ABSTRACT AND REFERENCES

TECHNOLOGY AND EQUIPMENT OF FOOD PRODUCTION

RESEARCH OF SEDIMENTATION STABILITY OF LIPID-MAGNETITE SUSPENSIONS BY THE METHOD OF SPECTROPHOTOMETRY (p. 4-11)

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A spectrophotometric method of the assessment of stability and determining of the morphological characteristics of lipid-magnetite suspensions (LMS) was studied. The sizes of the particles of magnetite with a surface-active substance (SAS) were defined. The diameter of the particles is 78 nm. The concentration of the particles of magnetite stabilized by a surface–active substance was determined – the concentration (number in 1 cm^3) equals $N=1.33 \cdot 10^{12}$ cm^{-3} when obtaining a suspension. A slight decrease in the number of particles of magnetite with SAS in 1 cm^3 of suspension was observed over time: during 48 hours, the concentration in 1 cm^3 decreased from $1.33 \cdot 10^{12}$ down to $1.13 \cdot 10^{12}$ cm^{-3}. The concentration decreases by approximately 2.25 % per 1 hour. Different LMS were obtained. The optimum ratios of the components were selected in the suspensions: magnetite, stabilizer and dispersion medium.

It was established that LMS can be used as biological–active additives, which possess comprehensive action: lipid-magnetite suspensions (LMS) on the basis of magnetite during oral introduction into human organism render beneficial biological effect with the period of action within the range of 3–4 hours: when entering LMS into human organism, the iron concentration in blood rises, which brings about:

– a short-term decrease in intracranial CSF pressure;
– activation of gastric and duodenum performance;
– increase in urination.

Due to bivalent iron and its ability to form transition complexes with oxygen and peroxide radicals (and hydro peroxides), magnetite also manifests antioxidant activity, which makes it possible to recommend it as an antioxidant, which facilitates improvement of the quality and prolongation of the period of storage of fat– containing products. Furthermore, LMS contain magnetite (which means digestible Fe^{2+}); therefore they can be recommended as anti-anemic agent due to easily digestible bivalent iron. Thus, introduction of LMS into food products increases their quality, nutritional and biological value.

Therefore the studies of LMS are actual and they represent significant theoretical and practical interest.

Keywords: magnetite, suspension, method, SAS, sedimentation, stability, spectrophotometry, particle size, stabilization.

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DEVELOPING A MODEL OF THE FOAM EMULSION SYSTEM AND CONFIRMING THE ROLE OF THE YIELD STRESS SHEAR OF INTERFACIAL ADSORPTION LAYERS TO PROVIDE ITS FORMATION AND STABILITY (p. 11-19)

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The model of the formation of the foam emulsion by the emulsion whipping was developed. It was experimentally proved that the yield stress shear of interfacial adsorption layers can be used as a criterion for evaluating the stability of foams, emulsions and foam-emulsion systems. It was found that the introduction of DATEM to the reconstituted skimmed milk increases the yield stress shear of interfacial adsorption layers and stability of foams and emulsions. The introduction of lecithin's or DATEM reduces the yield stress shear of interfacial adsorption layers and stability of foams and emulsions accordingly. Simultaneous use of milk proteins, LACTEM, lecithin's and DATEM provides 1.3 times higher yield stress shear of interfacial adsorption layers at the water-air interface than at the water-oil interface, which is a thermodynamic condition for the formation of the foam emulsion by the emulsion whipping. It was proved that homogenization of the emulsion based on cocoa butter, milk proteins and surfactants provides destabilization of the emulsion and creates conditions for the flotation of destabilized fat particles.

The results allow justifying the parameters of the technology of the whipped semi-finished product based on cocoa butter, which is the emulsion whipping of which provides the foaming capacity of 450±22 %, the mechanical strength of the foam emulsion of 3200±160 Pa. It was confirmed that the whipping process can be divided into three stages: foaming, emulsion destabilization and adhesion of fat particles to air bubbles, providing high mechanical strength of the foam emulsion.

Keywords: interfacial adsorption layer, yield stress shear, whipped emulsion, foaming capacity.

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OPTIMIZATION OF FORMULATION COMPOSITION OF THE LOW–CALORIE EMULSION FAT SYSTEMS (p. 20-27)

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Among the promising food products of oil-and-fat industry, special place is held by emulsion fat products, in which vegetable oil is in the dispersed state that increases its assimilation. High taste and nutritional properties, due to the specific character of their structure, are inherent in emulsion fat systems. Therefore, water-fat emulsions are the promising systems, on the basis of which it is possible to create mayonnaises, sauces, dressings, oil pastes, spreads and other food products, including low fat ones, with the balanced composition and health-improving properties.

The work substantiated the optimum content of the concentrate of Jerusalem artichoke "Noteo" and the stabilizing system "Hamulsion QNA» – 10,06 and 0,42 % respectively, as the components of low calorie emulsion fat basis for the production of low fat oil-and-fat products.

It is shown that a low calorie emulsion fat system, produced with the use of raw components in the optimal ratio, possesses standardized physical-chemical and microbiological indicators, high organoleptic characteristics and can be used as the raw material for the production of low calorie mayonnaises, sauces and dressings for healthy nutrition.

The recommendations are provided regarding the design of the technologies of the two groups of low calorie mayonnaises, sauces, dressings, enriched with food fibers and prebiotics (or the complexes of synbiotics), on the basis of the developed emulsion fat systems.

Keywords: low calorie emulsion system, Jerusalem artichoke, viscosity, organoleptic indicators, optimization, the response surface.

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TECHNOLOGY OF SPECIALTY FATS BASED ON PALM STEARIN (p. 27-33)

Ekaterina Kunitsa, Aleksey Udovenko, Elena Litvinenko, Fedor Gladkiy, Irina Levchuk

New technology of modification of fats was developed, which allows, by fermentative ethanolysis, obtaining a new type of specialty fats for use in the food industry (culinary, bakery and dairy products). We proposed, for the modification of fatty raw materials, restructuring of the fats, namely, their active parts (acyl groups) with obtaining of derivatives of fatty acids that have functional properties. Obtained fats meet the requirements of normative documentation by the indicators of quality, and are additionally enriched with physiologically–active ingredients – ethyl esters of fatty acids, which are better digested and reduce the resynthesis of fat in a human body. The influence of conditions of fermentative alcoholysis of palm stearin by ethyl alcohol on the degree of its conversion to ethyl esters of fatty acids was defined.

It was established that when using ethyl alcohol as a reagent in the presence of lipolytic enzyme, ethyl esters and incomplete acylglycerols accumulate that causes the change of physical and chemical indicators (including the melting temperature decrease), the composition of the reaction mixture, and allows obtaining fats with given composition and properties. Thus, using this method, selecting necessary raw materials and varying the conditions of the reaction, one can obtain a whole range of specialty fats.

Keywords: alcoholysis, palm stearin, ethyl alcohol, enzyme, ethyl esters, specialty fat.

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THE INFLUENCE OF MECHANOLYSIS ON THE ACTIVATON OF NANOCOMPLEXES OF HETEROPOLYSACCHARIDES AND PROTEINS OF PLANT BIOSYSTEMS IN DEVELOPING OF NANOTECHNOLOGIES (p. 33-40)

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A nanotechnology of protein plant supplements in the form of puree of peas was developed that is based on the processes of deep processing of raw materials. Finely dispersed grinding and steam and thermal processing were used in this work as the innovation. When using traditional methods of raw materials processing, biological potential is not used in full.

It was found that during deep processing of plant raw materials (dried peas), which is based on comprehensive effect of steam and thermal processing and finely dispersed grinding on the raw material in obtaining nanostructured puree, the processes of mechanical destruction and mechanical chemistry occur. These processes are accompanied by non–ezymatic biocatalysis – mechanolysis (destruction) of hard soluble biopolymers and nanocomplexes of biopolymers (proteins, heteropolysaccharides, namely, pectins, cellulose, starch) with their transformation to monomers (35...55 %) into soluble easily absorbed form (almost 2 times higher compared to the original raw material in a hidden form). The mechanism of protein mechanical destruction and its nanocomplexes, which is associated with the mechanical cracking, was discovered. It was found that the steam and thermal processing and finely dispersed grinding of peas, while obtaining finely dispersed puree, leads to the destruction of polysaccharides by the non–enzymatic catalysis, namely cellulose and starch (30...35 %), protopectin (50 %), to separate monomers. It is shown that in parallel there is an increase of glucose in nanopuree of peas (1.0 g. ...10.0 g/100 g, i. e. by10 times).

Integrated application of these processes is accompanied by mechanical destruction, mechanical activation and mechanolysis of

biopolymers of nanocomplexes (protein, heteropolysaccharides, etc.) to α–amino acids, glucose, etc. (48...55 %).

Keywords: nanotechnologies, finely dispersed grinding, mechanolysis, nanocomplexes, biopolymers, heteropolysaccharides.

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STUDYING THE ACCUMULATION OF NITROGENOUS SUBSTANCES IN BIOFORTIFIED PUMPKIN VEGETABLES (p. 40-46)

Gregoriy Deinychenko, Olha Yudicheva

The main purpose of biofortificatrion is obtaining plant products with improved nutritional properties. Plant products are biofortified by means of the classic selection, genetic modification, or with the use of special fertilizers. Food plants have traditionally been enriched with vital minerals and vitamins; lately, they have also been bioenriched with amino acids and proteins. Vegetable protein consumed with the animal one enhances the value of protein nutrition due to the formed biologically active amino acid complexes. The value of vegetable protein increases in vegetarian nutrition, especially hard food, and nutrition of people suffering from celiac desease. We have studied the peculiarities of nitrogenous substances' accumulation in biofortified pumpkin vegetables grown with the use of the liquid, organic, environment-friendly Riverm fertilizer. The objects of study are biofortified pumpkin vegetables: pumpkins of Oleshkivskyi and Sviten varieties, melons of Olvia and Fortuna varieties, and watermelons of Orphei and Atlant varieties. The reference samples are vegetables grown by the standard technology, without the above mentioned fertilizer. The research findings show that biofortified pumpkin vegetables are characterized by higher contents of total nitrogen and protein nitrogen, as well as contain more protein in comparison with the reference samples: pumpkins – by 15.0–17.6 %, melons – by 6.5–16.4 %, and watermelons – by 8.9–10.1 %. The highest amount of essential amino acids is contained in the protein of biofortified pumpkins, a bit lower – in biofortified melons and watermelons. The protein of biofortified pumpkins is characterized by the content of leucine, valine, and lysine. Biofortified melons and watermelons are dominated by lysine and phenylalanine. The largest shares of replaceable amino acids in all the samples are those of aspartic acid and glutamic acid. Bioenriched with nitrogenous substances (in particular, protein and amino acids) pumpkin vegetables cannot fully satisfy human needs of proteins and essential amino acids, although they can perfectly supplement nutrition with the latter. Such vegetables can be recommended to be used in balanced diets of animal and vegetable proteins, glutenless diets, and vegetarian diets.

Keywords: biofortification, fertilizers, Riverm, protein, nitrogenous substances, amino acids, pumpkin vegetables, micronutrients.

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RESEARCH INTO THE IMPACT OF ENZYME PREPARATIONS ON THE PROCESSES OF GRAIN DOUGH FERMENTATION AND BREAD QUALITY (p. 46-53)

Svitlana Oliinyk, Olga Samokhvalova, Anna Zaparenko, Elena Shidakova-Kamenyuka, Micola Chekanov

The important issue of improvement in the technology of grain bread is the development of measures to improve the rheological properties of dough and bread. With this aim we proposed the use of cellulases, hemicellulases ans oxidoreductases at the stage of dough mixing. It is shown that the application of the studied enzymes for grain emmer and wheat dough contributes to the intensification of non-starch polysaccharides hydrolysis, namely reduction of the content of cellulose by 11 %, hemicelluloses – by 14.3 and 13.0 %, and increase in the content of water-soluble fraction of hemicelluloses.

Additionally, the presence of enzyme preparations in the grain dough promotes slowing down of the processes of gluten proteolysis and improvement of its rheological properties that predetermines increase of gas-retaining capacity of the studied system. It was discovered that adding the studied enzyme preparations to grain dough contributes to the intensification of acid and gas generation in it. The resulting effect of biochemical and microbiological changes in grain dough under the influence of enzyme preparations of cellulase, xylanase and glucose oxidase is the improvement in the quality of grain bread compared to the samples without their addition.

Keywords: enzymes, grain bread, dough preparation, cellulase, xylanase, glucose oxidase.

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CONSUMER PROPERTIES IMPROVEMENT OF SUGAR COOKIES WITH FILLINGS WITH NON-TRADITIONAL RAW MATERIALS WITH HIGH BIOLOGICAL VALUE (p. 54-61)

Alina Tkachenko, Inna Pakhomova

According to the study of experimental data, the feasibility of unconventional raw material with increased biological value (powdered apples, dried apricots; sea-buckthorn and calendula officinalis syrups, fat-free whey powder, whey protein concentrate, preparation of eggshells with lemon juice, cherry plums and zucchini jam, sea-buckthorn jam) and unconventional oils (pumpkin, sea-buckthorn)

in the sugar cookies production has been proved. The study indicates the increased content of essential amino acids by 34,83 % in the cookies "Dachne" and in the cookies "Yasne sonechko" by 32,54 % as compared with the check sample. The content of polyunsaturated fatty acids and minerals has increased. Especially, the content of calcium has increased by 2,8–3 times. The total fraction of carbohydrates and fats has decreased; the fraction of proteins has increased. The new cookies samples have been evaluated by the parameters of taste and smell higher than the check sample especially according to the organoleptic evaluation. The developed samples meet the standard by the physical-chemical parameters and safety parameters. The results can be used for implementation in the confectionery companies for the diversification of products with high nutritional value.

Keywords: pastry products, unconventional raw material, consumer properties, nutrition value, sugar cookies with fillings.

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THE EFFECT OF GRAPE SEED POWDER ON THE QUALITY OF BUTTER BISCUITS (p. 61-66)

Olga Samohvalova, Nataliya Grevtseva, Tatiana Brykova, Anjelika Grigorenko

Butter biscuits that enjoy stable great demand in all segments of population traditionally contain a lot of fats and carbohydrates versus small amounts of biologically active substances. Enriching butter biscuits with dietary fibre, polyphenolic compounds, minerals and vitamins has a beneficial effect on the human body. These components are abundant in raw plant materials, primarily in powdered grape pomace. Grape pomace is a secondary product of wine manufacturing that is output in large quantities at wineries in Ukraine; it is an available and inexpensive raw stuff with a rich chemical composition.

We have studied the possibility of using grape seed powder in the technology of butter biscuits, in order to increase their biological value. We have found that in comparison with wheat flour, the powder is characterized by a higher water absorption capacity, and adding grape seed powder makes gluten less tensile and more elastic. The study has proved a positive effect of grape seed powder on physicochemical and organoleptic parameters of the quality of butter biscuits that become biologically more valuable.

Keywords: grape pomace, grape seed, powder, gluten, water absorption ability, butter biscuits.

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