds play an important role in the composition and quality of red wines. In this research have been studied various technological processes of the production of red wines and its impact on the phenolic complex. It has been found that the maximum content of phenolic substances and anthocyanins is present in the raw wines produced by the thermomaceration method.

Keywords: must, red raw wine, variety, maceration, alcoholic fermentation, phenolic complex, anthocyanin compounds

Introduction

An important point in making red wine is that the alcoholic fermentation occurs together with the seeds and grape skins, which give the wine its color. The production of red wines is conditioned by three main processes:

- maceration of pulp and alcoholic fermentation;
- malolactic fermentation.

Grape mash maceration and fermentation gives to red wines four specific properties: color, astringency, extraction and aroma, which distinguishes them organoleptically from white wines. Also, red wines are characterized by a lower acidity, due to the malolactic fermentation that reflects on the basic character of the red wine – the softness.

In winemaking, the process of maceration or „skin contact" is used to increase the concentration of phenols in wine.

Depending on the technological particularities of maceration and fermentation management, winemakers can obtain red wines through: traditional maceration, cryomaceration, thermomaceration, enzyme maceration, sulfur maceration etc.

Phenolic compounds play an important role in the composition and quality of red wines. The phenolic compounds in grapes contribute to the taste, color and mouthfeel of the wine. They are found especially in the seeds, skins and the bunches of grapes. Their quantity increases rapidly during the ripening of the grapes [4,5].

The objective of the study was to evaluate the influence of the maceration-fermentation processes on the quality of red wines and especially the enhancement of the phenolic compounds extraction.

Materials and methods

Raw wines have been obtained from Cabernet-Sauvignon red grape variety collected at „Purcari Winery" using general technologies of winemaking [4].

Have been tested 3 maceration-fermentation methods on grape mash: cryomaceration, traditional maceration and thermomaceration. The cryomaceration of must has been done at 5 – 10°C in 1 – 2 days, the cooling of grapes after harvest – at 0 –

3°C. The traditional maceration has been done at 30 – 32°C during 5 days, thermomaceration – at 70°C in 1 – 4 days.

The determination of the total content of polyphenolic, anthocyanin compounds and chromatic characteristics of wine has been done according to Compendium of International Methods of Analysis – OIV [6]. The chromatic characteristics of red and rosé wines are described by the intensity of color and shade.

The spectrophotometric analysis has been performed using PG Instruments T70 UV/VIS Spectrophotometer.

Results and discussions

Cabernet-Sauvignon grapes are characterized by a rich content of phenolic compounds, which easily pass into the liquid phase and ensure high organoleptic characteristics of wines. For the same variety of grapes, the content of phenolic compounds is variable, depending on the variety, degree of maturation of grapes, climate, culture system of the vine and vinification techniques [4].

The total content of polyphenolic and anthocyanin compounds, as well as chromatic characteristics of wine – the intensity of color (IC) and the shade (NC) has been determined by spectrophotometric measurements [3]. The obtained results are shown in table 1.

Table 1. *Specific and chromatic characteristics of raw wine*

The method	IPT*	Phenolic compounds**, mg/dm^3	Antho-cyanins, mg/dm^3	IC	NC
Cryomaceration (V_1)	**73,0**	**1585,92**	**178,1**	**19,340**	**0,637**
Traditional maceration (V_2)	**62,4**	**1453,76**	**177,4**	**16,809**	**0,577**
Thermomaceration (V_3)	**84,9**	**1781,8**	**214,0**	**21,587**	**0,740**

* –Total polyphenol index; ** – Phenolic compounds are expressed in gallic acid equivalents

For the determination of the total content of polyphenolic compounds the absorbance is measured at 280 nm, for the determination of the total content of anthocyanin compounds – at 520 nm [3] and straightly correlated with respective content.

A spectrophotometric method whereby chromatic characteristics are expressed conventionally as follows [3, 6]: the intensity of color is given by the sum of absorbencies using a 1 cm optical path and radiations of wavelengths 420, 520 and 620 nm; the shade is expressed as the ratio of absorbance at 420 nm to absorbance at 520 nm.

The maximum value of phenolic compounds has been obtained in the case of thermomaceration (V_3 – 1781,8 mg/l), the minimum values has been obtained by the traditional maceration (V_2 – 1453,76 mg / l).

The absorption spectra show that the wine produced by the thermomaceration method has a higher content of specific and chromatic parameters.

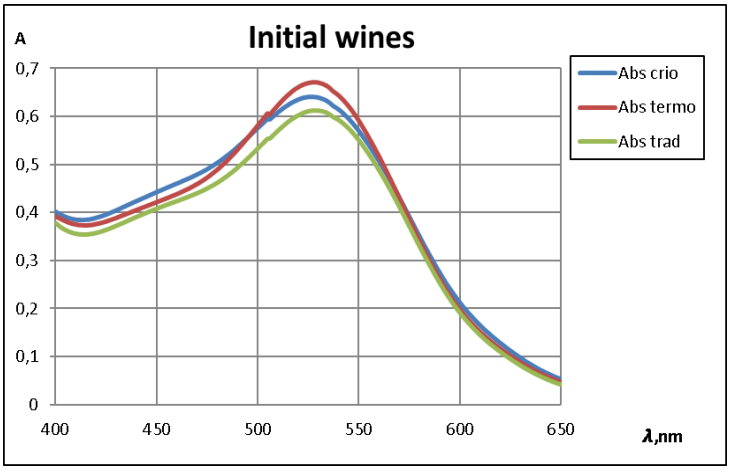

Fig 1. *The absorption spectra of the red wines produced by: cryomaceration, traditional maceration and thermomaceration*

The content of total phenolic compounds (TPC), phenolic cinnamic compounds (PCC), and phenolic flavonoid compounds (PFC) has been determined in order to assess the impact of maceration processes on these parameters. If was necessary, the samples have been diluted and measured spectrophotometrically. The obtained results are shown in the table 2.

Table 2. *The variation of phenolic substances content in the raw wines*

Parameters	**Cabernet-Sauvignon**		
	cryomaceration	**traditional method**	**thermomaceration**
optical absorption, 280nm	0,288	0,266	0,322
optical absorption, 320nm	0,116	0,102	0,120
A 280 SFT	53,7	49,2	60,4
TPC, mg/dm^3, gallic acid	1585,9	1453,7	1781,8
A 320 SFC	21,9	19,04	22,62
PCC, mg/dm^3, caffeic acid	219,0	190,4	226,2
A 280 SFF	39,1	36,5	45,3
PFC, mg/md^3, catechin	2741,2	2561,0	3172,4

The results show that the richest content of phenolic cinnamic and phenolic flavonoid compounds has been observed in the wine produced by the thermomaceration method.

Heat treatment is one of the most traditional physical processes of influencing raw wine material and wine. Heating increases the extraction of anthocyanins and other phenolic substances. The process can be easily monitored and directed.

The diffusion coefficient of anthocyanins in wines produced by traditional method (maceration – fermentation) is $0.03 \times 10^{-7} m^2/c$, but in wines produced by thermomaceration is much higher. In traditional red wine production the process of fermentation takes place simultaneously with maceration, but thermomaceration provides the separation of maceration from fermentation.

The applying thermomaceration method (V_3) consisted in heating up to 70° C and maintaining this temperature for 1 – 4 hours. In this way, the maceration phase anticipated the alcoholic fermentation. At the same time, Lafase Termo liquide enzymes have been added to this wort, which produces transformations useful for the evolution and quality of the future wine. Under the action of pectolytic enzymes, pectic substances present in the form of colloidal macromolecules are cleaved into substances with lower molecules and the viscosity of the must and wine is greatly reduced. Maintaining a quantity of wort (25 – 50%) is necessary to ensure its fluidity while forming the medium in which the components in the solid parts [1, 2] are disseminate and dissolve.

The results obtained in the proposed experiments (table 1) show that the heating of the must at 70°C for 1 – 4 hours extracts well the anthocyanins and the oxidation processes is inactivated. By thermomaceration, the total polyphenolic indices are the maximum value of 84.9, the concentration of anthocyanins is 178.1 mg / l. It can also be mentioned that simultaneously with the extraction action of the color and the oxidoreductase activity inactivation, the thermomaceration at 70°C for 1 – 4 hours can be successfully used also in the years with unfavorable conditions for the curing of the grapes, damaged crops, situations in which balanced wines with no particular taste and odor can be obtained that would diminish their quality and naturalness. By thermoinduction (V3) the rapid destruction of cell walls and the diffusion of polyphenols in the grape marc is achieved.

Conclusions

The climatic conditions of Purcari wine region are favorable to the cultivation of red grape varieties, for example Cabernet – Sauvignon and for production of wines with a high content of sugar and phenolic compounds.

On the basis of the study, at the Enology department, have been implementated three technological schemes of production of red raw wines by thermomaceration, cryomaceration and traditional maceration.

The processing of red grapes influences the specific and chromatic characteristics of raw wine. The maximum content of phenolic and anthocyanin compounds has been found in the raw wines produced by the thermomaceration method.

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THE INFLUENCE OF FOOD COATINGS ON THE MICROBIOLOGICAL STATE OF WALNUT KERNEL

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Abstract: Walnuts (Juglans regia L.) are widespread throughout the world. This paper compares the effect of food-based coatings based on serum protein and gelatinous isolate on the microbiological state of the nut kernels surface. For the purity of the experiment, two methods were used for all samples: deep and surface seeding. At the same time, it is possible to note the relationship between the number of germinated colonies, the type of coverage and the time of storage of the kernel.

Keywords: walnut kernels, coatings, microflora, moulds, fungi, whey protein isolate, gelatin;

In recent years, innovative techniques for enhancing the shelf life of walnuts have been reported for instance the use of edible coatings and films has made great advances toward improving product quality and providing stability to foods against various physicochemical hazards (Andrade, Skurtys, & Osorio, 2012) [1].Recently there has been a wealth of reports on the preparation of biodegradable and environmental friendly edible films and coatings from natural sources (Atares & Chiralt, 2016; Pineros-Hernandez, Medina-Jaramillo, Lopez-Cordoba, & Goyanes, 2017)[2,3]. Numerous studies have also been carried out on the development of an antimicrobial component for food coatings, which is an important factor in preserving the kernel of various types of nuts and other products (R.Ribeiro-Santos et al., 2017; JF Martucci et al., 2017) 4,5]. One of the antimicrobial and antifungal ingredients studied, which attracted a lot of attention and gives good results, is ginger and its products (N. Noshirvani et al., 2017) [6]. Since the presence of molds on walnut kernels compromises the quality of the product for sale, due to the threat of detection of microtoxins - products of their vital activity (John F. Leslie et al., 2008) [7].

The purpose of this study is to develop a food coating for walnut kernels, to reduce the microbiological contamination of the kernels surface, to reduce the level of molds to prevent their development during storage.

For the study, were selected walnuts (Juglans regia L.) of the Kogelnichanu variety of the highest quality of the 2017 crop. The quality of walnuts conforms to UNECE STANDARD DDP-01: 2013 [8]. For purity, walnut kernels in two types of coating (on a gelatin base and on a whey basis) were stored for 5 months, after which they were subjected to microbiological research along with freshly covered walnut kernels that were stored for 2 weeks. Walnut kernel data was covered with two types of food coatings. The first type of coating was developed based on the method described in the article by the authors Wang L. et al. Elsevier (2010) [9]. The main component of this coating is whey protein isolate. The second type of coating is developed on the basis of the patent of authors Nikolayenko N.S. et al. [10]. The main component of this coating is edible gelatin.

The results of the experiment revealed that food coatings with the addition of antimicrobial and antifungal ingredients have a positive effect on the microflora of walnut

kernels. Microbiological analysis showed that the largest number of molds was found on samples stored for 5 months. Moreover, the samples covered with whey were covered with more molds than the sample with a gelatinous coating. This can be explained by the fact that due to the presence of whey protein is formed a favorable environment for the development of microorganisms. In the deep seeding method, mold was found only in samples with a gelatin coating, and in the contact method, only with a serum one. As a result, it can be said that walnuts that have been stored for 5 months under natural conditions are not a reliable product for sale and consumption, as among the molds were found on their surface as: Fusarium and Aspergillus, which can serve as sources of mycotoxins.

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THE INFLUENCE OF WALNUT OIL MOISTURE ON QUALITY

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Abstract: The research presented in this study is an investigation of some of the factors that influence lipid oxidation. A case study on the influence of walnut oil moisture on the storage quality is presented. The quality of nut oil was appreciated by the indices of peroxide and acidity indices. Oil samples with a different moisture content have been stored at different temperatures. The interdependence of the acidity indexes and the storage life of the oil has been evaluated. The regress of walnut oil quality was evaluated by measuring Peroxide Value (PV), Acid Value (AV) et Fats Acidity (FA). All parameters of the quality of the walnut oil were determined in three replicates. It has been found that the acidity of the product in walnut oil with a higher water content has increased approximately 5 to 10 times over two weeks. This was due to the breakdown of triglycerides from walnut oil, which led to the sharply diminishing of its quality.

Key words: walnut oil, peroxide index, acidity, water activity

Introduction

The major constituents of walnut oil are triacylglycerols; free fatty acids, diacylglycerols, monoacylglycerols, sterols, sterol esters, and phosphatides are all present in only minor quantities [12]. The major fatty acids found in walnut oil are oleic (18:1), linoleic (18:2), and linolenic (18:3) acids. Essential linoleic and linolenic fatty acids have a beneficial effect on human health [6]. According to Simopoulos, walnuts are unique because they have a perfect balance of n-6: n-3 PUFA, a ratio of 4:1, which was showed to decrease the incidence of cardiovascular risk [5, 13]. As the results of scientific research [1, 11] show, consumption of walnuts and walnut oil reduces cholesterol in blood due to the increased content of mono- and polyunsaturated fatty acids and vitamin E. Water activity is a critical factor that determines shelf life. The highest ability to promote lipid oxidation in water-in-oil emulsions was shown by linolenic acid, followed by linoleic and oleic acids, indicating that the oxidative capacity increased with increasing degree of unsaturation [16]. Nuts oil is rich in polyunsaturated fatty acids, which are very easily oxidized to improper storage.

The rancidity characterized by deteriorative reactions that affect food fatty acids can be classified according to their nature, as hydrolytic and oxidative. The hydrolytic rancidity occurs by means of lipase enzymes present in the food. The oxidative rancidity can occur enzymatically, in which lipoxygenase enzymes are used, or by non-enzymatic means through autoxidation reactions or photooxidation [4].

The crude oils produced in our country have a free acid content of 1-4% due to the presence of free fatty acids. One of the causes that lead to their occurrence in oil is triglyceride cleavage, which can occur during storage of oilseeds; or in crude oil due to the presence of water traps and improper storage conditions. To obtain edible oils it is necessary to remove the free water [8]. Free fatty acids is the simplest test and indicative of good harvesting and handling processes. FFA are fatty acids which have broken away from oil molecules or triacylglycerols. Their presence indicates that degradation has occurred in the oil through poor handling during processing [7].

This research established the influence of the water-in-oil content on the first phase of the degradation of walnuts oil.

Material and methods

Materials

The study was conducted on autochthonous walnuts R. Moldova, harvest of the year 2017. Walnut oil was obtained by cold pressing. The oil was divided into three equal parts: cold pressed walnut oil; walnut oil, in which 0.5% water was introduced; walnut oil in which 1% water was introduced. The oils were placed in bottles and stored in the refrigerator (+3º C, in dark) and others at +20-22ºC (in dark).
Therefore, 6 samples were obtained and examined:

The sample stored under refrigeration conditions

- ***S 1*** (walnut oil cold pressed);
- ***S 3*** (walnut oil, in which 0.5% water was introduced);
- ***S 5*** (walnut oil in which 1% water was introduced).

The sample stored at room temperature

- ***S 2*** (walnut oil cold pressed);
- ***S 4*** (walnut oil, in which 0.5% water was introduced);
- **S 6** (walnut oil in which 1% water was introduced).

Methods

Peroxide value was determined by official method Cd 8-53 and recommended practices of the American Oil Chemists Society [3]. *Peroxide value* represents the quantity of peroxide who is found in aliment and who have the capacity to liberate in one oxidative process iodine by potassium iodine [9]. It consists of the reaction in darkness of a mixture of oil and chloroform/acetic acid 2:3 (v/v) with a saturated potassium iodide solution. The free iodine released was titrated with a sodium thiosulfate solution until its yellow color disappeared. In this state, 0.5 ml starch solution (1% w/w) was added and titration was continued until the blue. The Peroxide value is expressed in mill equivalents of peroxide oxygen per kilogram of oil and calculated by the following equation:

$$PV = \frac{(V_1 - V_2) \times n}{g} \times 100 \text{ ; (meg/kg oil)} \quad (1)$$

Where:
V_1 = solution volume of sodium thiosulphate used by sample titration, ml;
V_2 = solution volume of sodium thiosulphate used by reference sample titration, ml;
g = quantity of sample, g;
n = solution normality.

Acidity value represents KOH quantity in mg that is necessary for neutralization of free fat acids in one of fat (oil) [10, 14].
AV was determined by the following equation:

$$AV = \frac{28 \times V \times f}{m}; \text{ (mg KOH/g oil)} \quad (2)$$

Where:
V= solution volume of KOH used by titration, ml;

f = 0.8416, solution factor of KOH 0.5 N;
m = sample quantity, g.

FA was determined by the formula:

$$FA = 0.5041 \times AV; \text{ (g oleic acid/100g oil)} \quad (3)$$

Water activity plays an important role in the oxidation of walnuts and walnuts oil in storage. Water activity walnuts and nuts oil was evaluated with the device Novasina Lab Swift-aw.

Results and discussion

The effects of storage temperature and oil moisture content on the oxidative stability of walnut oil have been studied over a 14 days storage period. For this research the walnut oil sample was divided into several samples. Measurement of oil sample degradation parameters was performed each week. In Tables 1 and 2 the values obtained during 2 weeks of storage are entered.

Table 1. *The chemical parameters studied oil samples*

Samples	VP, meqO_2/kg			AV, mg KOH/g oil		
	Retention time, days			*Retention time, days*		
	0	**7**	**14**	**0**	**7**	**14**
	The sample stored under refrigeration conditions					
S 1	1.77±0.01	1.51±0.02	1.38±0.01	0.17±0.02	0.11±0.01	4.92±0.01
S 3	1.74±0.01	0.79±0.01	1.14±0.02	0.15±0.01	0.15±0.01	3.89±0.02
S 5	1.77±0.02	0.40±0.01	1.66±0.01	0.15±0.01	0.15±0.02	3.52±0.02
	The sample stored at room temperature					
S 2	1.77±0.01	0.97	0.94±0.03	0.17±0.01	0.11±0.03	5.05±0.01
S 4	1.74±0.03		0.49±0.01	0.15±0.02	0.27±0.01	5.59±0.02
S 6	1.77±-.01		2.08±0.02	0.15±0.02	0.92±0.01	20.91±0.01

The value of the peroxide (to show the content of the primary oxidation products (peroxides and hydroperoxides) and the acidity of the oil was measured.

Table 2. *Physic chemical parameters studied oil samples*

Samples	a_w			FA, g. oleic acid/100g oil		
	Retention time, days			*Retention time, days*		
	0	**7**	**14**	**0**	**7**	**14**
	The sample stored under refrigeration conditions					
S 1	0.491	0.325	0.306	0,09	0.06	2.46
S 3	0.544	0.418	0.395	0.08	0.08	1.95
S 5	0.531	0.391	0.405	0.08	0.08	1.76
	The sample stored at room temperature					
S 2	0.491	0.463	0.423	0.09	0.06	2.53
S 4	0.544	0.520	0.461	0.08	0.14	2.80
S 6	0.531	0.506	0.472	0.08	0.46	10.46

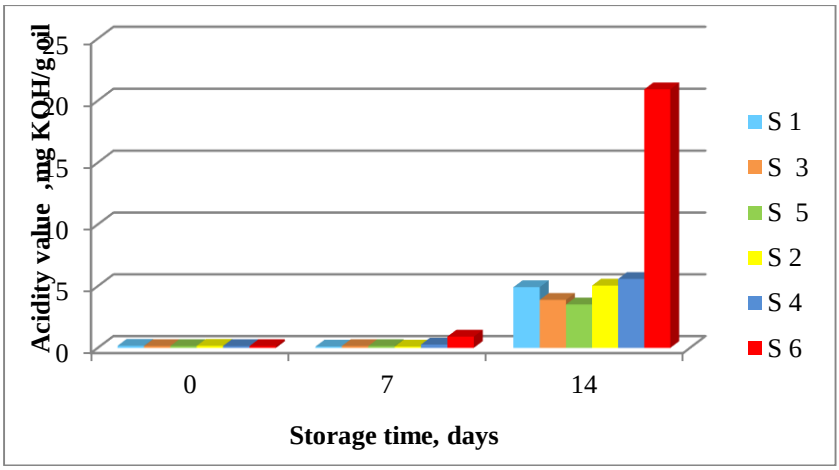

Fig. 1. *The acid values of the oil samples*

The results of the case study show that when stored in oil samples, changes in the peroxide index, acidity and water activity were observed. The most significant changes were the acidity of the oil. Was found that the acidity in vergin oil samples stored in the refrigerator increased from 0.17 to 4.92; in those stored at room temperature the acidity increased to 5.05. The limit value of the acidity index of vegetable oils mentioned in the Technical Regulation "Edible Vegetable Oils" is 4.0 mg KOH/g. However, in oil samples in which 3% water was introduced and stored at room temperature, there was a sudden increase in the acidity index from 0.15 to 20.91. Probably the water introduced into the oil samples interacted with the process of oil degradation. Study [15] indicates that a vegetable oil with an acidity value greater than 14 mg KOH/g is more susceptible to lipase action. The case study has shown that the higher the water content in the oil, the faster the quality of the nut oil. Acid value is an important index of physicochemical property of oil which is used to indicate the quality, age and edibility [2]. Fats must have very low free acidity. When acidity is increased, it denotes a hydrolysis or oil spilling process that refining has not been properly performed [8].

Storage temperature also plays a significant role in the stability of nut oil. High temperature accelerates the action of water on the degradation of nut oil.

It would be of interest for this study to be performed with a higher frequency of fixation of the quality parameters. At the same time, secondary oxidation compounds should be investigated, such as: thiobarbituric value, conjugated dienes, volatile aromatic substances, and fatty acid composition.

Conclusion

It can be concluded that the lipid oxidation of the walnut oil occurred rapidly because of its content of polyunsaturated fatty acids.

There were observed linear correlations between parameters values (Peroxide Value (PV), Acid Value (AV) et Fats Acidity (FA) versus storage time as well as the rate of parameter changes versus temperature and moisture.

The present study has shown that the value of peroxide and the acid value of nut oil are significantly affected by the environmental humidity during walnut storage, water content in nuts, and the oil production method.

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THE MATHEMATICAL MODELLING AND INTERDEPENDENCE OF TARTARIC STABILIZATION FACTORS IN NATURAL WINES

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Abstract: Wine quality depends on the vinification process and the geographical origin of the grapes but also highly relies on the varietal composition of the grape must. For this reason, the present work was undertaken to study the effect of the industrial stabilization process on the potassium bitartrate stability and composition of natural wines. Under laboratory conditions of production and refrigeration were tested and monitored two samples wines at each technological stage. According to achieved results was observed a decrease of color intensity, the content of tartaric acid within the limits of 23 ÷ 40 % of the initial values. Also, the complex stability of studied wines was conditioned by a number of factors: the mass concentration of potassium ions with a weight of 21.3 ÷ 24.5 %, the pH value with 12 %.

Key words: crystalline stabilization, mathematical modeling, winemaking

Introduction

Wine is an alcoholic beverage produced by the fermentation of the juice of fruits, usually grapes, although other fruits such as plum, banana, elderberry or blackcurrant may also be fermented and used to obtain products named "wine". The word "wine" is probably the most ancient fermented beverage and was mentioned in the Bible and in other documents from Asiatic peoples [1].

Wine quality is given by three production phases (grape production, winemaking and bottle conservation) but the factors that determine quality are numerous and a high quality wine is the optimum result of a large number of these factors [2].

In order to establish the interdependence of factors those determine quality was constitute the Pareto chart, a type of chart that contains both bars and where individual values are represented in descending order by bars. The aim of the Pareto chart is to highlight the most important among a (typically large) set of factors [3]. Also, the Pareto chart is one of the seven basic tools of quality control in Food Industry [4].

The present study was conducted in order to study the stabilization of white and red samples wines and to establish the interdependence of tartaric stabilization factors by the Pareto chart. This study allowed us to obtain data necessary for explaining physico-chemical phenomena, which influence stability or instability during wine stabilization treatments, related to the precipitation of tartaric salts.

NB: This study was conducted within the project 18.80012.51.30 A "*Criteria for wine traceability made from autochthonous grape varieties*"

Materials and Methods

Investigations have been conducted on two young wines of *Chardonnay* and *Pinot Noir* variety and carried out at the Oenology Research Centre of Technical University of Moldova and the National Audit Centre of Alcoholic Products, Chisinau.

The wine samples submitted for studio were obtained by classic technological schemes and the physico-chemical parameters were carried out on the: alcohol content, the total acidity, the pH value, the content of tartaric acid, potassium and others (Table 1), using the presented in national [5] and international standards methods [6]. The content of cations in wines before and after the tartaric stabilization were determined by the recommended International Organization of Vine and Wine (IOVV) method, using atomic absorption spectrometry [7] and the content of organic acids by capillary electrophoresis [8]. Data obtained of physico-chemical parameters were used for the mathematical modelling and Pareto diagram creation.

After the fermentation process wine samples have been fined with bentonite in order to ensure the protein stability (adsorption of wine proteins), then tartaric stabilized by two methods: conventional cold stabilization (scheme I) and contact seeding with 5 g/l KHT (svheme II) at the temperature of minus 5°C. The conventional process for tartaric stabilization of young wines consists of cooling the wines at a temperature near the freezing point for several days to induce KHT precipitation before bottling [9]. At the end of period, the samples are visual inspected and conclude on the presence or the absence of KHT crystals. The test results, therefore, indicate the final stability of wine and it presents a risk of tartrate precipitation. The sample of wine was considered to be stable, if the tartaric crystals are missing, if not the wine is unstable and will be cold retreated.

After the stabilization by two procedures, the wine samples were filtrated at the seeding temperature to avoid resolubilization of potassium bitartrate crystals back into wine [10]. Evaluation of studied wine quality was performed by sensory analysis because, generally, chemical data are not sufficient to define this parameter. All measurements were carried out in triplicate and the results were statistically analyzed using the Statistica 6.0 program to determine the average value and standard error.

Results and discussion

The data concerning the main wine composition characteristics before and after the stabilization are presented in table 1 and figure 1. According to these data, the wine samples during the stabilization diminished the color intensity, the content of tartaric acid and total polyphenol index within the limits of 23 ÷ 40 % of the initial values. Also, the content of tartaric acid and potassium in samples has decreased in the following order: 9,87 % and 23,8 % (for whitesample) and subsequently 22,42 % and 26,4 % (for red one).

From the comparative analysis of the two procedures is revealed that the decrease of all parameters is more significant in the case of contact seeding procedure in comparison with conventional cold stabilization. The conductivity has diminished in average with 15,9 % and the total polyphenol index with 40 %.

Table 1. *Physico-chemical characteristics of the wine samples.*

№	Parameters	Wine sample					
		White wine			Red wine		
		Initially	Stabilized by chillproofing	Stabilized by contact seeding	Initially	Stabilized by chill-proofing	Stabilized by contact seeding
1.	**Alcoholic degree, % v/v**	12,62	12,48		10,25	10,18	
2.	**pH**	3,13	3,08	3,06	3,30	3,20	3,22
3.	**Total acidity, g/L $C_4H_6O_6$**	7,82	6,80	6,72	8,43	7,52	7,6
4.	**Volatile acidity, g/L CH_3COOH**	0,42	0,48		0,52	0,54	
5.	**Content of tartaric acid, g/L**	2,62	1,62	1,58	2,07	1,48	1,46
6.	**Content of potassium, mg/L**	920	713	682	1070	894	821
7.	**Color intensity, $A_{420\ nm}$**	0,092	0,048	0,042	1,483	1,345	1,121
8.	**Total polyphenol index, mg/L**	148,76	86,31	82,54	1498,11	1076,47	1002,63
9.	**Conductivity at 20°C, µS/cm**	1988	1670	1620	2066	1702	1684
10.	**Sensory analysis, points**	7,7	7,8		7,9	8,0	8,0

In terms of organoleptic analysis, the treatment of young wines enhances the aroma expression, the flavor persistence and specific color for this type of wine.

The technique of refrigeration microbiologically purifies the new wines, stabilizing the color and the flavor, particularly red wines bottled young.

In order to validate the interdependence of tartaric stabilization factors in wine samples the Pareto diagram was constructed. That establishes the major influence of the concentration of potassium ions and tartaric acid, the pH on the resulting parameter - the tartaric stabilization as described in Figure 2.

The percentage share of the selected factors was different in wine samples, so the content of potassium ions was maximally controlled by 24.36 % and a minimum of 3.65 % for the alcoholic degree in white one. In red wine the influence of temperature increased by 2.34% and decreased by 3.0% for content of potassium compared to the white sample.

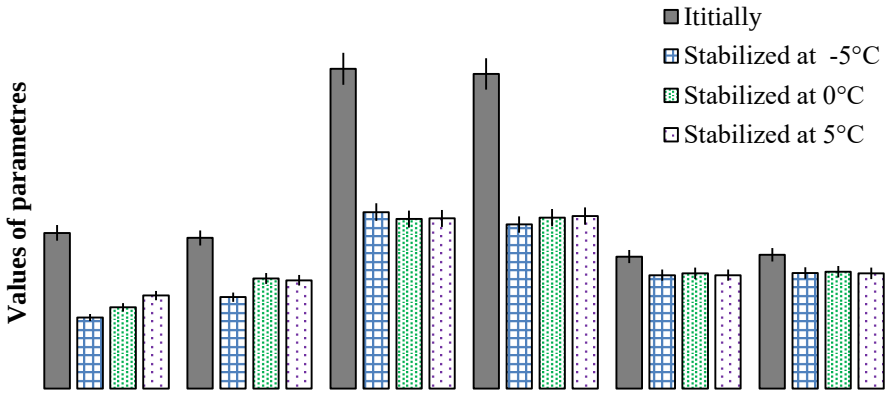
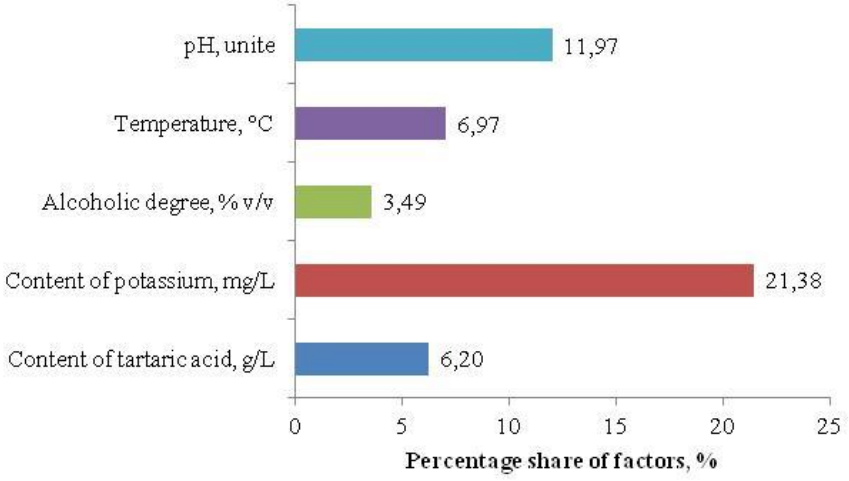
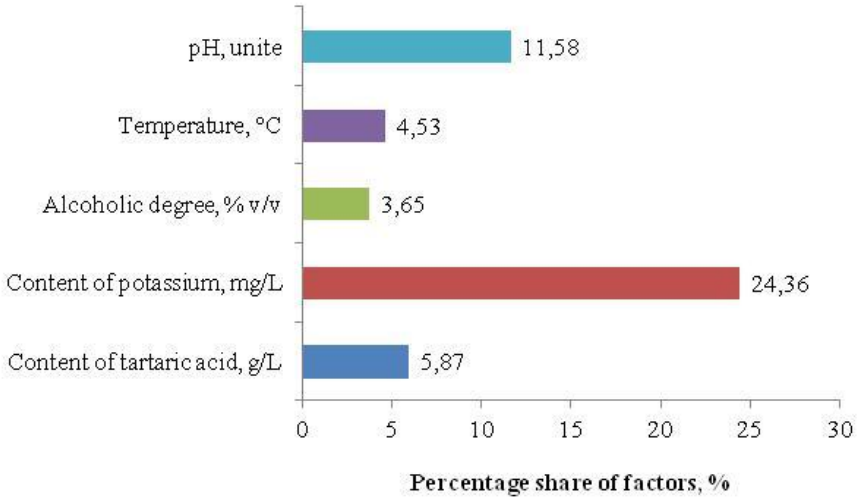


Fig. 1. *The evolution of physico-chemical parameters at different treatment temperature of wine samples.*



a) White wine



b) Red wine

Fig. 2. *The Pareto diagram of wine samples.*

The complex stability of studied wines is conditioned by a number of factors: entirely of the protein content; the mass concentration of potassium ions with a weight of 21.3 ÷ 24.5 %; the pH value of the wines with 12 % of and in the range of 4.5 ÷ 7 % of the treatment temperature.

Increasing temperature influence of the resultant parameter in red wine can be explained by the thermal instability of the phenolic complex that involves the colloidal balance changing in the system and serves as a support in the THK micro crystals creating process.

This study of mathematical modelling allowed us to obtain data necessary for the optimal regime of wines stabilization treatments related to the precipitation of excess tartaric salts.

Conclusion

In winemaking it is usually necessary to reduce the concentration of potassium bitartrate (KHT) in wine to avoid its precipitation in the bottle, which otherwise could reduce perceived wine quality. During cold stabilization the total acidity value had increased in middle with 21%, the color intensity values were halved into white sample and 25 % for red one. Also, the decrease of conductivity values at 20°C is range in limits 318-382 μS/cm.

According to the achieved results, cold stabilization reduces the values of content of tartaric acid of samples in the limits of 30 ÷ 40 % of initial values. Also, the contact seeding is the most efficient procedure of wine tartaric stabilization, due to the present of KHT micro-crystals in wine volume.

Relying on comparative analysis of the two procedures, we recommend the contact seeding procedure for stabilization of the young white wines for economic and technological reasons.

The complex stability of studied wines is conditioned by a number of factors: entirely of the protein content; the mass concentration of potassium ions with a weight of 21.3 ÷ 24.5 %; the pH value of the wines with 12 % of and in the range of 4.5 ÷ 7 % of the treatment temperature.

Further research is required to assess the effectiveness in different types of wine, especially tannic red wines and sweet one which have particularly complex colloidal structures.

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THE MINERAL SUBSTANCES INTAKE IN THE ALIMENTARY PUMPKIN

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Summary: Pumpkin represents a rich source if nutrients that have health benefits on the human's body. A special significance has the mineral substances contribution of the pumpkin. In this article are presented the results of the determination of mineral substances in the fresh pumpkin pulp, dried pumpkin pulp flour and pumpkin seed flour, Curcubita moschata variety, 2017 harvest.

Key words: Pumpkin pulp flour, pumpkin seed flour, mineral substances, atomic absorbtion.

Introduction

Pumpkin is one of the oldest agricultural crops. This being a valuable crop from the alimentary point of view, it is widely used in human's alimentation, it is at the base of Mediterranean cuisine. (1) Pumpkin is also widely used in the alimentation of Republic of Moldova's population.

The most often pumpkin is used for obtaining semi-finished products from pulp, pumpkin powder, dried pumpkin pieces, pumpkin juice or as an addition together with other fruits that improve the taste and the flavor of the final product.

The consumption of pumpkin has laxative action, diuretic, stimulates kidney's activity, regulates cholesterol, reduces the risk of some types of cancer, slows down the aging process and helps to the regenerating process, thanks to its richness in antioxidants it is useful in cardiovascular disorders, improves circulation, decreases gastric acidity. (2)

Resulting from pumpkin's beneficial properties on the human's body, the composition of mineral substances in native varieties presents interest. (3)

The purpose of this research was to determinate the composition of mineral substances of pumpkin pulp, pumpkin pulp flour and of the flour of pumpkin seeds of the Curcubita moschata variety, 2017 harvest.

Materials and research methods

Pumpkin from Curcubita moschata variety, 2017 harvest, has undergone complex processing aiming to obtain pumpkin pulp, pumpkin pulp flour and pumpkin seed flour.

Fresh pumpkin pulp was obtained after primary processing and mashing, pumpkin pulp flour - after being dried at the temperature of 70°C in the oven, ground and sieved in powder. Pumpkin seed flour was bought from a commercial network.

The obtained samples were subjected to photo-colorimetric analysis and atomic absorption. (4)

Results and discussions

The effectuated studies showed that the consumption of pumpkin has physiological benefits, diuretics, laxative, anti-inflammatory and contributes to health maintenance. A special interest presents the composition of pumpkin's mineral substances.

The content of mineral substances is presented in the Table 1.

Table 1. *The content of mineral substances in the research samples, mg%*

Indices names	Values found							
	Phosphates (P2O5), mg/g	**Calcium (Ca), Mg/g**	**Magnesium (Mg), Mg/g**	**Sodium (Na), Mg/kg**	**Potassium (K), mg/g**	**Iron (Fe) total, mg/g**	**Zinc (Zn), Mg/g**	**Copper (Cu), mg/g**
Fresh pumpkin pulp	0,183	31,9	13,27	1,05	263,0	0,295	0,081	0,071
Pumpkin pulp flour	5,02	184,0	134,85	12,50	2780,0	5,53	2,1	0,645
Pumpkin seed flour	12,4	99,2	559,35	23,24	910,0	15,5	14,35	1,67

The biggest part of mineral substances has the potassium (approx. 263mg/g in fresh pumpkin pulp, 2780mg/g in pumpkin pulp flour, 910 mg/g in pumpkin seed flour). Pumpkin pulp contains significant quantities of Ca 31,9 mg/g and Mg 13,27mg/g. Pumpkin pulp flour contains more significant quantities of Ca 184,0mg/g and Mg 138,45mg/g compared to the pumpkin pulp. The most significant quantity of Mg 559,35mg/kg was found in the pumpkin seed flour. These results show that pumpkin can provide a significant quantity of minerals that cover the recommended daily intake of mineral substances, being used in different forms such as fresh pulp, pulp flour or pumpkin seed flour.

Conclusions

In this research was highlighted the mineral composition of fresh pumpkin pulp, pumpkin pulp flour and pumpkin seed flour of the aboriginal variety C. moschata, 2017 harvest. It was demonstrated that pumpkin is extremely important source of daily potassium intake (aprox. 263 mg/100g in fresh pumpkin pulp, 278mg/100g in pumpkin pulp flour, 910mg/100g in pumpkin seed flour). It also has significant quantities of calcium and magnesium (numbers). This results show that pumpkin can provide o significant quantity of minerals to cover the recommended daily needs in mineral substances, being used in different forms such as fresh pulp, pulp flour or pumpkin seed flour.

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BIOLOGICAL ACTIVE COMPOUNDS OF HORTICULTURAL ORIGIN FOR CONFECTIONERY PRODUCTS*

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Abstract: Biologically active compounds of aronia fruit, white sea buckthorn, dog rose and grape marc have significant influence on health, and have side effects of dyes [1]. At present, synthetic dyes are used in manufacturing of dairy products, carbonated beverages, sweets, etc. The long-term consumption of these foods containing synthetic dyes has various harmful effects on the health of the consumers. It is known that the most common synthetic colorants - Sunset Yellow FCF, Quinoline Yellow, Azorubine, Allura Red AC, Tartrazine, Cochineal Red A cause children hyperactivity [2]. The use of biologically active compounds of aronia, white sea buckthorn, dog rose and grape marc in confectionery products for the substitution of synthetic dyes is of high topicality. The aim of the research is to obtain bioactive compounds from aronia fruit, white sea buckthorn, dog rose and grape marc, and their use in the formulation of confectionery products.

The chemical composition of bioactive compounds of aronia, white sea buckthorn, dog rose, and grape marc were examined. The extracts obtained have been shown to contain biologically active compounds such as polyphenols, tannins, anthocyanins and antioxidants. Confectionery masses, fondant candies and pralines with the addition of biologically active compounds of horticultural origin have been developed. The physicochemical quality characteristics of the candy correspond to the admissible values, regulated in GD RM No. 204 „Confectionery products". Based on the analysis of organoleptic indices, physicochemical indicators, microbiological stability, antiradical activity in gastric digestion „*in vitro*" and shelf life, it was found that they are competitive, have functional properties due to the presence of biologically active compounds and can be recommended for consumption.

Research results will contribute to the manufacture of confectionery products capable of mitigating the impact of oxidative stress and nutritional allergies, contributing to the integration of the concept of healthy nutrition and increasing the competitiveness of local businesses.

**This work was benefited from support through the 16.80013.5107.22/Ro project, "The substitution of synthetic food additives with bioactive components extracted from natural renewable resources".*

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CONTRIBUTION OF EASTERN EUROPEAN COUNTRIES TO THE WORLD INFORMATION PROCESS IN THE FIELD OF FOOD SCIENCE

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Abstract: In this study is presented the analysis of the development of food science research in Eastern Europe (EU, Poland, Romania, Bulgaria) and post-Soviet countries (Russia, Ukraine, Moldova). There have been presented the main information channels of the global information area in this research domain, as well as the most important information channels of Eastern Europe. Leading countries in this area of research on the total number of publications and the H-factor have been identified. It is analyzed the dynamics of the number of publications (per million inhabitants) for EU countries surveyed and the post-Soviet countries. It is shown that in all countries there is a positive dynamics.

The development of research in the field of food science is one of the trends of modern development of civilization. This, in particular, manifests itself in the fact that the sciences about man are increasingly determining in the direction of the development of science, and food science is one of its most important sections. The quantitative analysis of the science development in general and food science, in particular, is possible scientometrics methods [1]. In this paper, we will analyze the development of science in the above area on the basis of the Scopus database [2] - one of the main databases of the world information area, indexing 21 thousand scientific titles (journals, conference materials, serial books) in the field of natural, technical , medical and human sciences.

The main scientific publications in the field of food science are scientific journals published in American or European journals (Elsiver, Springer). They are the main channels of information, essentially determining the scientific "policy" in the analyzed area of science. As for the journals published in the countries of Eastern Europe, their degree of influence on the global information process is significantly lower.

The results of research allow us to conclude that within the information science model, the greatest development of food science in Eastern European countries was achieved in Poland. As for the dynamics of scientific development, it should be noted that it is positive in all countries of Eastern Europe. However, this trend is the most pronounced for Romania.

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CURRENT SITUATION AND PROSPECTS OF DEVELOPMENT OF THE VITICULTURE AND WINE SECTOR IN THE REPUBLIC OF MOLDOVA

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Abstract: One of the strategic sectors for economic development of Moldova has been and remains the wine sector. This sector has ensured during its evolution, important parts of the National Gross Domestic Product, contributed to the balance of foreign trade, drive job creation in rural areas, led to the development of the adjacent branches of the Moldovan economy. The industry's strategic importance also stems from the fact that the full range of value chain activities are carried out locally. Today the wine and viticulture sector in the Republic of Moldova depends on exports. Wine is one of the country's main export products. Over 90 percent of the produced wine production is exported.

As the wine sector continues to reach new markets, improve the regulatory framework, and build the capacity of wine producers and consumers, wine will continue regaining its position as a leader in Moldova's economy.

Keywords: economic development, viticulture and wine sector, wine industry, commerce, export

EFFECT OF BUCKWHEAT AND OAT FIBERS ADDITION ON THE QUALITY OF YOGURT

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Abstract: Novel trends in the market of fermented dairy products are leading to obtain various products with high functional and nutritive but less energy value. The proposed product is a natural, set yogurt with 8% fat content, being innovative in many ways, including: composition, texture, and packaging. In terms of composition, the innovation consists in the combination of two ingredients: buckwheat and oat fiber with yogurt, mix that is not found on the world market for dairy products. Buckwheat and oats are important sources of energy due to the high starch content, high-quality lysine and arginine-rich proteins, dietary fibers, and lipids which rich in unsaturated fatty acids. The antioxidant substances from buckwheat have a preventive role in the development of cancer, cardiovascular diseases, neurodegenerative diseases. Nowadays, global interest in oat has begun to grow more and more due to its bioactive and functional components: β-glucans, antioxidants, sterols, proteins and polyunsaturated acids. Adding buckwheat flour and oat fibers to the simple yogurt formula changes the physicochemical, textural and sensory properties of finished product.

This yogurt is the only national and international market product with this composition, it is in suitable with consumer preferences, trying to convince by superior quality and carefully selected ingredients. The product is easy to manufacture due to the low number of raw materials required, which can easily be purchased from local producers. This yogurt is recommended by its satiability that can be felt while enjoying the amazing taste.

Keywords: functional food, bioactive components, satiability

Acknowledgements

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FEATURES OF THE PRODUCTION OF APRICOT KERNELS AS A SECONDARY RAW MATERIAL FOR THE FOOD INDUSTRY

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Abstract: In this paper, we proposed convective and combined methods for drying wet kernels of apricot stones. Kernels of apricot stones are a very ambiguous food product, during their heat treatment in them occurs not only the loss of mass due to the removal of moisture, but also the loss of mass due to biochemical changes occurring at high temperatures.

Apricot stones are a healer of human cells. All because their kernel contains a rare vitamin B17, which includes cyanide substance. When cyanide enters the body, cancer cells either die or are healed [1]. In stone kernel, it is concentrated from 35 to 60 % of non-drying fatty oil. Also kernels contain: glucoside amygdalin, emulsin, lactase and hydrocyanic acid. Kernels can be eaten raw, dried or roasted, but not more than 20 grams at a time. 100 grams of apricot kernels contain more than 450 kcal [1, 2, 3].

Apricot kernels are very often used in medicine, in cooking in the form of powders, which are added into glazes, ice cream, yogurts, creams and other dairy products.

The purpose of this work was an experimental study of the drying process of the kernels of the apricot stones by convective and combined - convection + UHF (high frequency currents) methods. In the first part of the study, were studied the kinetics of convective drying. In the second part of the experiment, was studied the influence of high-frequency heating in combination with the convective method of energy supply on the kinetics of drying.

It was experimentally established that the drying process should be carried out in two stages: the first stage lasts until the critical moisture content of 110 % is reached and it should be implemented by convective energy supply (100 °C). The second stage lasts until the equilibrium moisture content of 30 % is reached, using a combined energy supply (convention + UHF) with the strength of the electromagnetic field $E = 1.8 * 10^4$ V·m^{-1}.

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INFLUENCE OF SEABUCKTHORN AND GRAPE SEED EXTRACT ON SENSORY, PHYSICOCHEMICAL AND RHEOLOGICAL CHARACTERISTICS OF YOGURT

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Abstract: The use of various ingredients in yogurt production, for the diversification of this dairy product, which is highly appreciated by consumers, is a frequent concern of specialists. Nutritionists recommend daily consumption of yogurt for good health, a balanced physical body, therapeutic properties and a mild digestion.

In this paper we used the research done in a previous laboratory study in which we optimized the addition of seabuckthorn powder and grape seed extract to the classic yogurt formulation. Yogurt with the best physicochemical and sensory properties was obtained by adding 1.75% seabuckthorn powder and 0.25% grape seed extract to its manufacturing formulation. Prior to inoculation, the ingredients mixture was pasteurized at 85°C for 15 minutes, and then cooled to 43°C. The samples were inoculated with 0.2% (w/v) yogurt starter culture and incubated at 43°C until the pH reached 4.6. The yogurt samples were stored at 4÷6°C for 24h, and then the analyses were performed in order to determine the rheological, physicochemical and sensorial properties at weekly intervals for 28 days. The rheological properties of yogurt samples were determined using a Modular Advanced Rheometer System (Thermo Haake Mars). The titratable acidity, pH, syneresis and water holding capacity were determined according to the standardizations method and other methods used by researchers. This new product can be obtained at the industrial level without changing the technological procedure.

Keywords: natural ingredients, therapeutic value, new product

Acknowledgements

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TOTAL CAROTENOID CONTENT OF LOCAL BERRIES LIPOPHILIC EXTRACTS*

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Abstract: Nowadays consumers tend to prefer natural compounds and additives to be used in food products production although food industry uses mostly chemically synthesized antioxidants and food additives. Sea buckthorn and rosehips berries are widely spread in Moldova which fact can motivate its use mainly in food industry.

Carotenoids represent a class of compounds that have colouring power, health benefit, antioxidant capacity, and antiobesity effect [1]. In order to analyze the carotenoid content of local berries were performed extractions in sunflower oil at preset temperature and time. Using analytical methods were determined the content of chlorophyll a and chlorophyll b, lycopene, β-carotene and zeaxanthin.

According to bibliographic sources, the carotenoids content may vary between 1 and 20 mg/L [2]. The results showed that the sea buckthorn extract has a content of chlorophyll a - 0,36±0,04 mg/l and b - 0,36±0,07 mg/L, the amount of β-carotene is 21,69±0,04 mg/L; lycopene - 21,49±0,14 mg/L; zeaxanthin - 24,31±0,06 mg/L. For the rosehip extract the content of chlorophyll a and b is 0,047±0,006 mg/L and respectively 0,28±0,01 mg/L, and the amount of β-carotene is 13,58±0,05 mg/L; lycopene - 14,39±0,38 mg/L; zeaxanthin - 15,19±0,06 mg/L.

Evaluating the carotenoids content of local berries extracts we can conclude that there is a high possibility to motivate the continuous use of this compounds in the production of functional food products with a high lipid content. Also there are possibilities to replace synthetic additives with natural ones to offer to consumers high quality and safe for consumption food products.

**This work was benefited from support through the 16.80013.5107.22/Ro project, "The substitution of synthetic food additives with bioactive components extracted from natural renewable resources".*

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Section III

Chemistry and Microbiology of Food

AGGREGATIVE STABILITY OF EMULSIONS CONTAINING WALNUT OIL

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Abstract. Phase diagrams of the state of a three-component emulsion – *Walnut oil / Aqua / Ethanol* were developed. It is shown that walnut oil is more prone to form A/O emulsion than O/A ones, that is possibly explains by the presence of surfactants in it. The aggregate stability of emulsions is also affected by the composition of a water-ethanol phase. The most stable emulsions were those that included practically equal volume fractions of ethanol and water. This fact could be explained by an approximate densities equality of polar (aqua + ethanol) and nonpolar (oil) phases.

Keywords: walnut oil, ethanol, emulsions, phase state diagrams, aggregative stability

Acknowledgments. Gratitude and deep appreciation are expressed to the National Scholarship Programme of the World Federation of Scientists for the support in a scientific activity.

Introduction

Walnut oil obtained by a cold pressing represents a complex composition, that includes, besides various fatty acids, phospholipids. These substances contain hydrophilic groups and therefore have a surface activity [1]. Thus, cold pressed walnut oil, unlike refined oils, should have its own surface activity [2]. From this point of view, it is interesting to investigate the aggregative stability of emulsions based on walnut oil.

Experimental

Systems containing nonpolar phase – a cold pressed walnut oil as, and polar phase – water and ethanol obtained by rectification, were investigated. Walnut oil was obtained from freshly picked and manually peeled nuts, aged for 24 h over anhydrous sodium sulfate to uniquely remove the aqueous phase with its attendant substances.

Results and discussion

"Three-component" emulsions were obtained, and diagrams of the type "***property = f (composition)"*** in the form of Gibbs-Roseboom Triangle were developed.

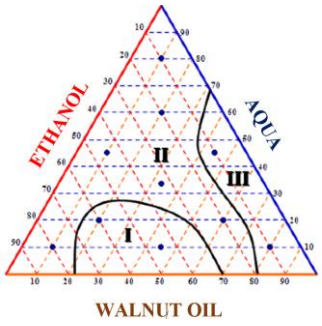

Fig.1. *Phasic state regions of Walnut oil/ Aqua / Ethanol system*

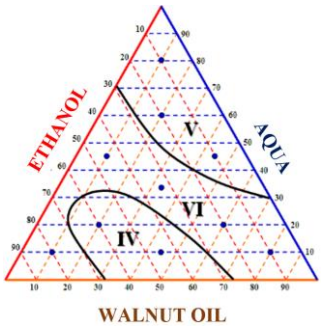

Fig.2. *Kinetic stability regions of Walnut oil/ Aqua / Ethanol system*

Region I (Figure 1) comprises: 25-65% Walnut oil, 0-25% Aqua, 30-75% Ethanol, where the A/O emulsion is formed. The formation of A/O emulsion on the left side of this region is quite unexpected, because the apolar phase (in other words, dispersion medium for A/O emulsions) is less than 50%.

Region II (Figure 1) is much more complicated by its shape and occupies a bigger space. The largest area in this Region is: 0...30% Walnut oil, 30...100% Aqua, 0...70% Ethanol. A very small field is attached to this area: 0...15% Walnut oil, 0...30% Aqua, 60...100% Ethanol. The formation of O/A emulsions in this area is natural, because the nonpolar phase volume doesn`t exceed 10%. The third area is very interesting, ranging from 40...80% Walnut oil, 0...30% Aqua, and a very narrow range of Ethanol, 20 ... 30%.

In Region III (Figure 1), the O/A/O three-phase emulsion is formed. Region borders are: 40...100% Walnut oil, 0...60% Aqua, 0...12% Ethanol. Thus, the "top" phase of the emulsion represents an oil, i.e. walnut oil tends to absorb the droplets of polar phase and it this area, too.

Region IV (Figure 2) shows a low aggregate stability, which doesn`t exceed 2 minutes, after which visible signs of coalescence appear in the system.

Region V (Figure 2) also represents a low stability, approximately 2 minutes. But this area has been separated from Region IV, because both regions are antipodes by water content (0...30% Aqua in IV and 30...100% Aqua in V) and does not overlap.

Region VI (Figure 2) disparates the areas of low stability. It has the largest field on the discussed diagram and shows a high stability, which reaches up to 5...10 minutes. It is interesting that the most part of Region VI is located almost symmetrically along the bisector, which starts from 100% Walnut oil and corresponds to the equation of straight *Aqua = Ethanol*. It is easy to show, that exactly this Aqua/Ethanol ratio contributes to the fact that the density of a polar phase is equal to the density of a nonpolar phase, that significantly reduces the coalescence rate. Region VI is also supplemented by a small area, located at 0...30% Walnut oil, 0...30% Aqua and 70...100% Ethanol.

Conclusion

Walnut oil is more prone to form A/O emulsion, than O/A one. Perhaps, this fact is due to the presence of phospholipids in it, which have surfactants properties. The composition of water-ethanol phase also influences on the aggregate stability of obtained emulsions. The most kinetically stable emulsions are those, in which the volume fractions of ethanol and water are approximately equal.

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DETERMINATION OF PHYSICO-CHEMICAL PARAMETERS OF POLYFLORAL

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Summary: The article presents the results of studies made on polifloral honey from various local producers. The paper describes the methods for determining the physico-chemical properties of honey by using research methods such as refractometry, titrimetry, spectrophotometry. Attention is drawn to the fact that high demand for apiculture products is often attractive and leads to falsification of honey, which can only be detected by laboratory research methods. Determining the presence of oximethylfurfural has made it possible to identify the natural character of honey and determine the degree of preservation of its natural qualities as well as being a criterion for detection of falsification.

Keywords: Natural honey, physico-chemical indicators, oximethylfurfural

Introduction

Honey is a complex natural product, resulting from the floral nectar of plants, which is enriched by bees with its own substances, through the action of juice secreted by their glands. Bees often produce handmade honey, which comes from various sweet liquids from the plant, but not from the flower.

From the food , hygiene and sanitary point of view, honey means the natural food extracted from the honeycombs when they have been bee-hatched on at least 3/4 of their area in such a way as to avoid the penetration of larvae, bee corpses , wax fragments or other impurities (Bulancea, 2002).

Polyfloral honey comes from the nectar harvested from different plants that flourish during the same period without the predominance of one of them.

The composition of honey is complex. It pools groups of inorganic and organic substances: carbohydrates, enzymes, organic acids, vitamins, proteins (amino acids), all solubilized or dispersed in the water contained in the honey.

Honey is highly appreciated for its qualities with therapeutic uses. Honey is a valuable food for health.

In the study of honey are used organoleptic, microscopic and measuring methods.

Organoleptic research allows us to determine the color, flavor, texture, taste, presence of foreign substances, fermentation of honey.

Physicochemical methods determine water content, invert sugar, sucrose, diastase index, acidity, amount of hydroxymethylfurfural.

The high demand for honey on the market often leads to falsification, which can only be detected by laboratory methods. The purpose of the research is to study the physico-chemical indices in the polyfloral honey from different producers present on the local market.

Materials and methods of research

In order to evaluate physico-chemical parameters, 10 samples of honey were purchased and selected from three different producers, and they are part of the group collected from June to September 2018.

The physico-chemical studies of honey were made using the following methods:

Determination of water content or moisture content: The water content is determined by measuring the refractive index at 20 ° C using a refractometer, and the water content corresponding to the refractive index is determined from the table.

Determination of pH and free acidity: The pH is measured at 20 ° C on a 10% honey solution in distilled water using a pH meter.

Determination of hydroxymethylfurfural: The amount of hydroxymethylfurfural (HMF) was obtained by the GOST-32169-2013 method. The principle is based on reading HMF absorbance at a wavelength of 284 nm and then at 336 nm using a UV-Visible spectrophotometer.

The mass fraction of water, pH and free acid content of oximetilfurfurol in honey samples were determined according to GOST 31774-2012, GOST-32169-2013, GOST-31768-2012

Results

Honey samples analyzed polyphlora have a clean, homogeneous appearance without impurities and foam, with a fluid-viscous consistency some crystallized, the color varies from light yellow to dark yellow. In terms of taste and smell - sweet, pleasant.

Moisture: The maximum water content regulated by the official rules in our country for all types of honey is 20%. This condition is based on the fact that at the end of the bee processing process (cell capacity), honey's humidity ranges from 17-20%.

The honey of the studied lots had a mass of water of 17% on average; two samples with a water content of 15.7%, two samples from 19-19.3%, and six samples with a water content from 16.9%, a sample of 17.8%, (Table 1).

The excess water content reduces the nutritional value of honey in proportion to the fermentation.

Honey Acidity: The active (actual) acid refers to acids in dissociated form and is expressed as pH units. The pH of honey depends on the amount of organic acids, such as gluconic, pyruvic, malic and citric acids, and minerals (Cavia et al., 2007). The chemical reaction of honey is acidic because of the rich content of organic acids. The normal pH values of nectar honey range from 3.5-4.5 (Bogdanov S., 1999) and exceeds 4.5 for honey. The chemical character of honey is pronounced acidic. Determining acidity helps to appreciate the freshness of honey.

Table 1. *Physico-chemical parameters of honey samples studied polyphlora*

	Humidity, %	**pH**	**Acidity/kg**	**HMF, mg/kg**
Norme UE, Codex Alimentar	17 < 21,0	3,5 < pH <4,5	<50mechiv/kg	<40mg/kg
Sample 1	15,7	3,83	16,4	22,4
Sample 2	15,8	4,15	14	31
Sample 3	17	4,41	10	18,5
Sample 4	19,2	4,25	21	21,8
Sample 5	17,8	4,37	18	28,3

	Humidity, %	pH	Acidity/kg	HMF, mg/kg
Sample 6	17,2	**4,81**	15	**41,6**
Sample 7	16,9	4,16	17	24
Sample 8	17	4,24	16	35,6
Sample 9	17,1	3,9	20	26,7
Sample 10	19	4,2	18	38,3

From the data presented (Table 1), we note that the new analyzed samples are within the established pH limits, and only the sample no. 6 has a pH of 4.81. This indicates that we have a honey or a honey fermentation.

According to Schweitzer (2004), the natural acidity of honey increases when honey matures when extracted with propolis and especially when it is modified by fermentation. Acidity is an important criterion of quality and provides very important indications of the state of honey (Bogdanov, 1999).

The pH value for all honey samples indicates their acidic reaction: the maximum pH was 4.81, the minimum was 3.83, on average 4.23 pH units.

Hydroxymethylfurfural (HMF). The presence of this product in honey originates either in the partial decomposition of fructose from its composition under the influence of external factors or exogenous origin in case of falsification.

In acidic and hot environment, fructose decomposes with the formation of furfurolic products, the most significant of which is hydroxymethylfurfural (HMF). HMF formation occurs as a result of long-term honey at a temperature of 21-26 ° C (a slow process under these conditions) and after heating of more than 55 ° C. The value of oximethylfurfural must not exceed 40mg / kg

The analysis of the ten samples shows a variation in HMF from 18.5 to 41.6 mg / kg. Again sample 6 has a higher HMF content, the maximum allowable being 40mg / kg. We can assume that this sample was not kept in optimal conditions. Otherwise, all samples have an HMF content of less than 40mg / kg and meet the required standards.

Conclusions

The quality of honey's natural honey depends on organoleptic, microscopic and physico-chemical parameters. In nine of the ten samples analyzed, these indices were in accordance with GOST 19792-2001 "Natural Honey, Technical Conditions". These honey samples can be characterized as a quality product with acceptable aromatic properties.

Honey from sample 6 did not meet the requirements of the standard for the pH index and the high level of hydroxymethylfurfural, which can be explained by inadequate storage conditions or falsification of honey. To say that it is a forged honey, other physicochemical indices need to be determined, such as the diastase index.

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DYNAMICS OF WALNUTS HUMIDITY AND REHYDRATION

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Abstract: Work deals with analysis of humidity values of the walnuts during storage and rehydration. Rehydration process contribute to delete oxidized polyphenols, and to diminished astringent taste, so directly rises walnuts safety and beneficial properties.
Keywords: walnut, core, cake, humidity, rehydration, kinetics, health benefits

Introduction. Why is important to control walnut humidity?

In the recent years, the world-wide popularity of the walnut fruits (Juglans Regia L.) and their derivatives (oil, cake, protein extracts) have significantly risen. Despite the high nutritional value, a fly in the ointment is high contain of polyphenols, which causes some problems. Phenolic compounds offer astringent taste and are inhibitors of normal enzyme release and activity, blocking biochemical processes, inclusive breath. This causes walnuts to lose water. The consequences of consuming of dry anhydrous walnut core are that it absorbs water from food lump and leads to partial indigestion. A simple solution of this problem is a control of humidity and well-timed rehydration of walnuts. The interest in softening the core of the nut before consumption also appeared when it is being used in preparing various foods. This work deals with brief analysis of humidity values of the walnuts parts (core, cake after oil pressure) which vary by the conditions and terms of storage and rehydration.

Experimental. Walnut humidity and rehydration

Control of humidity. All the samples for analyzes were taken from the same walnut variety, "Calarash". The moisture content of walnuts, was determined by drying the sample until a constant mass in the drying stove at a temperatures of 105 ± 2°C.

Table 1. *Relative (H_R) and absolute (H_A) humidity of walnuts in different conditions*

Sample, storage condition and time	H_R, %	H_A, %
Nuts core from whole walnuts, peeled immediately before the determination		
From the tree, with the green bark, milk ripeness, August	20.1 ± 0.4	26.2 ± 0.6
From the tree, without green bark, milk ripeness, August	13.6 ± 0.3	15.8 ± 0.4
Technical ripeness, September	3.2 ± 0.1	3.3 ± 0.1
After 10 months of storage at 3°C	3.1 ± 0.1	3.2 ± 0.1
After 22 months in desiccator, at room temperature	2.7 ± 0.1	2.8 + 0.1
Walnut cake		
In a polyethylene bag at 3°C, 10 months storage	6.1 ± 0.2	6.5 ± 0.2
In a polyethylene bag at 3°C, 22 months storage	6.1 ± 0.2	6.5 ± 0.2

So, storage of whole walnuts for a long time at the same storage conditions reduce their humidity (Table 1). It can be noticed that the humidity of walnut cake is twice higher than that of walnuts core of technical ripeness. This data is in good correlation with weight of walnut oil, evacuated by pressure of core in order to obtain oil and cake.

Rehydration (Moistening). The core samples were soaked in water for 1-8 hours. After soaking, humidity values were determinate by dehydration at 105^0C.

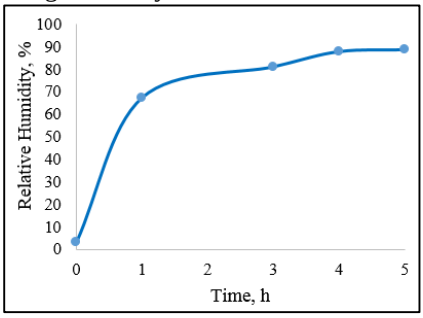

Fig.1. *Rehydration of walnut core after six months of storage (order I kinetics)*

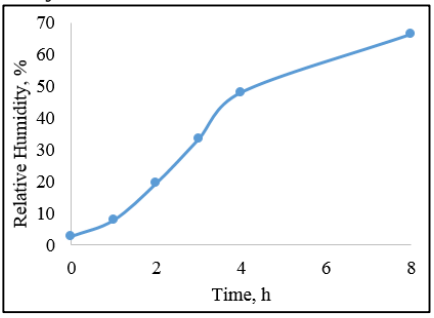

Fig.2. *Rehydration of walnut core after 22 months of storage (complex kinetics)*

Walnuts contain significant amounts of proteins and fats, that ensure germination and enzyme release. In reality, the role of enzymes is to dissolve other nutrients into smaller and simpler particles for digestion. The moistening process increases the phenomenon of enzyme release and their activity. It can be noticed, that the water in which we soaked the walnuts, became brown, and the taste of water became bitter. So, moistening contribute to deletion of undesirably substances and increase benefits of walnuts consumption. Figures 1 and 2 shows different kinetics of rehydration, but for all cases it has been determined that the optimal time is 4 hours, enough for the nearly full moistening of the core. If the process of soaking is too long (more than 8 hours), the taste of walnut cores changes, and becomes bitter.

Conclusions:

- The dehydration of walnut fruits core during storage can to produce inhibition of biologically active substances release and to cause digestion problems.
- Rehydration process contribute to delete oxidized polyphenols, and to diminished astringent taste, so directly rises walnuts safety and beneficial properties.
- Rehydration take place according to different kinetics: so, it seems order I kinetics after 6 months, and complex kinetics with induction period after 2 years of storage.
- An optimal time for rehydration of walnuts consists 4 hours at room temperature.

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FOOD ALLERGENS – A CHALLENGE FOR THE FOOD INDUSTRY

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Abstract: Food allergy represents an important food safety issue and the only effective treatment is the complete removal of the allergen from diet. However, food formulation are becoming more complex which means that foods may be unintentionally contaminated via allergen-containing ingredients or cross contamination affecting consumers, food companies and competent authorities. To tackle food allergen issue, food industry and control agencies rely on analytical methods to quantify the amount of a particular allergic commodity in a food. Nowadays mostly receptor based methods and in particular commercial kits are used in routine analysis. However, during processing chemical changes in allergens/proteins occur which affect the analytical outcome with issues related to extractability and matrix effects being the biggest challenge. Therefore, food industry needs to make extra efforts to provide accurate labeling and to reduce the contamination with allergens.

Keywords: food allergens, detection, challenges, food processing, extraction

Introduction

Food allergy, an abnormal immunological response due to sensitization to food proteins, has become an important food safety problem, especially in industrialized countries (1). Food allergens pose a risk only to a limited number of consumers while being harmless to most of the other consumers regardless of the amount ingested. When ingested by allergic consumers, the symptoms can range from mild to severe and life threatening *(2)*. Food allergies are estimated to affect about 2 % of the adult population and its prevalence is reported to be higher in infants and children (6– 8 %). Over 180 allergenic food proteins have been identified until now with a few major allergens occurring in common foods (e.g. egg, milk, fish, crustaceans, peanut, soybean, wheat and tree nuts) *(5)*. Food allergens are proteins or glycoproteins representing the major protein fraction in food and are typically reported to be resistant to proteolysis and food processing.

Legislation and labelling obligations

Food allergens represent a serious safety issue because many of the allergic food commodities are important nutrient sources (milk, eggs, wheat based products, etc.) and thus their complete exclusion from diet is, while possible, not desirable. Because of their functionality, several of these products are frequently used as a food ingredient. Therefore, food industry is obliged to provide accurate labeling by clearly indicating the composition of the produced foods. The European Commission (Directive 2007/68/EC) sets up a list of allergens which have to be labeled on foods regardless of the amount deliberately added as ingredient (Table 1) (4).

Table 1. *Ingredient included in the Annex III a of the Directive 2007/68/EC*

Cereals containing gluten and products thereof
Crustaceans and products thereof
Eggs and products thereof
Fish and products thereof
Peanuts and products thereof
Soybeans and products thereof
Milk and products thereof
Nuts and products thereof
Celery and products thereof
Mustard and products thereof
Sesame seeds and products thereof
Lupin and products thereof
Molluscs and products thereof
Sulfur dioxide and sulfites (concentrations of more than 10 mg/kg or 10 mg/liter)

Unfortunately, food allergens can still inadvertently be present in a product due to the fact that several different food products are produced within the same plant which can lead to cross-contamination. Cross-contamination might be caused by improper equipment cleaning/sanitation procedures, in case of a change from one product to the next but also due to re-work (5). This leads to the presence of the so called "hidden allergens". Over 1168 alerts due to presence of undeclared allergens in foods have been reported by the Rapid Alert System for Food and Feed in the EU alone (6).

The European "General Food Law" states that food manufacturers are responsible for the safety of food products, brought on the market (7). This means that food manufacturers need to take extra measures to prevent and control cross-contamination in order to protect the allergic consumers and their own reputation (expensive recalls). Nowadays warning labeling messages such as "May contain .." or "Present in the processing environment" or "This product is made on a line/in a factory that also handles.." are extensively and sometimes unnecessarily used which is confusing for the allergic consumers. Pele et al. (8) showed that food products free of warning messages are often contaminated with food allergens while some of the labeled foods were reported to be allergen free. This shows that extensive preventive labeling practices run the risk of undervaluing the labels and consumers might lose their trust in food producers applying them in an excessive manner. In order to provide accurate information for allergic consumers, food industry must therefore have access to reliable extraction and detection methods. Such methods are needed to screen the incoming materials for the absence of undeclared residues of allergens, to evaluate the efficiency of the preventives measures such as sanitation programs applied to remove residues of allergenic foods from shared equipment in the frame of risk management at company level and to control the end products.

Challenges related to food allergen detection in processed foods

Currently there are several analytical approaches applied for the detection and quantification of allergen traces in food products. These can either target the allergen itself (one or several allergenic or non allergenic proteins) or a marker that indicates the presence of the allergenic food. Among the methods targeting the allergen (protein based

methods), the most used are the receptor-based methods (e.g. antibody based: enzyme-linked immunosorbent assays (ELISA) and biosensors) and non-antibody based such as DNA-based and chromatographic and mass spectrometric methods. There are a number of requirements for the methods used for allergen determination in food namely they should be specific for the targeting compound, highly sensitive so that the lowest amount able to trigger an allergic reaction can be detected, must be specific and should not be influence by the presence of matrix components so that false positive and false negative results are avoided.

Food allergens/proteins have a very complex structure and upon processing they can be modified through numerous ways. They can be heat-denatured with disruption of the tertiary and secondary structure which might lead to modification of the conformational epitopes, they can be modified through Maillard reaction or partial hydrolysis which might modify the linear epitopes and they can aggregate and lose solubility. As previously mentioned, ELISA methods are based on the molecular recognition between the receptor (antibody) and the analytical target (the allergens/proteins). However, due to processing the interaction between the antibodies and the modified allergens/proteins can be affected which can lead to erroneous results (9-11).

Another important issue related to detection of food allergens is that they are present in trace amounts and their presence is often masked by the matrix compounds (12). This especially in case of the receptor-based methods (ELISA) which is caused by: (i) interaction of the target proteins/allergens with the matrix which hinders its extraction or (ii) co-extraction of matrix proteins which can non-specifically bind with antibodies therefore giving false positive results. But the most important is that there might be severe loss of extractability due to interaction of the target proteins/allergens with the matrix can which affect the detectability of food allergens. It is further known that for example interaction with matrix components, such as polyphenols and tannins from chocolate, might impair the extractability of the proteins/allergens as well.

Extraction represents another important cause of erroneous results obtained by all of the analytical methods used. One can only detect what is extracted. The yield of the extracted allergen depends on the type of allergen analyzed and the degree of modifications induced by processing. This means that preferably extraction methods should be also optimized and validated for specific products and processing conditions to help evaluate their applicability. Thermal processing is impairing the solubility of the allergens (13) and this can directly affect the robustness of the developed methods most often leading to false negative results. Fu et al. (14) showed that dry or moist heating of whole egg powder decreased with over 75 % the yield of extractable protein content. Similarly, Monaci et al. (15) reported over 80 % decrease in the yield of the extractable proteins from cookies. It is therefore important to make sure that the maximum amount of the targeted proteins/allergens is extracted.

In conclusion, all the analytical methods are prone to erroneous results especially if the extractability of the allergens/proteins is reduced. The results obtained by any analytical method should be evaluated with outmost care. False negative results can present a potentially fatal risk for allergic consumers, while false positive results may lead to unnecessary and costly product withdrawal.

What next?

Food companies are responsible for the safety of food products brought on the market and must implement a food safety management system based on good practices and Hazard Analysis Critical Control Point (HACCP) principles. Allergen risk management means that the chance for inadvertent presence of allergens in the end product through for example cross-contamination is thoroughly evaluated and minimized. Several guidelines are available for the food industry to set up an allergen management (e.g. on international level VITAL via http://www.allergenbureau.net/ or for Europe via http://www.eu-vital.org/en/home.html). Several key points of the production process need to be considered and managed (i.e. product design and formulation, raw material purchase, cross-contamination during production process, evaluation of the impact of rework, labeling and finally validation and verification). Unfortunately, "zero tolerance" level is difficult to achieve, therefore preventive measures should be taken to avoid cross-contamination. Cross-contamination can occur through several ways: air, contact materials, via personnel, carry-over from batches and through media such as oil and water during re-use. An important preventive measure is therefore cleaning. Validation of the cleaning is also necessary in order to estimate the risk of cross-contamination correctly and to adjust the cleaning methods if necessary (16).

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REGRESSION ANALYSIS OF CARTHAMIN EXTRACTION FROM SAFFLOWER (CÁRTHAMUS TINCTÓRIUS)

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Abstract: Effects of ethanol and moderate quantities of citric acid on the extraction of Safflower dyes were investigated. Complete two-factor experiment in linear approximation was used. A negative effect of the addition of citric acid on the extraction efficiency was detected. It is shown that the direct influence of ethanol on the extraction of Safflower dyes is insignificant (which generally is unusual for organic substances). It means, that carthamin and other water-soluble components extracted from Safflower, have a high potential for safety use in the food industry.

Keywords: safflower, carthamin, extraction, ethanol, citric acid, regression analysis

Introduction

Safflower is inhabitant of arid region and represents an herbaceous plant with sharply expressed external properties. Carthamin is natural pigment, obtained from petals of Safflower. This water-soluble pigment known as Natural Red 26, is traditionally used as a dye for hair and tissues. Cartamine molecule is composed from two chalcon residues, which conjugated bonds causes manifestation of red color.

Materials and methods

In standard chemical glass tubes were added 0.2 grams of Safflower petals, rectified ethanol, aqueous solution of citric acid and distilled water (Table 1).

Table 1. *Planning matrix of experiment "The influence of factors on the extraction of Safflower dyes" in encoded and real coordinates.*

Sample	Ethanol, X_1, mL		H_3Cit 1%, X_2, mL		X_{12}	Water, mL	Σ, mL
1	+	6.0	+	3.0	+	1.0	10
2	+	6.0	-	1.0	-	3.0	
3	-	2.0	+	3.0	-	5.0	
4	-	2.0	-	1.0	+	7.0	

UV – Spectra of extracts were registered at DR-5000 spectrophotometer in range of 200…800nm, using 1cm polystyrene curves.

Results and discussion

Was elaborated mathematical procedure, allowing to calculate parameters of the regression equation in express mode according to the plan of a complete two-level two-factor experiment, (CFE 2^2), as well as a two-level three-factor fractional experiment (FFE 2^{3-1}). The procedure uses standard Excel functions and allows to calculate the average value, dispersion of average value, dispersion over all matrix and dispersion of regression coefficients. It is possible to use any level of significance, **P**. We allowed a "world-wide" level of **P** = 95%, q = 5%. Hand-made soft also offer possibility to calculate the corresponding values of Student's coefficients, regression coefficients and beta-critical.

C	D	E	F	G	H	I	K	L	M	N
N	Матрица планирования ПФЭ 2^2 ДФЭ 2^{3-1}				Реплика			Дисперсия	Математическое ожидание	Дисперсия математического ожидания
	X0	X1	X2	X12=X3	A	B	<Y>	σ^2		
1	1	1	1	1	0,56	0,56	0,560	0,0000000	0,56	1,2326E-32
2	1	1	-1	-1	0,64	0,64	0,640	0,0000000	0,64	0
3	1	-1	1	-1	0,5	0,5	0,500	0,0000000	0,5	1,2326E-32
4	1	-1	-1	1	0,68	0,68	0,680	0,0000000	0,68	0
						Дисперсия по матрице		0,0000000	remanent	#ДЕЛ/0!
						Дисп. коэф. регрессии		0,0000000	rem/matr	#ДЕЛ/0!
	b0	b1	b2	b12		Уровень значимости		95		95
	0,59500	0,00500	-0,06500	0,02500	N*	Коэф. Стьюдента		3,182446305	Fisher:	#ЧИСЛО!
	1	1	1	1	4	бета-критическое		0,0000000		#ДЕЛ/0!

Figure 1. *Fragment of the Excel desktop for calculation of regression coefficients of equations according to CFE 2^2 and FFE 2^{3-1} plans.*

As a result, a regression equation for absorbance in the absorption maximum of spectra, at 540nm, was deduced:

$$\mathbf{A_{540nm} = 0.595 + 0.005X_1 - 0.065X_2 + 0.025X_{12}} \quad (1)$$

$$\mathbf{\beta_{critical} < 0.010} \text{ (estimated)}$$

The regression equation shows, that the influence of ethanol has positive, but very insignificant value (β_1 = + 0.005). Citric acid (β_2 = - 0.065), opposite, demonstrate a significant negative effect on the extraction of carthamine from Safflower petals. The factor of ethanol and citric acid interaction is positive and from our point of view, is significant (β_{12} = + 0.025). But at the same time it does not overlap direct negative influence of citric acid, so, this factor finally is not important for extraction of carthamine in the investigated conditions.

Conclusion: The specificity of the extraction of food dyes from Safflower is, that traditionally used ethanol and citric acid do not increase the yield of the dye, therefore, their use is impractical. This feature increases the value of dyes from Safflower, because the exclusion of alcohol and citric acid from the dye extraction process reduces the hazards of production and increases the safety of the dyed food product.

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THE CHROMATOGRAPHIC SEPARATION OF D AND F METAL IONS USING DIALKYLDITHIOPHOSPHORIC ACIDS AS COMPLEXING AGENTS

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Abstract: The metal ions separation by chromatographic techniques, using dialkyldithiophosphoric acids (HDADTP) as extracting agents is presented in this paper. The mechanism of extraction chromatography is briefly described. The separation mechanism of metal ions by TLC using HDADTP is a complex process based on adsorption-desorption, cation exchange and extraction, the later ones being dominantly. The nature of organic mobile phase containing HDADTP plays a decisive role in extraction chromatography of metal ions, especially for lanthanides and actinides.
Key words: cations exchangers, chromatographic techniques, dialkyldithiophosphoric acid, extraction chromatography, metal ion.

Introduction

In the last years, the trace metal ions determination has received particular attention due to a strong environmental impact. Many studies are devoted to the separation and identification of metal ions in particular samples. Uranium and thorium, natural occurring actinide elements, are found at trace level in the environment or associated with other ions in different complex matrices, monazite sands, geological materials and fission products. Many methods have been proposed for the separation of these elements including ion exchange, liquid-liquid extraction and chromatography and any combination of them have been popularly applied to the selective separation of radionuclides or metal impurities from radioactive materials [1]. Out of these methods, chromatographic separation is more suitable due to their simplicity in handing the radioactive materials and heavy metals. In particular, separation techniques based on extraction chromatography, which combines the selectivity of organic compounds in solvent extraction with the multistage feature of chromatographic process have been extensively applied in the analysis of radioactive materials [2-4, 5].

The closed column extraction chromatography and thin layer extraction chromatography, too, is used for metal ions separation using various complexing agents. In this paper are presented some cases when the metal ions are separated using dithiophosphoric acids (HDADTP) as complexing agents.

Mechanism of separation

The extraction chromatography is based on partition mechanism, combined with another mechanism, depending on extractant type: cationic exchange, anionic exchange, solvatation and synergic systems [4]. The derivatives used in extraction chromatography could be: chelating (derivatives of thiophosphoric acids, β-diketones etc) or nonchelating (derivatives of organophosphoric acids, carboxylic acids etc) cations exchangers, neutral compounds, anions exchangers or mixture of these. The cation exchangers with chelating effect are most used from these.

In the case of chelating cations exchangers, the extraction process develops in two stages: the formation of extractable species in organic phase and partition of these into those phases (Eq.(1) and Eq.(2)).

$$M_{aq}^{n+} + nHA_{org} \rightleftharpoons MA_{n,org} + nH_{aq}^{+} \quad (1)$$

$$MA_{n,org} \rightleftharpoons MA_{n,aq} \quad (2)$$

where *HA* – acid extractant.

The most used cations exchanger are HDADTP, especially for hard metals and rare earths separation.

Dithiophosphoric acids used in extraction chromatography

a) Dimethyldithiophosphoric acid was used for separation and quantitative determination of Bi(III), Cu(II) and Pd(II) by high performance liquid chromatography (HPLC) [6, 7]. In this goal was used a Licrosorb Si (250×4 mm), 5μ, column impregnated with dimethyldithiophosphoric acid. The mobile phase was a chloroform + acetonitrile + 1,2-dichlorethane (25:70:5, v/v) mixture with a 0.8 mL / min flow rate. The detection was performed at 295 nm. The detection limit for these cations was 0.1–0.2 ng / injection [7].

b) Diethyldithiophosphoric acid (HDEDTP) impregnated on columns with C18 chemically modified silica gel was used for metals separation from water and biological samples [8-14]. The mobile phase used for uranium, silver, tellurium and gold separation from water and biological samples was methanol. The detection limit of uranium and tellurium was very low: 0.05, and 2.24 pg / mL respectively [9]. The water samples were acidified with HNO_3 at 0.14M for preconcentration and quantitative determination of mercury from sea water. The detection limit was 5 pg/mL [10]. In the case of hard metals preconcentration (Cu, As, Se, Cd, Pb) it was obtained a concentration factor between 5 - 61; the detection limit of Bi was 0.43 pg / mL and 33 pg/mL for Cu [11].

The lead complexed with HDEDTP was fixed on mini-column with C18 silica gel, and on active coal. The ethanol was the mobile phase. The best results were obtained on C18 chemically modified silica gel, the detection limit being 0.3 ng / mL for silica gel, and 3 ng / mL for active coal [12]. The column with active coal impregnated with HDEDTP was used with success for gold, silver and palladium determination from aluminum and manganese salts, too. The mobile phase used was a 2M ammonia solution in acetone. The recovery percent of these metals was higher than 95% [13, 14].

Ma and Adams [15] analyzing the influence of carbon atoms chain length from HDADTP on Cd, Cu and Pb extraction, have observed that the extraction by column chromatography decrease with increasing of the number of carbon atoms. Thus, the best extracting agent was HDEDTP, in the case of di(n-hexyl)dithiophosphoric acid the extraction being very weak. However, it was observed that in the presence of masking agents like as oxalate or citrate radical, the extraction not decrease such drastic with the chain length.

c) Hodișan and coworkers [16, 17] have used **di(iso-propyl)dithiophosphoric acid** (HDiPrDTP) as complexing agent for UO_2(II) and Th(IV) separation from Ag(I), Pb(II), Zn(II), Co(II), Ni(II), Fe(III), Al(III), Zr(IV) and were obtained good results. Silica gel 60 F254 plates were used as stationary phase and the mixture of o-xylene + methyl-ethyl-ketone (MEK)+N,N-dimethylformamide (DMF) (16:2:1, v/v) with 0.02–0.1M HDiPrDTP

was the mobile phase. The spots visualizing was performed with Arsenzo I aqueous solution or at 254 nm in UV light. After separation it was observed that the retention factors of the studied metal ions increase with concentration of HDiPrDTP and it is constant after 0.07M HDiPrDTP. In this case it was suppose that the metal ions have formed a complex with HDiPrDTP (M(iPrDTP)n (n = 1–4)). The best separation was obtained at 0.05M HDiPrDTP and the detection limit was 1.21 μg / μL for uranium and 1.26 μg / μL for thorium [16, 17].

d) Dibutyldithiophosphoric acid (HDBDTP). The thin layer chromatography (TLC) behavior on silica gel H of U(VI), Th(IV), lanthanides(III), Co(II), Ni(II), Cu(II) using di(n-butyl)- (HDBDTP) (Figure 1) and di(iso-butyl)dithiophosphoric acids (HDiBDTP) as complexing agents in organic mobile phase was investigated. Choosing appropriate conditions concerning mixture of organic solvents and concentration of complexing agent, the separation of U(VI) – Th(IV) and Co(II) – Ni(II) – Cu(II) systems was obtained.

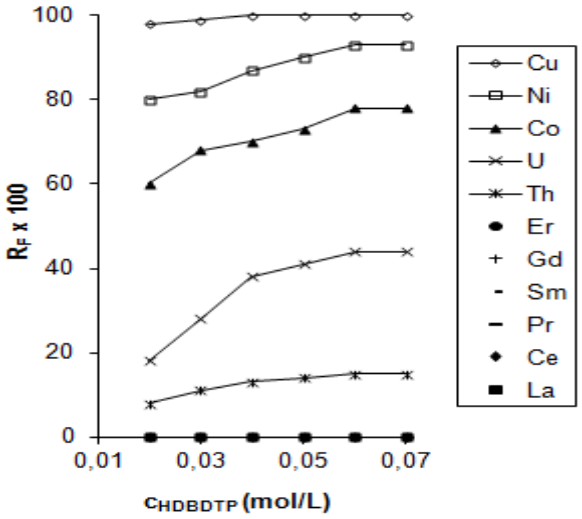


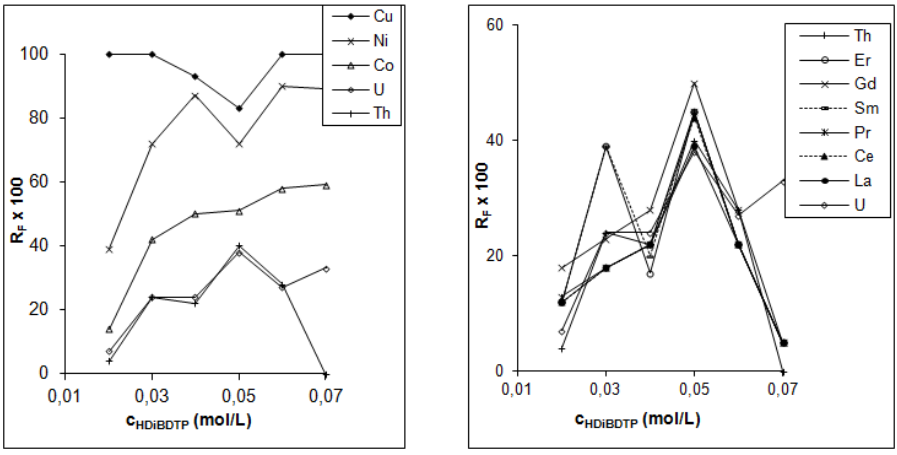
Fig. 1. *The influence of HDBDTP concentration on chromatographic behavior of U(VI), Th(IV), La(III), Ce(III), Pr(III), Sm(III), Gd(III), Er(III), Co(II), Ni(II) and Cu(II). Stationary phase: silica gel H; Mobile phase: o,m,p-xylene – MEK – DMF (16 + 2 + 1, v/v)*

The results obtained show that dithiophosphate anion play a decisive role in the migration of metal ions investigated. The branching chain improves significantly RF values for lanthanides(III) (Figure 2b). The presence of electron donor solvents in the mobile phase increases the retention factors especially for U(VI), Th(IV) and lanthanides(III). The effect is explained by increasing the solubility of the metal chelate with dithiophosphoric anion in organic mobile phase due to a solvation process. Using HDiBDTP in electron donor solvents, the separation of light lanthanides from heavy lanthanides and separation of Pr(III) – Sm(III), Sm(III) – Gd(III) and Gd(III) – Er(III) pairs can be achieved (Figure 2b) [18]. TLC separation of U(VI), Th(IV), Ln(III) (La(III), Ce(III), Pr(III), Sm(III), Gd(III), Er(III)), Co(II), Ni(II) and Cu(II) have been studied using tributylphosphate (TBP) and trioctylphosphine oxide (TOPO) besides (HDBDTP) in mobile phase. The results obtained

showed that a greater enhancement of the retention factor of U(VI), Th(IV) and Ln(III) is realized with mixture of HDBDTP and TOPO (Figure 3) and a synergic effect is suggested. An improvement of the resolution is achieved especially for Ln(III) separation from each other [19]. Di(sec-butyl)dithiophosphoric acid was used by Ma and Adams [20] for zinc separation in the iron presence, at pH = 3. 0.1M citrate solution was used for iron masking. The zinc extractability increase with the chain length of carbon atoms from extractant and with chain branching.

e) Dipentyldithiophosphoric acid (HDPDTP). HDPDTP was used for transitional and rare earth separation [21, 22]. In the case of Ni(II), Co(II) and Mn(II) separation was observed an increasing extractability with length of alkyl chain from extractant. It was obtained a quantitative extraction at pH = 3 for alkyl groups higher than butyl. These three ions were selectively extracted from a mixture with Cd(II), Cu(II), Pb(II), Fe(III) at the high concentration of HDPDTP. This method was used for trace extraction of Ni(II) from salt water samples (sea water and estuary water), obtaining good results [21].

f) Di(2-ethylhexyl)dithiophosphoric acid (HDEHDTP) is the dithiophosphoric derivative most used as extractant. In the most cases, this extractant is impregnated on various polymeric resins (chemically bonded or physically adsorbed), like as poly(4-vinylpyridine) and poly(N-dimethylacrylamide) [23, 24].



a) b)

Fig. 2. *The influence of HDiBDTP concentration on chromatographic behavior of a) Th(IV), U(VI), Co(II), Ni(II), Cu(II); b) Th(IV), U(VI), La(III), Ce(III), Pr(III), Sm(III), Gd(III), Er(III). Stationary phase: silica gel H; Mobile phase: o,m,p-xylene – MEK – DMF (16+2+1, v/v)*

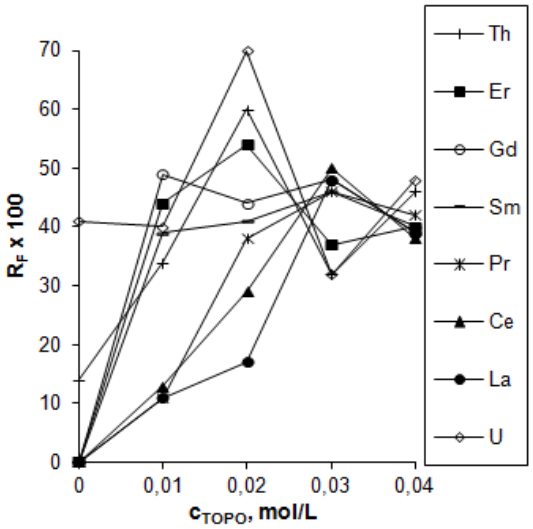


Fig. 3. *The chromatographic behavior of Th(IV) and Ln(III). Stationary phase: silica gel H; mobile phase: o,m,p-xylene – EMK – DMF (16+2+1, v/v); extractants: TOPO + HDBDTP (CHDBDTP = 0.04 M)*

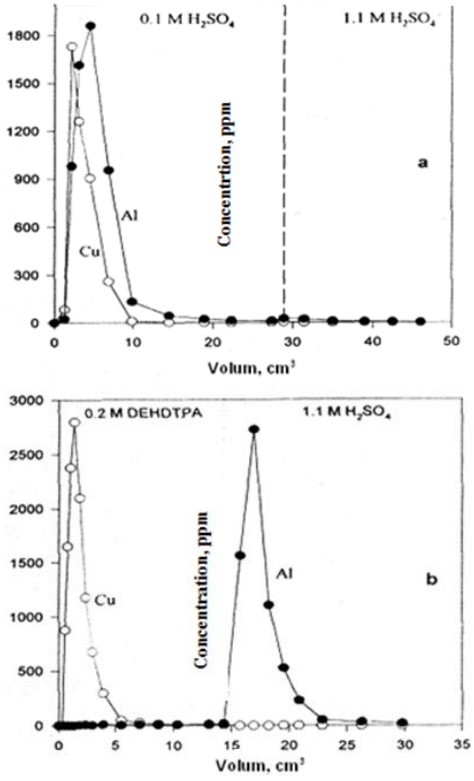
The solvents impregnated resins (SIR) were used for identification and separation of metallic ions from aqueous solutions by Flett as far back as in 1977. These combine the SIR advantages with the specifics properties of extractants, obtaining high distribution ratios and a good selectivity with a simple equipment [25]. In Warshawsky [26] vision, the SIR consist in a liquid complexing agent homogeneous dispersed in a solid polymeric medium. The impregnation agent must present a strong affinity for matrix.

The following conditions must be fulfilling for efficiently SIR: i) the extractant must to be a liquid or must to remove him in the liquid phase by adding a diluents; ii) the extractant and diluent to be more less soluble in aqueous phase; *iii*) the polymeric support must to be porous; iv) the method used for impregnation to not destroy the extractant or polymer properties [26].

Impregnated resins with HDEHDTP [27, 28] were used as stationary phases for selective extraction of hard metals from relative concentrated solutions or for recuperation of these metals from residual waters, the separation process basing on ionic exchange. The impregnated resins with HDEHDTP have proved a good selectivity at Cd(II), Pb(II) and Zn(II) separation [27]. The same type of stationary phase was used for purification of waters polluted with Cd, Pb and Cu, establishing that 1kg ions exchange resin can treat 1 m3 residual water polluted with 200 μg Cd / L water. This concentration is specific for metal ion in surface water. The concentration of these three metals in water was decreased a 100 times, from 1mg/l to less than 0.001mg / L [28].

Resins impregnated with HDEHDTP were used for extraction of Cu, Pb, Zn, Cd, Ni from aqueous solutions, too [26, 29-32], and it was succeeded to separate Pb(II) from Zn(II) and Pb(II) from Ni(II). It was observed an arrange of hard metals in HDEHDTP extractability order from acid aqueous solutions, like follows: Ag(I) > Hg(II) > Bi(III) >Cu(II) > Pb(II) > As(III) > Cd(II) > In(III) > Fe(III) > Ni(II) > Zn(II) [26]. After separation,

the metal ions were extracted from ligand matrix by washing with mineral acids, the ligand turning in mass of the polymeric support. Thus, the extraction of Cu(II) like $CuCl_2(HA)_8$ and $CuClX(HA)_8$ complexes (HA = HDEHDTP, X = inorganic anion) it was performed [30].



a) b)

Fig. 4. *The curves concentration – volume obtaining at the elution of Cu(II) and Al(III): a) 0.1 M and 1.1 M H_2SO_4, b) 0.2 M HDEHDTP and 1.1 M H_2SO_4*

HDEHDTP impregnated on resins was used by Muraviev, too, for separation of zinc from cadmium [31]. This has compared the results with those obtained with di(2-ethylhexyl)phosphoric acid (HDEHP) and di(3-propylphenyl)dithiophosphoric acid (HDPPDTP) impregnated on resins. The best results were obtained with HDEHDTP – SIR.Oleinikova and coworkers [32] have used HDEHDTP like mobile phase for column separation of Al(III), Cu(II) and Zn(II). The results were compared with those obtained using H_2SO_4, and HDEHP as eluents. This has combined the ionic exchange separation techniques with solvent extraction and has demonstrated the efficiency of this method. It was observed from the graphic c = f(v) (c – metal ions concentration, v – volume of used acid) that the metal ions are not completely separation using water impregnated polyacrylic resin as stationary phase, and 0.1 – 1.1M H_2SO_4 as mobile phase. Using 0.2M HDEHDTP

in heptane as mobile phase and than a 1.1M H_2SO_4 solution it was observed the selective separation of Cu(II) (Figure 4).

Adding 0.2M HDEHP in the elution system it was find that the 0.2M HDEHDTP solution have selectively extracted of Cu(II), and 1.1M H2SO4 have selectively extracted of Al(III) with high purity. Zn(II) was completely extracted in the organic eluent [32].

The results of this study show that HDEHDTP have a high affinity for Cu(II), achieving quantitative extraction of these metal ions.

Separation of U(VI) and Th(IV) from some rare earths by TLC has been studied using silica gel H and silica gel H impregnated with ammonium nitrate as the stationary phase. The solvent mixture methyl-ethyl-ketone + tetrahydrofuran (6:3, v/v) containing HDEHDTP was used as the mobile phase. When silica gel H impregnated with 2.5 M NH_4NO_3 was used as stationary phase, the resolution was much improved and the separation of rare earths from each other was also achieved [33, 34].

The dithiophosphoric acids were used as masking agents of copper at bismuth extraction from various ores [35].

g) The di(n-octyl)dithiophosphoric acid (HDODTP) was used in the same system like HDBDTP, HDPDTP, HDEHDTP, and the results were not semnificated [36].

h) The dithiophosphoric acids with cyclic substituents are used as extractants, too. The metal ions form less stable complexes with these ligands than that formed with acyclic substituent and can be used as selective reactive [37].

Conclusions

The increasing of extraction efficiency was obtained by combination of ionic exchange with liquid-liquid extraction in a single process. Thus, the extraction chromatography could be applied for nonferrous and hard metals separation from waste waters and for removing the ionic contaminants from diluted solutions.

The separation mechanism of metal ions by TLC using HDADTP is a complex process based on adsorption-desorption, cation exchange and extraction, the later ones been dominantly. The nature of organic mobile phase containing HDADTP plays a decisive role in extraction chromatography of metal ions, especially for lanthanides and actinides. In the presence of HDADTP appear an ionic exchange process between metal cation and hydrogen ion from HDADTP, in this process is formed a neuter chelating complex with dithiophosphat anion, M(DADTP)n. The compound solubility in organic solvent influence the distribution of metal cations in the mobile phase, and the increasing the retention factors of those cations.

HDEHDTP is the most used HDADTP, using silica gel and silica gel impregnated with 2.5 M NH_4NO_3 as stationary phase.

The increasing of alkyl chain length guide to the decreasing of the retention factors of UO_2(II) and Th(IV) and an increasing of lanthanides retention factors.

The chain branching promotes just the lanthanides migration, that in the systems with HDADTP with linear chain generally remain at start.

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THE DETECTION OF SPOILAGE YEASTS IN RAW WINES PRODUCED AT UNIVERSITY MICRO-WINERY

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Abstract: Yeasts that are present during winemaking play an essential role during fermentation, but the growth of wild yeasts may also lead to wine spoilage, reduce wine quality and value and are bearing an immense damage potential. One of the aims of winemaking is to minimize potential for yeast and bacterial spoilage of wine. This review focuses on the yeast contamination of raw wines produced at Oenology department of the Technical University of Moldova and on methods for detection of wild yeasts.

Key words: microbiological contamination, spoilage yeasts, Saccharomyces cerevisiae var. diastaticus, PIKA Weihenstephan protocols, quantification of DNA.

Introduction

Fermentation yeasts usually grow together with wild yeasts: *Saccharomyces cerevisiae var. diastaticus (S. diastaticus), Saccharomyces ludwigii, Zygosaccharomyces bailii Brettanomyces*, *Pichia*, *Candida*, *Hansenula*… Some wild strains of *Saccharomyces cerevisiae* can produce excessive amounts of acetic acid, sulphur compounds, SO_2, urea and volatile substances which might be detrimental to wine quality and must be considered as spoilage microorganisms [6].

S. diastaticus is facultative anaerobic yeast and can be found in a variety of places: bottling lines, pipework, pitching yeast, the brewhouse, fermentation cellar [3], further break down the more complex carbohydrates like starches and dextrins [12]. Damage ability of *S. diastaticus* has been linked to the presence of STA genes, which encode for the exoenzyme glucoamylase, also referred to as amyloglucosidase [5]. This amylolytic activity can lead to hyperattenuation, and/or secondary fermentation which can cause excess carbon dioxide formation in bottles, cans or kegs. Wines that contain residual sugars after packaging may undergo refermentation and may cause swelling and explosion of the container.

Wild yeasts can cause wine spoilage during alcoholic fermentation, storage and after bottling [2]. These particular strains of yeasts tolerate the very hostile conditions including high ethanol concentration (even more than 15%), high residual sugar concentration (up to 85g/L), acidity and SO_2 (more than 300mg/L total) [*1*]. That's why is very important to establish the origin of wine spoilage yeasts, their routes of contamination, critical points of yeast infection, and of course, their control.

The main goal of this research was to study yeast contamination of raw wines produced at Oenology department of the Technical University of Moldova.

The objectives of our research were: to study raw wines using microbiological, cytological, genetic and physical-chemical methods of analysis; to screen the presence of the spoilage yeasts in wines, like *S. diastaticus*; to evaluate the efficiency of different methods in screening spoilage yeasts; to implement efficient methods for testing the presence of spoilage microorganisms in wines at Oenology department.

Materials and methods

Raw wines studied at Oenology department has been obtained using general technologies of winemaking [4]. We have carried out the analysis of six red and white wine samples produced from following grapes varieties: 1 – Cabernet Sauvignon; 2 – Saperavi; 3 – Chardonnay; 4 – Sauvignon Blanc; 5 – Feteasca Neagră; 6 – Merlot. These samples were a model object for studying the biological stability of wine and have been not treated.

For microbiological detection and identification of yeasts in wine samples have been used a enrichment culture medium PIKA Weihenstephan™ FastOrange™ Yeast Agar [9].

The biological microscope Motic B1 ADVANCED have been used for citological identification of yeasts in wine.

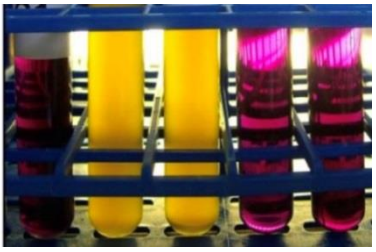
Isolation of DNA from yeasts have been done according PIKA Weihenstephan™ S0 Detection Kit H S. diastaticus protocol [10]. Material, equipment and consumables for DNA isolation were washing and lysis buffers, laboratory microcentrifuge EBA 21, thermoincubator CH-100, Vortex V-1 Plus, micropipettes, Eppendorf reaction tubes 1,5 ml.

Quantification of DNA have been performed using Jenway Genova Nano micro-volume spectrophotometer [13].

Results and discussion

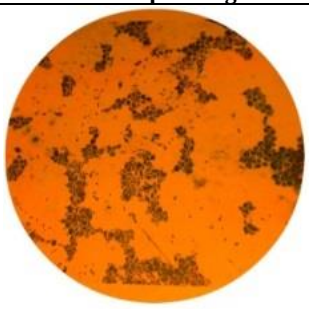
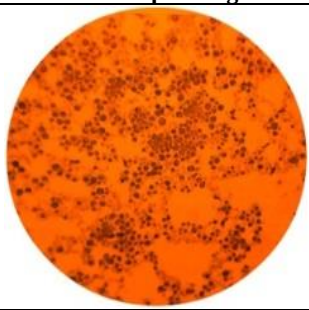
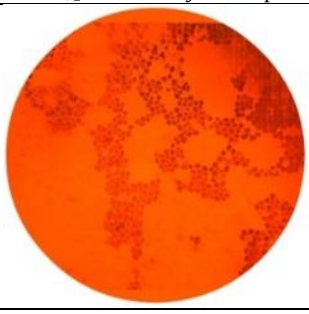
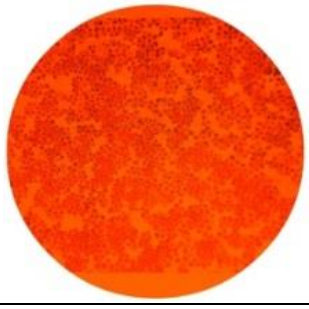
The presence of spoilage yeasts in raw wines produced at small winery has been determined using microbiological, cytological, genetic and physical-chemical methods of analysis.

At the first stage of our research was used microbiological method for detection of wild yeasts. Several microbiological techniques can be used for yeasts detection, such as $CuSO_4$ based media [12], starch agar plates, as well as growth in certain enrichment broths [11]. The choice of the enrichment medium always influences the growth rates of the wild and cultured yeast. We used PIKA Weihenstephan™, FastOrange™ Yeast Agar, a medium which was developed to detect contaminations by yeasts and molds. Yeasts and molds can be enriched with this medium, while bacteria are usually not able to grow. Besides turbidity and sediment formation, the presence of acid-producing yeasts is detected by a violet-to-yellow color change of the medium in all wine samples. The results of the our microbiological study showed that yeasts were present in all wine samples. It should be noted that **traditional plating** is semi-specific, requires healthy cells for presumptive yeast identification. Incubation and confirmation of results can take up to 14 days [8].



At the second phase of our research was done microscopic analysis of isolated wild yeasts from enrichment medium PIKA Weihenstephan™ FastOrange™ Yeast Agar and from wine samples. In all wine samples have been detected *S. diastaticus* yeasts (table 1).

Table 1. *Microscopic images of yeasts*

Nr.	Microscopic images	Nr.	Microscopic images
1		**4**	
	Saccharomyces cerevisiae var. diastaticus; Saccharomyces ellipsoideus		*Saccharomyces cerevisiae var. diastaticus; Saccharomycodes ludwigii*
2		**5**	
	Saccharomyces cerevisiae var. diastaticus; Saccharomyces oviformis		*Saccharomyces cerevisiae var. diastaticus; Saccharomyces ellipsoideus*
3		**6**	
	Saccharomyces cerevisiae var. diastaticus; Saccharomyces oviformis		*Saccharomyces cerevisiae var. diastaticus*

1 – Cabernet Sauvignon; 2 – Saperavi; 3 – Chardonnay; 4 – Sauvignon Blanc; 5 – Feteasca Neagră; 6 – Merlot.

Its morphology is comparable to the cultured wine yeasts like *Saccharomyces oviformis* or to the bottom fermenting brewer's yeast like *Saccharomyces pastorianus*. Cells are oval to egg-shaped, mostly single or in pairs. Microscopy analysis of yeasts requires 100,000 cells/mL for presumptive identification [8], but is not specific because ambiguous morphological characteristics of cells can easily cause false identification.

At the third stage of our experiment, we isolated yeasts DNA according to PIKA Weihenstephan™ S0 Detection Kit H S. diastaticus protocol [10]. We have transfered the wine samples containing yeasts into a sterile, 1.5-mL reaction tubes. Wine samples have been centrifuged several times at microcentrifuge EBA 21 for 3 minutes at 14,000 rpm. The liquid phase has been removed carefully from reaction tubes. The obtained pellet of yeast containing sample has been washed by adding 200 µL of washing buffer A. The samples have been resuspended briefly at Vortex V-1 Plus and have been centrifugated again. After that we have added 200 µL of lysis buffer B to the pellet and have resuspended the pellet by mixing briefly. The samples have been incubated at 80±5°C for 10 minutes in a thermoincubator CH-100 for lysis of cell wall of yeasts. The samples have been have been centrifuged again and 100 µL of the liquid phase containing the DNA have been transferred into a new reaction tubes for spectrophotometric analysis.

The quantification of DNA is a necessary procedure that allow to check the success of DNA isolation [10] and to show the presence of yeasts DNA in the samples. The results of the spectrofotometric DNA quantification is shown in the table 2.

Table 2. *DNA concentration, µg/ml*

Wine samples	Concentration,
Cabernet-Sauvignon	13,489
Saperavi	48,08
Chardonnay	5,52
Sauvignon-Blanc	88,39
Feteasca Neagră	81,85
Merlot	152,89

DNA concentration can be assessed using absorbance or optical density. The wavelength of *maximum absorption* for DNA is *260 nm [7]*. The absorbance at 260 nm is used to calculate the concentration of nucleic acids. The determination of absorbance has been done using a 1cm path length cuvette. The results of the spectrophotometric analysis show that all wine samples contain yeasts DNA. This kind of analysis is non-specific and do not indicate the type of yeast: cultured or wild.

The most reliable and fastest analysis today to get knowledge about the identity of a wild yeast is PCR testing, especially when testing for *S. diastaticus*, as there is no selective medium available for its detection. The sensitivity and specificity of PCR analysis is unreached by any other method – you can detect 1 spoiler cell within 400,000 yeast cells [12].

Conclusions

The presence of spoilage yeasts in raw wines produced at small winery has been determined using microbiological, cytological, genetic and physical-chemical methods of analysis. The obtained data bring new contribution in implementation the modern methods for monitoring yeast contamination at department of Oenology.

In all raw wine samples have been detected wild yeasts *S. diastaticus*, which were an object model in our research.

PIKA Weihenstephan™ FastOrange™ Yeast Agar is one of available enrichment medium for yeasts and molds and might be used for microbiological detection of wild yeasts. At the same time wild yeast detection, using traditional plating, generally can take a long time, as these species might grow slowly.

Analysis of contamination with *S. diastaticus* by microscopy might be done, but conventional analysis will not always detect it during the production process, as these wild yeasts looks just as cultured yeasts.

The advantages of spectrophotometry usage are that the process of obtaining resultis is rapid, is relatively inexpensive, and the obtained results are very reliable. The machinery is also easy to operate as it is automatable. The results of the spectrophotometric analysis cannot indicate the type of yeasts, but might be used to detect the presence of DNA yeasts in wine before bottling.

All presented methods for testing the presence of spoilage microorganisms in wines have been implemented successfully at Oenology department.

To test for *S. diastaticus*, we are recommending a combination of the following methods covering enrichment and specific detection of yeasts using PCR testing.

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THE OXIDATION BEHAVIOR OF HYDROXYCINNAMATES OF WHITE WINES PRODUCED FROM EUROPEAN AND INDIGENOUS GRAPE VARIETES

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Abstract: The browning processes of experimental wines produced from indigenous grape varieties *Legenda*, *Viorica* and European grapes *Chardonnay*, *Sauvignon* have been studied. The browning processes are corelated with oxidation of the most important group of phenolic compounds of white wines – *hydroxycinnamates* (hydroxycinnamic acids and their tartaric esters, HCA). The degree of alteration of wine colour have been appreciated by using POM-test. The comparative antioxidant capacity of wines have been determined using method of kinetics competition of Crocin oxidative fading (Crocin Bleaching Assay) through peroxy radicals generated by 2,2'-Azo-bis 2-amidinopropan-diidroclorid (AAPH).

Key words: white wines, hydroxycinnamates (HCA), oxidation, spectrophotometry, POM-test, Crocin Bleachig Assay

Introduction

Moldovan wines are made from international and indigenous grape varieties. In recent years, Republic of Moldova has made a big leap in the growing of local grapes: *Feteasca Alba*, *Feteasca Regala*, *Feteasca Neagra*, *Rara Neagra*, *Viorica* and *Legenda* (*VitisVinifera L.*). *Viorica* and *Legenda* are used by Moldovan wineries for the production of quality white wines.

In order to best exploit the potential of local wines it is necessary to study the physico-chemical and organoleptic properties of them, polyphenol metabolism during processing of grapes, winemaking and storage of wine.

The importance of cinnamic compounds is well known [1]: these compounds are responsable for oxidative browning, process catalysed by polyphenol oxidase (PFO) or by ions and transition metals (preponderant Fe and Cu). The HCA determine largely the colour of white wines, the antioxidant properties and some aromas after the alcoholic fermentation. In this conext, it is important to evaluate the phenolic profile and antioxidant capacity of the wine, the oxidation behavior of phenolic compounds.

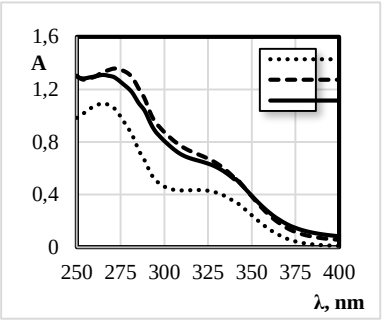
Materials and methods

The wines produced from 2 European grape varieties *Chardonnay* (Ch), *Sauvignon Blanc* (S) and 2 local grape varieties *Viorica* (V), *Legenda* (L) have been selected for research. The wines have been produced in 2017 at micro-winery of Enology department, Technical University of Moldova by using general technologies of white winemaking. The sulphur dioxide (SO_2) has been added in grape crusher (50 – 75 mg /kg). The grape must has been macerated 2 hours at 12 – 14°C. In the grape must during maceration have been added enzymes Ultrazym® 100G (Novozymes A/S, Denmark) (0,5 – 1 g/dl). From the grape variety Legenda the samples also have been taken directly from the grape press without maceration (L1), after 4 hours maceration (L2) and after 2 hours maceration (L3). For all wines the post-fermentation period lasted 40 days (14 – 16ºC). The wine samples have been filtered through the filter of 0,45 μ for spectrophotometric

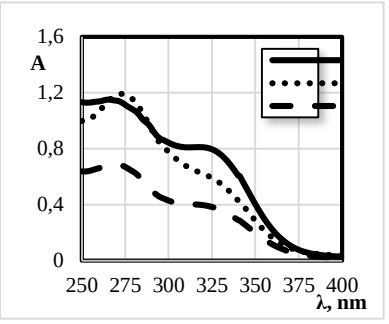
investigations (absorption spectra, total polyphenol index – IPT, phenolic compounds, the test of oxidation behavior – POM-test, antioxidant capacity of wines etc.). The spectrophotometric analyses have been done at single beam spectrophotometer PG T70 (PG Instruments, UK) and double beam spectrophotometer Specord 250 Plus (Analytik Jena, Germania). The comparative antioxidant capacity of wines has been determined using the method Crocin Bleaching Assay (CBA) [2, 3]. The absorbance capacity of Crocin has been measured at 443 nm. The generation of the radicals and its reaction with substrate have been performed in cuvettes held in thermostat at 40°C. Crocin has been extracted from commercial saffron (*Crocus Sativus L.*) (Aromatica SRL, Italia) and has been purified according to Ordoudi and Tsimidou [4]. The concentration of the extract has been determined by using spectrophotometric analysis. In reactant solutions with added wine is ensured the crocin concentration of 10^{-6} M. The concentration of total phenolic compounds, flavonoids and cinnamic compounds has been performed at the spectrophotometer according to Somers and Verette [5].

Results and discussion

The absorption spectra of the red wines in UV-vis region are measured at 260 – 280 nm. This value is based on the characteristic absorption of the benzene cycles of the majority of phenols at 280 nm. HCA (C6 – C3) are the major non-flavonoid phenolic compounds in white grape and wine. They have a maximum absorption at wavelength 300 – 350 nm. The visual analysis offers a first information about HCA content in the complex of total phenols. However, original spectra do not show the fine differences between studied samples, oxidized wine and unoxidized wine. This is possible if we study the second order derivative spectra. The minimum interdependences $d^2A/d\lambda^2$ show the exact positions of the obvious and latent maximum. The final spectra, the algebraic sum of individual spectra, can distinguish them and have no coincidence of maximum values with the values presented in the specialty literature. The second order derivative spectra are more sensitive at quantitative and quality changes of wines and allow to find out the differences by using spectrophotometry, a method more accesible than chromatography. The absorption spectra UV-vis of experimental wines *Legenda* without subsequent treatment (L1, L2, L3) and their second derivative spectra are shown in the figure 1. The second order derivative spectra in original forms are similar and highlight the essential differences in different spectral ranges.



a



b

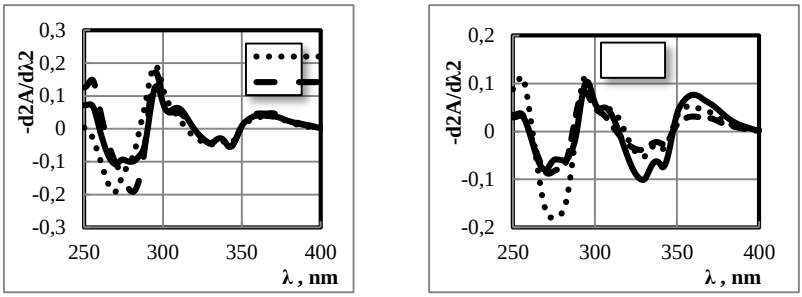


Fig. 1. *The absorption spectra of experimental wines Legenda (L1, L2 and L3 – a), Viorica, Chardonnay şi Sauvignon (V, Ch, S – b) and its second order derivative spectra (c and d).*

The major differences have been revealed at wavelength 260 – 280 nm, 300 – 315 nm and to a lesser extent at 330 – 345 nm. The sample with the less level of browning had a minimum of second derivative spectra at 269 nm and it had nearby the inflection point (281 nm), while the most oxidized wine (L2) had the minumum value at wavelength of inflection point L1.

The wine (L3) with intermediate browning have 2 minimum values in these positions (270 and 279 nm). This fact allow us to consider wavelength 269 – 270 nm suitable to maximum of unoxidized polyphenols, while the products of its oxidation correspond with wavelength 279 – 281 nm. The differences in the range 300 – 315 are less expressed where the second order derivative spectra have no extreme points. The more oxidized samples (L2 and L3) are characterized by minimum – maximum wavelength at 304 and 309 nm respectively. The samples L2 and L3 have more expressed minimum values than L1, because they have a higher content of oxidized polyphenols. These differences can be used for monitoring the oxidative processes in wines produced from *Legenda* grape variety.

The significant differences according to level of oxidation have been observed and in the visible region. These differences generally are quantitative, not qualitative. Legenda wines have no obvious or latent maximum values in the visible region. The absorbance at 420 nm for oxidized samples L2, L3 is 0,538 and 0,567 (l=1cm) and 0,164 for sample L1. *Viorica*, *Chardonnay* and *Sauvignon* wines in UV-vis region have absorption spectra with 2 distinct regions 250 – 300 nm and 300 – 350 nm. They are similar to *Legenda* wine spectra (Fig. 1). Absorption spectra show an increased HCA content in *Viorica* wine. The qualitative differences are more evident in second order derivative spectra. The same groups of minimum values in 300 – 350 region have been observed. In the interval between 250 – 300 nm, 2 minimum values 270 nm, 281 nm are evident for *Viorica* wine. In the case of Sauvignon wine prevails the first minimum value (272 nm), the second minimum is masked and is presented by an inflection point. At Chardonnay wine the both minimum have the very close values and its superposition gives a single band with λ_{min}=274 nm.

The concentration of total phenolic compounds – SFT (Galic Acid Equivalents, mg/l), phenolic cinnamic compounds – SFC (Caffeic Acid Equivalents, mg/l) and phenolic flavonoid compounds – SFF (Catechin Equivalents, mg/l) are presented in table.

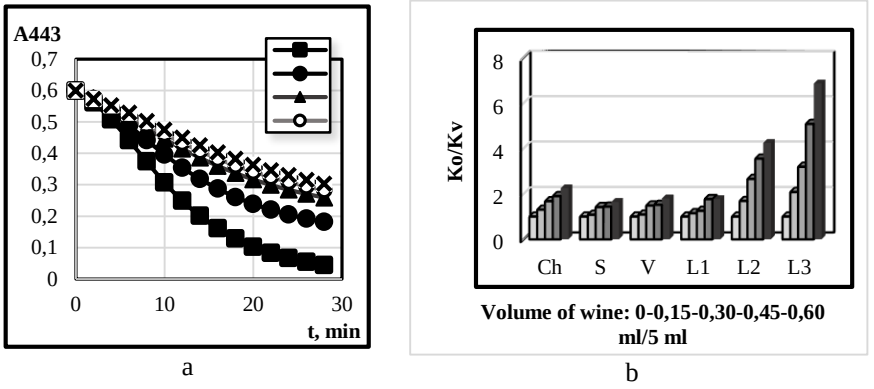
The maceration of L2 and L3 wines have been ensured the better extraction of HCA, total phenolic (SFT) and phenolic flavonoid compounds (SFF) than in L1 wine. The POM-test shows the increased oxidation behavior in L1 wine. This fact can be explained by the presence in the respective samples of unoxidized forms of HCA. The smallest value of POM-test have been identified in Chardonnay wine samples.

Table 1. *The concentrations of main phenolic compounds, the index of oxidation BEHAVIOR (POM-test) and the parameter of relative antioxidant capacity (K)*

Parameter	L1	L2	L3	V	Ch	S
SFT (Galic Acid Eq., mg/l)	145,1	269,4	236,1	199,3	220,4	68,8
SFC (Caffeic Acid Eq., mg/l)	29,6	56,2	51,7	67,0	48,1	25,7
SFF (Catechin Eq., mg/l)	206,2	377,0	319,1	160,1	298,7	43,6
IPT	8,95	12,98	11,94	10,76	11,47	6,59
POM-test (%)	81,8	74,2	42,1	24,0	10,1	67,7
K (Ko/Kv÷f(v wine))	1,34	5,46	9,14	1,.9	2,07	1,06
R^2	0,8964	0,9960	0,9759	0,9409	0,9793	0,9359

The value of POM-test for Sauvignon wine can be the consequence of decreased content of phenolic compounds extracted during processing. Our experiments shows that wine treatment with bentonite and PVPP can reduce efficiently the content of browning substances.

The antioxidant capacity of experimental wine samples have been determined by watching the competitive kinetics of Crocin color fading. The antioxidant capacity have been expressed by the interdependance between constant of color fading speed in absence of wine addition (Ko) and in the presence of wine addition in different volumes (v), in the reactant mixture (5 ml), in the spectrophotometer cuvettes (Kv). The monitoring of process has been done at 443 nm. In the figure 2 a is shown the kinetics curves of Crocin oxidation in the presence of different concentrations of *Chardonnay* wine.



a b

Fig. 2. *The kinetics of oxidative color fading of Crocin (CBA) in absence and presence of different concentrations of Chardonnay wine (a); dependence of comparative antioxidant capacity Ko/Kv on wine concentration in reactant solution (b).*

The interdependencies Ko/Kv for all studied wines show more moderate antioxidant capacity at Sauvignon, Viorica, L1 wines and unexpected expressed antioxidant capacity at L2 and L3 wines (Fig. 2 b). The close correlation between

antioxidant capacity and content of SFT, SFC and SFF have not been found, although the trend have been barely observed. The oxidation behavior of browning L2 and L3 wines can be explained due to high content of compounds mentioned before and possible antioxidant capacity of some products of browning, although have not been identified direct connection between the antioxidant capacity and browning degree of Maillard products in hydrophilic medium. The strict elucidation of these interdependencies requires the complex investigations for determine the influence of different wine antioxidant compounds, for reveal the possible effect of endogenous antioxidants of wine, the redox transformations that are catalized by transition metals, enzymes. The constants of linear dependencies Ko/Kv on the wine concentration in the reactant mixture have been determined with high values of correlation coefficient R^2 (Tab. 1).

Conclusions

The oxidation of hydroxycinnamic complex in experimental white wines Legenda, produced by using different technologies, have been studied. The oxidation of hydroxycinnamates were accompanied by quantitative spectral changes in visible light region and qualitative spectral changes in UV region. The POM-test offers the possibility to predict the risk of browning the white wine. There are no interdependence between the POM-test and total antioxidant capacity determined with Crocin.

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THE QUALITY INDICES OF YAGHURT MANUFACTURED WITH COW MILK AND GOAT MILK

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Summary: Goat milk is perfect as a food recommended for children's nutrition due to its well-balanced chemical composition, curative properties, fine curd formation and high digestibility. In this paper 5 samples of goat milk yoghurt, cow's milk and their mixture were developed. 100% goat milk yogurt has formed the finest, softer curd compared to samples with cow's milk without whey removal. All samples obtained high values of organoleptic indices, maximum values obtaining sample 2 and 4. Maximum viscosity values were obtained for sample 3 (mix of cow's milk and goat milk 50:50), minimum values for 100% milk sample goat. The physicochemical and microbiological indices determined fall within the limits specified in the yogurt specific normative documents.

Key words: goat milk, cow's milk, yoghurt, casein, fermentation

Introduction

The primary concern of nutrition specialists is to replace breast milk to a dairy product that is as close as possible to its composition. Milk has a key role in the nutrition and development of the human body, even in the first year of life.

However, some specialists in the field emphasize that the milk of animal origin can not be compared to the mother's milk in terms of nutrient content and balance. But the easily assimilable fat content and casein that form a homogeneous and soft curd compared to casein of cow's milk make it possible for goat milk to be consumed among children with cow's milk allergies and digestive tract problems. [1]

The gooat milk fat globules are 1/5 of the size of the cows' milk, they have a better dispersion and make a more homogeneous mixture. It consists of several different components, including glycoproteins, non-polar lipids, phospholipids and sphingolipids, all contributing to the nutritional and technological aspects of fat globulin membrane components. [2, 3, 4]

The amount of short-chain fatty acids (glycerol ethers) in the goat's milk fat is higher than in cow's milk, important for the nutrition of the newborn. [5]

Also, the goat's milk fat is more easily digestible, and can be considered an important source used in various metabolic processes, and even for combating some metabolic diseases. [7, 8]

Goat milk proteins are more easily digestible than cows' milk proteins. Goat milk has lower casein content and a lower coagulation capacity. This difference in coagulation power is attributed to low levels of α_{s1}-casein in goat milk compared to cow's milk, being a key reason for goat's milk to be considered as more easily digested than cow's milk. Casein of breast milk is completely hydrolyzed, compared with 96% casein from goat milk and 76-90% casein from cow's milk. The result is attributed to the higher level of β-casein and a lower level of α_{s1}-casein in casein of human and goat milk. [6]

Milk is a source of the important micro- and macroelements easily assimilated by the organization. In children's diet, dairy products are an important source of minerals such as calcium, magnesium, selenium and vitamins.

Reaction of goat's milk is alkaline, just like breast milk, while cow's milk produces an acidic reaction. An acidic environment stimulates the growth of bacteria, fungi and viruses. [4]

Thanks to well-balanced chemical composition, curative properties, fine curd formation and high digestibility goat milk perfectly fit among the products recommended for children's nutrition. The use of goat's milk in acidic dairy products assortment can highlight all its beneficial properties complete with a positive impact on the gastrointestinal tract due to the finished product microbiota.

Methods and research materials

Raw goat milk was received according to the Moldavian standard SM: 2015, adopted on 29.09.2015. Raw goat and sheep milk. Specifications. This standard establishes technical conditions for the quality of raw goat and sheep milk collected for industrial processing.

Lyophilized starter culture type YO-MIX 485 LYO 200 DCU was used. Dosage 10-20 DCU / 100 liters. Composition: lactobacillus delbruekii ssp. Bulgaricus, Streptococcus thermophilus. Additions of sucrose and maltodextrin.

Drinking water according to HG - 934 of 15.08.2007, Annex 2.

Appreciation of sensory quality based on the score scale. Method principle: Evaluation of each organoleptic characteristic by comparison with scoring scales of 0 ... 5 points and obtaining the average score of the tasters group, (ISO 6658: 2005).

$$P_{mp} = P_{mnp} \times f_p, \quad (1)$$

where: P_{mnp} – Unmatched average score (arithmetic mean of results);
f_p – the weight factor (shows how a sensory character carries the total sensory quality of the product).

$$P_{tp} = \sum P_{mp} \quad (2)$$

Titratable acidity determination (GOST 3627).

Determination of fat content by the acid-butyrometric method, (GOST 5867).

Determination of milk protein content. The principle of the method consists in blocking the amyl groups of proteins with formaldehyde and the liberation of the carboxylic groups, which are neutralized with 0.1N NaOH solution.

The viscosity of the acid dairy products determined by the Brookfield DV-III rotary viscometer.

Determination of Yoghurt Syneresis Index. The principle of the method consists in the separation between solid phase (gel) and liquid during coagulation of milk as a result of active physicochemical phenomena (casein network restructuring) and passive (porosity and permeability of the gel).

$$S = \frac{m_z}{m_p} \times 100, \quad (3)$$

where: m_z – the amount of exuded whey, g;
m_p – sample mass, g; , S – syneresis index, %.

Determination of total dry matter content. (MAC Humidity Analyzer, Radwag).

Determination of the total number of microorganisms (number of bacteria is assessed indirectly, based on the number of colonies generated by the microorganism cells after thermostation at 37 °C for 48 hours.)

$$\frac{X = a \times 10^n}{q} \quad (4)$$

where: a- arithmetic average of the colonies number;
q – hthe volume of material placed on the plate, cm^3;
n – product degree decimal dilutions.
Determination of yeasts and molds. GOST 10444.12-88

Results and discussions

For the manufacture and analysis of quality indices, 5 samples of classic yoghurt from the goat milk mix with cow's milk were proposed in the following proportions:

Table 1. *Assortment of children classic yogurt.*

Nr. sample/ row material (%)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Cow milk	100		50	25	75
Goat milk		100	50	75	25

Yogurt has been manufactured by the thermostat method, being an effective method for the appreciation of the firmness formed coagulum, an important aspect of the acidic dairy products quality for children. The coagulum of these products must be firm but at the same time fine to be easily assimilated by the body of the children.

To assess the quality of the produced yoghurt, organoleptic, physicochemical and microbiological indices were determined.

The recipe of yoghurt contains natural milk and starter culture, without any auxiliary material including stabilizers. Considering this, and given that they are acidic dairy products intended for small children, their shelf life is lower. The products were stored for 72 hours.

The degree of syneresis indicates the amount of whey removed to the surface (%) after the dairy products coagulation. In the case of experimental samples, no wheat discharges were detected at the surface, the value being 0%.

The dry matter content depends on the content of proteins, minerals, fats. The higher their concentration, the higher values has the dry substance. Maximum values of dry matter content were obtained for sample 4 and 5.

Quality indices of children goat milk and cow's milk are shown in the table 2.

Table 2. *Children yaghurt of goat and caw milk quality indices.*

Nr.	Characteristics	The experimental value				
		Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Physico-chemical indices						
1.	**Dry substance, %**	14	15,5	17,5	19,5	17
2.	**Protein content, %**	2,23	2,49	3,76	2,69	2,56
3.	**Fat content, %**	3,7	4,1	4,25	3,9	3,2
4.	**Viscosity, m^2/s**	$3,0*10^2$	$2,6*10^2$	$3,2*10^2$	$2,1*10^2$	$2,9*10^2$

Nr.	Characteristics	The experimental value				
		Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
5.	Titrable acidity, °T	80	100	110	120	100
Microbiological characteristics						
6.	Total number of microorganisms, NTG	$2*10^7$	$1,5*10^7$	$1,8*10^7$	$1,6*10^7$	$1,8*10^7$
7.	Yeast and mold	absence	absence	absence	absence	absence
Sensory characteristics						
8.	Appearance and consistency	liquid, moderately viscous undamaged curd				
9.	Taste and smell	lactic taste, without foreign smell and taste				
10.	Color	white, in the sample 1,3,5 with yellow shades				

Sample 3 shows the maximum values of viscosity than the other samples. This is due to the fact that the protein content in the sample is much higher and the coagulum was obtained as a strong one as sample 1. The lowest values were obtained for sample 2 - 100% goat milk yoghurt. According to the researches carried out [9], the casein micelles in goat milk differ from those in cow's milk, having a higher β-casein solubility, more calcium and phosphorus, and a lower stability to heat treatment. This is why the coagulum is softer and influences the duration of digestion, because in the acidic environment of the gastrointestinal tract it forms smaller and softer clusters than cow's milk, which is an advantage for the children's body.

The highest acidity values correspond to samples 3 and 4. Tritrable acidity depends on the lactic acid content obtained of lactic acid fermentation by lactic bacteria. Thus, the more lactose is in milk, the more lactic acid is produced and the acidity will increase. Normative values for yoghurt range from 85-120˚T. If these values exceed the normative limit in the analyzed product, this is an indication that the product is no longer safe for consumption.

The total number of germs determined for the yogurt samples falls within the yogurt-specific normative values. Yeasts and molds have not been detected.

Sensory characteristics of the products were analyzed by method 5 points according to the quality requirements under existing documents (MS ISO 22935-3: 2015).

The yoghurt samples have an average score of 20 points and according to their scoring scale they are given the "very good" and "good" qualifier and can be characterized as "Product with pleasant, specific, well-defined traits, non-defective sensory perceptible ". The visible defects from sensory analysis were fat-to-surface separation in samples where the cow's milk content was 100%, 50%, 75%. These defects are due to the lack of a homogenization process that aims at transforming fat globules of ≈15μm in size into small ones between 0.2 -1 μm. As a result of this process the defect of fat separation on the surface disappears, the color becomes white with creamy shades.

The results of the sensory analysis are shown in Figure 1, according to the average score.

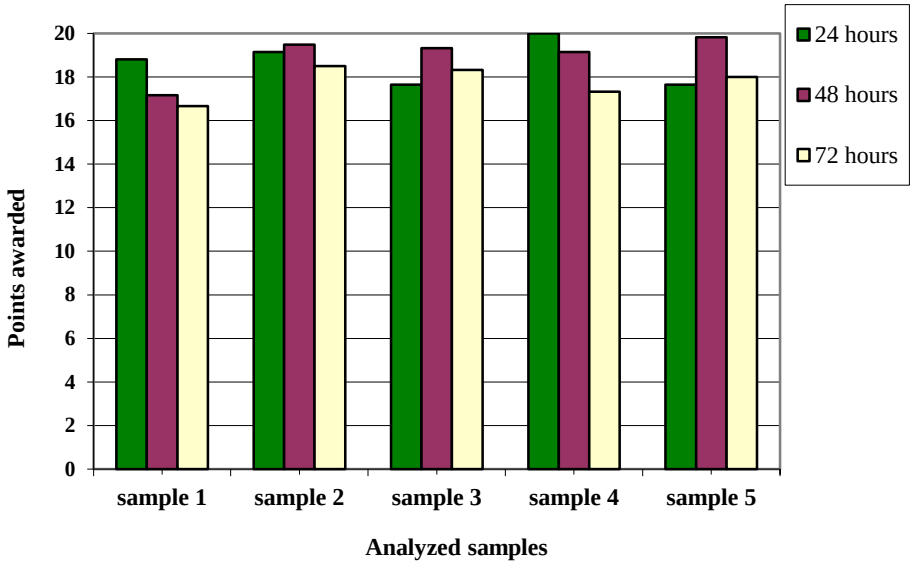

Figure 1. *Samples sensory quality variation for 72 hours.*

Conclusions

Goat milk is considered to be superior to cow's milk due to its nutritive, tonic, anti-anemic and anti-infectious effects. Also, goat's milk has a lower casein content and a lower coagulation capacity and higher digestibility. Because of these characteristics, goat's milk is recommended in the diet of a wider group of consumers, including children over 8 months of age. In children's diet, dairy products are the most important source of minerals and vitamins.

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THE STUDY OF WALNUT OIL (*JUGLANS REGIA L.*) OXIDATIVE STABILIZATION BY SATURATED FATTY ACIDS

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Abstract. Walnut oil (*Juglans regia L.)* is a local lipid product rich in *ω3* and *ω6* polyunsaturated fatty acids, which are extremely subjected to oxidation. The mix of walnut oil with solid vegetable fats can stabilize the system. In order to save the biological potential of walnut oil, it was proposed to minimalize the content of saturated fatty acids in the stabilized mix by the use of a pure saturated fatty acid with a long carbon chain. Thus, the 15:85 is an optimal ratio of *Stearic acid: Walnut oil* mix so as to form a spreadable composition with a melting point similar to that of dairy fat.

Keywords: walnut oil, saturated and polyunsaturated fatty acids, oxidation, rancidity

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Introduction

Lipids are the essential food components that largely determine the nutritional qualities, biological, energy value and the taste of food. The main factor that characterizes the efficiency of dietary lipids assimilation in body is the balance ratio of fatty acids.

An important role belongs to polyunsaturated fatty acids and their excluding from the diet can affect the balance of vital processes [1]. The local lipid product rich in *ω3* and *ω6* polyunsaturated fatty acids is walnut oil (*Juglans regia L.*), which ratio of unsaturated fatty acids to saturated fatty acids is twice as high as the ratio in olive oil [2]. Therefore, the oxidative stability of a cold pressing walnut oil is lower than in the other types of local vegetable oils [3].

In view of the above, the scientific research has been planned in order to accumulate new data about oxidative stability of walnut oil, the possibility of its use to obtain new final products.

Materials and methods

The main research object was a virgin walnut oil (*Juglans regia L.*) obtained by a cold pressing method at the Technical University of Moldova.

The study of saturated fatty acids influence on the walnut oil oxidative stability and the potential of a new products obtaining was realized by the use of several solid vegetable fats (palm oil, cocoa butter) and a pure saturated fatty acid – stearic one. In order to obtain some comparative data, it was also used a monounsaturated fatty acid – oleic one.

The stability of mixes of walnut oil and saturated fatty acids was analyzed by Rancimat method using the 892 Professional Rancimat. The tests were carried out with 3g of the fat samples at temperature of 120°C and an airflow rate of 20 l/h. [4].

The measurement of fats melting point was realized by a standard capillary method [5].

Research results

Research started with a comparative analysis of chemical compositions of solid vegetable fats and virgin walnut oil (Table 1).

Table 1. *Fatty acid composition of vegetable fats (% of total fatty acids)*

Fatty acid	Palm oil [6]	Cacao butter [7]	Walnut oil [8]
C8:0 (caprylic)		1,27	
C11:0 (undecanoic)		1,69	
C12: 0 (lauric)	0,1 – 0,4	19,68	
C14: 0 (myristic)	0,5 – 2,0		0,1
C16: 0 (palmitic)	39,0 – 46,8	28,16	2,9 – 7,0
C16: 1 (palmitoleic)	0,6		0,1
C18: 0 (stearic)	3,5 – 6,0	21,53	0,9 – 2,5
C18: 1 (oleic)	36,7 – 43,0	22,78	14,0 – 30,0
C18: 1 (trans-oleic)	≤ 1		
C18: 2 (linoleic)	6,5 – 12,0	4,88	53,0 – 70,0
C18:3 (linolenic)	0,5		9,8 – 13,0
C20: 0 (arachic)	1,0		
C20:1 (eicosenoic)			1,7
C22:1 (docosenoic)			3,8
Saturated	49,5	72,3	7,5
Monounsaturated	40,9	22,8	18,0
Polyunsaturated	9,6	4,9	74,5
Unsaturated / Saturated, ratio	1,02	0,77	12,33

Presented data denotes that walnuts oils have a high content of polyunsaturated fatty acids, that are first of all oil components that are exposed to oxidation.
The rate of oxidation of fatty acids increases in relation to their degree of unsaturation [8]. The oxidative stability of walnut oil mixed in the proportion of 1:1 with cocoa butter and palm oil was analyzed (Table 2).

Table 2. *Induction period for vegetable fats at 120 ^0C*

Vegetable fat	Induction time (IT), h	Stability time (ST), h	ST-IT, h
Cocoa butter [9]	9...15	-	-
Palm oil [9]	7…12	-	-
Walnut oil	1,92	2,56	0,64
Cocoa butter + Walnut oil (1:1)	2,33	3,34	1,01
Palm oil + Walnut oil (1:1)	3,14	3,84	0,7

According to presented data, even though the content of saturated fatty acids in cocoa butter is higher than in palm oil (Table 1), the induction time of Palm oil + Walnut oil mix is longer. But the period from the appearing of first volatile oxidation products to fat completely degradation is longer for Cocoa butter + Walnut oil mix.

Additionally, it was proposed to study the influence of oleic fatty acid on walnut oil oxidative stability (Figure 1). The content of this monounsaturated fatty acid in palm oil is almost twice as big as in cocoa butter (Table 1).

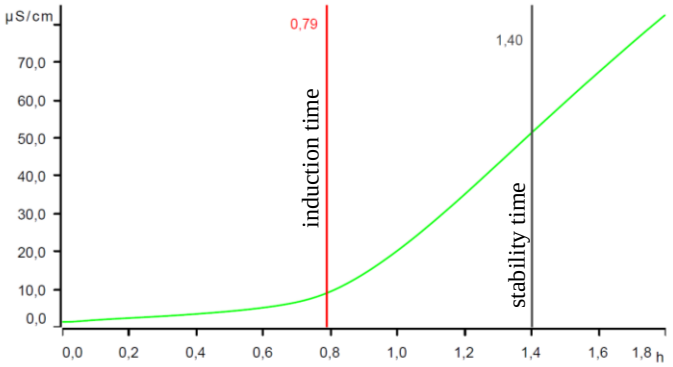

Fig.1. *The oxidation stability of Oleic fatty acid + Walnut oil mix (1:1) at 120 °C*

According to Fig.1, the presence of monounsaturated fatty acids in the mix on the contrary accelerates walnut oil oxidation. Thus, the stabilization potential of palm oil can be explicated by the "quality" of its saturated fatty acids and not by their quantity.

It has been assumed that the composition of palm oil essentially consists of saturated fatty acids with a longer carbon chain than in cacao butter. It has been made the calculations of carboxyl chain average length of unsaturated fatty acids (taking into account % fatty acid of total saturated fatty acids), that enter in the compositions of palm oil and cacao butter. In consequence, C_{lenght} (palm oil) = 16,16 and C_{lenght} (cacao butter) = 15,25.

In food industry solid vegetable fats are used in combinations with oils in order to obtain different kinds of spreadable products. The industrial transformation of vegetable fats – liquid at room temperature due to the concentration of unsaturated fatty acids – into spreadable fats is achieved by the crystallization of glycerides concomitantly with cooling and intensive mixing. One of the conditions necessary to carry out this process is that the melting point of vegetable fat should be similar to dairy butter t = 30 ± 5 °C [10], while the melting point of walnut oil is t = – 18˚C [11].

Solid vegetable fats balance the melting points of the vegetable oils mix due to the high concentration of saturated fatty acids. However, the composition of solid vegetable fats is complex and includes different types of saturated and unsaturated fatty acids, sometimes-even trans isomers (Table 1). Therefore, in order to optimize the mix of vegetable fats and minimize the concentration of saturated fatty acids, the use of a pure saturated fatty acid with a long carbon chain was proposed – stearic one.

In order to determine the optimal mix of walnut oil and stearic acid, the series of samples was made to obtain the Gibbs Roseboom Triangle (Figure 2), where an oleic acid was used as a monounsaturated fatty acid. The melting points of the samples were determined. The optimal zone of addition of stearic acid in walnut oil was established (~ 15% of total fat content) to form spreads based on walnut oil with a melting point similar to that of dairy fat.

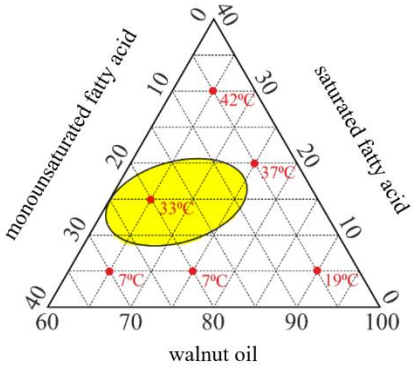

Fig. 2. *Diagram of Walnut oil / Monounsaturated fatty acid / Saturated fatty acid system*

Conclusions

The oxidative stability of walnut oil is positive influenced by saturated fatty acids, especially with long carbon chains, and negative – by monounsaturated fatty acids.

The mix of walnut oil and a pure saturated fatty acid has a research perspective in order to obtain food emulsions with optimal melting point and increased oxidation stability.

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VARIATION OF THE AMINO ACID CONTENT IN MINERAL PROTEIN CONCENTRATES AT ELECTROPHYSICAL PROCESSING OF WHEY

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Abstract: The main objective is the investigation of the content of the total, essential and non-essential amino acids in the protein-mineral concentrates in different processing regimes with variations of electric parameters at electrophysical processing of whey.

Keywords: electrophysical processing, whey, essential amino acids, non-essential amino acids, free amino acids, protein-mineral concentrates

Introduction

High biological or nutritional value of whey proteins is due to an elevated content of essential amino acids and conditionally essential or functional amino acids.

It is known that whey proteins make up about 20% of the milk proteins. The remaining 80% is casein.

All proteinogenic amino acids are classified into essential and non-essential ones. But comparing the amino acid profile of these two milk protein fractions shows that whey proteins contain a higher amount of essential amino acids (EAAs) and branched- chain amino acids (BCAAs) that are physiologically extremely important and confer whey proteins an important biological value [1].

Ten proteinogenic amino acids, called "essential" because they cannot be created from other compounds by the human body and so must be taken in as food, were identified in whey during electrophysical processing. The universal EAAs are: Val, Leu, Ile, Thr, Met, Lys, Phe, Trp, His and Arg. In some cases Arg and another proteinogenic amino acid Tyr can be considered partially essential, in dependence on the age and medical conditions. Other amino acids are non-essential (NEAA) ones.

More than 50% of the amino acids in whey proteins are either essential or conditionally EAAs.

The biological value of whey proteins is greater than that of other important proteins food sources. For example, it exceeds that of egg proteins by about 15%. Whey proteins are also leaders in the content of EAAs among other important sources of EAAs and are also rich in the BCAAs that are thought to play a role as metabolic regulations in protein and glucose homeostasis and in lipid metabolism [2]. In particular, β-lactoglobulin (β- Lg), which represent one of the main whey protein fractions, is rich in cysteine residues, an amino acid bearing a key role in stimulating the synthesis of glutathione. Another main protein fraction of whey proteins, α-lactalbumin (α-La), is commercially used in food supplements for babies because of its similarity in structure and composition to human milk proteins – coupled with its higher content of Cys, Trp,

Ile, Leu and Val residues, which makes it also an ingredient of choice in supplements for sportsmen [3,4].

Whey protein contains components such as β-Lg (~50-55%), α-La (~20-25%), glycomacropeptide (~10-15%), immunoglobulins (~10-15%), serum albumin (~5-10%), lactoferrin (~1%), lactoperoxidase (<1%), and other minor proteins such as β-microglobulin, lysozyme, insulin-like growth factors and γ-globulins [5-7].

Bovine serum albumin is another source of EAAs, but its therapeutic potential is largely unexplored.

Alfa-lactalbumin of whey is a protein source particularly rich in tryptophan, which modulates neurological and immunological functions through multiple metabolites, including serotonin and melatonin. Anevening intake of α-La by human volunteers increased plasma tryptophan availability and improved morning alertness and brain measures of attention [8, 9]. Recent studies have shown that tryptophan and its metabolites, e.g., serotonin (5-hydroxytryptamine, 5-HT) and melatonin can regulate the feed intake, reproduction, immunity, neurological function, and anti-stress responses [10]. Tryptophan may also modulate gene expression and nutrient metabolism to impact whole-body homeostasis in organisms.

Whey protein is also an excellent source of the key amino acids for glutathione production (cysteine, glycine and glutamate). Glutathione is your body's most powerful antioxidant that fights oxidative stress caused by free radicals in our body and is different from other antioxidants in that it is intracellular [11]. While glutathione can be found in supplement form, foods like whey are the best alternative.

Thus, an optimal balance among amino acids in the diet and circulation is crucial for whole body homeostasis and whey, from this point of view, is one of the best sources of EAAs, NEAAs and total free amino acids (FAAs).

Whey proteins, as a kind of amino acid cocktail, are important for sports training programs, not only for best athletes, and for recovery of health after severe illness, this is why an adequate dose of them is crucial for growth, development, and health of animals and humans.

Results and discussion

The degree of amino acids isolation in the PMCs during electrophysical processing of whey depends on the: current density, duration (time) of processing, and the type of whey. Varying these parameters, the content of essential and functional amino acids in the PMCs during electrophysical processing can be modeled.

In the framework of the experiments of electrophysical processing, three types of whey were used provided by the “JLC” Joint Stock Company, Chisinau, RM, after the manufacture of the: granulated cottage cheese „Grăuncior”; “Cottage cheese”, 2% fat content with the membrane electrolyzer EDP-4.

The determination of the content of amino acids in the studied samples was done by the ion-exchange chromatography [12], with the help of amino acid analyzer AAA-339M.

In our experiments, 18 proteinogenic amino acids out of 20 were detected: Asparate that includes both Aspartate and Asparagine and Glutamate that includes both Glutamate and Glutamine (in the process of detection Asparagine is combined with Aspartate and Glutamine with Glutamate and they have the identical picks that reflect the

quantity of extraction). In addition, we described the peculiarities of amino acids content and their spectrum changes, according to the mentioned groups during whey electrophysical processing at different current densities.

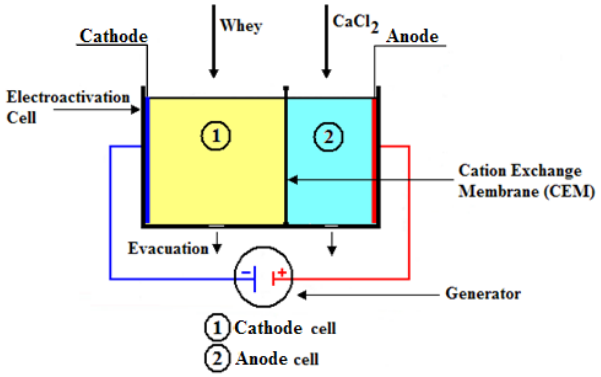

Fig. 1. *Layout of membrane electrolyzer EDP-4.*

Variations of the total FAAs, NEAAs and EAAs content during electrophysical processing with electrolyzer EDP-4 of the whey after the manufacture of the granulated cottage cheese „Grauncior" and that after the manufacture of the "Cottage cheese", 2% fat content, at current density j=10 mA/cm^2 are presented in Figures 2 and 3.

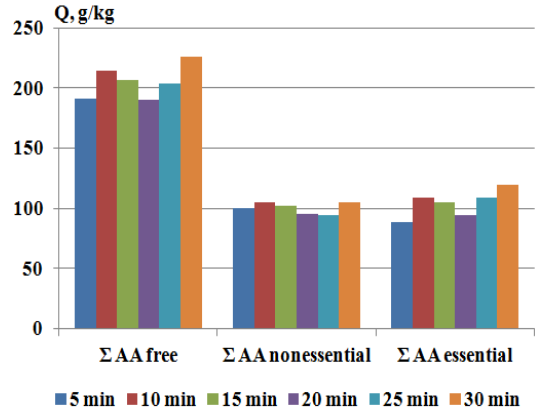

Fig.2. *Variations of total FAAs, NEAAs and EAAs content during electrophysical processing with electrolyzer EDP-4 of whey after manufacture of granulated cottage cheese „Grauncior" in stationary regime, at current density j=10 mA/cm^2*

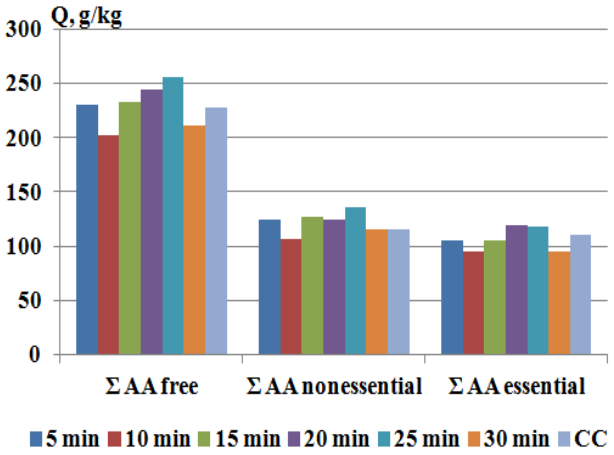

Fig.3. *Variations of total FAAs, NEAAs and EAAs content during electrophysical processing with electrolyzer EDP-4 of whey after manufacture of "Cottage cheese", 2% fat content, in stationary regime, at current density j=10 mA/cm²*

Variations of the total FAAs, NEAAs and EAAs content during electrophysical processing with electrolyzer EDP-4 of the whey after the manufacture of the granulated cottage cheese „Grauncior" and that after the manufacture of the "Cottage cheese", 2% fat content, at current density j=20 mA/cm² are presented in Figures 4 and 5.

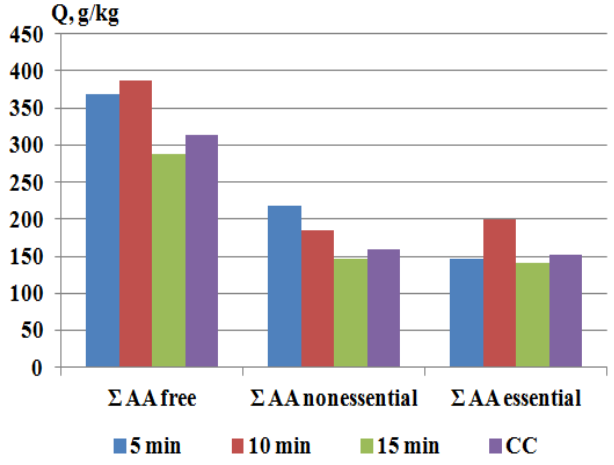

Fig.4. *Variations of total FAAs, NEAAs and EAAs content during electrophysical processing with electrolyzer EDP-4 of whey after manufacture of granulated cottage cheese „Grauncior" in stationary regime, at current density j=20 mA/cm²*

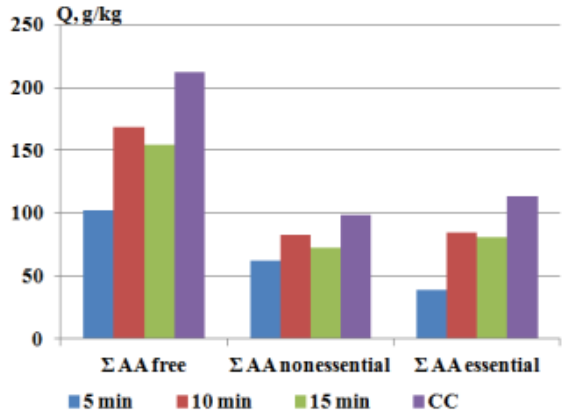

Fig.5. *Variations of total FAAs, NEAAs and EAAs content during electrophysical processing with electrolyzer EDP-4 of whey after manufacture of "Cottage cheese", 2% fat content, in stationary regime, at current density j=20 mA/cm^2*

A higher degree of total FAAs and the content of both EAAs and NEAAs isolated in the PMCs has been established during electrophysical processing of whey: after the manufacture of the "Cottage cheese", 2% fat content, at current density j=10 mA/cm^2 and after the manufacture of the granulated cottage cheese „Grauncior", at current density j=20 mA/cm^2.

The highest degree of extraction of free, especially EAAs, has been recorded in the PMCs during electrophysical processing with electrolyzer EDP-4 of whey after the manufacture of the granulated cottage cheese „Grauncior", at current density j=20 mA/cm2, at 10 min of processing, when pH=11.6 and tº C=29.5 ºC.

The content of NEAAs reached maximum values in the PMCs during electrophysical processing with electrolyzer EDP-4 of whey after the manufacture of the granulated cottage cheese „Grauncior" at current density j=20 mA/cm2, at 5 min of processing, when pH=8.5 and tº C=24.5 ºC.

Conclusions

The level of variations of each EAA and NEAA in the PMCs depends on the duration of electrophysical processing, current density, pH value and temperature (t ºC). The obtained results may be of interest for producing the PMCs with desired amino acids content and spectrum by applying various parameters (regimes) of whey electrophysical processing and can be promising for further investigations in that direction.

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COMPOSTING OF FRUITS AND VEGETABLE WASTES: PHYSICO-CHEMICAL AND MICROBIOLOGICAL ANALYSES

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Abstract: In this paper, food waste like fruits (apple, banana, orange and kiwi peels) and vegetables (cabbage leaves, potato and carrot peels) were composted at laboratory level. Three samples with different composition were considered in this study. pH meter IQ240 and CyberScan CON 510 Conductivity Meter were used for measuring of pH and electrical conductivity (EC), while DK Series Kjeldahl Digestion Units - VELP Scientifica was used for determination of nitrogen content. The heavy metals content from the obtained compost was determined with ICP – MS Agilent Technologies 7500 Series. Results showed that in the first week pH is acid and EC values are high for all three samples, and then the pH values are increasing during the composting process, while EC values are decreasing. The nitrogen content is low in all samples and will decrease during the composting process for samples S2 and S3, while for the first sample will remains around 1%. Cr, Cu, Ni and Zn values in the all three compost samples are below threshold values. Evolution of the yeasts and molds, mesophilic aerobic bacteria, lactic bacteria and coliform bacteria number was observed during the composting process.

Keywords: aerobic process, food waste, heavy metals, microorganisms, nitrogen content

EFFECT OF OSMOTIC CONCENTRATION ON THE COLOUR AND CHEMICAL CHARACTERISTICS OF SOME FRUITS

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Abstract: Osmotic dehydration is the pre-treatment method of preservation the fruit and vegetable to increase its shelf-life in which these are immersed in concentrated salt or sugar solutions.

The effect of an osmotic dehydration was investigated on the colour and chemical characteristics of dehydrated fruits (apricot and plum) in fructose osmotic solutions. Difference in CIE-LAB, chroma - C^* and hue angle H^* were performed with a Chroma Meter CR-400/410. Three aqueous solution of fructose (40, 60 and 80%) were used for dehydration, during 3 h of process at temperatures of 25 ^{0}C, with fruit/osmotic agent ratio of 2:1. Water loss and solids gain showed significant differences depending on the concentration of the osmotic agent and process time. The use of highly concentrated osmotic solutions induced losses of phenolic content (TPC) and ascorbic acid in sliced apricot and quince. Fructose concentration, osmosis time and temperature induce significant increase of a* and b* colorimetric parameters but did not affect the lightness (L*) of plum slices.

Keywords: apricot, plum, colour, polyphenols.

FLAX (LINUM USITATISSIMUM L.) SEED TEXTURE AGENTS FOR THE PRODUCTION OF FUNCTIONAL FOODS

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Abstract: Flax seeds serve as a good source of both soluble and insoluble dietary fiber. Flaxseed holds a unique place among the oilseeds due to presence of mucilage located in outer layers of the seed. Flaxseed mucilage has gained momentum due to its superb health benefits and potential functional properties. It contains 35–45 % of fibre and two-third is insoluble and one third is soluble fiber. Insoluble fiber consists of cellulose, hemicellulose and lignin. Most of the soluble fiber of flaxseed appears to be the mucilage of seed coat. It makes up 7–20% of seeds weight. Soluble fiber in the form of mucilaginous material consists mainly of water soluble polysaccharides; its recovery and purity vary with the extraction conditions. The water binding capacity of flaxseed mucilage is reported to be about 1600–3000 g of water/ 100 g of solids. High water binding capacity of flaxseed is attributed due to the presence of polysaccharides in the seed coat. Mucilage of flaxseed consists of acidic and neutral polysaccharides. The neutral fraction constitutes arabinoxylan as basic component (more than 12% from seeds weight), and other polysaccharides, formed from fragments of L-arabinose, D-xylose and D-galactose. Acidic fraction contains L-rhamnose, L-fucose, D-galactouronic acid and L-galactose. Functionally, these polysaccharides possess similar properties to guar gum [1]. The mucilage can be extracted by hot water and exhibit good foam-stability and water-retaining properties [2]. The present study is about optimizing the process of obtaining flax seed texture agents and applying them to the production of functional foods. Extraction from integer seeds or from very crushed seeds was inefficient, namely because of excellent capacity of arabinoxylan to absorb and to glue other components and small particles. It has been found that the preparation of arabinoxylan-rich monophasic extracts of polysaccharides is possible with a certain seed pretreatment technology that includes the removal of fat and oil substances, the moderate destruction of the outer coats of the seeds, and counter current extraction with acidulated hot water. The single-phase aqueous extracts of arabinoxylan obtained by us are a promising water-retaining component, and can be used in the development of different baking products, yogurts, vegetarian mayonnaises and sauces.

Keywords: flaxseeds, polysaccharides, arabinoxylan, extraction, health benefits

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FORMULATION ET CARACTERISATION DES PRODUITS DE PATISSERIE AVEC FARINE DE CITROUILLE

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Abstract: Pour prévenir plusieurs maladies liées à l'alimentation incorrecte on doit recourir à l'utilisation des sources végétales, afin d'augmenter la valeur biologique du produit et diminuer sa valeur calorique [1]. Les produits de pâtisserie sont caloriques et leur consumation non équilibrée peut provoquer l'excès du poids corporel. Dans le monde moderne est apparue cette tendance de diminuer la valeur calorique de ces produits, car leur consumation produit un plaisir et en même temps une dépendance.

L'objectif de la présente étude était l'élaboration de produits de pâtisserie avec l'ajout de farine de citrouille et de déterminer la durée de viabilité de produits élaborés. Les objectifs spécifiques suivants ont été examinés: l'analyse de la composition chimique générale de farine de citrouille ; formulation et caractérisation organoleptique et physico-chimique de produits de pâtisserie avec des ajouts doses de poudre de citrouille ; impact de la substitution partielle de la farine de blé par la poudre de citrouille sur le processus technologique. Finalement, les études physico-chimiques et organoleptiques des produits de pâtisserie avec des ajouts doses de poudre de citrouille ; l'analyse microbiologique, détermination de la durée de viabilité de produits de qualité optimale. Une étude visant la détermination de la capacité antioxydant des produits élabores par rapport au témoin a été réalisé.

Les produits de pâtisserie ont été fabrique par la méthode monophasique (l'administration concomitante des ingrédients). Les caractéristiques physico-chimiques et organoleptiques ont été déterminée selon les standards en vigueur. L'administration de la farine de citrouille n'influence pas significativement la valeur énergétique (une diminution de 1-2%), mais augmente la valeur biologique du produit. Dans le même temps, peut influencer les propriétés physico-chimiques et organoleptiques du produit. On a constaté que les ajouts de la farine de citrouille ont une influence marquante sur les caractéristiques physico-chimiques du produit fabriqué par la méthode monophasique. Le volume spécifique, et la qualité organoleptique du produit avec l'ajout de 10% de la farine de citrouille, sont considérablement plus élevées en comparaison avec le produit témoin.

Pendant la période de stockage dans conditions conformées au standards en vigueur (température de 18±5°C et l'humidité relative de l'air ne dépêche pas 75%), les indices physico-chimiques de qualités des échantillons recherchées, n'ont pas supporter des modifications essentielles. On a remarqué une augmentation de l'activité antioxydant (AA) dans le produit avec des ajouts de la farine de citrouille, en particulier dans le cas de la digestion intestinale. Cette augmentation de l'AA est due aux principaux composés antioxydants de la citrouille, les caroténoïdes.

La consommation d'aliments riches en caroténoïdes serait liée à un diminution de risque de développer certaines maladies, y inclue les cancers. Les résultats obtenus d témoignent sur l'effet bénéfique de la farine de citrouille sur les produits de pâtisserie, plaçant ces produits parmi les produits à haute valeur biologique - aliments fonctionnels.

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HONEY ADULTERATION DETECTION USING INSTRUMENTAL TECHNIQUES

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Abstract: Honey adulteration has three perspectives: public health (represented by the presence of uncontrolled ingredients which may affect the human body), legislation (the EU laws forbid the addition of any substances in honey) and economic (because represents an unfair competition comparing with authentic products). The aim of this study was to check the utility of a cyclic voltammetric e-tongue for the detection of honey adulterated with fructose, glucose and inverted sugar. 55 samples of authentic honeys of different botanical origin (acacia, honeydew, sunflower, tilia and polyfloral) were adulterated with these substances in different percentages: 5%, 10% and 20%, respectively. The e-tongue has classified correctly 81.11% of the adulterated samples according to the adulteration agent, while combining the e-tongue with physicochemical parameters the correct classification reached 96.66%.

Keywords: honey, adulteration, e-tongue, physicochemical parameters

OPTIMIZATION OF THETOTAL POLYPHENOLS EXTRACTION FROM HIPPOPHAE RHAMNOIDES USING CENTRAL COMPOSITE DESIGN*

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Abstract: Polyphenolic compounds provide health benefits by removing free radicals, protecting and regenerating other antioxidants from food. Therefore, in recent years, interest in polyphenols has increased among scientists, those in the agricultural and food industries, nutritionists etc. [1]. Also, the polyphenols from plants which can effectively absorb photons and rapidly return to ground state, exactly as UV filters have been recently considered as potential sunscreen resources [2].

The aim of this study was the optimization of the extraction processes (extraction by sonication and reflux) of polyphenols from sea buckthorn (*Hippophae rhamnoides*), depending on the water: ethanol ratio, solvent: vegetable material, temperature and extraction time. Before the extraction, it was established the sea buckthorn weighing mass, respectively the volume of the solvent according to the optimum hydromodule. For optimization of polyphenols extraction from sea buckthorn the Central Composite design was used, from the software Minitab 17, resulting 20 experimental variants. The obtained extracts were characterized in terms of the total content of polyphenols by the Folin-Ciocalteu method.

From the results obtained by spectrophotometric analysis of the extracts obtained by sonication, it was found that the largest amount of polyphenols (7.47 ± 0.10 mg / g dry vegetable material) extracted from the sea buckthorn was obtained under the following conditions: extraction solvent: 50% ethanol; extraction temperature: 56.8 °C; extraction time: 20 min. In the case of the reflux extraction, the largest amount of polyphenols (14.29 ± 0.57 mg / g dry vegetable material) was obtained by refluxing with 40% ethanol as the extraction solvent for 90 minutes.

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TOXIC INFLUENCE OF ENVIRONMENTAL POLLUTANTS ON GREEN LEAFY VEGETABLES*

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Abstract: The influence of environmental stress factors on both crop and wild plants of nutritional value represents a very important research topic. Continuously worldwide use of drugs is conducting to significant pollution of the environment. Understanding the effects of the important drugs on plant physiological activity and structural modification is still limited, especially at environmentally relevant concentrations. The aim of the present work was to investigate the influence of the nonsteroidal anti-inflammatory drugs (NSAIDs) on foliage photosynthesis, secondary metabolites and ultrastructure of the leaf of orache (*Atriplex patula* L.), lettuce (*Lactuca sativa* L.) and spinach (*Spinacia oleracea* L.). All green leafy vegetables selected for this study were grown in controlled conditions and treated with solution of different concentrations (0.1 mg L^{-1}- 1 mg L^{-1}) of diclofenac, ibuprofen and naproxen. Regarding the physiological characteristics, all the selected NSAIDs decreased the stomatal conductance to water vapour and net assimilation rate of *Lactuca sativa* L. Also, these two physiological plant characteristics decreased in the case of *Atriplex patula* L. upon ibuprofen exposure. The analyzed volatile organic compounds (monoterpene and lypoxigenase pathway products) significantly increased with the increasing of the NSAIDs concentration used for vegetables treatment. The volatile organic compounds emitted represented a sensitive and promising tool to assess toxicity of selected NSAIDs. Also, the ultrastructural analysis demonstrated that NSAIDs negatively affect the selected vegetables. In the case of *Atriplex patula* L. treated with diclofenac hight mithochondrial content was observed. Ibuproben and naproxen highly affected the chloroplast of *Atriplex patula* L. The treatment of *Spinacia oleracea* L. with diclofenac conducted to electron dense deposit inside a chloroplast and ibuprofen conduct to strongly vacuolized cells. *Lactuca sativa* L. was the most affected vegetable with obvious changes in the structure of the leaves treated with ibuprofen.

Thus, the results obtained contribute for a better understanding of the adverse effects of these drugs on the environment and awareness a responsible consumption of drugs.

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USE OF BERRIES TO REDUCE THE CONTAMINATION OF BAKERY PRODUCTS*

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Abstract: In recent times, wheat flour bakery products have been increasingly affected by *Mesentericus* disease (bread ropiness), which is a serious problem for bakeries [1]. This problem is generated by a relatively heterogeneous microbial population of bacteria belonging to the *Bacillus* genus. It is known that there is a direct correlation between the content of bioactive compounds and the antibacterial potential. In the case of fruit of the dog rose, the *R. canina* and *R. damascena* varieties showed antimicrobial activity against *E. coli, B. cereus, P. aeruginosa, S. typhimurium* and *MRSA* [2].

The objectives of the researches were to examine *in vitro* and *in vivo* the antimicrobial effect of direct contact of fruit powder, seabuckthorn and dog-rose fruit with *B. subtilis* microorganisms in order to reduce the risk of bread ropiness. The direct antimicrobial effect was analyzed *in vitro* by screening the implanted powder by the agar diffusion method. Determination of the influence of vegetable powders *in vivo* was performed by the baking sample method. Bread samples were obtained from superior quality wheat flour, with various additions of vegetable powder in concentrations of 1; 2 and 3 %.

It was found that the fruit powder and white seabuckthorn marc antimicrobial activity against *B. subtilis* is 1.4 times higher than the one of fruit powder and dog-rose fruit marc. Monitoring of bread samples with vegetal addition and without vegetal addition during 24...120 hours showed that a 1 % addition of vegetable powder already substantially reduces the risk of bread ropiness. The increase of the vegetable powder concentration from 1...3 % in wheat flour bakery products affected by *B. subtilis* and *B. mesentericus* reduces the risk of rope spoilage for up to 5 days.

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Section IV

Colloque francophone : « Sécurité alimentaire, nutrition et agriculture durable » (section française)

DEVELOPPEMENT DE LA TECHNOLOGIE DE FABRICATION DE BOUILLIE INSTANTANEE DESTINEE AUX PERSONNES PRESENTANT UNE INTOLERANCE AU GLUTEN

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Résumée : L'élaboration de produits alimentaires spécialisés compétitifs est une orientation actuelle dans le développement de l'industrie alimentaire. Afin de préparer des mélanges secs destinés à la production de bouillies sans gluten, on a choisi la matière première pour le régime sans gluten, à savoir : maïs, sarrasin, pois chiche et soriz. Les fruits et les légumes secs : pommes, carottes, citrouille, sont utilisés en tant que source de substances biologiquement actives dans les recettes développées. Les bouillies instantanées sans gluten contiennent la dose journalière recommandée des protéines, des glucides, des fibres alimentaires, des lipides et des substances minérales, qui sont essentielles au bon fonctionnement l'organisme humain.

Mots clé : bouillie, gruau, régime sans gluten, capacité d'hydratation.

La détérioration croissante de la situation écologique, les situations stressantes et la nutrition irrationnelle ont entraîné une série de maladies liées aux troubles du métabolisme, à l'apparition de l'allergie se manifestant par l'irritation de la muqueuse intestinale. Tous ces facteurs ont des conséquences désagréables sur le développement des enfants et la réduction de la capacité de travail des adultes. Les dernières années, le nombre de personnes atteintes de la maladie cœliaque a augmenté [1, 2].

Bien que les tendances nutritionnelles des dernières décennies aient été orientées vers la consommation de grains entiers et de céréales raffinées, aujourd'hui on se confronte à une tendance de hausse des troubles liés à la consommation du gluten. Les intolérances alimentaires, qui se manifestent par différentes réactions, sont devenues un grave problème. Dans le monde, environ 1 % des personnes souffrent de la maladie cœliaque [3].

Aucun médicament n'est nécessaire pour cette maladie, il suffit de respecter à vie le régime sans gluten. Le régime alimentaire est nécessaire pour les enfants dès leurs premiers jours de vie.

Actuellement, la fabrication des produits sans certains composants, dont la présence dans l'alimentation est inadmissible, selon les déterminations médicales (allergènes, certains types de protéines, oligo- et polysaccharides, etc.) se développe intensivement. Les produits alimentaires sans gluten constituent un segment important du marché alimentaire [4].

Le gluten représente un composant protéique complexe, insoluble dans l'eau, de certaines céréales, notamment de blé. La plupart des grains contiennent du gluten : le blé (jusqu'à 11%), le seigle (jusqu'à 2,3%), l'orge (jusqu'à 2,3%) et l'avoine (jusqu'à 2,1%) [5].

Les principaux producteurs de produits alimentaires sans gluten sont : Glutanov (Allemagne), Dr. Schor (Italie), Gullon (Espagne), Bezgluten (Pologne), Makmaster (Russie), Finax (Suisse), Tarnets (Russie).

Ainsi, la production des céréales de petit-déjeuner, basés sur les produits extrudés, est une direction en perspective.

À l'heure actuelle, en République de Moldova, aucun acte normatif ne réglemente la quantité du gluten dans les aliments. La fabrication de produits à base de gluten doit répondre aux exigences strictes, conformément aux normes européennes. Dans de nombreux pays, il existe des normes Codex (Gluten - Free Foods – aliments sans gluten), qui réglemente la norme du gluten dans les produits [6].

Selon les exigences de la norme Codex-Stan 118-1979, les aliments sans gluten se réfèrent au groupe des aliments diététiques prophylactiques, destinés à réduire le risque de développement de maladies, auxquels le taux maximal de gluten est 20 mg/kg.

Les personnes qui respectent le régime sans gluten consomment une faible teneur en vitamines (B_1, B_2, PP et acide folique) minéraux (Fe, Ca, etc.) et fibres alimentaires [7, 8].

On a étudié la gamme de bouillies sur le marché local, dans les supermarchés : "Green Hills", "Fidesco", "Fourchette", "Magazin Nr. 1", "Linella". Il y a un large assortiment de bouillies instantanées : "Русский завтрак" (Russie), "Kuncevo Минутка" en assortiment (Russie), "Axa" (Ukraine), etc. Les résultats de l'étude de marketing ont montré que les entreprises de fabrication des produits extrudés manquent quasiment dans la République de Moldova.

Au sein de l'Institut ISPHTA, des recherches scientifiques sont en cours sur le développement de la technologie de fabrication de la bouillie instantanée à partir de matières premières sans gluten.

Les produits élaborés sont destinés à la nutrition curative et prophylactique, en particulier pour les personnes souffrant de la maladie cœliaque.

La matière première sélectionnée est représentée par les cultures céréalières, telles que le maïs, les pois chiches, le sorgho, le sarrasin, etc., qui forment la base de bouillie instantanée. Pour le développement des recettes de bouillie instantanée on a fait l'analyse de la composition chimique des matières premières végétales sans gluten, basée sur des données bibliographiques (tableau 1) [9, 10, 11].

Tableau 1. *Composition chimique de la matière première végétale sans gluten*

Dénomination des cultures céréalières	**Constituants, %**				
	Humidité	**Protéines**	**Lipides**	**Amidon**	**Cellulose**
Sarrasin	14	12,6	3,3	63,7	1,1
Pois chiches	14	20,1	5,0	43,2	3,7
Maïs	14	10,3	4,9	56,9	2,1
Soriz	15	3,7	3,7	64,6	1,5

On a constaté que la teneur maximale en protéines se trouve dans les pois chiches, celle de l'amidon se trouve dans le sarrasin et le soriz. Ces constituants jouent un rôle important dans le processus d'extrusion.

La matière première sans gluten est riche en vitamines et en minéraux (tableau 2) [9, 10, 11].

Tableau 2. *Composition de vitamines et minéraux des matières premières sans gluten*

Dénomination des cultures céréalières	Teneur en vitamines, mg /100 g produit					Teneur en substances minérales, mg /100 g produit			
	PP	A	B_1	B_2	B_6	Ca	Mg	K	Na
Sarrasin	6,3	-	0,4	0,18	0,5	42,0	48,0	130,0	3,0
Pois chiche	3,33	15,0	0,08	-	-	193,0	126,0	968,0	72,0
Maïs	0,95	3,3	0,02	0,05	-	42,0	13,0	-	400,0
Soriz	3,56	0	0,4	0,12	-	31,0	123,0	235,0	34,1

Les cultures céréalières contiennent une quantité signifiante de substances minérales telles que : le Ca - dans le sorgho, Mg - dans le pois chiche et le soriz, K - dans le pois chiche, ce qui permet la fabrication de produits riches en nutriments et donc la possibilité d'utilisation dans le régime sans gluten.

En tenant compte de la valeur nutritionnelle de la matière première, des recettes de mélanges secs pour les bouillies instantanées ont été développées.

Les bouillies instantanées sèches sont des produits composés de divers mélanges de gruau, avec des fruits et des légumes, des baies, du sucre, du sel, etc.

La fabrication de mélanges secs pour des bouillies instantanées a été réalisée dans des conditions industrielles à l'extrudeuse pilote E-150, installée chez "Policom Prim" SARL. La préparation des échantillons a été effectuée dans le laboratoire Technologie des produits alimentaires de l'ISPHTA.

En fonction de la matière première utilisée, on a développé les suivants types de mélanges pour la production de bouillies sans gluten :

- Mélange sec nº 1 - à base de soriz; avec du sel et du sucre.
- Mélange sec nº 2 - à base de soriz et de sarrasin ; avec des morceaux de carotte séchée, du sel et du sucre.
- Mélange sec nº 3 - à base de soriz et de pois chiches ; avec des morceaux de citrouille séchée, du sel et du sucre.
- Mélange sec nº 4 - à base de soriz et de maïs, avec des morceaux de pommes séchées, du sel et du sucre.

Afin d'obtenir des bouillies prêtes à manger, la quantité de liquide (eau ou lait) requise a été déterminée en fonction de la capacité d'hydratation des bouillies en utilisant de l'eau à différentes températures : 20 °C et 60 °C, respectivement.

En utilisant de l'eau à 20 ° C, le temps d'hydratation est de 30 minutes (la capacité d'hydratation a été déterminée par intervalles de temps : 10, 20 et 30 min). En utilisant de l'eau à 60 °C, le temps total d'hydratation était de 5 minutes (la capacité d'hydratation a été déterminée à 2, 3 et 5 minutes).

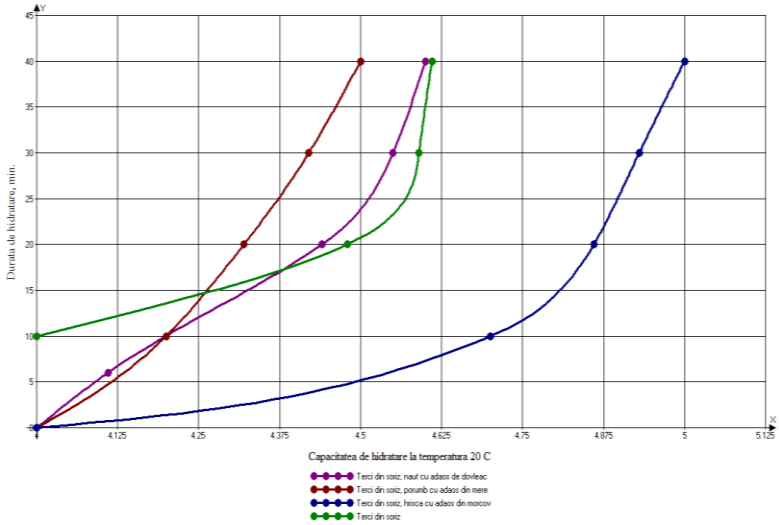

Fig. 1. *La dynamique de la capacité d'hydratation de bouillie dans l'eau à 20 °C en fonction de temps*

La capacité d'hydratation à la t = 20 °C des échantillons de bouillie n^{os} 1, 2, 4 est pratiquement identique pour la période de 10 minutes et constitue de 4,0 à 4,4, mais pendant 40 minutes ceci varie entre 4,52 et 5,0 (pour le bouillie de soriz et sarrasin).

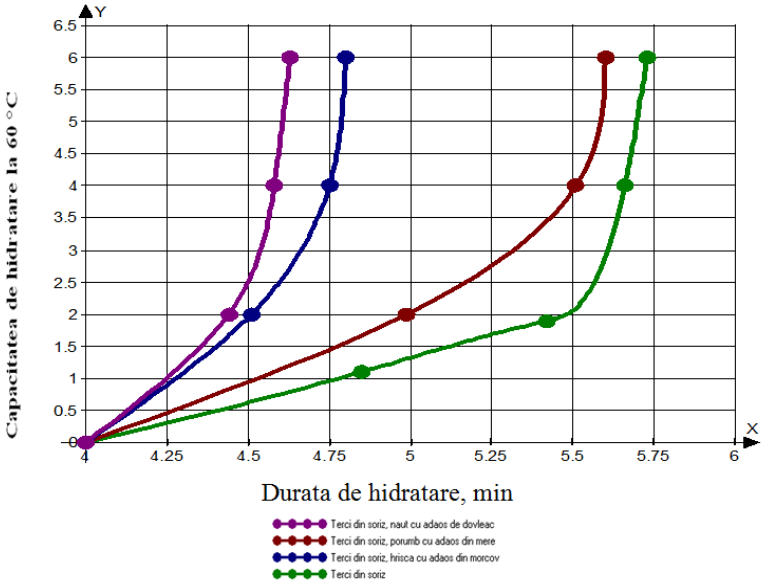

Fig. 2. *La dynamique de la capacité d'hydratation de bouillie dans l'eau à 60 °C en fonction de temps*

A la température de 60 ºC, la capacité d'hydratation augmente de manière identique pour les échantillons n^{os} 3 et 4 et, respectivement, après 2 min, la capacité d'hydratation est de 4,44 - 4,51; après une période de 6 minutes représentant 4,63 - 4,8.

Pour les échantillons de bouillie n^{os} 1 et 2 la capacité d'hydratation est de 4,99-5,42 pour 2 minutes et, respectivement, 5,6-5,73, pour 6 minutes.

Pour tous les échantillons de bouillie à 20 °C pendant 40 minutes, la capacité d'hydratation ne change pas jusqu'à 30 minutes, la même chose étant observée à 60 ° C. Ainsi, la capacité d'hydratation des bouillies à 20 ºC est calculée pour 30 minutes et pour 60 ºC - la période de 5 minutes.

La condition prioritaire pour le développement de nouvelles recettes est la valeur nutritive et la valeur biologique augmentées.

La valeur nutritionnelle et énergétique des mélanges de bouillie sèche est présentée dans le tableau 3. [5, 6]

Tableau 3. *Valeur nutritionnelle et énergétique des mélanges secs destinés à la fabrication des bouillies instantanées sans gluten (pour 100 g de produit)*

N/o	Dénomination de bouillies	Protéines, g	Lipides, g	Glucides, g	Valeur énergétique	
					kJ	kcal
1.	**Mélange sec nº 1**	7,8	0,6	59,3	1147,2	273,8
2.	**Mélange sec nº 2**	8,8	0,7	66,6	1290,1	307,9
3.	**Mélange sec nº 3**	8,2	0,6	74,1	1402,0	334,6
4.	**Mélange sec nº 4**	7,8	0,6	73,9	1391,9	332,2

L'assortiment de mélanges secs de bouillies développées diffère de celui existant dans le réseau commercial.

Conclusions

1. On a choisi la matière première de base pour la production de mélanges secs destinés à la production de bouillies sans gluten, notamment: le maïs, le sarrasin, le pois chiche et le soriz.

2. Des recettes de mélanges secs de bouillies sans gluten ont été développées en tenant compte des indices organoleptiques et physico-chimiques du produit fini.

3. En tant que source de substances biologiquement actives dans la production de mélanges secs de bouillies instantanées sont utilisés les fruits et les légumes séchés.

4. On a déterminé la capacité d'hydratation des mélanges secs dans des liquides ayant des températures différentes.

5. On a développé des recettes de mélanges secs pour des bouillies instantanées contenant la dose journalière recommandée des protéines, des glucides, des fibres alimentaires, des lipides et des substances minérales.

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LE SECHAGE DES POIRES SOUS UNE ATMOSPHERE MODIFIEE DE CO2

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Résumé : Le méthode de séchage sous une atmosphère modifiée par un gaz, c'est une relativement nouvelle méthode, qui permet au producteur de minimaliser l'influence indésirable de l'oxygène sur le produit en diminuant l'effet d'oxydation des polyphénols, aussi qu'à ralentir le développement de microorganismes. Pour les expérimentes on a utilisé trois des méthodes de séchage : classique convective, combinée (convective + champs électromagnétique d'haute fréquence) et séchage sous atmosphère modifiée de CO2.

Le résultat des comparaisons nous a montré que la méthode de séchage en atmosphère modifiée de CO2 est une méthode prometteuse pour le domaine de produit séché.

Mots clés : atmosphère modifiée, oxydation, polyphénols, etc.

Introduction

Le séchage est l'une des méthodes les plus anciennes de conservation des aliments. Les microorganismes qui impose l'altération sont incapables de se développer et se multiplier dans des environnements plus secs faute d'eau libre. Le séchage est un processus de mobilisation de l'eau présente dans la matrice alimentaire interne à sa surface, puis en la retirant de la surface du produit par évaporation. Le séchage implique souvent un transfert simultané de chaleur et de masse. La plupart des opérations de séchage impliquent une modification de l'eau libre, présente dans le produit, à l'état des vapeurs en les enlevant à l'aide de l'air chaud qui passe sur le produit. [1]

La conservation des aliments au moyen du séchage présente certains avantages par rapport aux autres méthodes de conservation, notamment en réduisant les coûts de stockage et de transport, en empêchant la dégradation par les microbes et en renforçant le développement des bonnes textures, arômes et couleurs. [2]

Figure 1. *Poires « Conference »*

Matériels et méthodes

Dans la partie pratique de la recherche le produit à sécher, notamment les poires de genre « Conférence » (***Figure. 1.***), a été soumis au processus de séchage par trois diffèrent méthodes : classique convective, combinée (convective + champs électromagnétique d'haute fréquence) et séchage sous atmosphère modifiée de CO2.

Pour chaque méthode de séchage ont été déterminés différent régimes de travail, en ce qui concerne les propriétés de l'agent de séchage (***Table 1.***).

Table 1. *Méthode et régimes de séchage de pores de genre « Conférence »*

Méthode de séchage	Régimes	
Convective	**Température de l'agent thermique (air)**	60°C
		70°C
		80°C
		90°C
		100°C
	Vitesse de l'agent thermique	1.1 m/s
Combiné	**Température de l'agent thermique**	60°C
		70°C
		80°C
		90°C
		100°C
	Vitesse de l'agent thermique	1.1 m/s
	Puissance du magnétron	438W
Atmosphère modifiée	**Température de l'agent thermique (CO2)**	40°C
		60°C
		80°C
	Vitesse de l'agent thermique	1.1 m/s
	Concentration de CO2	84% 840000 ppm

Pour effectuer le séchage on a utilisé l'installation expérimentale (***Figures 2. et 3.***) conçue pour être capable à permettre d'utiliser plusieurs méthodes et régimes de séchage.

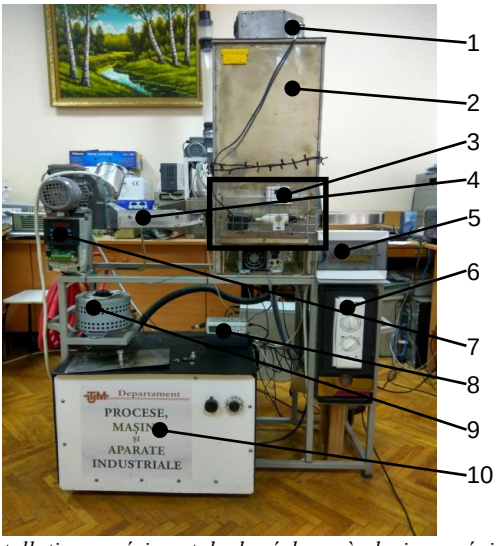

Figure 2. *Installation expérimentale de séchage à plusieurs régimes de travail.*
*1 – magnétron ; 2 – chambre de séchage ; 3 – complexe de gestion du CO2 (**Figure 3.**) ;*
4 – calorifère ; 5 – complexe des interrupteur ; 6 – dispositif de contrôle du magnétron ;
7 – dispositif de contrôle du ventilateur ; 8 – dispositif de contrôle de la balance ; 9 – dispositif de contrôle de la température ; 10 – condensateur.

Figure 3. *Complexe de gestion du CO2.*
1 – capteur de CO2 ; 2 – dispositif de refroidissement du CO2 ; 3 – pompe à CO2.

En préparant les enchantions pour le séchage, les poires ont été lavés, coupées en rondelles à une épaisseur de δ = 3 mm et installés, par m = 100 g, sur le plateau dans l'intérieur de la chambre de séchage 2. En fermant la porte, on a connecté le calorifère 4 (et/ou le magnétron 1), en calibrant la vitesse de l'agent thermique et la puissance du magnétron à l'aide de dispositifs de contrôle 3, 6, 7 et 9. A l'aide d'un câble USB, les données de changement de la masse du produit et les diagrammes de séchage sont transmis sur l'ordinateur. Après que le processus de séchage avait fini, le produit séché a été emballé en vide.

Résultats et discussions

En effectuant le séchage on a obtenu les diagrammes de séchage et de la vitesse de séchage, pour chaque méthode et régimes utilisé pour la partie expérimentale (***Figures 4, 5, 6, 7, 8 et 9.***).

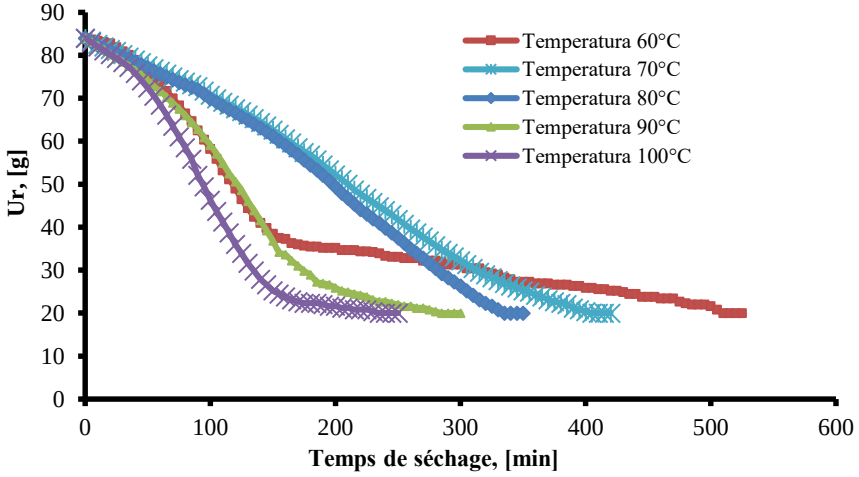

Figure 4. *Dynamique de la diminution de l'humidité par la méthode convective, Ur=f(τ)*
Température de l'agent thermique (air) : 60, 70, 80, 90 et 100°C
Vitesse de l'agent thermique (air) : 1.1 m/s

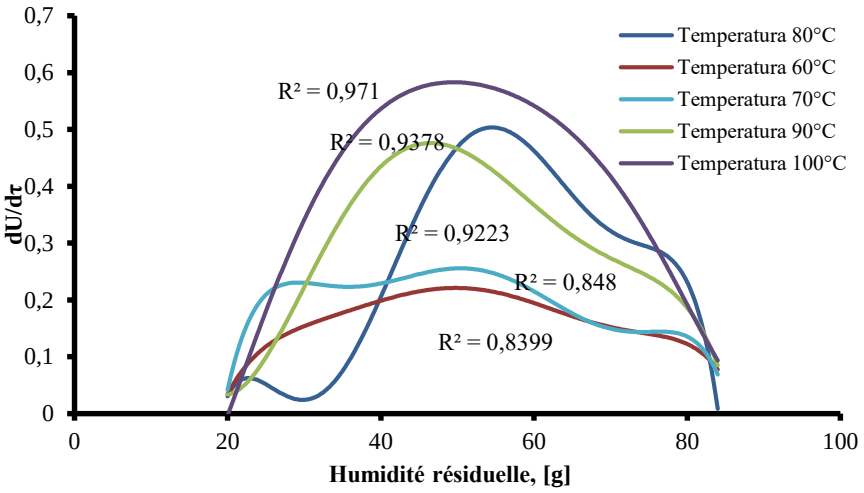

Figure 5. *Dynamique de la vitesse de séchage par convection, dU/dτ=f(Ur)*
Température de l'agent thermique (air) : 60, 70, 80, 90 et 100°C
Vitesse de l'agent thermique (air) : 1.1 m/s

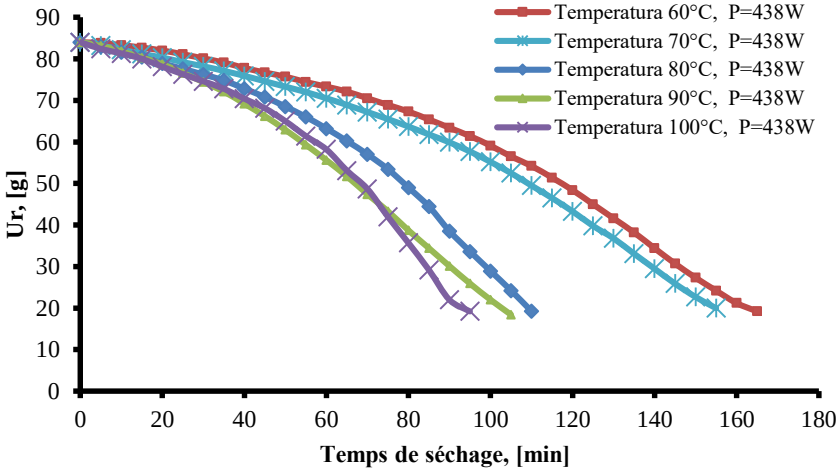

Figure 6. *Dynamique de la diminution de l'humidité par la méthode convection + SHF, Ur=f(τ)*
Température de l'agent thermique (air) : 60, 70, 80, 90 et 100°C
Vitesse de l'agent thermique (air) : 1.1 m/s
Puissance du magnétron : 438W

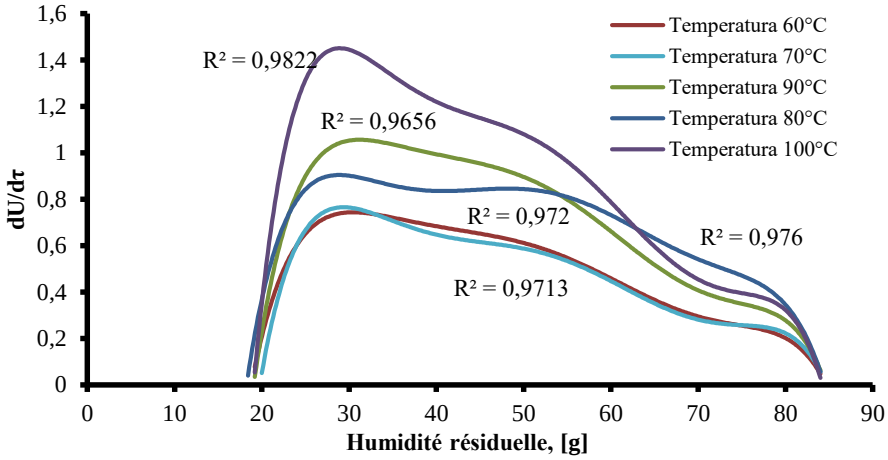

Figure 7. *Dynamique de la vitesse de séchage par convection + SHF, dU/dτ=f(Ur)*
Température de l'agent thermique (air) : 60, 70, 80, 90 et 100°C
Vitesse de l'agent thermique (air) : 1.1 m/s
Puissance du magnétron : 438W

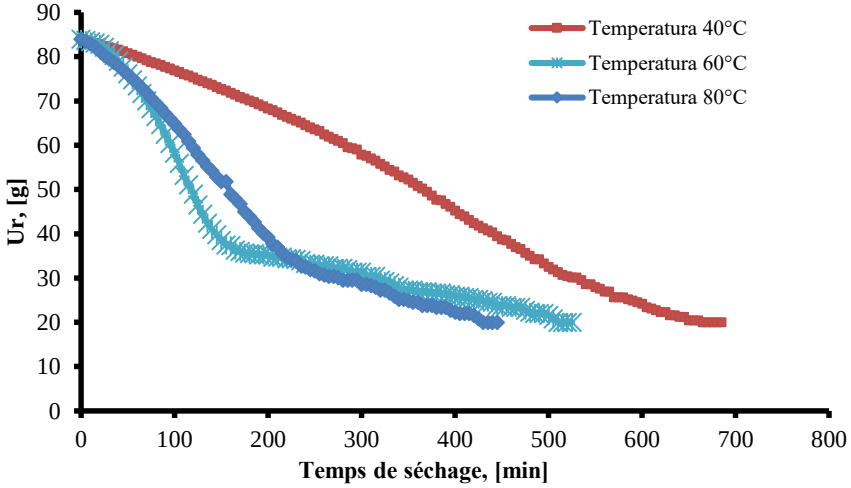

Figure 8. *Dynamique de la diminution de l'humidité par la méthode de l'atmosphère modifiée par CO2, Ur=f(τ)*
Température de l'agent thermique (CO2) : 40, 60 et 80°C
Vitesse de l'agent thermique (CO2) : 1.1 m/s

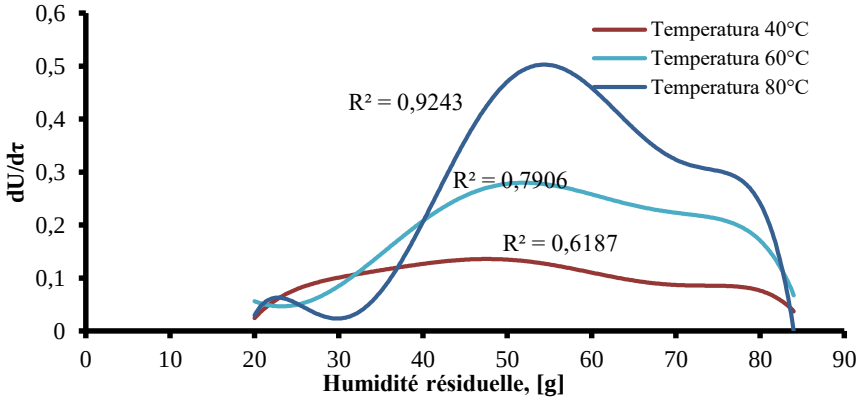

Figure 9. *Dynamique de la vitesse de séchage par l'atmosphère modifiée par CO2, dU/dτ=f(Ur) Température de l'agent thermique (CO2) : 40, 60 et 80°C ; Vitesse de l'agent thermique (CO2) : 1.1 m/s*

a ***b***

Figure 10. *L'aspect extérieur des pores séchées par la méthode classique convective (a) et la méthode de l'atmosphère modifiée par CO2 (b)*

Conclusion

Les digrammes obtenus ont démontré que les méthodes hybrides telles comme la méthode combinée sont plus situables pour un séchage rapide (à 60°C le temps de séchage 175 min contre 530 min pour la méthode convective et 680 min pour la méthode à atmosphère modifiée de CO2) mais elles ne sont pas convenantes du point de vue de la qualité, car l'action de microonde sur le produit végétal n'est pas bien propagée sur l'entière surface, en formant des taches noires où la température était plus haute. En ce qui concerne l'aspect extérieur, les poires séchés par la méthode de l'atmosphère modifiée par CO2 sont les plus attractives (***Figure 10***).

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L'ÉTUDE DE LA DYNAMIQUE DES INDICATEURS DE QUALITÉ PENDANT LE PROCESSUS DE SÉCHAGE DES CERISES AIGRES SANS NOYAUX (PRUNUS CERASUS L.) AUX DIFFÉRENTS RÉGIME DE TEMPÉRATURE ET PENDANT LE STOCKAGE

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Sommaire : Pendant le processus de séchage des cerises aigres à différentes températures (°C: 45; 60; 75; 85), on a suivi la formation et la modification de l'hydroxyméthylfurfurol (HMF). On a déterminé la valeur de l'HMF, l'indice de brunissement et la teneur en anthocyanes dans les cerises aigres immédiatement après le séchage et après 3 à 4 mois de stockage à la température ambiante. On a déterminé l'influence du facteur « température-temp » sur les indices de qualité des cerises aigress séchées à différents régimes de température.
Mots clés : cerises aigres séchées, température de séchage, hydroxyméthylfurfurol, indice de brunissement, anthocyanes.

Les cerises aigres sont riches en nutriments et phytonutriments, en particulier en composés phénoliques et antioxydants, qui déterminent la couleur et la valeur biologique de ces fruits [1-2].

Le séchage des fruits, même si conduit à assurer leur conservation à long terme, a une influence négative sur la dégradation des phytonutriments. Le séchage à long terme et à haute température entraîne la formation d'hydroxyméthylfurfurol (HMF) et d'autres composés de dégradation: la destruction des anthocyanes, la formation de composés copolymériques, la modification de l'indice de brunissement [3-4].

La formation de 5-hydroxyméthylfurfural (HMF) est largement utilisée comme un indicateur pour surveiller le stade de formation des produits intermédiaires dans la réaction de Maillard (réaction de brunissement non enzymatique). L'HMF est également considéré comme un indicateur de la qualité des produits riches en carbohydrates, qui ont été soumis à la chaleur ou qui ont été stockés pendant une certaine période de temps, y compris les cerises aigres [5, 6].

La réduction de la formation de l'HMF est possible en connaissant et contrôlant les facteurs de dégradation accompagnant le processus de séchage et de stockage: l'action de l'oxygène de l'air, l'activité de l'eau, l'action des différents régimes thermiques.

Ces données ont été utilisées pour cette étude, qui a été réalisée pour étudier la formation de l'HMF, de l'indice de brunissement, ainsi que le contenue des anthocyanes pendant le séchage des cerises aigres et pendant leur stockage ultérieur.

Matériaux et méthodes

La préparation des preuves pour la détermination de l'hydroxyméthylfurfurol (HMF) pendant le séchage.

Les cerises aigres fraîches de variété Oblacinscaia ont été obtenues du Département Expérimentale Horticole de l'Institut de l'Horticulture et des Technologies

Alimentaires. Les fruits ont été triés, calibrés, lavés et on a enlevé les pédoncules et les noyaux.

Les fruits sans noyaux ont été placés en une seule couche sur le plateau de séchage et déshydratées jusqu'à une humidité de 10 à 15 % à 4 températures constantes: °C: 45, 60, 75 et 85 et à la vitesse constante de l'air de 3,5 m/s. Pendant la déshydratation, à partir de la quantité totale de fruits placés sur le plateau, ont été prélevés des preuves, correspondant aux différents taux d'humidité (poids sec). Les preuves ainsi obtenues ont été emballées sous vide (dans un appareil d'emballage sous vide C15HL, WERBOMATIC, Allemagne) dans des sacs de matériau polymèrique.

Les cerises aigres séchées et emballées ont été congelées et conservées à - 18 °C jusqu'à la réalisation des analyses.

La préparation des preuves pour la détermination de l'hydroxyméthylfurfurol (HMF) pendant le stockage.

Les cerises aigres frais de variété Şpanca, achetées au marché de Chişinău ont été lavées, libérées des noyaux et séchées sous l'action de 4 régimes de température constantes: °C:45, 60, 75 et 85 et sous l'action de vitesse de l'air constante de v=3,5 m/s. Les fruits séchés et refroidis ont été emballés dans des sacs de matériau polymèrique, qui ont été thermosoudés, emballés dans une boîte de carton et conservés à la température ambiante pendant 3-4 mois.

Les indices suivants ont été sélectionnés pour évaluer la qualité des cerises aigres séchées et stockées:

1) L'Humidité, déterminée selon SM 273: 2012;

2) L'HMF. La méthode est basée sur la mesure de l'intensité de la couleur de l'oximéthylfurfurol dans l'extrait aqueux d'une preuve du produit avec de la n-toluidine et de l'acide barbiturique. La masse de l'HMF dans la solution d'essai est déterminée à partir du graphique d'étalonnage;

3) L'indice de brunissement (IB), est exprimé par la densité optique (λ = 420 nm) des extraits de fruits séchés, obtenus avec acide acétique de 20%;

4) La concentration des anthocyanes, qui a été determinée par la méthode de pH différentiel à l'aide du Spectroscope UV-Visible (pH = 1 et pH = 4,5)

Résultats et discussions

Dans la figure 1 est représenté le graphique de l'évolution de la teneur en HMF à différentes températures de séchage des cerises aigres. Comme on peut le voir, la quantité de l'HMF diminue (de 49 à 12 mg/kgSS) aux valeurs d'humidité de 72 à 35% à 45 °C; à la température de 75 °C l'HMF augmente légèrement jusqu'à la diminution d'humidité de 73% à 63% et est ensuite la quantité est stabile, de 22-25 mg/kgSS.

L'accumulation de l'HMF la plus forte se produit à 85 °C. Après que la teneur en humidité du produit atteint 42%, la teneur en HMF augmente avec une vitesse élevée, avec une valeur maximale d'environ 80 mg/kgSS à l'humidité approximative de 25%. En continuation du séchage, la quantité de l'HMF diminue. Probablement, la teneur en HMF diminue dans cette période car le processus de la dégradation de l'HMF prédomine sur le processus de formation de celui-ci, car le HMF est un composant intermédiaire du brunissement non enzymatique et participe à la formation des pigments bruns [5].

Dans ces limites d'humidité, les valeurs de l'indice de brunissement augmentent également [4].

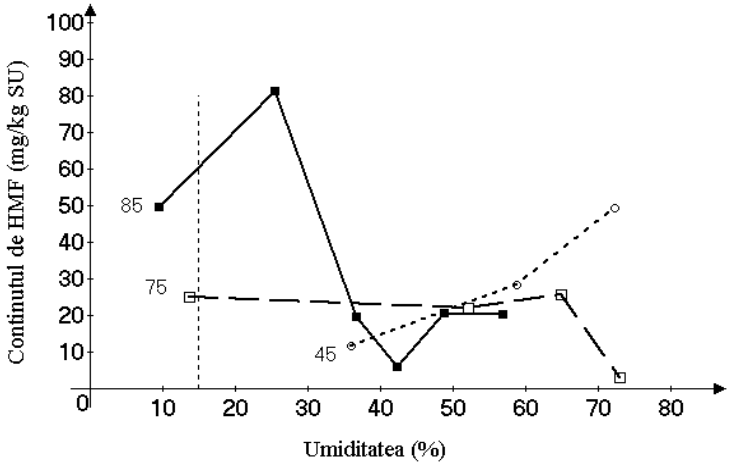

Fig. 1. *La dépendance de la teneur en HMF sur la teneur en humidité des cerises aigres séchées à différents régimes de température*

On sait que dans des conditions de séchage défavorables (facteur augmenté «température-temps»), la réaction de Maillard acquiert une certaine signification, et la température de séchage commence à jouer un rôle décisif dans le brunissement du produit [5, 7, 8]. Ainsi, après le séchage des cerises au régime de température de 85 °C, les cerises aigres séchées peuvent être soumises à un brunissement plus intense pendant le stockage.

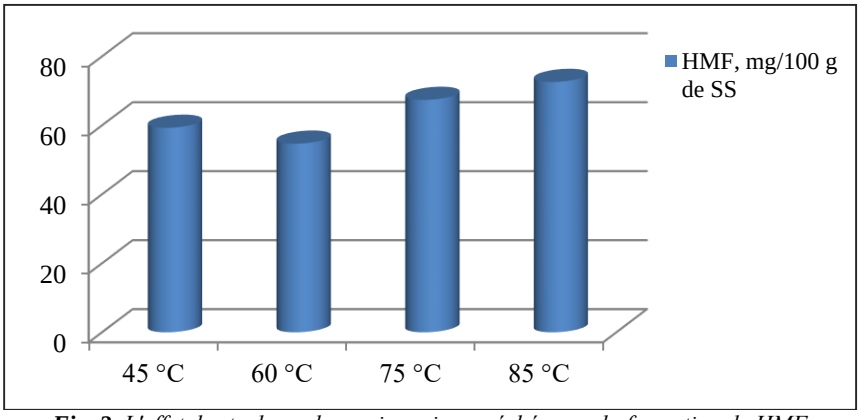

Fig. 2. *L'effet de stockage des cerises aigres séchées sur la formation de HMF*

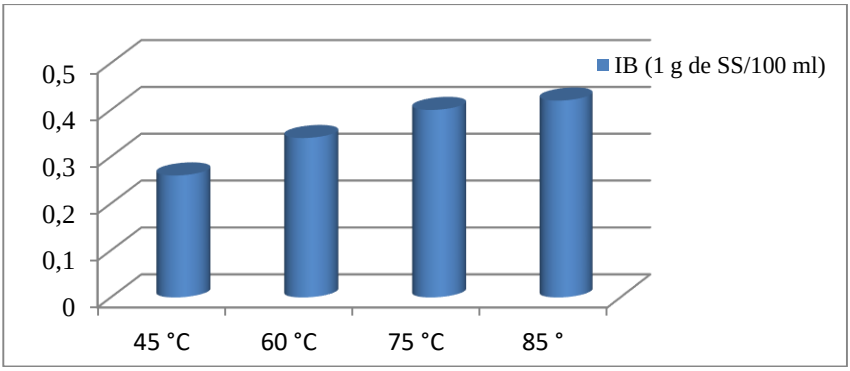

Fig. 3. *L'effet de stockage des cerises aigres séchées sur la formation de l'indice de brunissement*

Dans tous les preuves de fruits séchés, la teneur en HMF a augmenté pendant le stockage. Il était prévu que les valeurs des indices reflétant le brunissement du produit (HMF et IB) augmentent correspondant à l'augmentation de la température de séchage. Ceci est expliqué par le fait que dans les cerises aigres séchées à des températures plus élevées, la teneur en HMF immédiatement après le séchage a été supérieure que la teneur dans les fruits séchés à des températures plus basses (59,3 mg/100 g de SS à 45 °C, contrairement de 72,6 mg/100 g de SS à 80 °C). Ainsi, la formation de HMF influence les valeurs de l'indice de brunissement, car l'hydroxyméthylfurfurol se transforme en pigment brun au cours du stockage [8, 9]. De cette façon, l'HMF peut être utilisé comme indicateur pour évaluer le changement de la couleur et du brunissement non enzymatique pendant la conservation des cerises aigres.

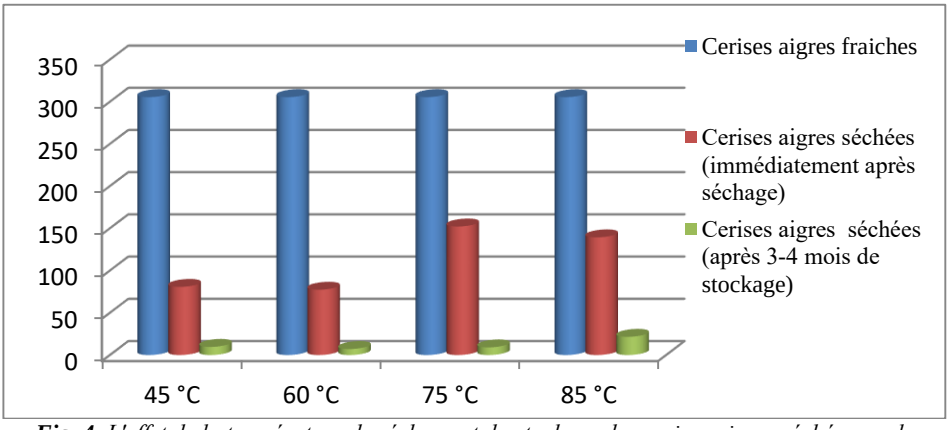

Fig. 4. *L'effet de la température de séchage et du stockage des cerises aigres séchées sur la teneur en anthocyanes, m /100 g de SS*

Comme on peut le voir sur la figure ci-dessus, mais aussi dans les travaux antérieurs [4], la quantité finale d'anthocyanes est plus faible aux températures basses de séchage (45, 60 °C - 80,64 et 77,28 mg/100 g de SS) qu'aux hautes températures (75, 85 °C - 152,11 et 139,28 mg/100 g de SS). La quantité finale de ces substances est déterminée

par le facteur «temparature-temps», c'est-à-dire que le temps de séchage plus long à basse température conduit à une destruction plus progressive des anthocyanes.

Le contenu des anthocyanes est tombé brusquement au stockage des cerises aigres, et toutes les expériences ont montré un niveau de moins de 10% par rapport à leur contenu dans les cerises aigres fraîches. Les expériences d'autres auteurs sur le contenu des anthocyanes dans différents produits après 50-60 jours de stockage à 30 °C montrent également une réduction de la teneur de ces substances à environ 10% par rapport à leur contenu dans la matière première [10]. Cependant, le contenu le plus élevé des anthocyanes dans les cerises aigres séchées a été conservé dans les fruits séchés à 85 °C, ce qui est dû au fait que la charge thermique (le facteur «temparature-temps») supportée pendant le séchage à ce régime était la plus faible comparée aux régimes de température plus basses, dont le temps de séchage était plus longue.

Les résultats obtenus montrent la nécessité d'optimiser le régime de séchage et de stockage des cerises aigres.

Conclusions

Les températures et la durée de séchage des cerises aigres entraînent l'accumulation d'hydroxyméthylfurfurol dans le produit final, la quantité étant plus élevée dans les fruits séchés à des températures plus élevées (12 mg/kg de SS dans les cerises aigres séchées à la température de 45 °C, au contraire de 49 mg / kg de SS dans les cerises aigres séchées à 85 °C).

Dans les cerises aigres séchées à 45 °C, la quantité d'hydroxyméthylfurfurol diminue de 49 mg/kg de SS à 12 mg/kg de SS. Dans les cerises aigres séchées à 85 °C, la quantité de HMF augmente au début du séchage jusqu'à 80 mg/kg de SS à 25% d'humidité, puis, pendant le processus de séchage, la valeur diminue jusqu'à 50 mg/kg de SS. Cela se produit parce que l'HMF formé jusqu'à ce stade participe en qualité de produit intermédiaire de la réaction de brunissement non-enzymatique (réaction de Maillard) et à l'accumulation de pigments bruns.

Pendant le stockage, dans tous les preuves de cerises aigres, la quantité d'hydroxyméthylfurfurol (HMF) et la valeur de l'indice de brunissement (IB) augmentent proportionnellement à l'augmentation de la température de séchage, car la teneur en HMF immédiatement après le séchage est plus élevée que dans les fruits séchés aux températures plus basses (59,3 mg/100 g de SS à 45 °C au contraire de 72,6 mg100 g de SS à 80 °C).

La valeur de l'indice de brunissement augmente proportionnellement avec la formation d'hydroxyméthylfurfurol, car le HMF se transforme en pigment brun au cours du stockage.

La teneur en anthocyanes a fortement diminué au cours du stockage, tous les preuves conservant moins de 10% de la valeur des anthocyanes des cerises fraîches.

Les resultats obtenus peuvent être utilisés pour améliorer le processus de séchage des cerises aigres, afin de réduire la température de séchage, de réduire le temps de ce processus et d'améliorer les conditions de stockage des cerises aigres séchées.

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L'ÉTUDE DE L'INFLUENCE DE L'ACTION DE RAYONNEMENT INFRAROUGE SUR LA DURÉE DE SÉCHAGE DES CERISES (PRUNUS AVIUM L.) ET DES CERISES AIGRES (PRUNUS CERASUS L.) SANS NOYAUX DÉSHYDRATÉES PAR OSMOSE

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Sommaire : Dans la présente étude, on a suivi l'influence de l'utilisation des rayons infrarouges sur la durée et sur les paramètres de séchage des cerises et des cerises aigres (température de l'air et température du produit) partiellement déshydratés par osmose dans la solution de sucre.

Mots clés : Cerises et cerises aigres séchées, déshydratation osmotique, rayons infrarouges

Introduction

Les cerises et les cerises aigres représentent un groupe de produits importants en République de Moldova, occupant la deuxième place après les prunes en ce qui concerne la production et l'exportation [1]. En raison du fait que les cerises et les cerises aigres sont saisonnières (environ 5-7 semaines, vers mai - juin) [2], il est nécessaire d'exploiter cette période pour avoir des produits fabriqués à partir de ces fruits tout au long de l'année.

L'une des méthodes les plus simples de conservation des cerises et des cerises aigres est le séchage par convection, mais l'exposition du fruit à l'agent de chaleur conduit à la destruction des phytonutriments, en particulier des anthocyanes [3]. Un autre résultat est que les produits finis, les cerises et les cerises aigres séchées, ont certaines caractéristiques organoleptiques qui limitent leur utilisation dans la confiserie ou en qualité de snacks.

La réduction du temps de séchage et de la charge thermique sur les cerises et sur les cerises aigres peut être accompli par déshydratation osmotique. Cette étape consiste à placer les fruits dans une solution sucrée concentrée, où les processus suivants ont lieu: une partie de l'eau des fruits est transférée dans la solution où ils sont immergés, tandis que le sucre de la solution est transféré dans le produit [4]. Ainsi, la teneur en eau, qui doit être évaporée pendant le séchage, diminue, diminuant ainsi la consommation d'énergie pour le séchage [5].

Une autre méthode de réduction du temps de séchage est l'utilisation des rayons infrarouges, qui offrent des avantages significatifs par rapport au séchage conventionnelle: temps de chauffage réduit, chauffage uniforme du produit, pertes basses de qualité, équipements simples et compacts et économie d'énergie significative [6]. Selon autres sources, l'action des rayons infrarouges, quelle que soit la température appliquée, détruit l'enzyme polyphénoloxydase (PPO), responsable du brunissement des fruits [7]. Ainsi, on obtient un produit final avec une couleur plus claire, plus proche de celle naturelle des fruits frais.

Le but de ce travail était de sécher les cerises et les cerises aigres déshydratées par osmose à l'action de 2 régimes (séchage par convection et séchage combiné – par convection + action des rayons infrarouges) et de suivre l'utilisation des rayons infrarouges sur le temps et les paramètres de séchage (la température de l'air, la température intérieure du produit, la charge thermique).

Matériaux et méthodes

La preparation des cerises et des cerises aigres

Les cerises aigres de varieté Oblacinscaia et les cerises de varieté Tehlovan ont été lavées et libérées des noyaux. Les fruits ainsi préparés sont recouvert d'une solution avec la temperature de 55 °C, le rapport des fruits et de la solution étant de 60:40. Pour obtenir la solution de coulée, on a preparé un sirop de sucre à 55%, de sorbate de potassium à 0,11%, de métabisulfite de sodium à 0,11% (correspond à 0,073% de SO_2) et d'acide citrique à 0,1%. Le pH du mélange obtenu (fruits, sirop) était de 3,0. Les fruits ont été gardés en sirop jusqu'à l'équilibre des concentrations de substances solubless dans le sirop et dans les fruits. La concentration finale de substances sèches solubles est de 37,4 - 37,6% pour les cerises aigres et de 33,4 - 33,8% pour les cerises.

Le séchage des cerises et des cerises aigres

Les fruits ont été séparés du sirop, puis placés sur un plateau d'acier inoxydable avec la surface de 0,04 m^2 (équivalent à 9,25 kg/m^2) en une seule couche et placés dans la chambre de séchage de l'installation de laboratoire à circuit fermée, où ils ont été séchés avec air chauffé à une vitesse de 3 m/s et à une température d'entrée constante de 65 °C. Dans le processus de séchage, on a determiné la température de l'air à l'entrée et à la sortie de chambre de séchage à l'aide de deux paires de thermocouples, et la température à l'intérieur du produit à l'aide d'un thermocouple inséré au milieu du celui-ci. La température a été enregistrée avec un intervalle de 15 à 30 minutes.

Le séchage avec l'action des rayons infrarouges a été réalisé dans la même installation de laboratoire, équipée d'une source de lumière infrarouge, fabriquée à partir d'un matériau nanocomposite de graphite expansé thermique d'une puissance de 176 *Wt* (équivalent à une charge thermique de 4,4 $kWt * h/m^2$), située à une distance de 9 *cm* du produit. Ont été enregistrés les mêmes paramètres comme dans l'exemple ci-dessus.

Pour les deux exemples ci-dessus, a été enregistrée la masse du produit pendant le séchage avec un intervalle de 15 à 30 minutes.

La détermination de la teneur en matière sèche a été effectuée: pour le sirop – au réfractomètre et pour les fruits séchés - par la méthode thermogravimétrique.

Traitement des données expérimentales

Pour construire les graphiques et les analyser a été utilisé le programme Advanced Grapher version 2.11. Ce programme a également été utilisé pour intégrer les graphiques des températures.

Les données expérimentales des études des dépendances cinétiques du processus de séchage ont été représentées sur graphiques dans les coordonnées suivantes: Humidité, *kg/kg SS* - Temps, *minutes* (Figures 1 et 4).

La détermination de l'action thermique a été effectuée par la méthode de calcul. En qualité de charge thermique a été prise l'intégrale $\int_a^b f(x)$ dx, où *a* et *b* représentent

l'intervalle de temps pendant lequel a eu lieu le processus de séchage; *f (x)* est la dépendance de la température du produit au temps de séchage; *x* – le temps de séchage. Cette intégrale est représentée par la surface de la figure, qui est limitée par l'axe des abscisses, les droites $x = a = 0$ et $x = b = \tau_{finale}$ et le graphe de la fonction $t_{produit}=f(\tau)$. La surface de la figure est déterminée graphiquement (figures 2, 3, 5 et 6). La température pondérée du produit dans le processus de séchage est calculée selon la formule:

$$S / \tau = t\ (°C) \quad (1)$$

Où:

S – est la surface de la figure, *°C*min*

τ – temps de séchage, *min*

t – température pondérée du produit, *° C*

Résultats et discussions

Le séchage de cerises aigres sans noyaux déshydratées par osmose

Comme on peut le voir sur le graphique représenté sur la figure 1, la quantité d'humidité des cerises aigres diminue pendant le séchage. Au début du séchage, est éliminée une plus grande quantité d'humidité, puis la taux d'élimination diminue. Ceci s'explique par le fait que l'évaporation initiale a lieu à la surface du produit, puis ce phénomène est remplacé par la libération d'humidité à l'intérieur du produit, ce qui est un phénomène plus compliqué et prends plus de temps. Ces résultats sont en accord avec les résultats précédents des autres études [8].

On peut également voir sur ce graphique que l'effet IR affecte le temps de séchage des cerises aigres, qui a diminué avec 37,9%, de 620 minutes au régime par convection, à 385 minutes au régime par convection + IR.

Ce phénomène peut s'expliquer par le fait que dans le cas d'utilisation de rayons infrarouges, l'énergie appliquée aux fruits est plus élevée, ce qui provoque leur réchauffement plus rapide et une libération plus rapide de l'eau. Comme le montrent les graphiques suivants (2 et 3), la température à l'intérieur du produit augmente également, ce qui entraîne la libération de l'humidité de la surface et de l'intérieur des fruits dès le début du séchage [9], de cette façon le temps de séchage est réduit.

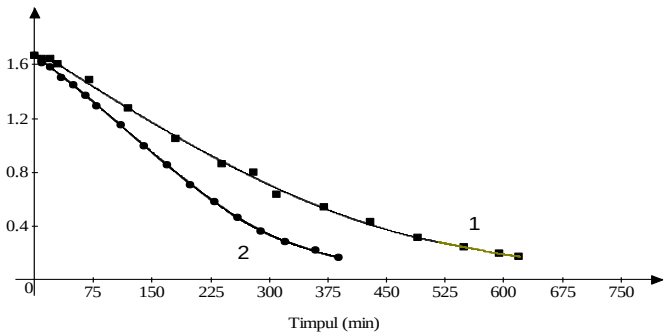

***Fig. 1**. Les courbes de séchage des preuves des cerises aigres sans noyaux et déshydratées par osmose aux 2 régimes: 1) t = 65 °C par convection, 2) t = 65 °C par convection + IR*

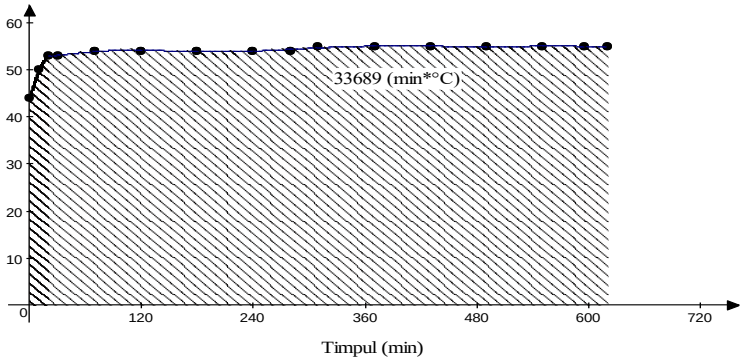

Fig. 2. *La courbe de température et la charge thermique des cerises aigres sans noyaux et déshydratées par osmose, séchées à 65 °C par convection.*

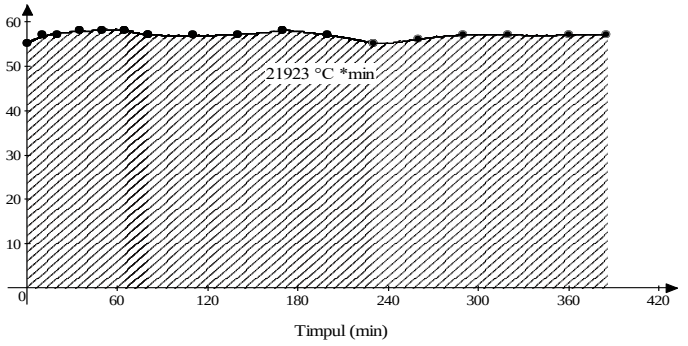

Fig. 3. *La courbe de température et la charge thermique des cerises aigres sans noyaux déshydratées par osmose, séchées à 65 °C par convection + IR.*

Comme on peut le voir sur les graphiques ci-dessus (figures 3 et 4), il résulte que l'action infrarouge a une influence sur la valeur de l'action thermique sur les cerises aigres, en la réduisant de 1,54 fois: de 33680 *°C*min* dans le cas du séchage par convection à 21923 *°C min* pour le régime par convection + IR.

Lors de l'utilisation des rayons infrarouges, la température de l'air (température moyenne à l'entrée et à la sortie de la chambre de travail) était supérieure à 2,4 °C à la température de l'air lors du séchage des cerises aigres, et la valeur de la température pondérée a augmenté à 2,6 °C (de 54,3 ° C à 56,9 ° C).

Le séchage de cerises sans noyaux déshydratées par osmose

Et le séchage de cet échantillon a entraîné une diminution du temps de séchage des fruits pendant l'utilisation des rayons infrarouges, à 22,25% (figure 4), de 373 minutes à 290 minutes.

À partir des graphiques représentés sur les figures 5 et 6, on peut voir que la charge thermique du produit a été réduite à 1,19 fois lorsque les rayons infrarouges ont été utilisés, la valeur diminuant de 18442 *°C*min* dans le cas du séchage au régime par convection, jusqu'à 15435 *°C*min* pour le régime par convection + IR.

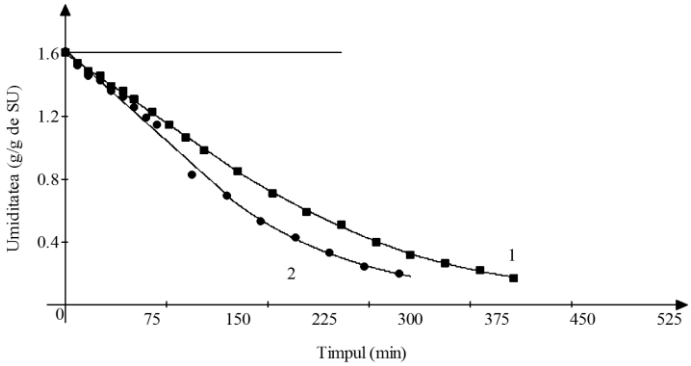

***Fig. 4**. Les courbes de séchage des preuves des cerises sans noyaux et déshydratées par osmose aux 2 régimes: 1) t = 65 °C par convection, 2) t = 65 °C par convection + IR*

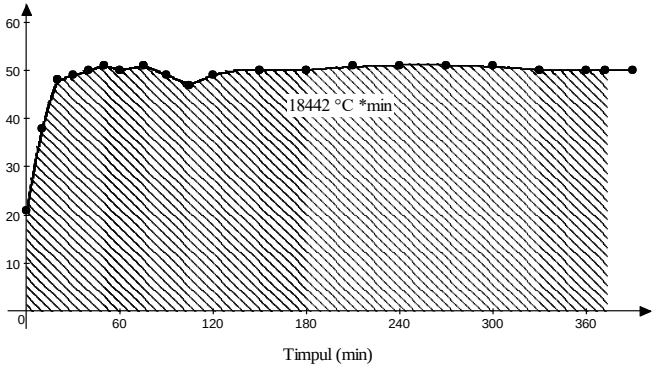

***Fig. 5.** La courbe de température et la charge thermique des cerises sans noyaux et déshydratées par osmose, séchées à 65 °C par convection.*

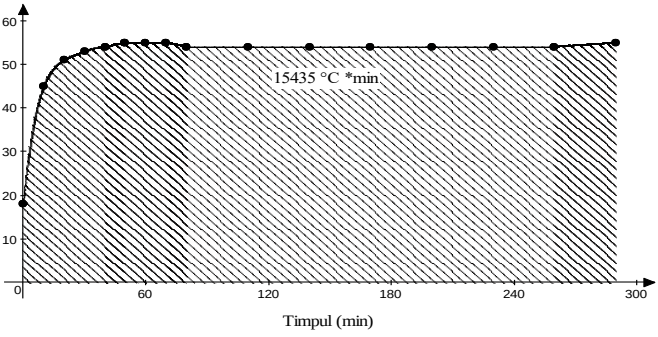

***Fig. 6.** La courbe de température et la charge thermique des cerises sans noyaux et déshydratées par osmose, séchées à 65 °C par convection + IR.*

Lors de l'utilisation de rayons infrarouges, la température de l'air dépassait à 1,1 °C la température de l'air du régime par convection, et la température moyenne pondérée du produit était plus grande à 3,8 °C (a augmenté de 49,4 °C à 53,2 °C).

Ainsi, et pour cet exemple, les tendances suivantes sont respectées: la température de l'air et la température pondérée des fruits augmentent, mais, en même temps, la charge thermique sur le fruit diminue et la durée du temps de séchage est réduite pendant le régime de séchage par convection + IR.

Conclusions

Pendant la déshydratation osmotique, la concentration de substances sèches dans les fruits atteint 37,4-37,8% pour cerises aigres et 33,4-33,8% pour cerises, ainsi que les fruits peuvent être soumis à un séchage supplémentaire.

Les recherches sur le séchage des cerises aigres à deux régimes (65 °C par convection et 65 °C par convection et IR) a montré une réduction à 37,9% du temps de séchage, et la charge thermique a diminué à 1,54 fois en utilisant les rayons infrarouges.

L'action des rayons infrarouges a contribué à la réduction du temps de séchage des cerises à 22,25%, et de la charge thermique à 1,19 fois.

On peut attendre que la réduction du temps de séchage à l'aide des rayons infrarouges influence positivement la qualité des cerises aigres et des cerises, par exemple: la conservation des anthocyanes, la formation moins intense d'hydroxyméthylfurfurol, la diminution de l'indice de brunissement, etc.

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PRODUCTION DE MOUTS DE RAISINS SULFITES POUR LES VINS MOUSSEUX À L'APPELLATION D'ORIGINE « CRICOVA »

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Résumé : Les travaux sont consacrés au développement et à la mise en œuvre de régimes technologiques pour la production, le stockage et l'utilisation de moûts de raisins sulfatés à des concentrations modérées en dioxyde de soufre pour la production de vins mousseux. En tant que critère assurant la stabilité, une concentration de dioxyde de soufre moléculaire ayant un effet bactériostatique vis-à-vis de la plupart des levures a été adoptée.

Mots clés : moût de raisin sulfité, acidification, électrodialyse, cationisation

Introduction

Au début des années 2000 il y avait une question de nouveaux types de produits à base de moût de raisin (vins mousseux naturels, vins tranquilles avec sucre résiduel et d'autres) [1]. Dans les compagnies vinicoles, le moût de raisin concentré importé est utilisé. Mais cela non seulement augmente considérablement le coût des vins, mais conduit également à leur dépersonnalisation des vins. En même temps, les méthodes recommandées préforment de moûts de raisins dans les entreprises (sulfitage avec des doses plus élevées d'anhydride sulfureux, avec l'ajout de l'acide sorbique, et conservé à basse température) ne sont pas justifiées non seulement à cause du coût élevé, mais aussi en raison de la formulation limitée. Dans la saison la production de moûts de raisins sulfité est une méthode commune de créer une réserve technologique de sucre de raisin naturel utilisé dans la production de différents vins [2]. Ceci est un mout, tout en préservant le potentiel technologique du raisin, à un coût proche du coût du vin sec, ce qui crée des conditions pour améliorer la qualité des produits viti-vinicoles.

Dans le même temps, la technologie habituelle de production de moût sulfité nécessite l'utilisation de fortes doses de dioxyde de soufre (600-1200 mg / dm3), ce qui nécessite des réservoirs de stockage spéciaux et limite son champ d'application.

Les informations ci-dessus ont servi de base au développement et à l'introduction de régimes technologiques pour la production, le stockage et l'utilisation des moûts de raisins sulfatés à des concentrations modérées en dioxyde de soufre, destines pour la production des vins mousseux a l'appellation d'origine « Cricova » [3].

Résultats expérimentaux

La concentration de dioxyde de soufre moléculaire dans un moût ayant un effet bactériostatique par rapport à la plupart des levures a été acceptée comme critère pour lequel la stabilité est assurée [4].

Dans la pratique, cela signifie que presque tous les cave, sous réserve des normes d'hygiène habituelles, peuvent produire pour le stockage à long terme et l'utilisation dans la fabrication de vins de moût de raisin sulfité modérément, sous réserve d'une

augmentation artificielle de l'acidité. Lorsque le pH recommandé est de 2,7- 2,8, dans le moût la concentration totale de dioxyde de soufre est suffisante pour assurer sa stabilité microbiologique, située dans la plage de 200 à 250 mg / dm^3. Même avec des valeurs relativement élevées de la capacité de liaison du moût de dioxyde de soufre (55 -65%), il permet de maintenir la concentration de dioxyde de soufre moléculaire dans celle-ci dans la plage de 5 à 10 mg /dm^3 (tableau 1).

Tableau 1. *La teneur en dioxyde de soufre moléculaire* en moût (en% de dioxyde de soufre libre) en fonction de la température, du pH et de la teneur en alcool*

pH	**2,4**	**2,6**	**2,8**	**3,0**	**3,2**	**3,4**	**3,6**
t, ^{0}C	**10 ^{0}C**						
$[SO_2]_{молб}$ %	7.33	6.61	4.17	2,63	1,66	1.05	0.66
t, ^{0}C	**20 ^{0}C**						
$[SO_2]_{молб}$ %	21.38	13.4 9	8.51	5.37	3.39	2.14	1.35
t, ^{0}C	**30 ^{0}C**						
$[SO_2]_{молб}$ %	43,65	27.54	17.38	10.6	6.92	4.37	2,75

** La valeur moyenne de trois mesures parallèles; écart type: ±0,5%.*

L'augmentation de l'acidité active du moût peut être réalisée soit par acidification directe (en introduisant des acides alimentaires – acides tartrique, citrique, malique etc.), soit par cationisation ou par électrodialyse. Dans le même temps, avec une acidification directe du moût, afin d'abaisser le pH à 2,8, il est habituellement nécessaire d'ajouter 4 à 8 g / dm^3 d'acides (tartrique et citrique 1: 1), c'est-à-dire acidité titrée du moût stable est 12 -14 g / dm^3. Avec la cationisation et l'électrodialyse, une diminution du pH à 2,8 s'accompagne d'une augmentation des acides titrés pas plus que 2-4 g /dm^3.

La technologie de production et de stockage du moût de raisin par échange d'ions (cations) est basée sur l'utilisation de la science connue concernant le rôle prédominant de l'anhydride sulfureux moléculaire dans l'action antiseptique (et conservateur) et sur l'utilisation de l'effet synergique d'une acidité active élevée pour augmenter sa concentration moléculaire dans le moût.

Ceci est nécessaire parce que le moût sulfité à haute acidité augmente la résistance microbiologique. Cette technologie permet une augmentation de l'acidité active (et en même temps une diminution du pH) dans le moût à des valeurs auxquelles il devient microbiologiquement stable aux concentrations habituelles d'anhydride sulfureux total acceptables dans la production du vin.

Ce moût sulfaté acidifié peut servir à différentes fins et peut être utilisé avec succès pour la production de vins mousseux. Dans le même temps, l'échange d'ions (cations) augmente la stabilité des vins à l'opacification des colloïdes, car la plupart des acides aminés sont éliminés (retirés sur colonne) par cette voie.

L'électrodialyse est une méthode d'extraction extrêmement efficace pour assurer la stabilité du vin, sans nécessiter l'ajout de produits chimiques. L'électrodialyse est conçue de manière à préserver toutes ses qualités naturelles et utiles dans le vin. Le processus passe à température ambiante en continu dans le flux à travers le module.

Sous l'action d'un champ électrique, l'excès d'ions potassium, calcium et tartrate est éliminé par des membranes spécialement adaptées au produit à traiter. Ces sels

saturent la solution circulant parallèlement au produit dans le module d'électrodialyse. À la sortie de l'électrodialyse, le vin est absolument stable aux cristaux.

Le moût acidifié sulfité de raisin est un composant naturel contenant un mélange de sucres dans lequel la totalité de la réserve technologique d'extraits et de substances aromatiques des baies de raisin est préservée et peut être utilisé pour produire des vins mousseux ou tranquilles naturels.

Dans le processus de production, la sulfitation et l'acidification du moût peuvent être effectuées de manière à extraire des effets technologiques supplémentaires, en particulier la stérilisation, ce qui permet de réduire considérablement la charge microbienne due aux communications, équipements, réservoirs infectés [5].

Les informations ci-dessus et le principe peuvent également être utilisés avec succès pour affiner les régimes technologiques de production de moûts de raisins sulfatés en utilisant un conservateur supplémentaire (acide sorbique), car leur utilisation, sans tenir compte de l'acidité active du moût avec le sucre élevé, caractérisé généralement par une faible acidité, permet d'améliorer sa stabilité.

Partant du fait bien connu que l'action antimicrobienne de l'acide sorbique est renforcée dans le moût à forte acidité active (avec un pH bas), il a été proposé de stocker le moût clarifié avec des concentrations de dioxyde de soufre 200-250 mg / dm^3 et d'acide sorbique 150-200 mg / dm^3 après acidification en ajustant le pH à des valeurs de 3,0 à 3,2. Parallèlement, l'augmentation de l'acidité active du moût peut être réalisée par acidification directe (en introduisant des acides alimentaires - citriques, tartriques, etc.) ou par cationisation ou électrodialyse.

Les concentrations ci-dessus de conservateurs aux valeurs indiquées d'acidité active (pH) garantissent la stabilité microbiologique des moûts de raisin clarifiés pour le stockage à long terme dans les conditions habituelles des établissements vinicoles. Un tel moût, utilisé comme édulcorant, peut non seulement réduire le coût des vins mousseux, mais aussi améliorer de manière significative leur qualité et authenticité des vins mousseux a appellation d'origine (DOC).

Conclusions

L'utilisation rationnelle des propriétés antiseptiques du dioxyde de soufre dans la vinification n'est possible que si l'acidité active est déterminée, enregistrée et fixée.

En tant que critère de l'activité antimicrobienne du dioxyde de soufre dans les environnements de vinification, l'utilisation de la valeur de concentration de sa forme "moléculaire" est recommandée.

L'augmentation de la proportion de « dioxyde de soufre moléculaire » par une augmentation de l'acidité peut réduire considérablement la concentration totale en dioxyde de soufre dans la production d'un moût de raisins sulfité microbiologiquement stable.

Le moût sulfité hautement acidifié a augmenté la résistance microbiologique. La technologie mise au point prévoit une augmentation de l'acidité active (et en même temps une diminution du pH) dans le moût à des valeurs auxquelles il devient microbiologiquement stable aux concentrations habituelles d'anhydride sulfureux total acceptables dans la production de vin.

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BOISSONS PROBIOTIQUES À BASE DE LÉGUMES ET DE FRUITS

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Sommaire : Les aliments fonctionnels sont étudiés et largement promus par diverses organisations d'alimentation et de nutrition. Globalement, il y a un grand intérêt à promouvoir la consommation de fruits, de légumes et de pseudo-céréales pour une nutrition équilibrée. Le progrès technologique a permis d'utiliser les fruits et légumes comme substrats idéaux pour le développement de probiotiques, en raison de leur teneur en minéraux, vitamines, fibres et antioxydants. Les probiotiques peuvent être inoculés directement dans les jus de fruits ou de légumes grâce aux technologies de dosage aseptique existantes. L'alimentation offre la possibilité de réduire, directement ou indirectement, les coûts médicaux associés à diverses maladies telles que le diabète, les maladies coronariennes, le cancer, etc. L'utilisation de sous-produits d'origine végétale résultant de différents procédés technologiques aurait des effets bénéfiques sur l'environnement et apporterait une valeur ajoutée aux produits finis. Bien qu'elles aient montré une bonne viabilité dans de nouvelles matrices alimentaires, des études cliniques sont nécessaires pour démontrer l'adhérence à l'intestin et la viabilité des probiotiques en raison de la consommation de produits végétaux à base de probiotiques. À mesure que la sensibilisation des consommateurs est en hausse, les aliments fermentés deviennent de plus en plus populaires et tendent à devenir l'un des plus importants marchés d'aliments fonctionnels. La principale raison du développement et de l'acceptation d'aliments fermentés en tant que boissons probiotiques à base de fruits et de légumes est liée à leur conservation, à leurs propriétés nutritionnelles améliorées (vitamines, minéraux, fibres et antioxydants), capables d'apporter les avantages pour la santé. En outre, les boissons probiotiques à base de fruits et de légumes ne contiennent pas d'allergènes tels que le lactose ou la caséine et ne contiennent pas de cholestérol. Cependant, le développement de boissons probiotiques à base de fruits et de légumes en est encore à l'état précoce.

Mots-clés : boissons, probiotiques, fonctionnels, légumes, fruits

DISTRIBUTION GRANULOMÉTRIQUE DE FARINE DE SORGHUM ORYZOIDUM

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Sommaire : Dans le papier sont présentés les résultats expérimentaux de l'analyse granulométrique de la farine de Sorghum Oryzoidum: la taille minimale et maximale des particules du matériau, la distribution par taille du broyeur sortant du broyeur, la taille moyenne des particules. La distribution granulométrique de la farine a été décrite mathématiquement par la relation Rosin-Rammler-Sperling-Bennett. Les résultats obtenus ont permis de classer la farine dans la catégorie des farines de qualité moyenne (selon la granulométrie) et faciliteront la sélection des procédés technologiques optimaux pour obtenir des produits de haute qualité.

Mots-clés : La farine de sorgho, relation Rosin Rammler.

EMULSIONS ALIMENTAIRES - ASPECTS TECHNOLOGIQUES ET NUTRITIONNELS

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Sommaire : La recherche consiste en détermination du potentiel de l'huile de noix grecque dans la fabrication des émulsions alimentaires fonctionnelles. On a étudié la possibilité et l'opportunité de l'utilisation de l'huile de noix grecque en qualité de component lipidique pour l'obtention des émulsions alimentaires fonctionnelles. On a élaboré la composition lipidique pour l'obtention des émulsions alimentaires avec rapport équilibré des acides gras poly-insaturés ω-3, ω-6. La recherche des indices physico-chimiques, rhéologiques et organoleptiques des émulsions alimentaires fonctionnelles a permet de développer certaines technologies efficaces pour obtenir des naturels substances biologiquement actives provenant de sources naturelles autochtones avec un potentiel antioxydant élevé. On a élaboré certaines technologies de fabrication des huiles végétales résistant aux processus d'oxydation grâce à l'introduction des naturels substances biologiquement actives avec un potentiel antioxydant élevé, tant que dans la modalité de solution des problèmes nutritionnels en évitant une approche médicalisée étroite.

Mots-clés : potentiel biologique, huile de noix grecque, composition lipidique, indices physico-chimiques, potentiel antioxydant

ÉVALUATION DU STATUT NUTRITIONNEL CHEZ LES JEUNES

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Sommaire : L'évaluation de l'état nutritionnel de la population est une méthode essentielle pour identifier les problèmes de santé. La malnutrition et l'obésité sont des exemples de problèmes nutritionnels graves, mais c'est aussi le résultat du développement économique du pays et de la famille. Dans les pays développés, l'état nutritionnel et la santé a subi une série de baisse au cours des dernières années. L'objectif de l'étude était d'évaluer l'état nutritionnel et de sensibiliser les jeunes sur la gestion des problèmes nutritionnels existants. L'étude a été menée dans le cadre du projet „Création du réseau universitaire régional dans les domaines de la santé, la nutrition et la sécurité alimentaire", AUF-ECO, tenu à l'Université d'Etat de Médecine et de Pharmacie „Nicolae Testemitanu". La recherche a impliqué 54 jeunes, âgés de 20 à 25 ans. Parmi ceux-ci, 69% étaient des filles et 31% des garçons. Pour évaluer l'état nutritionnel ont été utilisés les méthodes suivantes : l'indice de masse corporelle, l'indice Borngardt, le degré de développement physique, le type constitutionnel. La détermination des indices somatométriques a été réalisée avec TANITA (InnerScan Body Composition Monitor - BC571). Selon l'indice de masse corporelle, 2% des jeunes étudiés étaient obèses, 22% étaient en surpoids, 69% étaient normaux et 7% avaient un poids insuffisant. L'indice Borngardt caractérise l'état nutritionnel en fonction de l'état morphologique du corps. Ainsi, l'indice de Borngardt était optimal chez 6% des jeunes, 4% - normal, 5% - déficitaire, 18% - prémorbide et 67% - morbide. Le degré de développement physique était harmonieux chez 59% des jeunes, développement non harmonieux avec un déficit dans le développement - 19% et développement non harmonieux, avec un excès de développement - 22%. Le type constitutionnel a été évalué comme asthénique chez 67% de jeunes, normosthénique - 15% et hypersthénique - 18%. Il y avait donc une prévalence de surpoids. Cette tendance est attestée dans la société en raison du mode de vie malsain et de la malnutrition.

Mots-clés : jeunes, statut nutritionnel, santé.

FARINE : PRODUCTION, VARIÉTÉS ET NUTRITION

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Sommaire : La farine est le produit obtenu par broyage de l'endosperme de grains de céréales non cuits, généralement des grains de blé. Bien que la plupart des farines proviennent de céréales telles que le blé, l'orge ou le seigle, les farines peuvent être extraites du maïs, du riz, des pommes de terre, des haricots, des noix, des racines ou des pseudo-céréales comme le sarrasin, le sorgho, le quinoa, amarante ou mil. L'industrie de la farine est le principal consommateur de blé et de seigle, car tous deux sont les principales céréales utilisées dans la production du pain. Ainsi, les céréales comme le maïs, l'avoine, l'orge et le riz sont utilisées dans la production de farine en quantités nettement inférieures à celles du blé et du seigle. La farine est la principale source de protéines végétales dans l'alimentation humaine et constitue une excellente source de glucides complexes et de fibres alimentaires. Il est également riche en vitamines B et en minéraux, tels que le phosphore, le calcium, le fer, le magnésium et le potassium. Farine de blé, disponible dans une large gamme d'assortiments (farine de blé entier, farine tout usage, la farine de pain, semoule, blé dur) est le plus utilisé dans l'industrie de la boulangerie en raison de la teneur en gluten qui lui permet de former une pâte avec des propriétés viscoélastiques exceptionnelles. L'évolution démographique et les changements dans les habitudes culinaires ont conduit à la diversification des variétés de farine par l'introduction dans l'alimentation des différentes céréales comme le seigle, le maïs, l'orge, l'avoine et le riz. La demande sans cesse croissante de produits alimentaires plus diversifiés présentant des valeurs nutritionnelles et des effets hygiéniques élevés, ainsi que l'influence des cuisines ethniques sur le multiculturalisme culinaire ont conduit à l'inclusion de farines à base de semences pseudo-céréalières telles que le sarrasin (Fagopyrum esculentum) et sorgho (Sorghum bicolor). Les farines de pseudo-céréales se caractérisent par un excellent profil nutritionnel, une teneur élevée en fibres et en composés bioactifs. Les produits enrichis sans gluten avec farine pseudo-céréalière confèrent une valeur nutritionnelle élevée ainsi qu'une amélioration des caractéristiques sensorielles.

Mots-clés : Céréales, farines, aspects nutritionnels

FORMATION DE BIOFILM PAR BACILLUS SUBTILIS DANS L'INDUSTRIE ALIMENTAIRE

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Sommaire : Bacillus subtilis est une bactérie Gram positive, aérobie, motile et sporulâtes, généralement présente dans le sol, l'eau et associée aux plantes. Les Bacillus spp. peuvent se différencier par les autres microorganismes par des types de cellules (cellules végétatives et spores), ainsi que par la capacité à former des biofilms. Bacillus subtilis est capable de former un biofilm complexe avec une résistance accrue aux solvants et aux biocides commerciaux, ayant un impact négatif dans les différents domaines industriels. Les biofilms bactériens peuvent se former sur des surfaces biotiques et abiotiques, développant différentes étapes réversibles et irréversibles en fonction des conditions environnementales. Une caractéristique importante du biofilm est la matrice extracellulaire, qui pour le Bacillus subtilis est habituellement formée par des protéines et exo polysaccharidiques extracellulaires. Bacillus subtilis a la capacité de former des biofilms sur de nombreux types de surfaces dans la plupart des écosystèmes où des nutriments sont disponibles (tissus humains, dispositifs médicaux, systèmes aquatiques naturels, pipelines et équipements industriels, etc.). La formation de biofilms a de sérieuses implications dans les situations industrielles, environnementales, de santé publique et médicales en raison de la résistance accrue aux traitements antimicrobiens due en partie à la nature protectrice de la matrice des substances polymériques extracellulaires. Par conséquent, il est très important de prévenir et de contrôler la formation des biofilms, en particulier pour améliorer les performances du procédé de fabrication, la qualité du produit alimentaire et également pour réduire l'impact des biofilms dans le domaine médicinal.

Mots-clés : Bacillus subtilis, biofilm, substances polymériques extracellulaires

L'ASPECTS HYGIENIQUE DE LA NUTRITION DES ENFANTS

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Sommaire : Le corps de l'enfant interaction continuellement avec l'environnement. Les produits alimentaires participent à la couverture des besoins nutritionnels des enfants. Les aliments, quelle que soit leur mode de préparation sont composés d'éléments nutritifs. Comme il n'y a pas d'aliments contenant tous les nutriments dans des proportions équilibrées et optimales pour le corps de l'enfant, une alimentation quotidienne doit être réalisée en associant plusieurs aliments pour répondre aux besoins nutritionnels de l'enfant. Pour ces raisons, la nutrition des enfants doit correspondre par la composition, la quantité et la qualité de tous les composants (protéines, lipides, glucides, vitamines, macroéléments et microéléments) aux besoins physiologiques de l'enfant. Une alimentation déraisonnable, déséquilibrée, excessive ou déficiente constitue un facteur de risque majeur pour la santé et le développement physique des enfants. L'objectif de l'étude était d'évaluer le menu de répartition des enfants dans les jardins d'enfants à Chisinau, en République de Moldova. A cette fin, ont été étudiés 40 menus de répartition dans deux jardins d'enfants d'une capacité de 420 enfants âgés de 3 à 7 ans. La teneur en protéines, lipides, glucides, sels minéraux et vitamines des principaux repas (petit-déjeuner, déjeuner, collation et dîner) a été calculée selon le tableau « La composition chimique et la valeur énergétique des aliments ». L'apport en protéines était insuffisant - 52,1- 58,5g, soit 76,6% et 86,1% de moins que la norme - 68g (100%). Consommation de lipides - 41,4g (60,9%) et 49,5g (72,8%) respectivement 39,1% et 27,2%, par rapport à la norme journalière de lipides (68g). La quantité de glucides consommée pendant la journée était de 373g et de 348g, ce qui indique un excès. Ainsi, les menus se caractérisent par une teneur insuffisante en protéines et en lipides et un excès de glucides, ce qui peut entraîner divers problèmes de croissance et de développement chez les enfants.

Mots-clés : enfants, nutrition, menu de répartition.

LE POTENTIEL D'ACIDIFIANT ET D'HUILE DU RAISIN AVEC HAUTE VALEUR BIOLOGIQUE

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Sommaire : Le marché européen demande de quantités importantes de deux produits secondaires issus du raisin – l'acidifiant et l'huile avec hautes propriétés biologiques. Leur production est très importante pour la République Moldova : l'industrie des conserves et des boissons importent de quantités énormes des acidifiants alimentaires ; le réseau du commerce en détail importe de grandes quantités d'huile végétale. L'huile du raisin est utilisée aussi par l'industrie cosmétique et pharmaceutique. En Moldavie chaque année on vendange 450-500 milles tonnes du raisin, pour avoir une récolte d'haute qualité, on enlève 15-20% des grappes au moment du "veraison". Comme ça, on peut estimer jusqu'a 50 milles tones du raisin avec haute contenu en acides organiques. Les recherches effectuées par nous montrent que le jus obtenu à partir du raisin immature possède des qualitées nutritives sufisantes pour créer des aliments novatifs et écologiques. L'haute qualite des acidifiants a été garantie par les elaborations réalisées dans la periode 2012-2018, avec l'obtention du sortiment integre des produits : acidifiant concentre, acidifiant en etat natif, jus à l'acidité moderée, jus multicomposé avec de matrices des legumes et des fruits. Aussi, de la quantité de 500 milles tones du raisin, on obtient 20 milles tones de sémences, qui présentent une source précieuse a l'obtention d'huile à haute valeur biologique. L'activité biologique élevée d'huile de raisin est assurée par le complexe de substances biologiquement actives, notamment le resvératrol et les bioflavonoïdes - des proanthocyanidines oligomères - une groupe d'antioxydants qui empêche la dégénérescence cellulaire dans le corps humain.

Mots-clés : acidifiant, huile, raisin, valeur biologique.

LES FRAUDES ALIMENTAIRES – PRATIQUES, LEGISLATION, STANDARDS ET AUDIT

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Sommaire : La présence sur le marché des aliments fraudés mène à un degré faible de confiance dans les produits agroalimentaires, fait qui influence négativement la consumation de ces produits, bien au niveau national qu'au niveau international – tout cela dans le contexte où apparaissent bien plus de controverses sur la qualité des ingrédients utilisés dans l'obtention des produits alimentaires au même nom en fonction de la destination géographique. L'intégrité des produits alimentaires dans la chaine de production-commercialisation est d'abord fondamentale, la commercialisation de produits alimentaires fraudés étant au détriment du consommateur, de l'état et des opérateurs économiques du domaine. Si les aspects concernant la sécurité alimentaire et la qualité des produits agroalimentaires sont réglementées bien par la législation européenne que celle nationale, il n'y a pas encore un cadre législatif bien réglementé pour l'authenticité des produits agroalimentaires, il n'y a pas une définition validée, des conditions, caractéristiques, procédures, contraventions, sanctions. Ce désagrément favorise la falsification, la fraude des produits agroalimentaires tout au long de la chaine production-commercialisation. Les fraudes visant les aliments ne sont pas bien comprises ou elles sont confondues avec d'autres notions, par exemple la sûreté ou la sécurité des aliments. La falsification des aliments est rarement accompagnée par l'affectation de la santé des consommateurs (développement des allergies alimentaires, états de maladie causés par quelques components imprévus à la consommation humaine, par exemple la mélamine ou des huiles minérales etc.). La fraude alimentaire est une substitution frauduleuse et délibérée, dilution ou addition dans des produits ou matières premières, ou présentation false des produits ou matières, au but de revenus financiers, par l'augmentation de la valeur apparente du produit ou réduction du coût de production [IFS Food vers 6.1]. Ce travail se propose de réaliser un modèle de procédure opérationnel à l'aide duquel un agent économique soit capable d'évaluer sa propre vulnérabilité à la fraude et, dans le même contexte, puisse fournir des produits authentiques sur le marché.

Mots-clés : sécurité alimentaire, fraude alimentaire, vulnérabilité.

LES MICROALGUES ET LES CYANOBACTERIES POUR UNE ALIMENTATION SAINE

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Sommaire : Les microalgues et les cyanobactéries, en raison de leur composition chimique riche et bien équilibré, suscitent aujourd'hui un intérêt grandissant de la part de l'industrie agro-alimentaire, orientée vers l'obtention des aliments d'une qualité sûre. Depuis 25 ans, les chercheurs du laboratoire de Phycobiotechnologie s'investissent dans les vastes domaines d'application de la biomasse algale. Nouvelles souches et multiples technologies sont proposées afin de cultiver les microalgues et les cyanobactéries et d'obtenir une biomasse diversifiée pour des applications multiples, ainsi que d'orienter la synthèse et récupérer les molécules à intérêt pharmaceutique, cosmétique et alimentaire. L'utilisation de la biomasse algale ou de ces composés pour le développement de produits alimentaires est une approche innovante basé sur les propriétés nutritionnelles des certaines souches de notre collection : La cyanobactérie Arthrospira platensis (spiruline) a été définie comme la principale source non conventionnelle d'environ 50 substances bioactives ayant un impact nutritionnel et thérapeutique. Parmi eux citons : les acides aminés essentiels, les caroténoïdes et phycobilines en tant que colorants et antioxydants, les polysaccharides sulfatés et l'acide gamma-linoléique aux actions antivirale et imunomodulatrice. • La microalgue rouge Porphyridium cruentum produit entre autre les acides gras polyinsaturés à longue chaine (présents généralement dans l'huile de poisson). • La microalgue verte Haematococcus pluvialis est une riche source d'astaxanthine – un antioxydant privé de propriétés pro-oxydantes, aux effets anti cancer prouvés. L'utilisation de ces ingrédients naturels dans la production alimentaire permettrait de remplacer les composés bioactifs de synthèse et de modifier les propriétés fonctionnelles des aliments. De plus, l'apport des substances bioactives par l'alimentation quotidienne a un impact à longue terme sur la santé, par rapport aux compléments alimentaires ou aux médicaments. Aujourd'hui les microalgues ne reçoivent pas encore l'attention quelle méritent et très peu sont autorisées dans l'alimentation humaine. Mais ces excellents candidats pour obtention d'aliments de très haute qualité commencent à séduire le consommateur, qui exige des aliments plus naturels, fonctionnels et personnalisés. D'où notre conviction que ces organismes, qui sont à la base de toute la construction du vivant sur terre, seront amenés à jouer un rôle important dans l'industrie alimentaire moderne grâce à leur valeur nutritionnelle et thérapeutique.

Mots-clés : microalgues, cyanobactéries, alimentation fonctionnelle.

MESURES D'AMÉLIORATION DE LA COMMUNICATION INTERNE DANS LES PETITES ET MOYENNES ENTREPRISES DU SECTEUR VINICOLE DE LA RÉPUBLIQUE DE MOLDAVIE

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Sommaire : L'un des secteurs stratégiques pour le développement économique de la République de Moldavie était et reste le secteur vinicole. Ce secteur a fourni des parties importantes du produit intérieur brut national au cours de son évolution, contribue à la balance du commerce extérieur, généré des emplois, conduit au développement des branches adjacentes au secteur. L'importance stratégique de l'industrie est également due au fait que toute la gamme des activités de la chaîne de valeur se déroule au niveau local. Il est à noter qu'une grande partie des entreprises opérant dans ce secteur sont des PME. L'un des défis des gestionnaires des PME du secteur est de gérer la communication interne. Alors que la main-d'œuvre de la République de Moldavie est en perpétuelle migration et que les entreprises sont confrontées à une pénurie de personnel qualifié, le problème de la communication interne est devenu encore plus d'actualité. La communication interne permet d'établir un climat social bénéfique et favorable aux bons résultats. Dans ce contexte, ont été présentés plusieurs mesures visant à améliorer la communication interne dans les petites et moyennes entreprises du secteur vinicole de notre pays.

Mots-clés : secteur vitivinicole, PME, communication interne, mesures d'amélioration.

NUTRITION DE LA FEMME ENCEINTE, ENTRE LE CONCEPT ET LA PRATIQUE

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Sommaire : Depuis Hippocrate jusqu'à aujourd'hui, le concept de la nutrition est associé à l'émergence de différentes morbidités. La grossesse est une période de changements physiques et hormonaux, avec des besoins nutritionnels accrus. Une quantité insuffisante ou excessive de certains nutriments peut entraîner une fausse couche, des malformations, ou d'autres problèmes médicaux pendant le développement du fœtus. Matériel et méthodes : Une étude prospective a été réalisée en appliquant 1 000 questionnaires à des patients de l'Hôpital Clinique d'Obstétrique - Gynécologie "Buna Vestire" Galati. Résultats : La prévalence du surpoids chez les femmes enceintes était supérieure que chez les femmes avec un indice de masse corporelle réduit. Il y avait des différences significatives dans les recommandations d'un mode de vie sain pendant la grossesse dans le groupe de femmes étudiées. Quelques femmes enceintes avaient les bonnes notions nutritionnelles, mais ne les appliquaient pas correctement. Les irrégularités alimentaires signalées ont été corrélées à un faible niveau d'instruction ou à un faible statut socioéconomique, à un jeune âge ou à une parité élevée. Conclusion : La santé de l'individu dépend de l'éducation nutritionnelle et du comportement de la mère, même lorsque la femme décide de devenir enceinte. L'éducation nutritionnelle des femmes enceintes et l'application pratique des recommandations internationales sont des moyens importants d'améliorer les performances des naissances et même de prévenir le développement de maladies dans la vie adulte de l'individu.

Mots-clés : grossesse, nutrition, education.

PARTICULARITÉS DE LA VINIFICATION DE VINS ROSÉS

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Sommaire : La couleur est l'un des critères fondamentaux d'appréciation d'un vin rosé. Comme le rappelle VIVAS (1999) dans son ouvrage sur les oxydations dans les moûts, l'exposition prolongée à l'air se traduit par un brunissement plus ou moins accentué. L'origine de ces mécanismes d'oxydations est attribuée à la présence d'une enzyme appelée tyrosinase ou plus communément polyphénoloxydase (PPO). Parmi les constituants du raisin, les composés phénoliques de la baie étaient majoritairement impliqués dans les phénomènes d'oxydation. Ce sont donc ces mêmes composés responsables de la couleur qui sont transformés lors de l'oxydation des moûts. D'où l'importance de pouvoir gerer ce phénomène.

Mots-clés : vin rosé, moût, oxydations, brunissement, couleur, polyphenols.

PROCÉDÉ D'OBTENTION DE CONFITURE DE FRUITS À FAIBLE TENEUR EN SACCHAROSE

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Sommaire : Le but de notre recherche a été de développer la méthode physico-chimique d'évaluation de la douceur de la confiture, basée sur les caractéristiques physico-chimiques du fruit et la teneur en saccharose des produits finis. Compte tenu de tous ces facteurs on a élaboré une nouvelle technologie d'obtention de confitures de fruits à faible teneur en saccharose. Le procédé donné comprend la préparation et la déshydratation partielle de la matière première jusqu'à 16...22% de matière sèche soluble. L'addition de saccharose doit constituer 30...50 parties de masse de saccharose par 100 parties de masse de la matière première déshydratée. Le mélange des substances gélifiantes et des ingrédients et la cuisson sous vide du mélange obtenu présentent les étapes suivantes dans le processus d'obtention de la confiture de fruits. Le résultat final constitue l'obtention d'un produit avec une faible teneur en saccharose, un goût sucré agréable et des indices de qualité stables.

Mots-clés : caractéristiques physico-chimiques, déshydratation partielle, substances gélifiantes, goût sucré agréable, indices de qualité stables.

PROCESSUS D'OXYDATION AVANCEES UTILISES POUR LA RETENTION DES COLORANTS ALIMENTAIRES

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Sommaire : Dans ce travail nous avons étudiés des possibilités de décomposition de certains colorants alimentaires considérés dans notre étude comme polluants. Nous avons choisi à étudier, les procédés d'oxydation avancé de certains colorants de l'industrie alimentaire par l'utilisation de la catalyse ensemble avec l'ozonation. Les processus oxydatifs sont des sous - ensembles de processus chimiques qui utilisent le peroxyde d'hydrogène (H2O2), la lumière UV et l'ozone (O3). Après la minéralisation, les colorants synthétiques de l'industrie alimentaires, nous avons utilisés des procédés d'oxydation catalytique. Comme catalyseurs nous avons préparés des argiles cationiques modifiées et comme source d'oxydation : l'ozone. Ont été étudiés plusieurs paramètres : le pH, la température, la concentration d'ozone utilisée, la concentration de colorant, la quantité de catalyseur utilisée, e.a. Le colorant qui fait l'objet de cette étude est Sunset Yellow, qui est présent dans différents aliments, tels que : boissons diverses, glaces, snacks, canettes de poisson, puddings, e.a. Notre travail désir à démontrer que l'utilisation des processus d'oxydation avancée avec nos catalyseurs et l'ozone, peut donner des résultats prometteurs dans la lutte contre les polluants.

Mots-clés : processus d'oxydation, catalyseur, colorants alimentaires.

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Sommaire : De nos jours, les gens consacrent plus de temps et d'efforts pour mieux contrôler leur santé en explorant des médicaments alternatifs ou à base de plantes et des produits de santé naturels pour prévenir les maladies ou une vie plus saine. On sait que les personnes qui consomment une alimentation riche en aliments naturels, tels que les fruits, les légumes, les noix, les grains entiers et le poisson, ont tendance à vivre une vie sans maladies. Des études récentes suggèrent que la consommation régulière ou accrue de fruits et de légumes peut réduire le risque de maladies chroniques, et que ces avantages pour la santé seraient principalement dus à leurs antioxydants naturels et à leur teneur en fibres alimentaires. À l'heure actuelle, les consommateurs préfèrent les aliments bénéfiques pour la santé et, en même temps, faciles à consommer, à stocker et à manipuler. En ce sens, les produits nutritifs prêts à consommer, tels que les barres-collations, sont très appréciés pour leur commodité. Les snacks sont des produits polyvalents souvent fabriqués à partir de céréales, de fruits et de noix, qui constituent un format alimentaire idéal pour fournir aux consommateurs des nutriments sains, des composés bioactifs et des fibres alimentaires.

QUELQUES APPLICATIONS DE MATERIAUX A BASE D'ARGILE

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Sommaire : L'intérêt accordé ces dernières années à l'étude des argiles par des nombreux laboratoires dans le monde se justifie par leur abondance dans la nature, par l'importance des surfaces spécifiques qu'elles développent, par la présence des charges électriques sur cette surface et par la possibilité d'échanger des cations interfoliaires. Ces cations, appelés aussi compensateurs, sont les principaux éléments responsables de l'hydratation, du gonflement, de la plasticité et de la thixotropie en leur conférant des propriétés hydrophiles. Grâce à leurs caractéristiques, les argiles sont utilisées, de plus en plus souvent, dans les biotechnologies et dans des domaines tels que l'industrie pharmaceutique, l'industrie alimentaire et la protection de l'environnement. Dernièrement, l'intérêt vis-à-vis de la possibilité d'utiliser les argiles comme des matériaux alternatifs pour l'encapsulation s'est beaucoup amplifié, comme en témoignent de nombreuses recherches sur ce sujet. Concernant la protection de l'environnement un sujet intéressant pour notre collectif, est représenté par la préparation de différents matériaux à base d'argile, capables de retenir différents polluants industriels, problème, qui est devenu un enjeu environnemental majeur. Un intérêt croissant a été porté sur les méthodes de piégeage de différentes gazes industrielles en utilisant de matériaux à base d'argiles. Dans ce travail, nous désirons de présenter quelques applications qui démontre que les matériaux à base d'argile ont produit des résultats prometteurs en matière de protection de l'environnement.

Mots-clés : polluants, matériaux poreux, industrie alimentaire.

RÉTENTION DE POLLUANTS DE L'INDUSTRIE ALIMENTAIRE SUR DES MATRICES À BASE D'ARGILE ANIONIQUE

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Sommaire : Dans ce travail, nous avons étudiés la rétention des polluants sur les argiles anioniques - hydroxydes doubles lamellaires. Les polluants peuvent provenir de différentes industries prioritaires comme : l'industrie alimentaire, l'industrie pharmaceutique, ou des eaux usées hospitalières, eaux industrielles et autres. Au sein de notre équipe, nous avons préparés différents types d'argiles anioniques (Mg-Al avec différents rapports) et nous avons étudiés leur comportement concernant la rétention des polluants. Les hydroxydes doubles lamellaires (HDLs) sont des matériaux stratifiés chargés positivement contenant des cations divalents et trivalents. L'électro-neutralité du matériau est assurée par la présence d'anions inter-foliaires, solvatés par des molécules d'eau. Le HDL également appelé argile anionique, en raison de sa charge portée par les feuillettes, est rarement trouvé dans la nature, mais ce sort d'argile peut être facilement synthétisée. En utilisant des matériaux à base d'argile, nous avons déterminés les isothermes d'adsorption pour différents polluants. Aussi intéressant pour nous, a été de trouver les facteurs clés, déterminants, pour le processus de rétention des polluants et particulièrement, les polluants de l'industrie alimentaire. Pour faire ces expérimentes, nous avons étudies les influences de certains paramètres comme : la nature du matériel utilisé ; la quantité d'adsorbent, le temps de contact et le pH. Au cours de nos travaux, les matériaux de type HDL, ont démontrés leurs efficacités pour la rétention des polluants, et en particulière pour les polluants de l'industrie alimentaire.

Mots-clés : HDL, rétention polluants, industrie alimentaire.

RÉTENTION DE POLLUANTS SUR DES MATRICES À BASE D'ARGILE ANIONIQUE DANS LES EAUX USÉES DE L'INDUSTRIE ALIMENTAIRE POUR RÉHABILITATION ENVIRONNEMENTALE

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Abstract: In this work, we studied the retention of pollutants on anionic clays. The pollutant can result from different industries with a very high priority in food industry, hospital wastewater and others. Within our team, we have prepared various anions of anionic clays (Mg-Al in different ratios) and we have studied their behavior concerning the retention of pollutants. Lamellar double hydroxides (LDH), are positively charged layered materials containing divalent and trivalent cations. The electro-neutrality of the material is ensured by the presence of inter-foliar anions, solvated by water molecules. LDH also called anionic clays, because of the load carried by leaflets are very rarely found in natural form. Using this material, adsorption isotherms were determined as a function of agitation rate and temperature. It is important to identify the key factors in the management of food industry residues, which are relevant to the control of pollutants, on the basis of the anionic clays, and on the other. With materials prepared in our laboratories, we have studied the parameters that can influence the retention of pollutants on these materials. To see the influences of parameters, we varied: the nature of material used in the experiments; the adsorbent mass of materials studied the contact time and the pH of the polluting solution. The experiments have led to some conclusions, the most important is that if we add the LDH material, we can functionalize the anionic clay to achieve a more efficient material concern the retention of pollutants.

Keywords: lamellar double hydroxydes, wastewater, pollutants retention, food industry

TECHNIQUES ANALYTIQUES POUR ÉTABLIR L'AUTHENTICITÉ DES VINS

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Sommaire : Ces dernières années, la question de l'authenticité du vin est de plus en plus invoquée dans un certain nombre de pays européens qui protègent les consommateurs des produits falsifiés. Les tests usuels ne répondent pas à la question de l'origine naturelle du vin, lorsque les indices physiques et chimiques répondent aux exigences de la norme. Avec des racines grecques, la notion d'authenticité est devenue complexe et couvre divers aspects (origine, étiquetage, adultère et fraude) liés à la qualité d'un produit pour être authentique/original. Transposé pour le secteur vitivinicole, le concept d'authenticité des produits certifie qu'ils ont une certaine origine (par exemple botanique et géographique), conformément aux normes et règles en vigueur et aux inscriptions sur l'étiquette de présentation.

Mots clés : authenticité, vins, IRMS, RMN, oligo-éléments.

TRAÇABILITÉ DES VINS NATURELS ISSUS DE VARIÉTÉS LOCALES

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Sommaire : Le secteur agroalimentaire est depuis plusieurs années particulièrement visé par les problèmes de traçabilité, à cause du lien étroit entre le produit et le client. Même si le vin est relativement préservé face aux risques alimentaires, les contraintes de production ne cessent de s'alourdir, et la confiance des consommateurs vis à vis du produit doit impérativement être sauvegardée [1]. C'est pourquoi de nombreuses entreprises de la filière viti-vinicole ont déjà pris des dispositions pour établir une traçabilité intégrale de leurs produits, et instaurer les normes qualités ISO et HACCP [2].

L'article se rapporte aux résultats obtenus sur la traçabilité des vins naturels de cépage *Feteasca Alba* et *Rara Neagra*, vinifiés par la méthode classique de production de vins secs dans la section de micro-vinification du département (campus nr. 5 de l'U.T.M.). Comme matériel d'analyse, on a utilisé deux lots de vin naturel provenant de la région centrale et du sud de pays. La mise en œuvre du système de traçabilité a été réalisée en base du système de gestion de l'information existante/réalisée, et dans une logique de progression continue, qui comprenait: evidence des traitements phytosanitaires réalisés à la vigne; enregistrement des origines parcellaires de la vendange; enregistrement de tous produits entrant dans la composition des vins naturels; référencement des fournisseurs des produits œnologiques; enregistrement et suivi des paramètres technologiques de vins en cuves et barriques; suivi des stocks de produits en temps réel; conservation des bulletins d'analyses, etc.

Les données obtenues ont démontré que la mise en place du système de traçabilité des vins naturels issus de variétés locales est un élément important de la loyauté des échanges en termes de sécurité et d'échange d'informations et de consolidation des marchés.

Mots-clés : traçabilité, variétés locales de vigne, vin.

N.B. Cette étude a été menée au sein du projet de science et d'innovation nr. 18.80012.51.30 A pour les jeunes chercheurs 2018 – 2019 „*Stabilirea criteriilor de transabilitate a vinurilor obținute din soiuri de struguri autohtone".*

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TRANSFERS DES MYCOTOXINES DE FUSARIUM DE LA MALTE AU MOUT DE LA BIERE

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Sommaire : Les céréales sont une des matières premières plus utilisés dans l`industrie alimentaire. Une contamination par les moisissures filamenteuses peut se produire soit dans le champ soit pendant le stockage qui pourrait dériver dans l`accumulation des composes secondaire toxique appelés mycotoxines. Ces composés ont des effets négatifs sur la sante des êtres humains et des animaux (carcinogène, œstrogènes, nausées etc.). L`orge représente la matière première de base de la bière et a été démontré susceptible de souffrir une infestation fongique par Fusarium (la fusariose de l'épi). Dans le cadre de ce travail, l`évolution des deoxynivalenol, deoxynivalenol-3-glucoside et de zearalenone ont été étudié à travers les processus de macération et d`ébullition pendant la fabrication de la bière. Trois différent scenarios de contamination ont été considérés pour l`étude. Dans presque toutes les preuves, une augmentation du niveau des mycotoxines dans le moût a été observé pendant la macération suivie par une baisse dans les suivantes 30 minutes d`ébullition. Deoxynivalenol et son métabolite ont été réduits jusqu`à son niveau initial avant la macération ou encore plus, mais sans être éliminés complètement. La zearalenone a suivi aussi une augmentation dans le moût pendant la macération et a été entièrement éliminée a la fin de l`ébullition.

Mots-clés : deoxynivalenol, deoxynivalenol-3-glucoside, zearalenone, HPLC-MS/MS, mycotoxines ¨masquées.

ULTRASONS DANS LE TRAITEMENT DES ALIMENTS

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Sommaire : Basée sur le livre récent Ultrasound in Food Processing dans lequel nous avons écrit un chapitre, la conférence présentera brièvement les chapitres du livre en commençant par les principes de base de l'ultrason, pour introduire le public dans le monde de l'acoustique et de ses applications. Certains chapitres du livre (le livre entier comprend 19 chapitres) seront succinctement présentés, simplement pour donner au public une idée de la façon dont les ultrasons pourraient aider l'industrie alimentaire. La partie principale de la conférence sera consacrée à l'extraction assistée par ultrasons (EAU) dans la préparation des aliments et aux défis de l'intégration de l'ultrason dans l'industrie alimentaire. Plusieurs exemples et règles sur la manière de faire correctement l'extraction complèteront la conférence. Un schéma des opérations unitaires ainsi que l'endroit où l'ultrason pourrait être utilisée, complété par une charte technologique proposée, seront présentés. Un graphique de traitement général pour les extractions assiste ultrasonique sera également présenté et commenté. L'utilisation des ultrasons dans la préparation des aliments est une technologie émergente [1-32].

Mots-clés : Ultrasound; Food Processing; Extraction methods.

UTILISATION DES EXTRAITS ET DES TOURTEAUX DE DECHETS DE TOMATES DANS L'INDUSTRIE ALIMENTAIRE

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Sommaire : En République de Moldova, à l'échelle industrielle, sont fabriqués : jus, purée et pâte, concentré, ketchup et autres sauces à base de tomates. La production de ces produits génère une grande quantité de déchets biodégradables qui, bien que possédant des substances biologiquement actives et des antioxydants, sont rejetés à la périphérie des localités et constituent une source de pollution de l'environnement. Cependant, ils pourraient être valorifiés par la méthode d'extraction au dioxyde de carbone supercritique, dans le but d'obtenir des ingrédients ou des produits de haute valeur nutritionnelle, ayant des effets bénéfiques sur la santé.

A l'aide d'une modélisation mathématique, les régimes optimaux d'extraction des substances liposolubles des déchets industriels de tomates ont été établis en faisant varier les paramètres de température, pression et temps d'extraction.

Suite à l'extraction supercritique, le CO2-extrait lipophile et les tourteaux des déchets de tomates sont obtenus. L'extrait est riche en caroténoïdes, notamment le lycopène, les tocophérols, les polyphénols, les acides gras polyinsaturés ; et le tourteau est riche en fibres, protéines végétales et acides aminés essentiels.

Des recettes et des technologies ont été mises au point pour diversifier l'assortiment des produits traditionnels afin d'obtenir des aliments fortifiés, tels que: ragoût (zacusca, tocana) de courgettes, ragoût d'aubergines, chou-fleur mariné, céleri mariné avec addition d'extrait liposoluble de déchets de tomates et des produits de panification: pain et bretzels secs à partir de farine de blé de haute qualité avec l'ajout de tourteaux de déchets de tomates; qui ont ensuite été testés dans des conditions de production industrielle.

Mots-clés : déchets de tomates, extraction supercritique, extrait liposoluble, tourteau, aliments fortifiés.

VITAMINE C – MIRACLES INCONNUS

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Sommaire : La vitamine C est une vitamine hydrosoluble sensible à la chaleur et à la lumière jouant un rôle important dans le métabolisme de l'être humain et de nombreux autres mammifères. Contrairement aux animaux, l'homme ne peut pas la produire lui-même. Cette vitamine hydrosoluble participe à de nombreux processus métaboliques et est active dans tout l'organisme. Dans certaines situations pathologiques (comme le stress, dépression, l'inflammation, l'infection etc.) les besoins en vitamine C peuvent être accrus. Certains modes de vie comme la consommation excessive d'alcool ou le tabagisme peuvent entraîner le même phénomène. La vitamine C est très importante pour renforcer les défenses naturelles de l'organisme. Cette vitamine doit donc être largement utilisée dans toutes les infections, qu'elles soient dues à des bactéries, des virus, des champignons, des levures ou des parasites. De même, la vitamine C joue un rôle actif et important dans la prévention du cancer, une teneur faible en vitamine C (hypovitaminose) double le risque statistique de cancer. Lorsqu'un individu se retrouve carencé en vitamine C, il va développer une pathologie spécifique qui est le scorbut. Les manifestations du scorbut sont essentiellement des œdèmes et des hémorragies pouvant entraîner la mort si les carences s'installent sur le long terme (plusieurs mois). A l'inverse, l'excès de vitamine C sera éliminé par les urines. Cependant il a été décrit parfois des symptômes comme des douleurs stomacales, des diarrhées ou encore des lithiases rénales. Sources de vitamine C sont les fruits et les légumes colorés et crus : poivron rouge, cassis, kiwi, ananas, orange, citron, pamplemousse, cantaloup, framboise, fraise, brocoli, tomate, chou-fleur, choux de Bruxelles etc. Généralement, la consommation d'au moins 5 portions de fruits et de légumes frais permet de combler largement les apports nutritionnels recommandés en vitamine C.

Mots-clés : vitamine C, santé, produits alimentaires.

"Bucuria" J.S.C.
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Tel: +37322895600
https://www.bucuria.md / office@bucuria.md

Company history SA Bucuria

The trademark SA «Bucuria» is the visit card of Moldova. Today this is the largest enterprise producing confectionery in the republic. For more than six decades the company SA «Bucuria» gives joy to the children and grown-ups, totally corresponding to the motto – «Life is sweeter with us…»

The invariably high quality, the natural verified ingredients and the widest assortment of production – these are the main components of the success of SA «Bucuria», which made the company famous not only in its country, but also far away its borders. The huge variety of denominations of candies, chocolate, marshmallow, marmalade, biscuits, many other sweets produced at SA «Bucuria» have long ago become, together with the Moldavian wines, a particular symbol of Moldova. And today, when out of the production lines of SA «Bucuria» around 37 tons of confectionery are received daily, it is difficult to believe that the history of the «sweet legend» of our country began in the far year 1946 from the association of several small manufactories.

2013 Advancing to the future

At present SA «Bucuria» is the greatest enterprise specialized in the production of confectionery. The amount of production is of almost 90 percent of the amount of candy productions in the Republic of Moldova.

The strong points of the activity of the enterprise are:

- the availability of primary raw material and materials;
- the favorable geographic location of Moldova, which creates favorable conditions for the promotion of the production on the market of Europe, CIS and Middle East;
- the branchy networks of specialized stores, which actively supports the ale of the production;
- the production of a wide range of high quality production corresponding to the consumer demand;
- the technology of use of natural primary components, which favorable distinguishes the production of SA «Bucuria» from the production of the foreign enterprises, where frequently a lot of preservatives are used;
- the possibility to manufacture production at an available price.

CUPTORUL FERMECAT S.R.L.
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MD-3112, 55 Bulgara str., Balti,
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Tel. +37323176798
http://www.cuptorul-fermecat.md/

SRL "Cuptorul Fermecat" și-a început activitatea în anul 1998, iar direcția principală de dezvoltare este producerea produselor de panificație.

Pe parcursul activității desfășurate, compania a devenit lider între furnizorii de materie primă și ingrediente pentru producătorii de panificație și cofetărie în Republica Moldova.

Compania "Cuptorul Fermecat" este reprezentantul oficial al companiilor europene și asiatice: Lesaffre (Franța), Unigra (Italia), Zeelandia (Olanda), ABK (Ucraina), Agrana Frut (Ucraina), Cargill (Malaezia), Combinatul de uleiuri din Voronej (Rusia) și altele.

În gama noastră de produse Dumneavoastră veți găsi toate produsele necesare pentru cofetărie și brutărie: de la produse de categorie econoamă până la categoria premium. Suntem mereu în căutarea noilor produse care ar satisface cele mai rafinate cerințe ale cumpărătorilor.

Î.M. EFES VITANTA MOLDOVA BREWERY S.A.
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http://www.efesmoldova.md

Bere Chişinău 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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http://www.farmmeatgroup.md

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.

Fourchette-M S.R.L. ÎCS
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Rețeaua de supermarketuri **FOURCHETTE**, a făcut primii pași în 1992, în Ucraina, ca mai apoi, în 2006 să apară și pe piața Republicii Moldova cu un concept de supermarketuri de cumpărături pentru toată familia.

Avem 15 supermarketuri în toată țara cu peste de 1 milion de cumpărături lunar și aduce pe rafturile magazinelor peste 40 000 de produse alimentare și de uz casnic. Suntem mândri să spunem că avem ca principii de bază diversificarea sortimentului de produse și accesibilitatea prețurilor pentru toate categoriile de clienți, fără excepție.

FOURCHETTE este un supermarket de cumpărături pentru toată familia, unde fiecare membru își va putea găsi și alege produsele potrivite. Promoțiile noastre săptămânale și lunare fac deliciul cumpărătorilor, astfel încât aceștia devin fideli magazinelor **FOURCHETTE** și sunt remunerați cu campanii și concursuri online și offline foarte des.

Adresele noastre, la care vă așteptăm cu drag:

1. Chișinău, Calea Ieșilor 10
2. Chișinău, bd. Moscova 19
3. Chișinău, str. Arborilor 21
4. Chișinău, str. Ceucari 2/7
5. Bălți, str. Alexandru cel Bun 5
6. Bălți, str. Hotin 17
7. Edineț, str. Independenței 90
8. Soroca, str. Ștefan cel Mare 110
9. Ungheni, str. Națională 17
10. Nisporeni, str. Suveranității
11. Comrat, str. Pobedi 58
12. Cahul, str. Ștefan Cel Mare 20
13. Cahul, str. Ștefan Cel Mare 29a
14. Taraclia, str. Inzova 14a
15. Vulcănești, str. Lenin 79

S.R.L. FRANZELCOM "BONPAN"
Legal address:
9 Valea Bicului str., Chisinau,
Republic of Moldova
Tel: +37369222218
http://bonpan.tilda.ws /
franzelcomsrl@gmail.com

Am început activitatea în 2013, o brutărie mică, într-unul din raioanele orașului, dar a crescut rapid și produsele noastre s-au împrăștiat în tot orașul. Când interesul către produsele noastre a venit din alte regiuni ale țării, am realizat că pur și simplu trebuie să împărtășim cu dvs. produsele noastre delicioase. Dar nu am avut suficiente capacități, atunci am venit cu ideea de a extinde producția. Am decis să înființăm o companie de producție "BONPAN", apoi sa ne bucurăm clienții noștri cu plăcinte și produse de panificație pe toată raza Chișinăului și a suburbiilor.

Vreți să primiți produse proaspete la prețuri accesibile? Suntem bucuroși să oferim acest lucru. Echipa noastră, sunt oameni care vin cu suflet la îndeplinirea obligațiunilor sale de serviciu

Calitate

- În timpul activității noastre, am câștigat încrederea a peste 300 de magazine
- Produsele noastre sunt fabricate din produse naturale și ecologice.
- Perfecțiunea constantă în rețetă, de la clasici la tehnici de creație, pentru fiecare gust.

Încredere

- Compania "BONPAN" activează pe piața Moldovei în 2013.
- Timp de 5 ani de activitate am format un ciclu complet de producție — de la elaborarea unei rețete la livrarea produselor într-un magazin cu logistică bine dezvoltată

Preț

- Oferim condiții confortabile de cooperare, precum și prețuri adecvate între concurenți, datorită la aceasta am devenit liderii de piață în acest segment.

Disponibilitate

- Compania "BONPAN" livrează produse în Chișinău și în suburbiile sale. Datorită logisticii bine stabilite, obțineți produse de cofetărie proaspete la ora stabilită!

„FRANZELUȚA” S.A.
Legal address:
MD 2032, 30 Sarmizegetusa str., Chisinau,
Republic of Moldova
Tel: +37322853460
http://www.franzeluta.info/ /
info@franzeluta.md

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)
- Broad range of confectionery, including waffle products, candy and marshmallows.
- Crisp bread rings
- Gingerbreads, biscuits, cakes
- Refrigerated dough
- Products for Eastern

“CUPTORUL FERMECAT” S.R.L.
Legal address:
22 Pușkin str.; 7 Ierusalim str.; 2/3 Calea Ieșilor str.; 4/6 Mircea cel Bătrîn bd.,
Chisinau, Republic of Moldova
Tel. +37368099913
info.lamamuca@gmail.com

"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.

”La Mămuca” oferă trecătorilor produse bine rumenite și absolut delicioase, cafea și buna dispoziție!

Î.M. "Fabrica de brânzeturi din Soroca" S.A.
Legal address:
MD-3000, 133 Stefan cel Mare str.,
Soroca c., Republic of Moldova
Tel. +37369959494
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".

“LACTIS” S.A.
Legal address:
MD-5600, 73 Komarov str., Riscani,
Chisinau, Republic of Moldova
Tel. +373025628644
https://lactis.md / info@lactis.md

Given the date of the opening of the first butter production department, LACTIS Joint-Stock Company has been working for 68 years now. In 1956, the Cheese Factory from Riscani was opened: it comprises departments of drinking milk, casein and butter. The first part of cheese was produced on November 23, 1969. This date is considered the birth date of the Cheese Factory from Riscani. Lactis JSC is one of the oldest milk processing and marketing enterprises.

Currently, we have 240 employees who are engaged in producing a wide assortment of cheeses: hard, semi-hard, melted and smoked. Alongside with whole milk products (pasteurized milk, kefir, sour cream, whipping cream, butter and fresh cheese), since 2012 a line of milk products, rich in bifidobacteria-bio (2.5% in kefir and 15% in bio sour-cream), has been installed.

Today, Lactis JSC produces 17 sorts of cheeses. In order to have an access to sources of high-quality raw material, Lactis JSC opened 90 milk collection stations in 86 villages of 7 regions of the Republic of Moldova. Most of them are equipped with refrigerating machinery and laboratories, which are specially designed for verifying the quality of the raw material.

Entering the market, Lactis JSC aims at increasing the level consumption of milk products providing the consumer with a high quality and wide range of products. Lactis JSC is systematically expanding its range of products in different segments of the market. Technological equipment is constantly upgraded.

For many years, Lactis JSC won numerous awards, medals and diplomas. Our achievements as regards quality include:

- Great Award “Golden Mercury”
- Award of first and second degree “Silver medal” for the best trade mark of the 2004 and 2006 year
- State Award for quality and competitivity
- Honor Diploma for “The best taxpayer of the 2010 year”
- Silver medal for the best trade mark of the 201 year
- Great Award “Golden Mercury” for the best trade mark of the 2012 year “Social responsible”.

Î.C.S. "Lapmol" S.R.L.
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MD-2023, 17 Uzinelor str.
Chisinau, Republic of Moldova
Tel. +37322410765; +37322410766
www.lapmol.md; www.casutamea.md /
reception@lapmol.md;
casutamea@lapmol.md

Istoricul companiei

Lapmol este unul din producătorii lideri de produse lactate din Republica Moldova cu tradiții de aproape 20 ani. Compania are în prezent 450 angajați (în Chișinău, la fabrica din Călărași și fabrica de unt din Lipcani).

Compania Lapmol a fost fondată în anul 1997. Inițial Lapmol realiza distribuția de produse lactate ale producătorilor locali iar acest lucru a avut impact direct asupra denumirii companiei care vine de la două cuvinte LAPte MOLdovenesc.

În 1999 au fost lansate brînzelele glazurate „Lapmol". Acestea au fost un produs nou pe piața Moldovei și au fost îndrăgite imediat de consumatori. În 2001 a fost înregistrată marca comercială „Big Lapik". Inițial asortimentul de brînzele nu era mare – doar 4 tipuri. În prezent Big Lapik are un sortiment de peste 20 tipuri de brînzele glazurate și brînzele neglazurate.

În 2002 întreprinderea a extins aria de activitate și a început să fabrice produse lacto-acide: lapte, chefir, smîntînă, brînză urmate de lansarea untului. A fost lansată noua linie de produse cu marca comercială „Căsuța Mea". Produsele „Căsuța Mea" sunt fabricate din lapte de calitate înaltă de la văcuțele crescute la fermele din Republica Moldova. Pentru a păstra gustul adevărat și proprietățile laptelui de casă, tindem să mărim constant numărul de ferme-partenere.

În plus, pe lîngă fabricarea produselor lactate, Lapmol este importatorul oficial al mai multor branduri internaționale de renume, printre care se numără produsele Danone. Parteneriatul cu Danone România a început în anul 2000. La moment Lapmol întreține relații strînse de parteneriat cu Danone România și Danone Ucraina, fiind distribuitor exclusiv al acestora în Republica Moldova.

Filosofia companiei

- Misiunea – grija zilnică de sănătatea consumatorilor.
- Strategie – oferirea de produse lactate sănătoase, de înaltă calitate, fabricate local sau a celor mai buni producători internaționali.
- Slogan – Sănătate în fiecare zi!

Lokmera S.R.L.
Legal address:
MD2001, of. 415, 23A Bucureşti str.,
Chisinau, Republic of Moldova,
Tel.: +37322261077
http://lokmera.md / office@lokmera.md

Compania **Lokmera SRL** - a fost fondată in anul 2007 și în scurt timp a reușit să ocupe o poziție de lider în domeniul furnizării echipamentelor de măsurare și control, precum și a soluțiilor integrate de laborator. În prezent, Lokmera - este unul dintre principalii furnizori de echipament metrologic, utilaj analitic, aparatura de testare, sisteme de monitorizare si radioprotecție nucleară de la producători de renume mondial.

Misiunea

Misiunea companiei noastre constă în sporirea competitivității și eficienței clienților noștri prin furnizarea tehnologiilor moderne.

Obiectivul

Obiectivul principal al companiei este găsirea soluțiilor optime, la baza cărora stau cele mai bune practici internaționale, punerea în aplicare a acestora și suportul tehnic pe toată durata de exploatare a echipamentului.

Principii

În scopul realizării misiunii noastre, utilizăm următoarele principii:

- stabilirea relațiilor de încredere, pe bază de corectitudine, cu furnizorii , clienții, și partenerii de afaceri;
- respectarea cu strictețe a obligațiilor contractuale;
- dezvoltarea profesională continuă îndreptată spre creșterea eficienței colaborării cu partenerii.

Datorită profesionalismului si experienței echipei noastre, am realizat cu succes mai multe proiecte în țara, printre care Filiera Vinului, JICA, IMPEFO, DCFTA, EuropeAid, finanțate de către Guvernului Republicii Moldova și comunitatea internațională.

Personalul competent și calificat vă va acorda suportul și toată informația necesară pentru alegerea celor mai bune soluții pentru Dvs. Noi punem la dispoziția Dvs. servicii de consultanță tehnică, instalare, instruire, deservire tehnică și reparația echipamentelor furnizate. Noi propunem soluții testate, ce sunt bazate pe tehnologii avansate în domeniul măsurărilor și adaptate la cerințele clientului.

Tendința spre inovații, care în condițiile contemporane de piață stabilește poziția de lider, reprezintă o parte integrantă a strategiei companiei și pe care noi continuăm să o dezvoltăm împreună cu clienții noștri.

Lokmera - partenerul dumneavoastră de încredere în domeniul măsurării.

Maspex Romania S.R.L.
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Vălenii de Munte, 38-40 Stefan cel Mare str.,
Prahova cty, Romania,
Tel.:+400244283344
www.maspex.ro / hr@tymbark.ro

Maspex Wadowice Group is now one of the largest companies in Central and Eastern Europe in the food products segment. It is the leader in many product categories, such as juices, nectars, non carbonated soft drinks, pasta, jams, ketchups and sauces.

Maspex Wadowice Group's mission is to **offer products that consumers value the most.** The company has a strategy of building strong brands through expansion of its branded products and acquisition of new brands.

Maspex Wadowice Group comprises of 13 manufacturing facilities and logistics centers in Poland and abroad. The company has the most modern logistics and distribution center in Central and Eastern Europe. Thanks to complete process automation, Maspex offers the highest level of service, and the possibility of individual preparation of supply, high standard and quality of service and a convenient location. The logistics, manufacturing and planning based on modern management systems achieves economic indicators that our competitors cannot match.

Maspex Wadowice Group's products are exported to over 50 countries around the world. The company works with customers in European Union countries and the rest of Europe, the US, Canada and the Middle and Far East. **Foreign sales now account for 35% of company turnover**, and exported products reach such far-flung locations as the United Arab Emirates, Malaysia, South Korea, Japan, Uruguay, Mongolia, Ghana, Kazakhstan and Iraq and are available on all continents except Antarctica.

Maspex Romania is one of the leaders of different Romanian segments market. Maspex Romania is a subsidiary of Maspex Wadowice Group from Poland, one of the largest food companies in central and Eastern Europe. Romania represents the second largest market after Poland, both in terms of fiscal value and investments made, but also of purchasing power. The Maspex Group has entered on Romanian market in 1996, and in present is one of the greatest polish investors from Romania. Nowadays, the factory is completely changed. It has a very well equipped laboratory, modern production lines which facilitate market entry with high quality products (using Top Aseptic packaging technology) and it is certified IFS vers. 6.0. The Maspex Group guarantees a permanent development on FMCG market and also the job security of his employees.

„NITECH" S.R.L.
Legal address:
5/3 Hristo Botev str., Chisinau
Republic of Moldova
Tel. +37322920220; +37379308777;
+37379920220
www.nitech.moldagro.md

"NITECH – partenerul dumneavoastră în domeniul aparaturii de laborator"

Nitech oferă clienților săi soluții pentru dotarea laboratoarelor.

Nitech dotează la cheie următoarele tipuri principale de laboratoare:

- laborator științific
- laborator clinic
- laborator fizico-chimic
- laborator de ape
- laborator de mediu
- laborator microbiologic
- laborator pentru controlul materiilor prime
- laborator de metrologie
- laboratoare școlare.

Structura si dinamica Nitech:

- debut activitate 2006
- capital 100% străin
- departamente : Vânzări, Logistica, Tehnic, Service, Administrativ

Echipa Nitech:

- Excelenți profesioniști, specializați în chimie, biologie, fizică, electronică,dar şi în economie şi comunicare
- cursuri de pregătire la furnizori externi din Germania, Elveţia, Austria, Anglia, Olanda, Franţa, Danemarca, SUA, etc.

Nitech vine in întimpinarea Dvs. cu o gamă diversă de echipamente de laborator şi servicii aferente, toate realizate conform sistemului de management al calităţii ISO 9001.

Servicii

Alături de aparatura de înalta performanţă Nitech asigură servicii de calitate şi suport tehnic pentru aplicaţiile Dvs.

Departamentul Service al firmei Nitech vă oferă:

- operațiuni de întreținere, service în garanție şi post-garanție pentru aparatura de laborator
- calibrări
- verificări
- calificări si validări
- consultanta tehnica pentru echiparea laboratoarelor

- decontaminări de hote şi filtre HEPA

Activitatea de service acoperă toata ţara şi este asigurata de o echipa experimentată şi dinamică de ingineri specializaţi la firmele producătoare.

De asemenea NITECH oferă clienţilor săi:

- instruire personal
- livrări din stoc
- asistenţă 24 din 24 ore
- seminarii, expoziţii, demonstraţii practice cu aparatura de laborator

NITECH a creat si a menţinut un dialog continuu cu partenerii si clienţii săi prin intermediul: **www.nitech.md**

Modern si prietenos, site-ul NITECH va da posibilitatea să aflaţi rapid informaţii şi noutăţi din domeniu, dar şi gama de produse şi servicii oferite de NITECH.

Info NITECH este o publicitate dedicată clienţilor şi partenerilor noştri cu ştiri, interviuri, prezentări de produse şi aplicaţii de ultima oră.

Calendarul NITECH , creativitate si umor la fiecare sfârşit de an.

Catalogul NITECH ghidul utilizatorului de aparatura de laborator, o lucrare complexă, în peste 500 de pagini, integral color.

Vă mulţumim pentru interesul şi încrederea Dvs. în produsele şi serviciile NITECH.

Nivali-Prod S.R.L. Î.M.
Legal address:
MD-4822, Dubasarii Vechi vlg, Criuleni cty,
Republic of Moldova,
Tel.: +37322855858
http://www.nivalli.md

Meat and meat products factory, "Nivali-Prod" LLC

• 8 Years of activity of meat and meat products factory *"**Nivalli**".*
• 8 Years of work, passion and creativity.
• 8 Years in which our team of specialists with experince in meat field become a family, meant to satisfy our customers needs.

Keen to come up with something new and qualitative on the consumer market in the Republic of Moldova, in 2010, in the scenic valley of the River Nistru, s. Dubasarii Vechi, r. Criuleni, where does the name *„**Nivalli**" cames from* – Nistru Valley, the inauguration of meat and meat products factory *"Nivali-Prod" has been held.*

The meat factory *"Nivali-Prod"* it is build in accordance with the requirements and rigors of the food industry, equipped with modern machinery and equipment produced in Germany and Austria, which allows the uniques product characteristics, and the possibility of fast adaptation to the evolution of consumer preferences and perception. The meat and meat products factory *"**Nivali-Prod**"* has obtained the certification of the International Standardization Organization ISO:

• ISO 9001- Quality Management System
• ISO 22000 – Food Safety Management System

Relying on **products quality**, the correctness of **delivery in time and excellence of services** we are producing more than one hundred types of meat products, sausages, meat specialties, Moldavian traditional products as well. The art of producing sausages and meat specialties has been fully accomplished in the branded products *„**Nivalli**".*

The main purpose of the company is the manufacture of high quality products, from fresh meet, natural seasonings, individually selected for each product with great passion. Branded products *„**Nivalli**"* satisfy even the requirement of the most versatile gourmets.

Life has a taste, the taste has a name - Nivalli! Welcome to our Family!

I.P. Oficiul National al Viei si Vinului
The National Office for Vine and Wine
Legal address:
MD-2012, 126 Mitropolit Dosoftei str.,
Chisinau, Republic of Moldova,
Tel: +37322105560
http://www.wineofmoldova.com /
marketing@wineofmoldova.com

Wine of Moldova – A legend Alive

The National Office for Vine and Wine is a public institution established by the Law on Vine and Wine

to implement the government policies in the field of viticulture.

The basic missions of the Office are to promote quality wines through the Wine of Moldova program; to manage the production of PGI and PDO wines; and to provide assistance and consultancy to the Moldovan wine industry.

Our wine has been crafted

Our wine has been crafted by generations of winemakers in the largest cellars in the world appreciated by consumers in both east and west supported by legends that everyone can embrace. Moldova is a fertile land. Generations of winemakers crafted our wine with dedication, through centuries. The country's wineries gained worldwide fame. The past and the present intertwined in our legend, inspiring the future of our victories.

Wine made with Care and Passion

Our wine is produced with care by talented winemakers from grapes that are picked from rich vineyards with local varieties and international varieties adjusted to the local terroir. It expresses the authenticity and traditional style of winemaking for consumers who are looking for adventure.

S.C. PLOVDIV-LEN S.R.L.
Legal address:
MD-2068, 6 Moscova bd., Chisinau,
Republic of Moldova
Tel.:+37322440230; +37322441044
http://www.plovdiv-len.md / p
lovdiv-len@bk.ru

Torturi delicioase și frumoase de la Plovdiv Len!

Delectați-vă la evenimentul Dumneavoastră cu un desert, care vă va încânta oaspeții! Torturile se prepară cu acuratețe și dragoste doar din produse proaspete! Gustându-le o dată, garantat le veți mai comanda, pentru că gustul deserturilor noastre vă va urmări!

Torturi de nuntă, cup-cake-uri, prăjituri și alte deserturi la comandă la Chișinău.

Compania Plovdiv-Len oferă o gamă largă de produse de patiserie și cofetărie. Torte la comandă și "Candy Bar" pentru crearea unei ceremonii impresionante.

Î.I. "Pleşca Elena"
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MD-4101, 10 Ion Popusoi str., Cimislia c.,
Cimislia cty, Republic of Moldova
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plescabrutarie@gmail.com

Dried fruits

Starting in 1999, with a noble purpose to provide the population with the bakery, we all know the situation post-Soviet 90-2000, exchange currency and its deficit.

However, the head of the enterprise, Mrs. Elena Plesca earnestly and dignity raised the business to a level much higher than initially inherited since the Soviet period.

All this has been possible thanks to the studies in the youth and changes made to the companies as a result of market research and producers from abroad, already then-Republic of Moldova.

The knowledge obtained in France led to the change of old equipment on one performance, more economical that is still allowed further production of bakery items, with a much higher profit and with a more qualitative product, we all know the "Franzela/Loaf Franceaza", croissants and many other products.

Currently, the company provides two southern districts of the country with bakery products, has annual certification of products by NISM and also for metrological control.

FPC Rogob S.R.L.
Legal address:
1/1 Gloriei str., Goianul Nou vlg., Stăuceni cty., Chisinau, Republic of Moldova
Tel.: +37322866556
www.rogob.md

Fabrica Noastră

Deja de 20 de ani, ROGOB este una dintre cele mai mari companii de mezeluri proaspete din Republica Moldova, o companie în care grijă pentru calitatea produsului se reflectă in toate procesele tehnologice realizate cu ajutorul celor mai moderne tehnologii de procesare. Întreprinderea are cea mai modernă și mai mare fabrică de mezeluri din țară, ce ocupă o suprafață de 5000 m^2 și este construită după model european, care corespunde tuturor normelor sanitare și standardelor de calitate europeană. Întregul lanț de producție și distribuție a produselor noastre respectă cu strictețe normele impuse de Uniunea Europeană. Fabrica este utilată cu cel mai performant echipament tehnic, achiziționat de la liderii mondiali în domeniul utilajelor de producere a mezelurilor: Handtmann, Seydalmann, Poly-Clip, Ulma, Mutivac și alții. Munca depusă timp de 2 decenii este răsplătită prin fidelitatea clienților noștri și aprecierea întregii țări.

Evoluție ROGOB

Fondată în anul 1997, compania ROGOB s-a dezvoltat pe parcursul anilor, devenind astfel lider în domeniul producerii și comercializării mezelurilor.

Suntem cea mai mare și cea mai modernă întreprindere de realizare a delicateselor din carne din toată țara, cu o capacitate de producere ce depășește 50 de tone de produs finit zilnic.

Produsele ROGOB sunt vândute în **peste 4.400 de puncte comerciale** din țară precum și în propria rețea de magazine specializate, formată din **22 de magazine**.

Propunem **o gamă** variată de peste **250 de produse** - mezeluri inedite pentru piața din Republica Moldova prin tehnologia nouă de fabricare și prin compoziția naturală și sănătoasă a acestora.

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“Salent Exim”

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Despre Companie

SRL „Salent Exim” și-a început activitatea în anul 2012, iar direcția principală de dezvoltare este producerea produselor de cofetărie, asigurând livrarea și comercializarea produselor marca **Salenti** pe întreg teritoriul țării și peste hotare.

Compania „Salent Exim” are sediul și producerea în Republica Moldova, producând o gamă largă de produse de cofetărie, și anume **„Marmeladă în asortiment”,** fiind în continuă dezvoltare, începând cu anul 2018, compania și-a mărit capacitatea de producție cu o linie modernă de fabricare a biscuiților cu umplutură și alte sortimente de biscuiți fragezi. Producătorul oferă produse calitative în conformitate cu toate cerințele în vigoare.

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Fabrica **OLOI PAK SRL** este amplasată în orașul Comrat și a fost fondată în anul 2003. Este una din principalii producători de produse lactate din Republica Moldova, zilnic procesează aproximativ 10000 litri lapte. Întreprinderea fabrică produse lactate sub brandul SANA. Produsele finite care se fabrică sunt: lapte de consum pasteurizat, chefir, smântână, brânză proaspătă, iaurt, unt. Pentru toate produsele SANA se folosește lapte obținut în cadrul fermei SRL „Doksancom", din satul Tomai, raionul Ciadîr-Lunga.

În anul 2016 Fabrica OLOI PAK SRL a fost premiată în cadrul ediției a III-a a concursului „Operator Alimentar Responsabil", fiind o întreprindere care operează în domeniul alimentar în mod responsabil, ținând cont de interesele și drepturile consumatorului.

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Velmart-ul este primul hypermarket-discouner din Moldova. **Velmart**-ul înseamnă: prețuri mici; aranjarea compactă și comodă a mărfurilor fără a ține cont de branduri; un sortiment larg de produse vândute în vrac. Misiunea noastră – de a oferi cumpărătorilor doar produse de calitate la cele mai bune prețuri. Principiile și valorile noastre: satisfacerea celor mai mari așteptări ale cumpărătorilor și partenerilor noștri; oferirea cumpărătorilor doar produselor de calitate; implementarea inovațiilor ca să corespundem cerințelor cumpărătorilor noștri; să fim un etalon pentru clienții noștri în deservirea rapidă și de calitate, în oferirea asortimentului larg de mărfuri, inclusiv a diversității produselor fresh la prețuri optime; să fim consultanți și consilieri buni pentru fiecare cumpărător; cea mai mare apreciere pentru noi – zâmbetele cumpărătorilor noștri. Unul dintre principalele avantaje ale hypermarketului **Velmart** – este stabilirea relațiilor de parteneriat cu producătorii ceea ce ne permite să obținem cel mai bun preț de pe piață. Evitând intermediarii, putem oferi clienților noștri o gamă larga de produse la cele mai mici prețuri.

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