

ABSTRACT AND REFERENCES

ECOLOGY, TECHNOLOGY AND EQUIPMENT OF FOOD PRODUCTION

IMPROVEMENT OF THE ENVIRONMENTAL PERFORMANCE OF CHEMICAL AND TECHNOLOGICAL PRODUCTION (p. 4-7)

Tatyana Bojko, Alla Abramova

The article studies the question of improvement of environmental performance of chemical and technological production of ammonia by automating the process of absorption of ammonia from purge gases. The basic principles of the automation process of absorption of ammonia and selected means of automation were determined, taking into account the characteristics of the technological mode. The functional scheme of the automation and the system of automated control of absorption of ammonia in the production of fixed nitrogen were developed. The designing of control system by consistent definition of principles, parameters and technical means of the automation was performed. The computer simulation of absorption in the software package Honeywell Experion Process Knowledge System was carried out. The process control strategy was developed on the basis of the microprocessor C200 Honeywell using software package Experion PKS. The computer simulation provided the results, which show the system response to change of input parameters. The circuit of emergency shutdown and clipping of the system from input parameters was developed.

Keywords: environmental performance, chemical and technological process, automated control system, absorption of ammonia, purge gases.

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COMPLEX ECOLOGICAL ESTIMATION OF NATURAL AND MANMADE COMPLEXES WHICH BASIS ON MIPS- AND RISK ANALYSIS (p. 8-13)

Tatiana Kozulia, Daria Emelyanova, Maria Kozulia

The article provides an algorithmic support which determines the ecological level of systems of natural environment and processes in it. The given algorithmic support allows identifying negative

factors disturbing the homeostasis of man-made complexes, and provides complex ecological quality assessment of man-made objects. Using the proposed algorithm of the quality assessment of a complicated system-systematic formation based on MIPS-numbers, risk-characteristic as to the conditions of objects and processes connected with ecological state disturbance, we have received a complex assessment of the studied territory (hard domestic waste landfill (HDWL) in Kharkiv region (the town of Dergachi) and Rivne city(Ukraine), with the pressure indices and ecological security destabilization processes being estimated. The calculations at the given territories have shown the following results: by the activity of chemical influence on the water systems according to the standards of conditions, the environmental risk on Dergachi and Rivne HDWL was determined as acceptable; chlorides were recognised as a destabilizing factor.

The investigation involving the complex ecological assessment methodology on the level of system objects allows taking into account the transformation processes of ecological safety destabilization when determining the situation safety level based on the results of monitoring the balance violation factors, which gives the grounds for creating a complex mechanism for quality management of anthropogenic territories.

Keywords: risk analysis; complex quality assessment; MIPS-analysis; water pollution index.

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DEVICE FOR GERMICIDAL AIR DISINFECTION BY ULTRAVIOLET RADIATION (p. 13-17)

Anatoly Semenov, Gregory Kozhushko

Air often becomes a source and a distributor of pathogens, that's why one of the ways of germicidal public safety is the introduction of UV air disinfection methods. The UV methods, unlike chemical methods do not change the air composition and its organoleptic properties. The studies of these methods are especially noteworthy for scientists. The results of theoretical and experimental studies have shown that the methods, used in the design of closed-type devices for germicidal air disinfection, take into account the volume dose of bacterial inactivation, which depends on the chamber geometry. This disadvantage is solved by using the surface dose that does not depend on the chamber geometry and is a function of bacterial species. The design of the UV closed-type device for germicidal air disinfection is proposed. This device is made in the form of a cylindrical chamber from a special material, in which a germicidal lamp is placed symmetrically. The device capacity is calculated from the minimum irradiance conditions, which provides the required surface dose on any section of the inner surface of the chamber.

Keywords: UV radiation, UV devices, antibacterial disinfection, ultraviolet lamps, irradiators, bactericidal flow.

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ECOLOGICAL NICHE MODELLING BASED ON THE HUTCHINSON'S THREE-DIMENSIONAL MODEL (p. 18-24)

Victoria Khalil, Elena Sidorenko

The notion of "ecological niche" and its parameters is analyzed in the paper. The theoretical frameworks of developing an ecological niche model for complicated conditions of technosphere (operating environment) based on the known Hutchinson's theoretical model are considered. Basic dimensions of a geometric model are specified with regulatory requirements, standards and GOST State Standards for each of working space parameters. Selecting three limiting factors (C_i – temperature, °C; C_d – air velocity, m/s; C_f – relative humidity, %), a mathematical model, which is presented by a parallelepiped, is worked out. The volume of the parallelepiped (or array), formed by the corresponding vectors (C_i, C_d, C_f) determines the outcome, i.e. carrying out the regulatory requirements to quality indicators (state) (O) of the ecological niche of a human being in the technosphere. The suggested approaches are substantiated by environmental minimum laws and the tolerance law, applicable to current climate parameters, defined by acceptable and optimal working conditions. The mathematical model of ecological niche allows visualizing the working space state for determining the microclimate state. A model, based on the normative values established by legislation can serve as an optimal model and a pattern for further comparing it with the model, developed on the basis of actual indicators.

Keywords: ecological niche, Hutchinson's model, geometric model, minimization rate, process control optimization.

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IMPROVING THE PROCEDURE OF ENVIRONMENTAL AUDIT OF OIL AND GAS FACILITIES AND INDUSTRIAL ENTERPRISES (p. 24-29)

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As a result of a systems analysis of economic activity of enterprises, the procedure for environmental impact reduction or prevention is proposed, which, at the stages of making and implementing decisions allows not to interfere with performing production functions of industrial facility, provide analysis of the results achieved and adjust its activity according to the results achieved.

By carrying out the analysis and comparison of each stage of the conventional procedure for the environmental impact assessment (EIA) with the proposed stages of impact reduction or prevention, it was found that they coincide. The specificity of the EIA procedure lies in selecting methods in conditions of implementing individual stages of the procedure.

In terms of the systems analysis, the environmental audit procedure corresponds to the EIA procedure and, in turn, to the proposed procedure for environmental impact reduction or prevention. The analogy between the objectives and procedures of the EIA and environmental audit (EA) has allowed to use expert decision support methods and EIA experience with specific modification during the EA.

As a result, the improved EA procedure in terms of the environmental impact minimization, which during the EA provides higher probability and effectiveness of analysis, increases the efficiency of the auditors is developed.

Keywords: environmental audit, expert system, oil and gas complex, environment, environmental management.

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RESEARCH OF OIL MIXTURE QUALITY ENRICHED WITH BIOGENIC COMPLEX OF PLANT INGREDIENTS (p. 30-33)

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Among the measures aimed at preservation of public health, prevention of emergence and spread of chronic non-contagious diseases, it is necessary and appropriate to create new food products, affordable to people, as well as corresponding to physiological norms of a human body and containing quite a high concentration of biologically valuable natural micronutrients.

Butter-based oil mixtures are manufactured and sold at restaurant businesses and health resorts. The studies deals with improving their prescription content and increasing the nutritional value due to the harmonious combination of components and oil structure formation using plant raw materials, i.e. white sesame seeds and paprika powder.

During microstructural studies of aqueous suspensions of crushed sesame seeds it was found that except sesame seed tissue particles the test samples contain structural elements with a globular and polyhedral structure. Dimensions of the structural elements vary from 1...15 to 4...40 microns respectively. The identified areas with the formation of different pattern structures and layers on the structural element surfaces prove that white sesame seeds are able of interacting with the aqueous phase significantly.

The technology of a salt oil mixture was developed. The mixture is enriched with biogenic complex of plant supplements, by their optimal dosing in formulation: 4 % of paprika powder, 20 % of crushed white sesame seeds.

The quality of the new oil mixture was studied. It was shown that according to the organoleptic qualities the enriched oil mixture is characterized by high flavor properties.

Hardness, heat resistance and the structure ability to endure the liquid fat phase of the fresh oil-enriched mixture and during storage at +5 °C for 7 days were studied.

It was shown that the addition of crushed sesame seeds and paprika powder enables the formation of a complementary spatial network with a new coagulation bond between components of the oil mixture and supplements, and the formation of a structure with prominent thixotropic properties.

Keywords: oil mixture, technology, sesame seeds, quality indicators, suspension microstructure.

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INFLUENCE OF EMULSION SYSTEMS OF CRYOPROTECTIVE ACTION ON THERMOPHYSICAL PROPERTIES OF MEAT SYSTEMS (p. 34-39)

Marina Yancheva, Elena Dromenko, Vladimir Potapov, Olga Hrinchenko

The paper gives the results of studying the thermophysical properties of meat systems based on minced beef, pork and adipose tissue during freezing and thawing.

It is shown that the morphological structure of meat (the proportion of muscle, connective and adipose tissue) and its chemical composition has a significant influence on the technological parameters of minced meat semi-finished products in implementing the freeze-thaw cycle.

A hypothesis on possible use of emulsion systems as the components of cryoprotective action in the technology of frozen minced meat semi-finished products was proved. Based on a comprehensive study of the thermophysical properties of the meat systems (cryoscopic temperature range, specific heat of phase transition and the fraction of moisture, changing the aggregation state, in the cryoscopic temperature range), the rational content of the emulsion system consisting of frozen minced meat semi-finished products was justified.

Keywords: freezing, cryoprotective properties, raw meat, emulsion system, thermophysical properties.

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INVESTIGATION OF VITAMIN C PRESERVATION IN MELONS DURING LONG-TERM STORAGE (p. 39-44)

Dmitrij Stepanenko

The melons of Zolotistaya and Bereginya varieties of average ripening period were under experimental studies. One of the electron technology methods was applied for storage. This method implies processing fresh fruits before storage in the air, ionized by electric current of corona discharge. In addition, fruits were packed in shrink wrap (SW). Two types of packaging were used: full and partial (leaving empty space around the fruit base and stem). For determining the influence of ionized air (IA) on preservation of vitamin C in melons, the fruits, fully and partially packed in SW without the IA treatment were laid down for storage. The fruits without packaging and

treatment were used as control samples. The control samples were stored both in natural conditions (at the temperature of 20–25 °C) and in the refrigerator (at the temperature of +3 °C and the relative humidity of 85 %).

Taking into account the importance of preserving ascorbic acid for as long time as possible, its dynamics was studied.

The analysis of the obtained results showed that using the melon storage method stabilizes metabolism in fruits and partially disinfect their surface. It was found that the use of ionized air prolongs shelf life and favors relatively high preservation of vitamin C. Shrink wrapping positively effects the preservation of biochemical fruit constituents. It protects them from mechanical damages and impedes penetration of pathogenic organisms from one package into another.

The scientific literature gives no information about melon storage in ionized air. The lack of dynamics patterns for basic biochemical indicators of fruits during storage creates certain difficulties in predicting the product life terms and yield at the final stage with the best given organoleptic indicators and biological value. Therefore, there are no doubts concerning the appropriateness of conducting studies in this field.

Keywords: storage of fruits, vitamin C, ionized air, corona discharge, shrink wrap.

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INFLUENCE OF FORMULATION INGREDIENTS OF DRY FAT SEMI-FINISHED PRODUCTS FOR WHIPPING ON MECHANICAL STRENGTH OF FOAM MASSES (p. 45-49)

Oleg Kotlyar, Andrey Goralchuk, Olga Grinchenko

The mechanical strength of foam-emulsion systems based on formulation ingredients of dry fat semi-finished products for whipping was studied. Experimental studies of the influence on the mechanical strength of the foam-emulsion systems of a stabilizer, surface-active substances (GMS, lecithin's) and sunflower oil are presented.

The patterns concerning the influence of concentration of kappa-carrageenan, surface-active substances, sunflower oils on the mechanical strength of foam-emulsion systems were defined in the paper for the first time. It was found that using GMS at the concentration rate of 1..6 % increases the value of the boundary stress of foam offsets in foam-emulsion systems "sodium caseinate-GMS-oil" with the sodium caseinate content varying between 1.0 and 2.0 % and the oil content fluctuating from 2.5 to 10.0 %. Using the lecithin's in foam-emulsion systems of "sodium caseinate-GMS-lecithin's-oil" at the concentration ranging within 0.1..0.2 % increases the mechanical strength, while at higher concentrations reduces it. It was found that for increasing the mechanical strength of foam-emulsion systems, it is appropriate to use kappa-carrageenan, which enhances the foam strength that is caused by the increase in viscosity and the formation of a gel-like structure. The rational concentration of kappa-carrageenan in the system (0.5..1.0 %) was estimated, which increases the offset boundary stress by 1.5..1.6 times, i. e. amounting to 1120..1270 Pa, and the foaming capacity from 640±1 % to 780..800 %.

The obtained results allowed developing a fundamentally new technology of dry fat semi-finished products for whipping by means of spraying a fat blend on a powder-like filler with high technological properties, which are gained at the determined concentrations of sodium caseinate, kappa-carrageenan, GMS, lecithin's.

Keywords: foam, mechanical strength, foam-emulsion, surface-active substances, stabilizer, offset stress.

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DEVELOPING TECHNOLOGIES FOR PRODUCING URDA ALBUMIN CHEESE (p. 49-53)

Oksana Bilyk, Hryhoriy Dronyk

One of the food industry priority trends concerns improving current and developing new technologies of functional food products. Using whey is a promising trend in the production of these products. Urda is an albumin cheese made of the whey of sheep milk. The product that is made exclusively of the sheep milk whey is rather expensive. However, using a blend of the sheep milk whey along with the cow milk can significantly reduce the cost of the finished product, and, in addition, use secondary raw materials efficiently.

The purpose of the research lies in developing a technology of producing the urda albumin cheese and in studying its organoleptic and rheological properties. The sheep and cow milk whey and its blends were used. The blend for preparing urda cheese was made in three ratios: 1:3, 1:1, 3:1. Following these proportions, the cheese was produced. The cheese made exclusively of the sheep milk whey served as control.

Organoleptic properties of the cheese samples under the experiment were determined by conventional methods. Rheological properties of cheese paste were estimated by using the "Labor" and "Zsuvomir" penetrometers.

As a result of the studies, the process of producing the urda albumin cheese was developed and described. The optimal ratio of whey made of sheep and cow milk for producing the urda cheese in industrial conditions makes 1:1. The produced cheese exhibits good organoleptic properties and is characterized by a high biological value. The results of determining the rheological properties of cheese correlate with their organoleptic estimation.

Keywords: urda albumin cheese, sheep whey, cow whey, rheological properties, organoleptic estimation.

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USING GUM ARABIC TO FORM OIL-WATER EMULSIONS IN FOOD PRODUCTS (p. 54-57)

Oksana Lugovska, Vasilij Sidor, Tatiana Nikitchina

Despite the large number of studies on using gum arabic in various fields of the food industry, little attention has been paid to the study of this stabilizer in food emulsions for beverages. In this paper, the influence of the physical and chemical properties of gum arabic when using it in food products was determined. Using the dependence theory of the emulsion stability on the ratio of water gum arabic stabilizer and the oil phase, the process of obtaining pre-emulsion and the homogenization mode of the emulsion system, the formulations of food emulsions with varied amount of stabilizers and the fat phase were developed. The results of the samples of food emulsions using different amounts of gum arabic (at the constant oil phase) and the samples of emulsions with the variable oil phase and a constant amount of gum arabic were considered in detail. The analysis of the prepared emulsion indicators, such as the measured particle size, viscosity, turbidity and dependence on the ratio of water and oil phases

of the system, the process parameters, was carried out. The indicators of each emulsion were measured: viscosity by the Brookfield viscometer, particle size by a microscope EASTCOLIGHT 92012-ES (100x, 250x, 550x, 750x), turbidity by a turbidimeter 2100P. The optimal ratio between water stabilizer and oil phase of the emulsion, which is characterized by obtaining the maximum amount of emulsion particles of up to 1 micron was determined. Emulsion has a highly reliable stability if the particle size is less than 1 micron and has some turbidity, but the more particles are smaller than 1 micron, the less turbidity is. If there is insufficient amount of stabilizer, a small number of particles larger than 1 micron is formed, leading to the appearance of "oil ring" during long-term storage. The results can form the basis for the establishment of production technology for beverage emulsions as a class of food products. Creating a stable emulsion system is a relevant issue in the food industry, that is why the studies are useful and important for the development of new food products.

Keywords: gum arabic, emulsion, stabilizer, phase, water, fat distribution, turbidity, viscosity, particle size.

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FATTY ACID COMPOSITION OF CULTURED BUTTER PRODUCED USING MESOPHILIC AND PROBIOTIC CULTURES (p. 58-63)

Luba Musiy, Orysia Tsisaryk, Olga Golubets, Sergey Shkaruba

The aim of the research was to study the possibility of modeling the composition of fatty acids by lactic acid bacteria in the production of cultured butter. For the cream culturing, fermenting compositions DVS (Chr.Hansen, Denmark) FloraDanica (FD) and Lbm. acidophilum La-5 (La-5) were used. Four groups of cultured butter were produced: I (samples K1, K2, K3 using FD; FD+La-5; La-5) - cream culturing at a temperature of 30 °C; II (K4, K5, K6 using FD; FD+La-5; La-5) - cream culturing at a temperature of 37 °C; III (K7, K8, K9 using FD; FD+La-5; La-5) - physical ripening 8 °C (2 hours) → biological ripening 20 °C (8 hours) → 12 °C (10 hours); IV (K10, K11, K12 using FD; FD+La-5; La-5) - introducing fermenting compositions in butter granule. Sweet butter served as control (S). Fatty acid composition was examined by gas-liquid chromatography method on a gas chromatograph HewlettPackard HP-6890.

Modeling the fatty acid composition of milk fat lipids in order to increase the trans-11 isomers of fatty acids, endowed with various positive biological properties, is an important scientific task today. Accordingly, modeling the fatty acid composition of butter as the product, which is a milk fat concentrate using the capabilities of lactic acid microflora is of scientific and practical interest.

It was found that the cream culturing affects the isomeric composition of fatty acids. The content of the amount of trans-11 fatty acid isomers was the highest (7.92) in K2 in comparison to 7.56 % in S ($p < 0.05$), including cis-9, trans-11 C18:2, reaching the maximum in K2 ($p < 0.05$). The content of trans-11 C18:1 has increased from 5.19 in S to 5.28-5.41 %

in cultured butter samples, the highest was in K2 ($p < 0.05$). The content of the amount of trans-9 isomers was 1.22 in S, whereas in K2, it was the lowest - 1.02 %.

The results of the content of trans-11 isomers in cultured butter samples suggest that at the joint culturing of *FloraDanica* and *Lactobacillus acidophilus* they can be synthesized by lactic acid bacteria, culturing temperature plays an important role in this case.

Keywords: cultured butter, *Lbm. acidophilum* La-5, fatty acid composition, conjugated linoleic acid.

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STUDYING POSSIBILITY OF USING FRUIT POWDERS IN TECHNOLOGY OF SPONGE-CAKE SEMI-FINISHED PRODUCTS (p. 64-69)

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The paper shows the possibility of enriching flour confectionery with powders of viburnum, ashberry and sea buckthorn

for producing sponge-cake semi-finished products, as fresh fruit production is a seasonal product and does not provide a regular supply of biologically active substances into the population food ration.

The influence of viburnum, ashberry and buckthorn powders on the amount and quality of gluten in dough was studied. In addition, the appropriateness of using SAS (surface-active substances) was substantiated. The data of amilograph studies for estimating the influence of fruit powders on the progress of gelatinization of flour raw materials is given. The structural and mechanical properties of dough during mixing, as well as changes of these properties during its fermentation was assessed by farinograph. Estimation of the influence of viburnum, ashberry and sea buckthorn powders on physical properties required carrying out studies by the Chopin alveograph.

The conducted studies allow predicting improvements of such technological parameters as the sponge dough resistance, which plays an important role while mixing and baking, the baking loss reduction, and the increase of sponge-cake semi-finished products yield as well as prolongation of their shelf life, respectively.

The research results can be used by production engineers in the confectionery industry along with restaurant businesses for developing new flour confectionery formulations.

Keywords: fruit powders, viburnum, ashberry, sea buckthorn, sponge-cake semi-finished product, structural and mechanical properties.

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