

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)

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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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