ABSTRACT AND REFERENCES

TECHNOLOGY AND EQUIPMENT OF FOOD PRODUCTION

STUDY OF THE WATER BINDING IN THE GEL SYSTEMS OF PECTIN AND SODIUM ALGINATE (p. 4-11)

Iryna Sokolovska, Julya Kambulova, Nataliia Overchuk

One of the modern development trends of the confectionery industry is sugar reduction in products. Some sugar can be reduced in technological schemes of those confectionery masses in which structural stability is achieved by gelling. In such systems, hydrocolloids absorb and retain significant amounts of water, decrease its activity, which contributes to the microbiological stability of products during storage, and provides constant structural and mechanical properties.

Gel systems, which are the basis of many confectionery products form a strong structure with the comprehensive use of structure-forming agents. It is found that the combination of sodium alginate and pectin produces additional hydrogen bonds between chains of macromolecules, which increases the water binding energy in the system and the bound water portion. It is revealed that the adsorption-bound water has the largest share in the systems. Its amount in the complex gels is by 8–10 % higher than the amount of bound water in monocomponent samples. That is, water removal in these gels will be slower. That is, water removal in these gels will be slower. This has a positive impact on the structural stability of gel-like confectionery products with reduced sugar in the formulation, provides microbiological safety of products during storage.

The development of this direction will find wide application, since the structure of a wide range of confectionery products is stabilized due to the developed gel-like properties of hydrocolloids. These are pastila and fruit jelly products, fillings for flour confectionery and candies, centers for sweets, etc.

Keywords: sugar reduction, pectin, alginate, polysaccharide complexes, synergy, thermogravimetric analysis of gels.

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THE RATIONALE OF SELECTING PASTRIES TO BE MADE WITH WAXY WHEAT FLOUR (p. 12-18)

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Analysis of the distinctive characteristics of various pastries has proved relevance of the differentiation approach (practiced outside Ukraine) to the technological properties of flour in producing specific product groups in Ukraine. The study shows the expediency of using non-amylose waxy wheat flour to stabilize the quality of pastries. The study of the technological properties of waxy wheat flour and characteristics of its starch composition has predetermined the choice of pastries with different textures – yeast pastries and honeybread cookies compatible with this type of flour. It has been found that the use of waxy wheat flour in the technology of yeast cakes improves the quality of finished products. A non-amylose type of flour instead of wheat flour in making low-sugar biscuits results in higher consumption characteristics in comparison with the standard, even when sugar is completely excluded from the recipe. The study of changes in the quality of no-bakeand boiled honeybread cookies in storage shows that the use of non-amylose flour facilitates preserving the honeybread cookies' freshness, which is evidenced by a lower crystallinity of starch in no-bake honeybreads based on waxy wheat flour as well as less intensive weight loss in boiled honeybread cookies and higher crumbliness of the latter compared to the standard.

Keywords: waxy wheat, amylopectin, flour, technological properties of flour, yeast cakes, low-sugar biscuits, no-bake and boiled honeybread cookies.

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RESEARCH OF RHEOLOGICAL PROPERTIES OF EGG SPONGE WITH EXTRUDED CORN FLOUR (p. 19-23)

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Addition of extruded corn flour affects the egg sponge stability. The dependence of the effective viscosity of egg sponge samples with different concentrations of extruded corn flour on the shear rate and stress is investigated. Viscosity index is closely associated with the water-retaining capacity of the egg sponge. So, there is a need to study the state of free and bound water in the egg sponge depending on the content of extruded corn flour. The aim of the research was to identify the impact of extruded corn flour on the rheological properties of the egg sponge under mechanical impact, and study of the effect of extruded corn flour addition on the ratio of the state of free and bound water in it.

The most intensive decrease in viscosity with increasing shear rate is observed in the sponge based on the mixture with the content of extruded corn flour of 50 % at a shear rate of 2.4 s^{-1}. Further decrease in effective viscosity with increasing shear rate is less intense, and all the samples tend to approach a constant viscosity of 2.4 Pa·s for the control sample and the viscosity of 4.2 Pa·s in the sample with the content of extruded corn flour of 50 % at a shear rate of γ 11.65 s^{-1}.

Increased amount of extruded corn flour raises the spin-spin relaxation time, indicating a decrease in the mobility of water molecules in solution. This suggests that increased amount of extruded corn flour in the egg sponge increases the amount of bound water, which contributes to retaining more moisture in the finished product.

The research shows the feasibility of extruded corn flour in the technology of semi-finished sponge cake that will improve the quality indicators of the finished product and extend its life.

Keywords: extruded corn flour, semi-finished sponge cake, rheological properties, nuclear magnetic resonance.

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STUDY OF THE PROTEIN-CARBOHYDRATE MIX EFFECT ON THE TECHNOLOGICAL PROPERTIES OF SHORT YEAST-LEAVENED DOUGH (p. 24-32)

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The possibility of increasing the nutritional and biological value of bakery products through the use of a protein-carbohydrate mix (PCM) is considered. The main purpose of the research was to substantiate the effective concentration of PCM in terms of the technological properties of yeast-leavened dough.

The study was conducted on the model systems of short yeast-leavened dough by preactivation of yeast (Saccharomycescerevisia) in a culture medium consisting of water and dry additives produced from potato secondary products.

Investigations to determine the chemical and amino acid composition of PCM were carried out, high biological value of the mix was proved. The PCM effect on the gas-forming ability of dough, as well as indicators of active and titratable acidity of the yeast-leavened dough was examined. Improvement of the properties of flour protein-proteinase complex in the presence of PCM was revealed.

It is proved that the use of PCM in a concentration of 15 % by weight of flour improves the technological properties of yeast-leavened dough.

The results can be used in the baking industry to intensify the production of yeast-leavened baked products, as well as increase the biological value of the finished products.

Keywords: protein-carbohydrate mix, dry potato additive, yeast-leavened dough, gas-forming ability, active acidity.

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A STUDY OF THE EFFECT OF ENRICHED WHEY POWDER ON THE QUALITY OF A SPECIAL-PURPOSE BREAD (p. 32-40)

Anatoliy Ukrainets, Oksana Kochubei-Lytvynenko, Olena Bilyk, Valerij Zacharevich, Tetyana Vasilchenko

A topical problem of the bakery industry is to expandthe range of bakery products for special purposes, especially for people over 60. The problem can be solved by using whey in the technology of bread-making. However, whey has a limited shelf life. We have made a comparative analysis of the chemical compositions as well as functional and technological properties of different types of whey powder existing on the market of Ukraine and innovative ones, developed at the National University of Food Technologies (Kyiv, Ukraine). The analysis was aimed at selecting dairy products capable of meeting the technological requirements of lability. Regarding the considerable practical interest, behaviour during processing, transportation and storage, an objective analysis and an accurate calculation of the

comprehensive quality index determined the choice of the following criteria: organoleptic characteristics, solubility, and storability. It has been found that the highest comprehensive index (98 %) characterizes whey with an enriched mineral composition, which has served as the basis for its use as a dairy ingredient in the recipes of wheat bread for people of older age groups. It has been specified that the optimal dose of whey to enrich the wheat bread and prolong its freshness is 5 % to the weight of flour. The study has proved the positive influence of whey powder enriched with Mg and Mn on the quality and freshness of bakery products. The findings ascertain the feasibility of introducing magnesium-enriched and manganese-enriched whey powder in the recipes of wheat bread to expand the assortment of bakery products for people of older age groups.

Keywords: whey powder, magnesium-enriched and manganese-enriched, wheat bread for special purposes.

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QFD METHODOLOGY TO DEVELOP A NEW HEALTH-CONDUCIVE GRAIN PRODUCT (p. 42-47)

Marina Mardar, Dmytro Zhygunov, Rafaela Znachek

The article describes using quality function deployment (QFD) methodology to develop a new grain product as healthy food. A questionnaire survey of consumer requirements for the new grain product was processed with the help of two techniques of quality management – an affinity diagram and a tree diagram – to generalise and structure consumer preferences. The elicited consumer requirements were further ranked according to the priorities, which made it possible to distinguish between imperative requirements and those that can be disregarded without significant effect on the resulting quality of the product.

The methodology of quality function deployment was used to transform requirements of potential customers for the quality of grain crackers into technical characteristics of a new health-conducive grain product to develop through priority optimisation. The study has determined that development of a grain product as healthy food should guarantee prophylactic effectiveness of the new product on the basis

of natural enriching additives, increased BAS content, and, certainly, longer shelf life and safety parameters of grain crackers.

Keywords: quality, quality function deployment methodology, consumer requirements, grain crackers, "quality house".

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QUALITY ADJUSTMENT FOR JELLY MARMALADE OF A MODIFIED CARBOHYDRATE STRUCTURE (p. 48-56)

Katerina Iorgachova, Karine Avetisian

The study explores changes in the structural and organoleptic properties of marmalade jelly with different amounts of acid. The research findings make it advisable to reduce the recipe amount of acid by 25 % for agar-based marmalade with 50 %-substitution of syrup IG-60 for sugar, glucose, and maltodextrin. Products with improved organoleptic properties were obtained from samples that were based on using syrup and polydextrose instead of glucose, maltodextrin and 75 % to 100 % of sugar as well as 50 % of the recipe amount of acid. The carbohydrate structure of pectin-based marmalade masses has determined expediency of reducing the recipe amount of acid by 8 % ... 20 %. Besides, we studied physicochemical, structural and mechanical as well as organoleptic indicators of quality of double-layer marmalade in which starch syrups of various carbohydrate structures or fructose with polydextrose were used instead of glucose, maltodextrin, and sugar. We have proved the expediency and developed recommendations as to changing the amount of acid in the recipe of marmalade jelly on agar and on pectin depending on its carbohydrate structure.

Keywords: double-layer marmalade, agar, pectin, starch syrups, fructose, polydextrose, pH scale, acid, strength, quality indicators.

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A TECHNOLOGY OF AN ANTILIPOLYTIC DIETARY SUPPLEMENT BASED ON PHENOLIC COMPOUNDS AND BIOPOLYMERS OF PLEUROTUS OSTREATUS (p. 56-63)

Natalya Cherno, Sophya Ozolina, Olexandra Nikitina

A rapid increase in the number of people suffering from abnormal weight gain is observed worldwide. Scientists have discovered a causal relationship between obesity and a number of serious diseases. At present, the only means used for correcting body weight is orlistat, which is a semi-synthetic medicine of non-Ukrainian production and a remedy that is not devoid of side effects.

Our aim was to develop a technology of obtaining a dietary supplement that would produce antylipolitic effect and be based on substances of vegetable origin: phenolic compounds of rapeseed and a biopolymer complex of oyster mushrooms.

It has been determined that the inhibitory activity of phenolic compounds of rapeseed that are immobilized on the biopolymer matrix of oyster mushrooms depends on the conditions of obtaining the latter. The highest levels of antylipolitic activity were found in antylipolitic preparations derived from the biopolymer complex that had been obtained through treating the raw material with water, acid, and a 7 % solution of sodium hydroxide. The selected duration of contact with the alkaline agent is 90 min.

Rational conditions have been established for immobilization of the inhibitor on the carrier: saturation of the matrix with a 0.17 % solution of phenolic compounds of rapeseed (hydrological module 6) at a temperature of +20–25 °C for 20 minutes. Samples with an immobilized inhibitor have been found to surpass the intact form according to such properties as pH stability, thermal stability, stability under conditions simulating the gastrointestinal tract, and stability in storage.

We have developed a technology of obtaining a dietary supplement of antylipolitic effect. The dietary supplement contains 1 % of phenolic compounds of rapeseed while the rest of the structure consists of a biopolymer complex of oyster mushrooms that includes glucan, chitin, melanins, and protein. It is characterized by high levels of antylipolitic, antioxidant and enterosorption activities; moreover, it is able to stimulate growth of lactobacteria and bifidobacteria as well as to respond to the normalized indicators of microbiological safety.

Keywords: technology, dietary supplement, lipase inhibitor, biopolymer complex, mushrooms, rapeseed.

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RATIONALE FOR THE USE OF PROTEIN-CARBOHYDRATE MIX IN THE TECHNOLOGY OF DISPERSE PRODUCTS (p. 64-71)

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The possibility of using skim milk proteins and pectin of dogberries and sloes is considered.

The high-quality whipped system was obtained based on the protein-carbohydrate clot and berry puree. This was possible due to the activation of the functional components of the berry puree in their joint whipping, due to the presence of the surface-active sodium caseinate and stabilizing properties of pectin. As a result of the controlled interaction of these substances, calcium pectate, and protein-carbohydrate complexes are formed, which ultimately improves the system viscosity.

The content of essential ingredients in the mixes, including the protein-carbohydrate clot (PCC) with a concentration of 65...70 %; berry puree – 15...20 %, and sugar – 15 % was determined.

Based on the experimental data, the production process parameters of the protein-carbohydrate mix (PCM), including preparation of raw materials; solubilization of protein-carbohydrate clot proteins; solubilization of berry puree pectin; mixing of the protein-carbohydrate clot and modified berry puree; cooling of the system to 4±2 °C were determined.

It was found that the protein-carbohydrate mix (PCM) can be used in technologies of frozen dessert products under certain process conditions (temperature, pH).

The studies confirm the feasibility of the PCM use in technologies of frozen dessert products both in terms of effectiveness and nutritional value. The developed technology is low-waste, resource-saving and simple.

Keywords: protein-carbohydrate clot, dogberry, sloe, pumpkin, sea-buckthorn, frozen desserts, foaming capacity, foam stability, glycemic index.

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