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DEFINING A CRITERIA FOR THE IDENTIFICATION OF A TECHNIQUE FOR PRODUCING TOMATO JUICE (p. 6–12)**Oleksandra Babii**

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The basis of modern analysis of the quality of juice products is a matrix approach. The essence of the matrix approach is to define a series of parameters, which comprehensively characterize the composition of juices. In this regard, it is important to study the content of individual biologically active components in addition to general quality parameters in evaluation of juices. The content of individual biologically active components depends on the origin of raw materials and technology of processing.

Analysis of the chemical composition of tomatoes showed that carotenoids are characteristic nutrients inherent to this particular kind of vegetables. In this regard, we propose the content of β -carotene as the most acceptable criterion for identification.

We studied quality of tomato juices by organoleptic and physical-and-chemical parameters (soluble solids content, total acidity, mass fraction of pulp and β -carotene content) in order to confirm a method of production of tomato juices, namely, the method of recovery or direct pressing.

The profile analysis showed that the most positive parameters were in the juices of «EosBio» TM and «Galicia» TM, which makes us assert that their production technique was direct pressing. We established that the mass fraction of soluble solids, titratable acids and pulp met the requirements in all samples. The largest mass fraction of pulp was in the juices of «Galicia» TM – 30.80 and «EosBio» TM – 24.23. This data confirms that the method of production of these juices was direct pressing.

We established that the content of β -carotene in the juices of «Sandora» TM, «Rich» TM and «Sadochok» TM produced by the method of recovery was in the range of 0.24–0.32 mg/100 g. At the same time, these values were significantly higher in the juices of «Galicia» TM and «EosBio» TM produced by the method of direct pressing, they were 0.589 and 0.591 mg/100 g, respectively. Thus, we confirmed the assumption about the connection between a production method and the content of β -carotene in tomato juices. We proposed using this parameter as a marker criterion for the identification of a technique for producing tomato juices.

Keywords: tomato juice, recovery, direct pressing, β -carotene, identification criteria, high-quality falsification.

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DEVELOPMENT OF NANOTECHNOLOGIES FOR CURD DESSERTS AND FRUIT AND VEGETABLE CRYO-ADDITIVES FOR THEIR PREPARATION AS BAS ENRICHERS, STRUCTURE-FORMING AGENTS, AND COLORANTS (p. 13–22)

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The paper reports the newly devised method and nanotechnology for production of curd desserts for healthy nutrition. They include the mechanical processing of curd grains accompanied by processes of mechanical activation and non-enzymatic catalysis of the casein-calcium-phosphate complex into a nanoscale form, as an innovation. The nanotechnology of cryo-additives made from fruits and vegetables has been devised. We used them as fortifiers with biologically active substances (BAS), natural structure formers and colorants in curd desserts. New curd desserts have the nanoscale form and possess a high content of natural BAS of fruits and vegetables (β -carotene, phenolic compounds, tannins, chlorophylls, L-ascorbic acid and soluble pectin substances). The latter serve as natural fortifiers and structure formers in curd desserts. The above makes it possible to eliminate a need to use food additives and synthetic additives.

The low-fat curds were used as a base for production of curd desserts for healthy nutrition. We selected the following raw materials for production of fruit and vegetable cryo-additives: carotene-containing fruits (pumpkin, apricots, and sea buckthorn), citrus (lemons with rind), Jerusalem artichokes, spinach, and apples.

We considered homogenization of a product as a technological approach, which leads not only to obtaining of a homogeneous structure of a product, but also to processes of mechanical activa-

tion, mechanical destruction and mechanolysis, which is destruction of a protein to its individual components. An increase in the mass fraction of free α -amino acids and simple peptides occurs during the mentioned processes. The study showed that 40...45 % of the bound α -amino acids of protein transform into a free, easily digestible form. The size of α -amino acid molecules is from 0.3 to 1.5 nm. We revealed the mechanism of the process associated with the mechanocracking of protein and its components with mineral substances in the study.

The fillers in the form of cryopaste made of fruits and vegetables for curd desserts have been prepared. They are the source of a unique complex of natural biologically active substances, namely, phytocomponents, such as phenolic compounds (1...2.1 %), carotenoids (32.6...45.6 mg per 100 g), L-ascorbic acid (102...260 mg per 100 g), and chlorophylls (800...1,680 mg per 100 g). We showed that fruit and vegetable cryopastes exceed raw materials by 2.5...3.5 times in the content of biologically active substances, due to extraction of hidden forms of BAS from raw materials. In addition, they have a high content of soluble pectic substances due to extraction of hidden inactive forms into a free form from fresh raw materials when preparing paste-like cryofillers. We developed formulations and technology for curd desserts and studied the content of BAS. Curd desserts exceed the known analogues by chemical composition.

Keywords: nanotechnology, curd desserts, fruit and vegetable raw materials, mechanolysis, mechanocracking, homogenization, cryoprocessing, α -amino acid, BAS.

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DETERMINING THE RATIONAL MODES FOR LOW-TEMPERATURE STORAGE AND FOR OBTAINING PRODUCTS OF JAPANESE QUINCE PROCESSING WITH HIGH CONSUMER PROPERTIES (p. 23–29)

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The article reports a comprehensive study into the rational modes for low-temperature storage and for obtaining the products of Japanese Quince processing with high consumer indicators by examining the kinetics of freezing and by investigating microbiological indicators of samples.

The study of behavior of a representative part of Japanese Quince in the process of low temperature storage was conducted.

It was found that an increase in the weight of the liquid part and a decrease in the weight of the solid part are observed at an increase in the number of cycles of freezing and centrifuging.

The cryoscopic study of the product of Japanese quince processing with the use of a low-temperature calorimeter was carried out, which made it possible to regulate the temperature and the freezing rate and to record continuously the temperature of the samples. It was established that the content of the frozen moisture increases from 84.8 % to 87.0 % for the liquid part and from 63.7 % to 64.9 % for the solid part.

The first and the second ranges of crystallization temperature and the temperature of melting of frozen moisture in the products of Japanese quince processing were determined quantitatively. It was noted that freezing at temperature of minus 20±2 °C contributes to complete conservation of products.

The research into the changes of microbiological indicators of quality and safety of the products of Japanese Quince processing within 270 days of storage at the temperature of –18±2 °C was performed. It was found that the amount of MAFAM, yeast and mold did not exceed the requirements of DSTU 6029:2008 «Semi-finished frozen fruit and berry (crushed and puree-like) products». The obtained data indicate the consumer safety of these products during the whole storage period.

The data obtained make it possible to determine reasonably the optimal modes of low-temperature storage of processed products of Japanese Quince and get certain effects from their introduction in production. This will offer an opportunity to expand the range of frozen products based on domestic raw materials.

Keywords: Japanese Quince, frozen products, kinetics of freezing, defrosting, microbiological indicators.

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DEVELOPMENT OF MEASURES TO IMPROVE MILK QUALITY AND SAFETY DURING PRODUCTION (p. 30–39)

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The number of somatic cells in cow milk affects its quality indicators, grade and safety. The level of somatic cells in milk depends on the state of the udder in animals. That is why it is important to diagnose sub-clinical mastitis of cows and prevent its occurrence.

The performed studies made it possible to determine the histological spectrum of somatic cells in cows of the Ukrainian black-speckled dairy breed. It was experimentally proved that the microorganisms, selected from the cow udder skin are identical to the microflora, which causes sub-clinical mastitis disease in cows.

As a result of the conducted research, the way of passing pathogens of mastitis infection through the rubber of milk glasses of milking equipment was identified.

In addition, the spectrum of the pathogens of sub-clinical mastitis was determined and the scheme for disease prevention and its spreading among the herd of dairy cows was developed. The experimental researches proved the efficiency of using rapid mastitis test that makes it possible to remove from herds the cows with poor quality milk in due time.

The emergence of ketone bodies in milk increases its acidity and reduces the milk quality. Acidity index characterizes the nutritional value of milk and is controlled when milk is accepted to a dairy factory. In this case, an enterprise loses money due to milk grade lowering.

The method for prevention and treatment of ketosis in cows based on chelates of metals due to the improvement of metabolic processes in cows' rumen was experimentally developed. The performed studies revealed the interrelation between the state of the rumen microflora and emergence of acetonemia in cows. Thus, the suggested measures provide an opportunity to enhance the quality and safety of cow milk by reducing the number of animals with symptoms of mastitis and ketosis in a herd.

Keywords: somatic cells, sub-clinical mastitis, microflora, milk cup rubber, milk quality, ketone bodies.

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IMPROVEMENT OF THE PROCESS OF
HYDROTHERMAL TREATMENT AND PEELING
OF SPELT WHEAT GRAIN DURING CEREAL
PRODUCTION (p. 40–51)

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The influence of hydrothermal treatment (grain moistening, steeping) and peeling duration on the yield and quality of spelt wheat cereal was studied. The mechanism of the influence of the studied factors on the formation of cereal and culinary quality of the product was established. A comparative analysis of the yield and quality of cereals after hydrothermal treatment at actual humidity content from 13.0 to 14.0 % was performed. Due to the hydrothermal treatment, the properties of the endosperm and shells change significantly. This leads to an increase in the strength of endosperm and formation of higher yield of the finished product. The influence of peeling duration and hydration gradient on the yield of cereal and middling is reliable. The influence of duration of spelt wheat steeping on this process was insignificant. Application of grain damping (humidity content of 15.0–16.0 %) makes it possible to increase the yield of cereal from 88.6 % to 91.7 %. Culinary quality does not change in this case.

The obtained mathematical models of the influence of damping steeping, peeling of grain on the yield and quality of cereals are linear.

Their accuracy is proved by the high determination coefficients ($R^2=0.97-0.98$) and by the absence of autocorrelation of residues.

In the technology of production of cereals from spelt wheat the recommended method of hydrothermal treatment implies its damping up to 15.0 % of moisture content, which makes it possible to increase the yield of cereals by 3.1 %. The difference from the classical method is the absence of the grain steeping phase before peeling. Damping of spelt wheat grain up to 15.0 % with peeling duration of 160 s is optimum. The proposed way of treatment allows getting 86.5 % of cereals with culinary quality of 8–9 points.

The developed recommendations may be used by food industry enterprises during conducting marketing activities or production intensification.

Keywords: hydrothermal treatment, spelt, culinary estimation, competence of experts

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RESEARCH INTO THE STRUCTURAL-MECHANICAL PROPERTIES OF SHORTBREAD DOUGH WITH OILSEED MEALS (p. 52–59)

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This paper reports results of research into the application of oil-seed meal in the technology of flour-based confectionery products, specifically shortbread dough. We have investigated the structural-mechanical properties of shortbread dough with the addition of meal from the seeds of sesame, nut, and flax. It has been revealed that the indicators for elasticity, plasticity, and distensibility decrease compared to control sample by 4 % to 40 % when adding the meal of sesame, nut, and flax whose content ranges from 10 % to 30 %. Adding meals helps reduce the amount of gluten-free flour, which is a positive factor for making shortbread dough. Adding a composition of the specified meals at a ratio of 1.5:2:1.5 to shortbread dough increases the content of protein, fiber, macro- and micronutrients.

We have performed sensory quality assessment of shortbread dough semi-finished products made from oil-seed meals. The distensibility of control and experimental samples of shortbread dough semi-finished products has been calculated when replacing flour with a 10 %, 20 %, and 30 % of the composition. We have estimated the structural-mechanical characteristics of shortbread dough – deformation, relative plasticity, elasticity, distensibility. A diagram has been constructed for the deformation dynamics of shortbread dough that contains the model compositions of sesame, nut, and flax meals. The developed dough semi-finished products demonstrate the reduced indicators for plasticity, elasticity, distensibility, and deformation. It has been determined that the amount of gluten in shortbread dough decreases and the developed products show a greater fragility. It was found that the best sensory indicators were demonstrated by the sample with a 20 % content of meals in the flour.

We have experimentally confirmed the appropriateness of using oilseed meals, as well as devised a technology of flour confectionery products made from shortbread dough. It has demonstrated the increased protein content, by 2.4 times, selenium – by 41.2 times, fiber – by 4.7 times, calcium – by 18.4 times, magnesium – by 8.5 times, vitamin E – by 9.1 times. It was established that the developed functional products have improved food and biological value and fragility.

Keywords: shortbread dough, meals, oilseeds, structural-mechanical properties, dough deformation.

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DEVELOPMENT OF THE FORMULATION FOR EXTRUDED PRODUCTS BASED ON SUGAR CORN GRAIN AND DETERMINING THEIR QUALITY INDICATORS (p. 60–69)

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The formulations of extruded products based on sweet corn grain, bare-grain barley, carrot root crops, and licorice root and collagen hydrolysate have been developed.

We determined physical-and-chemical parameters (wettability, digestibility, and microstructure) of the extrudates obtained. The hardware-technological scheme of production and analyzed parameters of wettability and digestibility are presented. The study of the composition of micronutrients showed that consumption of 100 g of «Kukurudzianka» sticks satisfies the human need for vitamins A and B₆ by 76.62 and 75.76 %, respectively, and consumption of 100 g of «Kukurudzianka+» – by 80 and 79.25 %. The data obtained showed that an increase in temperature and pH of a medium leads to an increase in the wetting ability of the developed sticks by 14...15 % on average.

In vitro studies established that the products developed have a rather high degree of digestibility, which reaches 85 %.

The obtained data from the study of quality indicators showed that the content of sanitary-indicative microorganisms corresponds to the sanitary-and-hygienic requirements for breakfast cereals at storage for 6 months at a temperature of (15±5) °C and humidity of 70...75 % in polypropylene packaging.

The developed products have a high content of protein substances, which is quite important for meeting the needs of a human body nowadays. Consumption of 100 g of sticks will provide a human body with essential amino acids by almost 24.1 % in general. The products presented in the study have a rather high content of basic micronutrients necessary for a human body, namely calcium, phosphorus and potassium.

We can recommend the developed extrudates for use by adolescents, children, for diets and consumption of other segments of the population.

Keywords: mathematical modeling, definition of quality, corn grits, extruded products, protein, collagen, storage, processing of grain.

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DESIGN AND STUDY OF EQUIPMENT FOR ACCEPTING AND DRYING SOYA SEEDS WITH HIGH MOISTURE CONTENT (p. 70–78)

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The studied designs of existing equipment for post-harvest processing do not ensure careful reception and drying of high-moisture soya seeds which leads to a decrease in quality and yield loss. To solve this problem, a mobile device was developed and manufactured for accepting and drying in one pass of a high-moisture soya piles, that is, a cloth air-slide conveyor. The developed device design with a low

specific quantity of metal provides reception, drying and transportation of high-moisture seeds. These advantages have been achieved through the use of additional air supply ducts in the design and woven materials including woven sieves with a coefficient of open space increased to 46 %.

Drying of wet materials is the most critical operation in humid climate areas. The use of existing reception departments and devices for drying and ventilating seeds of leguminous crops does not ensure quality and reduction of costs of drying high-moisture seeds in the areas of high humidity.

The use of additional ducts for supplying air from the cloth screens in the design of the cloth air-slide conveyor can additionally increase supply of the drying agent to the pile layer by 60 %. The design of the drying chamber ensures high uniformity of drying with deviation of the relative moisture of soya seeds no more than 1.2 % and an increase in their germination capacity by 4.5 %.

The use of the developed cloth air-slide conveyor makes it possible to receive high-moisture seeds of loose crops in batches of various weights and dry them at high quality, without injury in one pass at the least energy consumption. Features of the design open up the possibility of its use in areas of high humidity at enterprises with various product outputs.

Keywords: dryer, drying of soya seeds, cloth air-slide conveyor, screen of bolting cloth, post-harvest treatment.

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