

ABSTRACT AND REFERENCES

TECHNOLOGY AND EQUIPMENT OF FOOD PRODUCTION

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RESEARCH INTO EFFICIENCY OF USING THE COMPLEX BAKING IMPROVER “SVIZHIST” IN ORDER TO PROLONG FRESHNESS OF BRAN CRISPBREADS (p. 4-10)**Olena Bilyk**Ukraine National University of Food Technologies, Kyiv, Ukraine
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Actual problem in the bakery industry is prolonging the freshness of bakery products, in particular, those of special purposes, whose formulation includes bran. To solve this problem, it is recommended to use complex baking improvers. We developed the complex baking improver “Svizhist” to prolong the freshness of bakery products, which includes in its composition beer powder, carboxymethylcellulose, emulsifier, enzyme preparation of amilolitic action, and ascorbic acid. We examined technological aspects of using the complex baking improver “Svizhist”. It was established that the optimal dosage of the improver to prolong freshness of bran crispbread is 2 % by the weight of flour. We studied the processes related to staling, to the loss of organoleptic and physical-chemical quality indicators of bran crispbread during storage. A positive effect of the complex baking improver “Svizhist» was proven on the indicators of crumbling and swelling. It was established that the use of CBI “Svizhist” reduces the content of osmotically-bound water, confirming a slow-down in the process of bran crispbread staling. We obtained a positive effect of using CBI “Svizhist” on microbiological indicators, which prolongs preservation of freshness by bran crispbread over 72 hours. The results received prove expediency of applying the complex baking improver “Svizhist” in the technology of bran crispbread to prolong the term of their freshness when stored unpacked to 72 hours.

Keywords: complex baking improver, bran crispbread, staling, starch retrogradation, osmotically-bound moisture.

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DEVELOPMENT OF A MODEL OF STERIC STABILIZATION OF THE AIR-NUT SEMI-FINISHED PRODUCT STRUCTURE (p. 11-17)**Andrii Goralchuk**Kharkiv State University of
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The study has suggested a theoretical model of steric stabilization of an air-nut semi-finished product structure by adding Glycerol Monostearate and Natrium Carboxymethyl Cellulose. It has been experimentally proved that adding low-molecular surfactants to oil provides hydrophilization of the fat phase and reduces desorption of egg whites from air bubbles. It has been shown that in foam emulsion systems the interfacial shear stress of adsorption layers at the interface with air can be increased 3.2 and 6 times by adding low-molecular surfactants such as Glycerol Monostearate, Diacetyl Tartaric Acid Esters of Monoglyceride, and Sodium Stearoyl Lactylate to oil, respectively. It has been revealed that the stability of the air-nut semi-finished product structure can be ensured by adding 0.2 % of Natrium Carboxymethyl Cellulose at the end of churning egg whites. For the technology of making air-nut semi-finished products, it is proposed to ensure hydrophilization of the fat phase by crushing nuts with 0.6 % of Glycerol Monostearate (as to the mass of all recipe components). Nuts should be chopped to the prevailing average fraction diameter of 0.4 mm. The egg white has been proved to stabilize air bubbles, whereas Glycerol Monostearate and Natrium Carboxymethyl Cellulose stabilize fat particles and particulate nuts, respectively. The study has substantiated the parameters of the technological process and the possibility of industrial production of air-nut semi-finished products. The comparative evaluation of a new product and a traditionally made product was performed. In the proposed technology, the new product is characterized by a specific volume of $3.7 \pm 0.1 \text{ m}^3/\text{kg}$ in comparison with $3.1 \text{ m}^3/\text{kg}$ produced by the traditional technology.

Keywords: air-nut semi-finished product, steric stabilization, flotation, foaming ability, foam stability, interfacial layers.

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SUBSTANTIATION OF THE METHOD OF PROTEIN EXTRACTION FROM SHEEP AND COW WHEY FOR PRODUCING THE CHEESE «URDA» (p. 18-22)

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We substantiated the methods of protein extraction from sheep and cow whey for the production of the cheese “Urda”. We established a similar dependence of the effect of the method of protein extraction from both sheep and cow whey on the yield of bulk protein. The largest yield of bulk protein was achieved when using the chloro-calcium method of extraction. Slightly less – when applying the acid-alkaline and acid methods. The lowest yield was observed when employing the thermal technique. The yield of bulk protein from sheep whey is 1.60 times higher than that from the cow whey.

The bulk protein, received from sheep whey by the chloro-calcium and acid-alkaline methods, has rather low titrated acidity, which causes unpronounced sour milk taste and smell in the cheese “Urda”. The cheese, produced from bulk protein received from sheep whey by the acid method, has extremely high values of acidity (115.5 ± 1.5 °T), excessive sour milk taste and flavor. The indicated results will not enable a long term of its storage. That is why, for the extraction of proteins from sheep whey, we recommend using the thermal method in the technology of the albumin cheese “Urda”, similar for protein extraction from cow whey.

Thus, we can state that for the production of the albumin cheese “Urda”, it is possible to apply the thermal method of protein extraction from the mixtures of sheep and cow whey in the ratio of 1:1 or 3:1.

Keywords: sheep whey, cow whey, albumin cheese “Urda”, methods of protein extraction, bulk protein.

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A STUDY OF PROPERTIES OF MARSHMALLOW WITH NATURAL ANTHOCYANIN DYES DURING STORAGE (p. 23-30)

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An actual problem of the development of marshmallow with natural anthocyanin dyes was solved. The object of the investigation was organoleptic, physicochemical, antioxidant properties of the products during storage for 30 days. The subject of the investigation was 6 samples of marshmallow. They differed in the type of a structuring agent – gelatin or gelatin with solubilized substances and the type of a dye – a water or water-alcohol extract of Sudanese rose Aryopowder or water-alcohol extract of black chokeberry Aryopowder.

For the new types of marshmallow with natural anthocyanin dyes, the quality indexes necessary for the product were provided. Moisture content is within 19.0...21.5 %, density is 0.51...0.67 g/cm³, reducing substances content does not exceed 13.6 %, total acidity is 3.5 degrees.

The use of natural anthocyanin dyes allows increasing the antioxidant properties of the finished product. The value of the antioxidant capacity for all of the developed samples is 2...2.5 times more than that of the samples, made without the dyes.

It was found that short-term (up to 2 days) storage of marshmallow with natural anthocyanin dyes at a temperature of (15...18) °C and relative air humidity of 60...75 % is possible without packaging.

Storage of the products hermetically packed in polyethylene wrap and a cardboard box provides high indexes of quality, preservation of colour intensity within a long time (up to 30 days). It was shown that antioxidant properties of marshmallow with water-alcohol extract of Sudanese rose and black chokeberry cryopowders remain stable and do not depend on the type of packaging.

The developed new types of marshmallow with natural anthocyanin dyes expand the range of confectionery and can be used for correction of the human diet.

Keywords: marshmallow, anthocyanin dye, cryogenic technology, powder, Sudanese rose, black chokeberry, antioxidant capacity.

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RESEARCH INTO PROBIOTIC PROPERTIES OF CULTURED BUTTER DURING STORING (p. 31-36)**Lubov Musiy**Lviv National University of Veterinary Medicine and Biotechnologies named after S. Z. Gzhytskyi, Lviv, Ukraine
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The purpose of experimental research was to determine the number of viable cells *L. acidophilus* of the strain La-5 and *Flora Danica* when storing cultured butter. For this purpose, we employed different temperature modes of the fermentation of cream, as well as various technologies. The original concentration of cultures in cream is 1·10⁶ cfu/cm³; with a combination of cultures – the ratio of 1:1 at original concentration in cream of 1·10⁶ and 1·10⁶ cfu/cm³, respectively). We prepared 4 groups of butter:

– group I (samples BW (Butter Winter)1, BW2, BW3 and BS (Butter Summer)1, BS2, BS3 at souring the cream by FD, FD + La-5, La-5, respectively, in winter and summer). Cream fermentation was conducted at temperature (30±1) °C;

– group II (BW4, BW5, BW6, BS5, BS6, BS7 at souring by FD, FD+La-5; La-5) – fermentation (37±1) °C;

– group III (37, 38, 39 at souring by FD, FD+La-5, La-5, respectively) – (8±1) °C→(20±1) °C→(12±1) °C – winter stepwise cultured butter production mode similar to the Alnarp mode. (BS7, BS8, BS9) – (20±1) °C→(6±1) °C→(10±1) °C – summer stepwise mode similar to the Danish one;

– group IV (BW10, BW11, BW12, BS10, BS11, BS12 at souring by FD, FD+La-5, La-5, respectively) – introduction of souring cultures to a butter grain. The original concentration of cells at inoculation – 1·10⁸ cfu/cm³.

The largest number of viable cells of La-5 was registered for the sample in which we used FD+La-5 and the fermentation of cream at temperature (30±1) °C. Duration of storing the cultured butter with the probiotic properties is 35 days at temperature 0...–5 °C.

Keywords: cultured butter, *Flora-Danica*, *L. acidophilus* La-5, viable cells, probiotic properties.

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DEVELOPMENT OF A TECHNOLOGY WITH AN IODINE-CONTAINING ADDITIVE TO PRODUCE KEFIR FROM GOAT MILK (p. 37-44)

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The authors have suggested a technology of making goat milk kefir using an iodine-containing supplement – Elamine.

The applicability of the iodine-containing additive Elamine was determined in experimental batches of goat milk kefir in terms of increasing the amounts of macro and micro nutrients, including organic iodine and essential amino acids and fatty acids. Tests were conducted to specify the physicochemical and biochemical properties of the aforementioned additive.

It has been determined that Elamine contains calcium, phosphorus, copper, manganese, iron, and iodine in the amounts of 1.293, 0.156, 0.612, 0.915, 3.42 and 554 mg/kg, respectively. This indicates that the iodine-containing additive comprises in its composition a balanced set of macro and micro elements in an organically bound form. The contents of iodine, phosphorus, calcium, and iron are higher than in other additives.

According to the FAO/WHO scale, the scores of all the essential amino acids of the iodine-containing supplement Elamine (threonine, valine, methionine+cystine, isoleucine, leucine, phenylalanine+tyrosine, and tryptophan) are 15.5, 19.6, 17.1, 32.5, 17.3, 176.4 and 37.0 % higher than in the ideal protein.

The only exception is the amino acid lysine, whose score was found to be by 28.5 % lower, compared to the same property of the ideal protein. This indicates that the protein of the iodine-containing supplement is of full value as to the content of essential amino acids.

Adding Elamine to a milk mixture in a concentration of 0.10...0.15 mass % increased the amounts of essential amino acids and fatty acids in the experimental batches of kefir. This additive stimulates the growth of lactic acid bacteria in kefir up to $2.2 \times 10^7 \dots 2.5 \times 10^7$ CFU/cm³ (2.2–2.5 times in comparison with the control sample).

The amount of yeast in the experimental batches of kefir increased slightly – by 0.5 CFU/cm³, compared with the reference.

The increased amounts of beneficial microflora components in the experimental batches of kefir stimulated the intensity of the lactic fermentation of milk sugar. This contributed to reducing the milk clot formation time by 2 hours (6 hours instead of 8 hours in the control sample).

The aforementioned allows recommending dairy processors of Ukraine to implement the advanced technology of producing cost-effective high-quality kefir from goat milk.

Keywords: goat milk kefir, milk mixture/formula, iodine-containing additive, Elamine, amino acids, fatty acids.

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DEVELOPMENT OF FRUIT DISEASES OF MICROBIAL ORIGIN DURING STORAGE AT TREATMENT WITH ANTIOXIDANT COMPOSITIONS (p. 45-51)

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Present study addresses scientific substantiation of appropriateness of conducting after-harvesting treatment with antioxidant compositions for preventing the development of pathogenic microflora on the surface of fruits during long-term storage. We examined the fruits of apple of the varieties Idared, Golden Delicious, Simirenko Renet, the fruits of pear of the varieties Victoria, Izyuminka Crimea and Cure, the fruits of plum of the varieties Voloshka, Stanley, and Ugorka Italian. The fruits were treated by immersion in the following antioxidant compositions: ACM is a mixture of dimethylsulfoxide, ionol and polyethylene glycols; AARL is a mixture of ascorbic acid, rutine and lecithin; DL is a mixture of dimethylsulfoxide, ionol and lecithin. Control fruits were treated with water. Exposure is 10 seconds. Storage was maintained at a temperature of 0±1 °C, at relative air humidity 90–95 %. It was established that during preparation of fruits for storing, the largest mean population of epiphytic microflora was registered on the surface of plums and pears with medium term of ripening. The species composition of epiphytic microflora was dominated by spores of mesophilic aerobic and facultative anaerobic microorganisms. Their mean population on the surface of apples was 9.6-103 cfu/g, on the surface of plums – 18-103 cfu/g. Treating all kinds of fruit with AOC significantly decreased speed of growth of both MAFAm and microfungi. It is shown that the application of composition reduced the level of daily losses from microbiological diseases over the entire period of storage by 2...3.5 times. The largest positive effect was obtained when applying the composition based on dystynol and lecithin. By performing a multi-factor analysis, it was revealed that the level of daily losses from microbiological diseases during storage was affected by the dominant influence of factors of generic features of fruit raw materials (factor A) and treatment with antioxidant compositions (factor D). The shares of influence are, respectively, 24 and 21 %.

Keywords: fruits of apple, fruits of pear, fruits of plum, antioxidants, after-harvesting treatment, microorganisms, fungal rots.

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MODELING OF THE PROCESS OF PEELING JERUSALEM ARTICHOKE IN ORDER TO DETERMINE PARAMETERS FOR CONDUCTING PRODUCTION PROCESS (p. 52-60)

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We proved the need to create equipment for the implementation of a combined process of peeling the tubers of Jerusalem artichoke. A combined peeling process is proposed, which is based on a combination of thermal and mechanical effects on the peeled product.

An experimental installation was designed to study the process of thermal treatment of Jerusalem artichoke.

It is proven that an increase in steam pressure and duration of the process of thermal treatment lead to the increase in depth of the thermal treatment of the surface layer of Jerusalem artichoke and reduce the efforts required to separate the rind from the tuber. We determined that an increase in duration of the process of mechanical post-peeling increases the percentage of peeled tubers of Jerusalem artichoke, but results in growing losses of raw material. It was established that reducing the effort required to separate the rind of Jerusalem artichoke at thermal treatment makes it possible to reduce duration of the process of mechanical post-peeling. We determined that an increase in depth of the thermal treatment of the surface layer of Jerusalem artichoke leads to increasing losses of raw material. It was proven that the tubers of Jerusalem artichoke, which have a longer storage period, require an increase in duration of the process of their mechanical post-peeling to ensure the required quality of peeling.

We determined rational parameters of the combined process of peeling Jerusalem artichoke, which enable to significantly intensify and mechanize the peeling process, to reduce losses of raw material and to improve quality of peeling.

Keywords: thermal treatment, mechanical post-peeling, percentage of losses of raw material, quality of peeling.

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DEVELOPMENT OF SANITARY-SAFE POULTRY PASTE PRODUCTS WITH BALANCED FATTY ACID AND VITAMIN COMPOSITION (p. 61-70)

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Development of original recipes of meat pastes enriched with biologically active components due to the use of vitaminized blended vegetable oils (VBVO) and protein-fat emulsions (PFE) on their basis for general and special nutrition was considered. In the process of this work, eight recipes of chicken and turkey meat paste were developed using PFEs which were included in the recipe in an amount of 15...20 % and two recipes with vitaminized blended vegetable oils of two-component and three-component compositions in an amount of 10 %. Samples of the pastes prepared according to DSTU 4432:2005, which contained 10 % of slab bacon were taken as reference samples.

A complex of organoleptic, physico-chemical, biochemical, functional-technological, structural-mechanical, sanitary-hygienic and medico-biological studies of the new meat paste recipes has been carried out. By way of mathematical modeling, yield of products with a balanced composition was optimized depending on the amount of protein-fat emulsion and vitaminized blended vegetable oil and the type of protein in minced meat. Composition of vegetable oils has been developed and their fatty acid composition and content of fat-soluble vitamins in them were determined by gas chromatographic method

Modern molecular genetic methods have been applied for an accelerated diagnosis of paste safety concerning the regulated spore-forming food poisoning agents such as *Clostridium perfringens* and *Bacillus cereus*, the quantity of mesophilic aerobic and facultative anaerobic microorganisms (QMAFAnM), Coliform bacteria or Bacteria of group of *Escherichia coli* (BGEC), sulfite-reducing clostridia, *Staphylococcus aureus*, *L. monocytogenes* and *Salmonella*. Shelf life of meat pastes was doubled (up 48 hours) while

DSTU 4432:2005 specifies 24 hours. Expediency of their introduction in production was proven.

Keywords: meat pastes, vitaminized blended vegetable oils, protein-fat emulsions, poultry meat, sanitary-hygienic safety.

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