

ABSTRACT AND REFERENCES

TECHNOLOGY AND EQUIPMENT OF FOOD PRODUCTION. PART 1

INFLUENCE OF MOTION PARAMETERS OF THE DRYING AGENT ON KINETICS OF MIXED HEAT TRANSFER DRYING (p. 4-8)

Micola Pogozhikh, Andrey Pak, Alina Pak, Maxim Zhrebkin

The paper deals with studying the influence of motion parameters of the drying agent on the kinetics of mixed heat transfer drying for obtaining the requirements to functional features of turbulators, used in drying by this method.

It was noted that one of the promising drying methods in terms of increasing the dehydration intensity, reducing specific energy consumption per unit of dried products and preserving the feedstock quality is mixed heat transfer drying.

Installation for studying the influence of motion parameters of the drying agent on the temperature kinetics and the moisture content kinetics of feedstock during MHT-drying was designed and built. Based on studies of temperature kinetics and moisture content kinetics of feedstock at different angles of blowing of mass transfer gaps by drying agent from the range 0°–90° it was found that the temperature kinetics of feedstock at the investigated blowing angles are of nature, typical for the MHT-process. It was determined that the dehydration duration is the longest for blowing angles 25°–35°, time the thermogram achieves local minimum and, respectively, maximum of drying speed for this range is the latest. It was found that at increasing and decreasing the blowing angle with respect to this range, drying duration reduces and maximum dehydration speed is reached earlier. It is noted that inserts-turbulators, which are structural features of MHT-dryers, must provide blowing of FC mass transfer gaps by drying agent at angles, close to rational, which are the angles 0° and 60°.

Keywords: mixed heat transfer drying, functional capacity, temperature kinetics, turbulent disturbances, blowing.

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MODELING OF THE PROTEOLYSIS PROCESS OF FISH COLLAGEN RAW MATERIALS (p. 8-13)

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The studies aimed at modeling the process of fish collagen raw material proteolysis by using enzyme preparations of collagenase and bromelin are given in the paper. The data for determining reasonable ranges of the proteolysis parameters, in particular, the temperature and duration of the proteolysis, pH and concentration of enzyme preparations, are given. The obtained set of data indicates the high efficiency of collagenase in relation to connective-tissue proteins. The mathematical model of the process of fish collagen raw materials proteolysis was developed and significant technological factors that provide functional and technological properties of the final product were determined. The proteolysis parameters, namely duration of (9...11)×60 s, temperature of 40±2 °C, type and concentration of the enzyme preparation $C_{\text{collagenase}} = 0,050 \pm 0,005$ % to the mass of fish raw materials, value of the pH medium 7,0±0,2 were scientifically justified. The obtained results can be used for solving the problems of control and management of the process of the fish collagen proteolysis and controlled accumulation of water-soluble fractions of connective tissue of the salmon skin, depending on the composition and type of the raw materials.

Keywords: fish collagen raw materials, proteolysis, protein supplement, collagenase, bromelin, mathematical modeling.

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EFFECT OF HOT TREATMENT BY ANTIOXIDANTS ON THE SHELF LIFE AND QUALITY OF SWEET PEPPER (p. 14-18)

Olesia Priss, Valentina Kalitka

In order to prolong shelf life of sweet pepper and maintain its high quality heat treatment solution by integrated antioxidant is proposed in the article.

This treatment involves dipping the fruit in a solution of antioxidant complex with ionol, lecithin and horseradish root extract at a temperature of 45 °C for 15 min. The use of this treatment allows to extend the duration of pepper fruits storage for 2 weeks. The level of chilling injury can be reduced in 7 ... 9 times, the chilling severity can be reduced in 9 ... 12 times. An average weight loss per day during treatment is reduced almost twice, the rate of decline of dynamic firmness is reduced in 1.4 times. All this contributes to the increasing of the commodity products output of, which makes up 88 % with taking into account weight loss after storage for 30 days.

Keywords: storage, postharvest treatment, antioxidants, sweet peppers, chilling injury.

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SENSORY ANALYSIS OF BIOFORTIFIED PICKLED PEPPERS (p. 18-24)

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A sensory analysis of biofortified pickled peppers, obtained by traditional production technology and technology, which provides additional use of ginger root in the spice rack is conducted. Peppers for processing are grown using eco-friendly fertilizer "Rivern", which provides a natural increase in the content of vitamins and minerals in vegetables (agronomic biofortification).

Applying biofortification when growing vegetables is one of the ways to increase the content of important for people minerals and vitamins, which in turn affects the balance of the diet.

But today the impact of biofortification on the sensory properties of the obtained crop products remains uninvestigated. Also, there is no information about the possibilities of using biofortified vegetables for processing, as well as change in sensory parameters of finished products depending on the production technology.

Modern analytical estimation methods - categorization method (gradation by quality) and quantitative descriptive (profile) method were used during the study. The results have proved that pickling as a way of processing biofortified peppers is appropriate. Using ginger root in pickling improves the finished product quality, in particular flavor and aroma. Profile taste analysis of biofortified pickled peppers has led to the conclusion that the sample, produced with adding the ginger root in the spice rack, was characterized by a pleasant, spicy and harmonious flavor. The aroma of pickled biofortified peppers, produced with using the spice rack with the added ginger root, was spicy, harmonious, very enjoyable and impressed tasters more than that of the control sample.

Thus, biofortified peppers can be used for pickling processing using different spice racks. Agricultural producers of biofortified vegetables can plan pickling for their processing, which is able to give high sensory properties to finished product.

Keywords: pickling, sensory analysis, descriptors, biofortification, pepper, fertilizer "Rivern", ginger, method.

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INCREASING OF MICROBIOLOGICAL STABILITY OF BAKERY PRODUCTS WITH USING PLASMA-CHEMICAL TECHNOLOGIES (p. 30-36)

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Solving the problem of preventing spoilage of food products is one of the most important tasks of the food industry. Bakery products refer to the segment of food products with a high demand in the market, therefore, the question of their safety is extremely important. Synthetic additives, the presence of which can adversely affect human health are often used to extend the shelf life of bakery goods. Using water pretreatment by contact nonequilibrium low-temperature plasma is an innovative approach to the raw materials preparation at the initial production stage of bakery goods. The results of studying the effect of plasma-chemically activated water on the change of consumer properties of bakery products, related to their microbial spoilage during storage are given in the paper. It is shown that using water, additionally treated by contact nonequilibrium plasma prevents molding of a wide variety of products that allows to extend their shelf life. Applying plasma-chemically activated water adversely affects the development of the spores of bacteria, which cause the potato disease of bread. An increase in the microbiological stability of products is demonstrated by a significant reduction in the amount of mesophilic-aerobic and facultative-anaerobic microorganisms and mold fungi in the products, manufactured under the proposed technology. Using the water, exposed to the contact nonequilibrium plasma ensures the manufacture of high-quality storage-stable bakery products that in turn allows to solve the problems of manufacturing ecologically pure food products and the world food problem.

Keywords: bakery products, plasma-chemically activated water, microscopic mold fungi, potato bacillus.

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NEW POSSIBILITIES OF PROCESSING OF ESSENTIAL OILS FOR FOOD AROMATISATION (p. 24-29)

Natalia Frolova, Olena Usatiuk

The paper gives new possibilities of processing essential oils, which ensure obtaining individual aromatic substances of high purity, establishing their organoleptic, physicochemical properties and physiological effect on the human body. The sequential combination of three stages of processing: vacuum rectification, preparative extraction and gas chromatographic control of content purity of the obtained products, was proposed for the first time. The conditions for the separation and extraction of components of essential oils were optimized. The technique of analytical gas-solid chromatography on an optically active stationary phase to control the purity of the extracted substances was developed. The obtained aromatic products, namely the individual components of essential oils and “narrow” vacuum rectification fractions, relate to natural flavors, which are in short supply in the domestic market today. The research results will promote the development of domestic technologies of food flavors, are of considerable attractiveness for food, perfume and cosmetics, pharmaceutical and other industries.

Keywords: essential oils, aromatics, “narrow” fraction, vacuum rectification, natural flavors.

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IDENTIFICATION OF ENTEROBACTER SAKAZAKII IN RAW MILK FOR DRY INFANT FORMULA PRODUCTION (p. 42-47)

Oleksandra Bergilevych,
Yevhenuya Hryshyna, Victoria Kasianchuk

Microorganism *E. sakazakii* was first identified in Ukraine in general and in raw cow's milk in particular. Cultural, morphological and biochemical properties of 8 strains of this microorganism were studied, whereby one of the strains has been deposited with the National Collection. *E. sakazakii* was identified in raw milk in 22.3 % of cases. Direct correlation between the total bacterial milk pollution and *E. sakazakii* identification was determined. Average *E. sakazakii* count in 1 ml of raw milk, in which the total microbial count was up to 100.000 CFU/ml, was from 3 CFU/ml to 10 CFU/ml. In milk with high total bacterial pollution level – 500.000 CFU/ml, the *E. sakazakii* count was on average 150 CFU/ml – 200 CFU/ml. Optimal raw milk storage conditions: 4 °C for 12–24 hours, in which the *E. sakazakii* growth and development slows down were determined. Thermoresistivity level of *E. sakazakii*, which is 58 °C – 60 °C was defined.

It was proved that the raw cow's milk can be a potential source of contamination of dry infant formulas by *Enterobactersakazakii* in case of failure of proper control over its obtaining, storage, transportation and processing and therefore pose a threat to children under the age of 12 months, who are fed by these formulas. It is recommended to pasteurize raw milk for producing dry infant formulas at a temperature no less than 70 °C.

Keywords: enterobactersakazakii, dry infant formulas, total microbial count, raw milk.

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ACIDITY DYNAMICS OF HYDROLYZED SWEET CONDENSED MILK IN THE STORAGE PROCESS (p. 37-41)

Yelena Kalinina, Oleksandr Kovalenko, Olga Kornilova

There is almost no market for low-lactose products in Ukraine, except infant formulas, that is why, about 10 % of the population are limited to the consumption of dairy products. Recently, there are attempts in creating dairy products wherein the lactose is partially hydrolyzed by the β -galactosidase preparations. Creating low-lactose dairy products is of great social importance, the regulation of sugar profile of dairy products by the lactose fermentation is relevant. Herewith, lactose is split into monosaccharides glucose and galactose, the chemical composition of milk is changed, which enables saving sucrose when manufacturing sweet condensed milk, in the finished product organoleptic indicators are improved, excluded the possibility of lactose crystallization in sweet condensed milk during storage, the new products are designed for people intolerant to lactose and a wide range of people.

The studies of determining the quality of new products are given in the paper, the organoleptic and physico-chemical characteristics of hydrolyzed sweet condensed milk were defined for the first time: water activity, osmotic pressure, weight ratio of dry solids, titratable and active acidity in fresh products and during storage.

Keywords: low-lactose products, titratable acidity, active acidity, organoleptic characteristics, water activity.

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STUDY OF THERMODYNAMICS OF COMPLEX FORMATION OF FLAVONOIDS OF STEVIA (*STEVIA REBAUDIANA BERTONI*) LEAVES (p. 47-50)

Inga Kuznetsova

Scientists have studied the mechanisms of forming complexes between flavonoids of different plants and ions of iron and copper. Stevia is one of many plants, rich in biologically active substances and which is practically uninvestigated. In particular, the antioxidant effect of flavonoids of stevia leaves is not studied and there are no data on its thermodynamic properties, namely the possibility of natural flow of the complex formation process. There are no data on the possibility of forming the complex of flavonoids with aluminum ions.

Taking into account that the dried leaves of stevia (*Stevia rebaudiana Berton*) is a rich source of flavonoids, their antioxidant action was studied based on thermodynamic researches. It is determined that 65 % of flavonoids of stevia leaves are involved in forming the complex with aluminum ions. The degree of complex formation of the flavonoids of the leaves of stevia, grown in different agro-climatic zones of Ukraine was calculated. The Gibbs energy of stevia flavonoids is 12,8–13,8 that indicates the natural flow of the complex formation process. Stability constant of the formed complex is 250.6 l/mol. It was determined that the stevia leaves are a rich source of flavonoids, which take active part in the complex formation and show antioxidant effect. The obtained research results have become the basis for the developed nomogram, which allows to speed up defining the complex formation degree depending on the content of flavonoids in stevia leaves.

Keywords: stevia leaves, flavonoids, complex formation degree, Gibbs energy, stability constant.

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STUDY OF INFRARED SPECTRA OF EXTRACTS FROM ROSE HIP, SEA BUCKTHORN AND VIBURNUM (p. 51-55)

Denis Mironov

The possibility of using a vortex layer of ferromagnetic particles for processing rose hip, sea buckthorn and viburnum in preparing them for the extraction process was considered. To study the influence of the turbulent layer of ferromagnetic particles on plant raw materials, the spectrophotometric method was chosen, as one of the most accessible and precise. The study aimed at investigating the influence of the turbulent layer of ferromagnetic particles on the qualitative indicators of plant extracts. The performed experiments allowed to confirm that extracts based on alcohol-water extractants do not differ from extracts based on water extractants. In extracts from fruits treated in the turbulent layer of ferromagnetic particles, the indicators of phenolics, sugar, biopolymers, organic acids were much higher than in the control samples. This allows to eliminate the stage of dealcoholizing plant extracts in the manufacture of soft

drinks, to increase the quality indicators, and to develop new manufacturing technologies.

Keywords: IR – spectra, extracts, turbulent layer of ferromagnetic particles, dealcoholizing, soft drinks.

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MATHEMATICAL SIMULATION OF THE ORGANIC DISPERSE MATERIAL MECHANICAL TREATMENT PROCESSES (p. 55-61)

Evgen Shtefan, Dmitro Rindyuk, Sergey Kadomsky

The concept of presenting disperse masses in the form of two-phase mixtures of porous or granular solid deformed structure with a liquid or gas is accepted. To describe the mechanical behavior of such materials, the notions of stresses, deformations, density and the rate of changing these parameters are used. Since these tensor and scalar properties have a local nature, mathematical operations of passage to the limit, when the space elements (volumes and surfaces) are contracted to the points (material) are proposed for their determining. This allowed to partially apply the traditional continuum models, in which points are identified with the particles of the medium (infinitesimal volume of material continuum), and they in turn are elementary carriers of the material properties.

Based on the accepted concepts, a new approach to creating mathematical models of mechanical treatment of food materials is proposed.

The basic provisions of this approach are:

- formulating boundary-value problems of the mechanics of disperse moisture-saturated food materials in the mode of elasto-viscoplastic deformation of the solid phase;
- using computer projection-grid methods for solving the set tasks;
- modern computer technologies for effective use of software systems;
- developing and conducting experimental studies on determining the rheological properties of the solid phase of the material.

Using the developed model concepts on the structural-mechanical properties of disperse materials and corresponding digital models within the proposed information design technology will ensure performing a complex of design calculations when considering typical technological operations of processing raw disperse materials in the food and pharmaceutical industries.

Keywords: disperse materials, mathematical model, solid phase, processing, deformation, defining relationship.

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INFLUENCE OF INCORPORATING HONEY, ROYAL JELLY AND POLLEN ON BIOTECHNOLOGICAL PROCESSES OF DAIRY DRINK (p. 62-65)

Neonila Lomova, Olga Snezhko

The influence of adding bee honey, royal jelly and pollen on the incubation time, smell, taste and texture of dairy drink, obtained by the fermentation of starter cultures such as Lac. Lactis, Str. Thermophilus, Lbm. Acidophilus, Lbm. Bulgaricum, kefir, combined ($\frac{1}{3}$ Str. Thermophilus, $\frac{1}{3}$ Lbm. Acidophilus, $\frac{1}{3}$ Lbm. Bulgaricum) was studied. The nature of influence of bee products on the yogurt microflora, including the third and sixth day of storage was studied.

Increasing the viability of yogurt microorganisms was proportional to the concentration of honey, pollen and royal jelly to a certain level. Further, the reverse process was observed.

Based on the preliminary results, a starter culture with which bee products are combined in the best way was defined. A possible dose of honey, royal jelly and bee pollen for the production of yogurt with bee products was selected.

Keywords: yogurt, honey, royal jelly, pollen, biotechnology, starter preparation, organoleptic characteristics.

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STARTER COMPOSITIONS FOR BABY CULTURED MILK PRODUCTS WITH HIGH LEVEL OF PROTEOLYTIC PROPERTIES (p. 66-71)

Nataliya Tkachenko,
Anastasiya Avershina, Yuliia Nazarenko, Yuliia Ukraintseva

The paper gives the results of selecting the adapted to milk bifidobacteria monocultures and lactic acid bacteria concentrates of direct application with high level of proteolytic properties for creating starter compositions of mixed lacto- and bifidobacteria cultures, intended for producing baby cultured milk products. It is shown that combining the use of mixed cultures of bifidobacteria and mesophilic lactic lactococci with high level of proteolytic proper-

ties in the content of starter compositions, it is possible to produce cheese and fermented milk drinks for baby nutrition with hypoallergenic properties. The combination of bacterial concentrates of *Lbc. Acidophilus* monocultures of direct application with mixed cultures of bifidobacteria allows obtaining the compositions for producing fermented milk drinks for babies with reduced allergenic effects on babies' body. Starter compositions of monocultures/mixed cultures of bifidobacteria, bacterial concentrates of *Lbc. Acidophilus* monocultures of direct application and mesophilic lactic lactococci with high level of proteolytic properties can be used in biotechnology of producing protein pastes for babies with hypoallergenic properties.

Keywords: baby nutrition (food), cultured milk product, food allergy, starter composition, proteolytic properties.

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TECHNOLOGICAL ASPECTS OF OBTAINING STRUCTURED EMULSIONS IN COMPOSITION OF MINCED MEAT PRODUCTS (p. 79-84)

Krystyna Nechepurenko, Pavel Pivovarov

The nutrition structure that has developed in Ukraine today dictates the need to expand the range of culinary products by more efficient use of plant products, to which still little attention has been paid. The problems of the lack of nutrients with high biological value in nutrition of a modern man are shown in the paper. The studies in this field are first given in the paper, and it was proved that a promising raw material for producing such products is the use of structured products, the use of which lies in the basis of alginate emulsions with calcium residues. The studies of the rheological properties of the structured emulsions and physico-chemical aspects of obtaining the latter in the composition of minced meat products are given in the paper. The use of a wide range of new technologies, including emulsification of various raw materials, namely polysaccharides for the production of fundamentally new products, which are characterized by high biological value, is submitted for consideration. As a result of the studies, structural and mechanical properties of the model systems and physico-chemical indices were determined. These data allow presenting the technology, ready for introducing to the technological process of obtaining emulsions in minced meat composition. This technology will allow obtaining products not only with standardized indices, but also overtaking the organoleptic indicators of quality that facilitate the production process.

Keywords: emulsion, structurization, food technology, meat production, thermal stability, ionotropic polysaccharides, alginates.

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CRYOSCOPIC RESEARCH OF SOLUTIONS OF FOOD INGREDIENTS OF POLISACCHARIDE NATURE (p. 84-89)

Marina Yancheva, Tatyana Zheleva, Nikolai Pogozhych, Olga Hrynchenko

One of the latest trends in the global market is frozen products. Taking into account this factor, the paper deals with studying the food industry that will allow to determine the thermal and physical charac-

teristics of ingredients, recommended for using in the technologies of producing frozen minced-meat semi-finished products for maintaining the quality of products as a result of the negative influence of low temperatures during freezing. That is why, the purpose of the research was to determine the temperature ranges of ice formation and melting, as well as the frozen moisture content in solutions of food ingredients of polysaccharide nature at different concentrations. The paper shows that the cryoscopy studies were carried out using a low-temperature calorimeter, the method of which is based on measuring the amount of heat, released during free moisture crystallization in food raw materials. The research results indicate the possibility of using food ingredients of polysaccharide nature in manufacturing frozen semi-finished products, as cryoprotective additives, which minimize the damage level at the stage of “freezing-storage-thawing”.

Keywords: freezing, thawing, ice formation, frozen water, food ingredients of polysaccharide nature.

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BIOMEDICAL RESEARCH OF CHOPPED MEAT PRODUCTS WITH COMPLEX ADDITIVE «MALTOVIN» (p. 90-95)

Inna Litvinova, Oksana Savinok, Shafran Shafran, Olena Tretyakova

The results of biomedical research on the impact of additive «Maltovin» with antioxidant properties on the state of the antioxidant system of animals by biochemical parameters are given in the paper. The main objective of the research was to determine the toxicological safety of using chopped meat products with complex additive «Maltovin» for biological objects and solve the problem of improving the quality of meat products by increasing their resistance to oxidation processes.

Subchronic administration of the additive “Maltovin” in chopped meat products, which have passed the preliminary heat treatment, to the diet of laboratory rats did not result in any statistically significant changes in indicators of morphometry, metabolism and overall functional state of experimental animals compared with the control group. There was no lag in the weight gain, structure indicators and ratio of blood cells, hemoglobin content in experimental animals, behind that of control animals. The activity of key enzymes of carbohydrate and protein metabolism changed insignificantly that proves the lack of the negative impact of additive and foods with it on the hepatorenal system. Safety of using

the additive is also confirmed by indicators, characterizing preserving the balance between pro- and antioxidant systems (by indicators of MDA, DP, GR, G-6, FDG) of animals. Analysis of the obtained results showed that "Maltovin" can be used as an effective antioxidant additive, which promotes preserving the quality of meat products with significant fat content and does not affect the state of the main physiological systems.

Keywords: antioxidant, peroxidation, meat products, phenolic compounds, toxicological safety.

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ASPECTS OF BREAD TECHNOLOGY WITH THE USE OF DRIED PLANT RAW MATERIAL (p. 95-101)

Alexandra Niemirich, Oksana Petrusha,
Inna Bonchak, Viktoria Filipenko

The problem of enriching bakery products with dried plant ingredients is considered in the paper. Cabbage powder, obtained by drying with the mixed heat supply is selected as raw material for enriching the chemical composition of bread. Functional and technological properties of dried cabbage such as organoleptic properties, dispersion, water absorbing ability in different polar media are investigated. Predominant content of particles with dispersion 5...50 microns in powder is shown. High technological potential of the cabbage powder lies in restoring the structure when increasing the polar media temperature.

The obtained data allowed to recommend using the cabbage powder directly in dough kneading or preliminary dehydration.

Using sesame and flax seeds at excluding sugar and fat from the recipe is proposed to improve the nutritional value of bread with cabbage powder.

Optimal dosing of plant raw materials was determined using the design program "OPTIMA".

The influence of the specified ingredients on production and quality of bread is studied. Improved gas generation, reduced dough proofing time, increased porosity and shape-stability of finished products in comparison with the control sample are shown.

Based on the studies, the recipe of "Lean" bread with cabbage powder, sesame and flax seeds is proposed.

Excellent taste and compliance of physicochemical quality indicators of new products with existing regulations are shown.

Chemical composition and energy value of "Lean" bread is calculated. Increased protein content is shown, fats are represented by unsaturated fatty acids.

"Lean" bread has higher staling resistance by indicators of crumb swelling and crumbliness compared with the control sample.

Keywords: bakery products, technology, cabbage, sesame, flax seeds, vegetable powder, quality indicators.

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POTENTIAL OF MEDICINAL AND AROMATIC PLANTS TO INCREASE THE QUALITY OF WHEAT BREAD (p. 101-108)

Kateryna Iorhachova, Tetiana Lebedenko

The characteristics of bakery products from the perspective of consumers, nutritionists and manufacturers was given, the analysis of the main problems of the baking industry, decreasing the quality of physiological properties and product safety, was carried out.

The chemical composition, biochemical and pharmacological properties of medicinal and aromatic plants were considered, the promising ones of long-term use in the bakery production, safety and supply in the market of Ukraine were selected. Four groups of phytonutrients were presented, common and distinctive features of their content and properties were given, the potential for solving urgent problems and the industry tasks was evaluated, use as an alternative to improvers, preservatives that will allow reducing the chemical load on the human body.

Promising directions of using medicinal and aromatic plants for improving the quick dough methods, domestic product technologies, special purpose products, the quality of bread made of flour with reduced baking properties, preventing its microbiological and oxidative spoilage, were given.

The prospects for further researches on expanding the knowledge base of functional and technological properties of phytonutrients, methods of their preparation for the production and formation of the specified properties, creating plant raw material compositions, taking into account the compatibility in food systems, biological activity potentiating, synergistic effects of active ingredients in baking semi-finished products and bakery goods.

Keywords: bakery products, medicinal, aromatic plants, quality, physiological properties, safety.

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IMPROVED CONSUMER PROPERTIES OF WAFERS USING NON-TRADITIONAL RAW MATERIALS (p. 108-113)

Tatyana Lozova

An urgent problem of increasing nutritional and biological value of wafers with fatty fillings, formulae of which include non-traditional raw materials is set forth, and some results of our studies are given. The main purpose of the research is to justify the possibility and feasibility of using natural non-traditional raw materials in the production of wafers. For these studies, organoleptic characteristics, nutritional value, amino acid, fatty acid, mineral and vitamin composition, clinical studies of new products are determined. Three model samples of wafers with fatty fillings, which contain farina, walnut oil, natural honey, extruded bean flour, powders of black elderberry flowers, fenberry and leather bergenia, high content of skimmed milk powder as non-traditional raw materials, are developed. Using non-traditional raw materials allowed to reduce the amount of confectionery fat, powdered sugar in the formulae of fillings, to eliminate the use of cocoa powder. The biological value of the test samples of wafers was increased by 7–15 % compared with the control sample. The clinical studies of waffles, filling of which include apiproducts, confirmed the absence of allergic reactions and other side effects, decrease in the activity of free radical processes in a biological medium of the body, immunity increase. The proposed products may be recommended for mass nutrition. Conducting the trade studies of the model samples of wafers confirmed the increase of their nutritional and biological value, improved organoleptic characteristics.

Keywords: wafers, non-traditional raw materials, biological value, nutritional value, organoleptic characteristics.

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USING COMBINED PROTEINS AND HYDROCOLLOIDS FOR CREATING AERATED CANDY MASSES (p. 113-121)

Tatyana Kalinovskaya, Vera Obolkina

The paper deals with studying the functional and technological properties of whey proteins, combined mixtures of whey protein concentrate and egg-whites, additional stabilizers such as gelatin and gum arabic. The influence of combined protein and hydrocolloid systems on forming structural properties of aerated candy masses such as "soft nougatines" with increased aggregate stability is determined.

Theoretical data on functional and technological properties of proteins and hydrocolloids are given.

The technological factors, influencing foam formation and foam stability are considered. Experimental data on the influence of sugar, gelatin hydrocolloids and gum arabic on the structure and properties of foams are given in the paper.

Analyzing these data, the authors have concluded that adding sucrose-glucose syrup to protein foams increases the foam formation of the system. In addition, the positive effect of sugars is caused by the increased viscosity of the bulk phase that reduces the rate of water loss by lamellae and increases the system stability.

Adding complex mixtures of gelatin - gum arabic have a high stabilizing effect due to reducing the surface tension and creating aggregation-resistant layers of the dispersion medium. Owing to such laws, the authors have confirmed the possibility of stabilizing the properties of multi-component disperse systems of aerated candy masses.

The data, given in the paper, show the possibility of further studying of whey protein concentrate properties. Using the combined protein and hydrocolloid system attracts interest when creating a new range of aerated candy masses with the original structure.

Keywords: protein, egg, whey, stabilization, hydrocolloids, gelatin, gum arabic, aerated candy masses.

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REGULATION OF STRUCTURAL AND RHEOLOGICAL PROPERTIES OF JELLY AND CREAMED MASSES FOR TWO-LAYER FRUIT JELLY (p. 122-127)

Katerina Iorgachova, Olga Makarova, Karine Avetisyan

The possibility of using starch syrups in a two-layer fruit jelly technology on different jelling agents was studied. The influence of syrups on structural and rheological properties of jelly and foamy masses was defined. Based on the analysis of the carbohydrate profile, technological properties of syrups and formulas of jelly products for replacing sugar components in the pectin jelly formula, it was recommended to use syrup IG-42, and on agar – IG-60. The study of the structural and rheological properties of jelly masses showed that the viscosity change is caused to a large extent by the content of high molecular sugar. Herewith, viscosity of pectin masses depends on the sucrose content, the exception of which leads to its reduction, despite the high content of dextrans in syrup masses. Determining the influence of the used syrups on a yield value of jelly masses showed that replacing the specified amount of glucose, syrup, as well as 50 % of sugar for syrups, a solid structure of marmalade jelly is formed. However, a complete replacement of all the components is accompanied by reducing the strength of jelly products. For regulating their structure, it is proposed to use polydextrose in the amount of 12 % on agar and 9 % on pectin that will allow providing the required jelly strength, expanding the assortment and improving the quality of paste-jelly products.

Keywords: two-layer jelly, agar, pectin, starch syrups, strength, viscosity, density, polydextrose.

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POSSIBILITIES OF USING SYNBIOIC COMPLEX IN MARSHMALLOW TECHNOLOGY OF FUNCTIONAL PURPOSE (p. 127-133)

Hanna Korkach, Galina Krusir, Iryna Borovik

Synbiotic complex, consisting of microcapsulated bifidobacteria and lactulose was developed in the paper. Comparative analysis of free and immobilized forms of microbial cells, obtained using appropriate immobilization methods, by studying their stability in the model conditions of a real digestion, was performed. The lactulose mass fraction was determined.

The influence of the synbiotic complex on physicochemical and structural-mechanical properties of experimental foam-like masses was studied in the paper. The main physicochemical parameters that determine the marshmallow quality are the content of moisture and reducing substances, density, titratable acidity, foam ratio. The obtained results indicate that the content of moisture and reducing substances grows with an increase in the lactulose mass fraction. This is caused by partial substitution of sucrose by reducing sugar - lactulose in the control marshmallow sample.

The effect of synbiotic additive on the rheological characteristics of whipped masses, in particular on the effective viscosity and adhesive strength, was investigated. The study of the marshmallow mass strength depending on time has revealed that the structure formation duration reduces for all test samples as compared to the control sample by 20-60 minutes.

Theoretical and experimental studies prove the promising nature of using the developed synbiotic complex in the marshmallow technology.

Keywords: probiotics, prebiotics, synbiotics, functional confectionery, marshmallow, structural-mechanical properties.

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RESEARCH OF QUALITY OF YEAST-LEAVENED DOUGH PRODUCTS AND SHORTBREAD USING CRYPOWDERS MADE OF HERBAL RAW MATERIALS (p. 133-137)

Andrej Chuiko, Marina Chuiko, Oksana Orlova, Sergey Eremenko

Promising and appropriate use of cryopowders made of grape pomace and black chokeberry (*Aronia melanocarpa*) for improving the quality of yeast-leavened dough products and shortbread, and for enhancing their biological value, was considered.

The antioxidant properties of cryopowders were studied, and their ability to inhibit chain free-radical reactions, allowing to use them in manufacturing products, containing fats, to improve the quality and extend the storage life of finished products, was proved.

It was found that introduction of the powders under investigation reveals a strengthening effect on a gluten wheat flour complex, promotes more intensive accumulation of reducing sugars in dough, improves the dough quality, increases the release of products, reduces baking losses and shrinkage of products. It was proved that rational concentrations of additives are 3 % to dough weight.

Studying the influence of cryopowders on organoleptical, physical and chemical indicators of shortbread and yeast-leavened products quality and their changes during storage allowed to improve the quality of the samples under investigation compared to the control ones; herewith, the storage life of shortbread increases by 1.3–1.8 times, of bakery products – for 20–24 hours.

The conducted comprehensive and integrated quality assessment of the shortbread and roll “Vitaminn” by the quality control methods has shown that the use of cryopowders enhances organoleptical, struc-

tural, mechanical and functional properties of the products, as well as their cost-effectiveness compared to traditional ones by 4 % and 8 %, respectively, indicating a high level of the finished product quality and determining its benefits in food production.

Keywords: cryopowder, grape pomace, black chokeberry, product quality, shortbread, yeast-leavened dough products.

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STABILISATION OF GUMMY GINGERBREAD QUALITY DURING STORAGE (p. 138-143)

Katerina Iorgachova, Olga Makarova, Kateryna Khvostenko

The relevance of searching for solutions, aimed at slowing the staling of bakery products is shown in the paper. The most common ways to ensure freshness of these products, one of which is using waxy wheat flour, starch of which consists only of amylopectin, are considered. Based on the analysis of changes in physicochemical quality indicators of gummy gingerbreads, crumbliness of crumb, its hydrophilic and structural-mechanical properties during storage, the feasibility of using waxy wheat flour in the technology of gummy gingerbreads to stabilize their quality characteristics during storage is shown. Longer preservation of freshness - slowing the moisture loss, less intense change of crumbliness and hydrophilic properties of the crumb, preserving softer consistency of gingerbread products using the amylose-free flour testifies to slowing their staling during storage. This is caused by the technological properties and composition of waxy wheat flour – high water-absorbing and water-binding abilities, lower starch gelatinization temperature, high autolytic activity and starch retrogradation slowing as compared to baking wheat flour.

It is found that using waxy wheat flour is one of the effective ways to solve the problem of fast staling of gummy gingerbreads.

Keywords: waxy wheat flour, amylopectin, gummy gingerbreads, staling, starch retrogradation.

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