

TECHNOLOGICAL ASPECTS OF OBTAINING STRUCTURED EMULSIONS IN COMPOSITION OF MINCED MEAT PRODUCTS (p. 79-84)

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The nutrition structure that has developed in Ukraine today dictates the need to expand the range of culinary products by more efficient use of plant products, to which still little attention has been paid. The problems of the lack of nutrients with high biological value in nutrition of a modern man are shown in the paper. The studies in this field are first given in the paper, and it was proved that a promising raw material for producing such products is the use of structured products, the use of which lies in the basis of alginate emulsions with calcium residues. The studies of the rheological properties of the structured emulsions and physico-chemical aspects of obtaining the latter in the composition of minced meat products are given in the paper. The use of a wide range of new technologies, including emulsification of various raw materials, namely polysaccharides for the production of fundamentally new products, which are characterized by high biological value, is submitted for consideration. As a result of the studies, structural and mechanical properties of the model systems and physico-chemical indices were determined. These data allow presenting the technology, ready for introducing to the technological process of obtaining emulsions in minced meat composition. This technology will allow obtaining products not only with standardized indices, but also overtaking the organoleptic indicators of quality that facilitate the production process.

Keywords: emulsion, structurization, food technology, meat production, thermal stability, ionotropic polysaccharides, alginates.

References

- Zharinov, A. I. (1994). *Kratkiye kursy po osnovam sovremennoy tekhnologii pererabotki myasa. Part 1. Emul'girovannyye i grubo izmel'chennyye myasoprodukty*, Itar-TASS, 154.
- Musina, O. N., Loseva, A. I., Safonova, Ye. A. (2012). *Polucheniye emul'sionnykh produktov kak primer innovatsionno-proyektnoy deyatel'nosti v pishchevoy otrasli. Pishchevaya promyshlennost'*, 9, 10–12.
- Sviridov, V. V., Bannikova, A. V., Ptichkina, N. M. (2012). *Vliyaniye prirody studneobrazovateley na svoystva pishchevykh studney. Izv. vyssh. ucheb. zavedeniy. Pishchevaya tekhnologiya*, 1, 59–61.
- O sekretakh zhelirovaniya i studneobrazovaniya: master-klass kanadskoy olimpiyskoy komandy kulinarov* (2011). *Pitaniye i obshchestvo*, 8, 14–15.
- Kalugina, I. M. (2011). *Modelyuvannya draglepodibnikh strav funktsional'nogo priznachennya z dobavkami mors'kikh vodorostey. Kharchova nauka i tekhnologiya*, 4, 14–16.
- Kolisnichenko, T. O. (2010). *Obgruntuvannya dotsil'nosti vikoristannya mors'kikh vodorostey pri virobnitstvi yemul'siynikh sousiv. Rib. Gosp-vo Ukraïni*, 7, 14–15.
- Nekrasov, P. O. (2010). *Doslidzhennya fiziologichnikh vlastivostey zhirovikh yemul'siynikh sistem, zbagachenikh diatsilglitseridami. Vopr. Khimii i khim. tekhnologi*, 4, 55–58.
- Tokarchuk, Yu. (2009). *Kharakteristika ta zastosuvannya poverkhnevo-aktivnikh rechovin (PAR). Khlibopekars'ka i konditers'ka promislovist' Ukraïni*, 6, 18–22.
- Dmitrik, I. (2009). *Osoblivosti vikoristannya kharchovikh tekstur u molekulyarniy tekhnologii. Tovari i rinki*, 2, 58–64.
- Mc Natt Kristen, W., Powers Mary, E., Sloan, A. Elizabeth (2006). *Foods colors and safety; consumer viewpoint. Food Technology*, 15–17.
- Pereyra, Ricardo, Schmidt, Karen A., Wicker, (1997). *Louise Interaction and stabilization of acidified casein dispersions with low and high methoxyl pectins. J. Agr. and Food Chem, Vol. 45, № 9, 3448–3451.*

CRYOSCOPY RESEARCH OF SOLUTIONS OF FOOD INGREDIENTS OF POLISACCHARIDE NATURE (p. 84-89)

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One of the latest trends in the global market is frozen products. Taking into account this factor, the paper deals with studying the food industry that will allow to determine the thermal and physical charac-

teristics of ingredients, recommended for using in the technologies of producing frozen minced-meat semi-finished products for maintaining the quality of products as a result of the negative influence of low temperatures during freezing. That is why, the purpose of the research was to determine the temperature ranges of ice formation and melting, as well as the frozen moisture content in solutions of food ingredients of polysaccharide nature at different concentrations. The paper shows that the cryoscopy studies were carried out using a low-temperature calorimeter, the method of which is based on measuring the amount of heat, released during free moisture crystallization in food raw materials. The research results indicate the possibility of using food ingredients of polysaccharide nature in manufacturing frozen semi-finished products, as cryoprotective additives, which minimize the damage level at the stage of “freezing-storage-thawing”.

Keywords: freezing, thawing, ice formation, frozen water, food ingredients of polysaccharide nature.

References

- Glushkov, O. A. (2010). *Improvement of production technology of meat products frozen. Dis ... cand. tehn. sciences: 05.18.16. / Odessa*, 160.
- Holodov, F. V. (2011). *Develop compositions supplements cryoprotective action to preserve the quality of meat products. Dis ... cand. tehn. sciences: 05.18.04 / Moscow*, 107.
- Yablonenko, L. A. (2008). *Investigation of the influence of freezing on quality glibokogo rissoles. Dis ... cand. tehn. sciences: 05.18.04 / Ulan - Ude*, 123.
- Phillips, G. O., Williams, P. A. (2006). *Handbook of hydrocolloids. Translation from English. ed. A. A. Kochetkova, L. A. Sarafanova, St. Petersburg. : GIORD*, 536.
- Milani, J., Maleki, G. (2012). *Hydrocolloids in Food Industry. Food Industrial Processes - Methods and Equipment*, 2, 2-37.
- Thomas, R. L. (2007). *Hydrocolloids: Fifteen Practical Tips. Guaranteed Gums*, 8, 2 - 17.
- Krala, L., Dziomdziora, M. (2003). *The effect of hydrocolloid mixtures on frozen pork properties. Polish Journal of Food and Nutrition Sciences*, 12/53, 4, 55-58.
- Nishinari, K. (2008). *Structure and Properties of Food Hydrocolloids - Gels, Emulsions and Foams. Foods Food Ingredients J. Jpn.*, 213, 5, 138-141.
- Evans, J. A. (2010). *Frozen food manufacturing and sale. Translated from English V. D. Shirokov, Title*, 440.
- Maslikov, M. (2006). *Rozmorozhuvannya m'yasa. Meat business*, 8, 40-41.
- Patent № 13953 Ukraine, MPK A/23L 1/00. *Device for determining the amount of free and bound water at temperatures close to the temperature of liquid nitrogen. № 200511091; 23.11.2005; 17.04.2006. Bul. №4. – 6.*

BIOMEDICAL RESEARCH OF CHOPPED MEAT PRODUCTS WITH COMPLEX ADDITIVE «MALTOVIN» (p. 90-95)

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The results of biomedical research on the impact of additive «Maltovin» with antioxidant properties on the state of the antioxidant system of animals by biochemical parameters are given in the paper. The main objective of the research was to determine the toxicological safety of using chopped meat products with complex additive «Maltovin» for biological objects and solve the problem of improving the quality of meat products by increasing their resistance to oxidation processes.

Subchronic administration of the additive “Maltovin” in chopped meat products, which have passed the preliminary heat treatment, to the diet of laboratory rats did not result in any statistically significant changes in indicators of morphometry, metabolism and overall functional state of experimental animals compared with the control group. There was no lag in the weight gain, structure indicators and ratio of blood cells, hemoglobin content in experimental animals, behind that of control animals. The activity of key enzymes of carbohydrate and protein metabolism changed insignificantly that proves the lack of the negative impact of additive and foods with it on the hepatorenal system. Safety of using

the additive is also confirmed by indicators, characterizing preserving the balance between pro- and antioxidant systems (by indicators of MDA, DP, GR, G-6, FDG) of animals. Analysis of the obtained results showed that "Maltovin" can be used as an effective antioxidant additive, which promotes preserving the quality of meat products with significant fat content and does not affect the state of the main physiological systems.

Keywords: antioxidant, peroxidation, meat products, phenolic compounds, toxicological safety.

References

- Chomutov, B. I., Lovachev, L. N. (1972). Storage of dietary fat. Moscow: Economics, 160.
- Dudkin, I. S., Shchelkunov, L. F. (1998). New foods. Moscow: Nauka, 303.
- Sastry, D. S., Shende, M. (1983). Status of food grade antioxidants in India. *Indian Food Packer*, 5, 39–49.
- Rosival, L., Engst, P., Sokolay, A. (1982). The alien substances and food additives in food. transl. from Germany. D. B. Melamed. Light and Food Industry, 264.
- Demidov, I. N., Danilova, L. A., Chernova, L. A. (1992). The study of the possibility of using plant extracts as antioxidants fat oxidation. *Math. Universities. Food Technology*, 3, 30–31.
- Golant, B. J., Petrov, N. A. (1958). Increasing resistance fat and fat containing products. M.: Pishchepromizdat, 191.
- White, R. H., Howard, J. W., Barnes, C. J. (1971). Determination of polycyclic aromatic hydrocarbons in liquid smoke flavors. *Journal of agricultural and food chemistry*, Vol. 19, № 1, 143–146.
- Buldakov, A. S. (1996). *Food Additives Handbook*. St. Petersburg: Ut, 240.
- Avsicer, L. P. (1996). Technology of storage and processing of animal products (quality control of milk and dairy products). Moscow: Publishing House of the ICCA, 328.
- Couchoud, P. (1994). Les additives, substances indispensables a la maitrise de Paliment Nutritional Supplements – necessary substances in food production (France). *Ind. Alim. Et Agr.*, Vol. 111, № 9.
- Askinazi, A. I., Radchenko, L. M., Shelaeva, E. A. (1988). Evaluation of the antioxidant activity of flavors for foods. Development of the combined processes of food: reports of proc. scientific and engineering. conf. Moscow, 328–329.
- Radchenko, L. M., Konchalovskaya, M. E., Schmidt, A. A. (1978). Effect of spice extracts on the oxidative stability and organoleptic deodorized sunflower oil. *Scientific-technical. Ref. TSNIITEIPP collection*, 6, 26.
- Weinreich, B. (1995). Rosmarinextrakte erhalten produktqualitat. *Backer und Konditor*, 10, 34–36.
- Lisitsyn, A. B., Semenova, A. A., Gundyreva, M. I., Kharitonov, A. A., Lepeshkov, A. G. (2006). Investigation of antioxidant properties of supercritical CO₂ extracts. *Meat Industry*, 3, 30–35.
- Sarafanova, L. A. (2007). The use of food additives in meat and fish processing. St. Petersburg: Profession, 256.
- Klimenko, S. V. (1990). Dogwood in Ukraine. *Naukova Dumka*, 164.
- Petrov, V. P. (1986). *Biochemistry of wild fruit plants*. High school, 287.
- Kravchenko, S. N., Pavlov, S. S., Popov, A. M. (2005). Use in the manufacture of food antioxidants derived from plant material. Storage and processing of agricultural raw materials, 2, 37–38.
- Degtyarev, P. S., Pikunov, A. V., Svergunenko, S. L. (2004). New data on the antioxidant activity of *Scutellaria baicalensis*. *Meat Industry*, 5, 51–52.
- Plotnikov, E. E., Glazov, G. V. (2010). Herbal and other antioxidants in the production of meat products. *Meat Industry*, 7, 26–28.
- Kochieva, I. V., Plotnikov, E. E. (2008). Effective method of delaying oxidation processes. *Meat Industry*, 8, 62–63.
- Kochieva, I. V., Plotnikov, E. E. (2008). Perspective and other antioxidant herbal. *Meat Industry*, 7, 60–62.
- Krishtafovich, V. I., Duborasova, T. Y., Tolkunova, N. N. (2002). Impact on preserving additives hydrolytic changes lipid. *Meat Industry*, 1, 18–20.
- Bazarnova, Y. G., Kolodyaznaya, V. S., Dmitrieva, V. I. (2003). Investigation of antioxidant activity of natural substances. Storage and processing of agricultural raw materials, 10, 66–71.
- Silva, R. C., Rigaud, J., Cheynier, V., Chemina, A. (1991). Procyanidindimers and trimers from grape seeds. *Phytochemistry*, 30, 1259–1264.
- Kandaswami, C., Middleton, E. (1994). Free radical scavenging and antioxidant activity of plant flavonoids. *Adv. Exp. Med. Biol.*, 366, 351–361.
- Middleton, E., Drzewieki, G. (1983). Flavonoid inhibition of human basophile histamine release stimulated by various agents. *Biochem. Pharmacol.*, 3333–3338.
- Ho, C. T., Lee, C. Y., Huang, M. T. (1992). Phenolic compounds in food and their effects on health. *Analysis, Occurrence and Chemistry*, American Chemical Society, Washington, DC, 102–117.
- Savinok, O. M., Litvinova, I. O. (13.05.2013). Patent 79879 UA MPK ⁵¹. A 23 L 1/29 (2006.01). Method of obsession functional additive "Maltovin". Odessa national academy of food technologies. № 201210153, № 9.
- Savinok, O. M., Litvinova, I. O., Bourdeau, O. G., Kapetula, S. M. (25.04.2013). Pat. 79379 UA MPK ⁵¹ C 11 B 1/10 (2006.01). Method of obsession extrakts grape seeds. Odessa national academy of food technologies. № 201210165, № 8.
- Savinok, O., Litvinova, I., Kuzelov, A. (2012). The natural additive with antioxidant properties for meat products. *Macedonian journal of animal science*, Vol. 2, 405–408.
- Reznikov, A. G. (2003). General ethical principles of animal experimentation. *Endocrinology*, Vol. 8, № 1, 142–145.
- European convention for the protection of vertebrate animals used for experimental and other scientific purposes (1986). Council of Europe, Strasbourg, 53.
- Danilova, L. A. (2003). *Reference Laboratory Methods*. Petersburg, 736.
- Orehkovich, V. N. (1997). *Modern methods in biochemistry*. Medical, 391.
- Donson, R., Elliot, D., Elliot, W. (1991). *Reference book of biochemist*. Mir, 446.
- Lapach, S. N., Chubenko, A. V., Babich, P. N. (2000). Statistical methods in biomedical research using Excel. MORION, 320.
- Antomonov, M. (2006). Mathematical processing and analysis of biomedical data, 558.

ASPECTS OF BREAD TECHNOLOGY WITH THE USE OF DRIED PLANT RAW MATERIAL (p. 95-101)

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The problem of enriching bakery products with dried plant ingredients is considered in the paper. Cabbage powder, obtained by drying with the mixed heat supply is selected as raw material for enriching the chemical composition of bread. Functional and technological properties of dried cabbage such as organoleptic properties, dispersion, water absorbing ability in different polar media are investigated. Predominant content of particles with dispersion 5...50 microns in powder is shown. High technological potential of the cabbage powder lies in restoring the structure when increasing the polar media temperature.

The obtained data allowed to recommend using the cabbage powder directly in dough kneading or preliminary dehydration.

Using sesame and flax seeds at excluding sugar and fat from the recipe is proposed to improve the nutritional value of bread with cabbage powder.

Optimal dosing of plant raw materials was determined using the design program "OPTIMA".

The influence of the specified ingredients on production and quality of bread is studied. Improved gas generation, reduced dough proofing time, increased porosity and shape-stability of finished products in comparison with the control sample are shown.

Based on the studies, the recipe of "Lean" bread with cabbage powder, sesame and flax seeds is proposed.

Excellent taste and compliance of physicochemical quality indicators of new products with existing regulations are shown.

Chemical composition and energy value of "Lean" bread is calculated. Increased protein content is shown, fats are represented by unsaturated fatty acids.

"Lean" bread has higher staling resistance by indicators of crumb swelling and crumbliness compared with the control sample.

Keywords: bakery products, technology, cabbage, sesame, flax seeds, vegetable powder, quality indicators.

References

- Rossia, P., Ribotta, P., Perez, G. (2009). Influence of soy protein on rheological properties and water retention capacity of wheat gluten. *Food Sci. and Technol.*, 42, 1, 358–362.
- Hymowitz, T. (2007). On the domestication of the soybean. *Economic Botany*, 4, 24, 408–421.
- Nilufer, D., Boyacioglu, D., Vodovotz, Y. (2008). Functionality of soy milk powder and its components in fresh soy bread. *Journal of Food Science*, 73, 4, 275–281.
- Gruppen, H., Voragen, A. (2005). Physicochemical Properties of 2S Albumins and the Corresponding Protein Isolate from Sunflower (*Helianthus annuus*). *Journal of Food Science*, 70, 1, 98–103.

5. Feldheim, W. (2000). The use of lupins in human nutrition. Proceedings of the 9-th International Lupin Conference. Auburn University: Auburn, 434–437.
6. Ostroborodova, S. N. (2009). Razrabotka tehnologij funkcional'nykh hlebubulochnykh izdelij s primeneniem syr'ja rastitel'nogo i zhyvotnogo proishozhdenija. 05.18.01, Voronezh, 219.
7. Pogozhik, N. I. (2002). Nauchnye osnovy teorii i tehniki sushki pishhevoogo syr'ja v massobmennykh moduljah. 05.18.12, Har'kov, 365.
8. Stear, C. (1990). Handbook of Breadmaking technology. London, New York, Elsevier Applied Science, 848.
9. Drobot, V. I. (1998). Dovidnik z tehnologii hlibopekars'kogo virobniictva. K., Ruslana, 415.
10. Arsen'eva, L. Ju. (2007). Naukove obruntuvannya ta rozroblennja tehnologii funkcional'nykh hlebubulochnykh virobiv z roslinnymi bilkami ta mikronnutrientami. NUHT, K., 402.
12. Food and Agriculture Organization of the United Nations. (2005) Trade in Medicinal Plants. Retrieved from <ftp://ftp.fao.org/docrep/fao/008/af285e/af285e00.pdf>.
13. Saxena, M., Saxena, J., Nema, R., Singh, D. & Gupta, A. (2013). Phytochemistry of Medicinal Plants. Journal of Pharmacognosy and Phytochemistry, 1(6), 168–182.
14. Pengelly, A. (1999). The Constituents of Medicinal Plants – An Introduction to the Chemistry & Therapeutics of Herbal Medicines. Sunflower Herbals.
15. Yakovlev, H. P. (2006). Medicinal plant and animal raw materials. Pharmacognosy: tutorial. SPb, SpetsLit.
16. Korenskaya, I. M. (2008). Medicinal plants and medicinal plant raw materials containing vitamins, polysaccharides, fatty oils. VGU, Voronezh.
17. Pustyrskiy, I. & Prokhorov, V. (2000). The universal encyclopedia of medicinal plants. Knizhnyi Dom, Mahaon, Moscow.
18. Poliakov, V. A., Burachevskiy, I. I., Tikhomirov, A.V. (2011). Fruit-berry and plant raw materials in beverage industry. DeLi plus, Moscow.
19. Duthie, S. J., Dobson, V. L. (1999). Dietary flavonoids protect human colonocyte DNA from oxidative attack in vitro. European Journal of Nutrition, 38, 28–34.
20. Lee, J., Koo, N., Min, D. B. (2004). Reactive Oxygen Species, Aging, and Antioxidative Nutraceuticals. Comprehensive Reviews in Food Science and Food Safety, 3, 21–33.
21. Brewer, M. S. (2011). Natural Antioxidants: Sources, Compounds, Mechanisms of Action, and Potential Applications. Reviews in Food Science and Food Safety, 10, 221–247.
22. Denev, P. N., Kratchanov, C. G., Ciz, M., Lojek, A., Kratchanova, M. G. (2012). Bioavailability and Antioxidant Activity of Black Chokeberry (*Aronia melanocarpa*) Polyphenols: in vitro and in vivo Evidences and Possible Mechanisms of Action: A Review. Comprehensive Reviews in Food Science and Food Safety, 11, 471–489.
23. Craft, B. D., Kerrihard, A. L., Amarowicz, R., Pegg, R. B. (2012). Phenol-Based Antioxidants and the In Vitro Methods Used for Their Assessment. Comprehensive Reviews in Food Science and Food Safety, 11, 148–173.
24. Bravo, L. (1998). Polyphenols: chemistry, dietary sources, metabolism, and nutritional significance. Nutrition Reviews, 56(11), 317–333.
25. Yefimov, S. N. (2004). The development of medicinal plant collection as the base for creating antimutagenic phytoremedy (PhD dissertation). Tomsk.
26. Correa, M. J., Perez, G. T. Ferrero, C. (2012). Pectins as breadmaking additives: effect on dough rheology and bread quality. Food and Bioprocess Technology, 5(7), 2889–2898.

POTENTIAL OF MEDICINAL AND AROMATIC PLANTS TO INCREASE THE QUALITY OF WHEAT BREAD (p. 101-108)

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The characteristics of bakery products from the perspective of consumers, nutritionists and manufacturers was given, the analysis of the main problems of the baking industry, decreasing the quality of physiological properties and product safety, was carried out.

The chemical composition, biochemical and pharmacological properties of medicinal and aromatic plants were considered, the promising ones of long-term use in the bakery production, safety and supply in the market of Ukraine were selected. Four groups of phytonutrients were presented, common and distinctive features of their content and properties were given, the potential for solving urgent problems and the industry tasks was evaluated, use as an alternative to improvers, preservatives that will allow reducing the chemical load on the human body.

Promising directions of using medicinal and aromatic plants for improving the quick dough methods, domestic product technologies, special purpose products, the quality of bread made of flour with reduced baking properties, preventing its microbiological and oxidative spoilage, were given.

The prospects for further researches on expanding the knowledge base of functional and technological properties of phytonutrients, methods of their preparation for the production and formation of the specified properties, creating plant raw material compositions, taking into account the compatibility in food systems, biological activity potentiating, synergetic effects of active ingredients in baking semi-finished products and bakery goods.

Keywords: bakery products, medicinal, aromatic plants, quality, physiological properties, safety.

References

1. Dewettinck, K., Bockstaele, F. V., Kühne, B., Van de Walle, D., Courtens, T. M., Gellynck, X. (2008). Nutritional value of bread: Influence of processing, food interaction and consumer perception. Journal of Cereal Science, 48, 243–257.
2. Sokolov, A. (2011). The rules of the game are changing. Bakery products: market review. Brutto, 52, 25-33.
3. Haharina, A. (2011). Bread moments. Products & Ingredients, 2, 24-27.
4. Nechaiev, A. P., Kraus, S. V. & Fihntner, E. (2013). Food ingredients in the industry of bread and pastry products. DeLi plus, Moscow.
5. Akinfieva, I. (2008). Our daily bread. Products & Ingredients, 2, 24-26.
6. Zhigunov, A. D. & Toporash, I. G. (2013). The quality of wheat grain processed on mills of south Ukraine. Bakery products, 1, 22-25.
7. Toporash, I. G., Zhigunov, D. A. & Akselrud, D. V. (2012). the study of technological properties of modern types of wheat in Ukraine. Physical and biochemical properties of grain. Grain products and mixed fodders, 2, 30-35.
8. Polandova, R. D., Dremucheva, H. F., Karchevskaia, O. Ye. (2009). Baking properties of wheat flour, state and methods of control in bakery products industry. Agrarian bulletin of South-East, 3, 8-10.
9. Vasilchenko, A. V. (2013). Some features of functioning of bread market in Ukraine. Grain storage and processing, 3, 49-51.
10. Kosovan, A. P. (2012). Science of bread in search of optimum solutions of field problems. The results of work of HOSNIHP in 2012. Bread making of Russia, 1, 4-6.
11. Tiurina, Ye. B. (2010). The market of food ingredients for bakery industry. Food ingredients. Raw materials and additives, 1, 19.

IMPROVED CONSUMER PROPERTIES OF WAFERS USING NON-TRADITIONAL RAW MATERIALS (p. 108-113)

Tatyana Lozova

An urgent problem of increasing nutritional and biological value of wafers with fatty fillings, formulae of which include non-traditional raw materials is set forth, and some results of our studies are given. The main purpose of the research is to justify the possibility and feasibility of using natural non-traditional raw materials in the production of wafers. For these studies, organoleptic characteristics, nutritional value, amino acid, fatty acid, mineral and vitamin composition, clinical studies of new products are determined. Three model samples of wafers with fatty fillings, which contain farina, walnut oil, natural honey, extruded bean flour, powders of black elderberry flowers, fenberry and leather bergenia, high content of skimmed milk powder as non-traditional raw materials, are developed. Using non-traditional raw materials allowed to reduce the amount of confectionery fat, powdered sugar in the formulae of fillings, to eliminate the use of cocoa powder. The biological value of the test samples of wafers was increased by 7–15 % compared with the control sample. The clinical studies of waffles, filling of which include apiproducts, confirmed the absence of allergic reactions and other side effects, decrease in the activity of free radical processes in a biological medium of the body, immunity increase. The proposed products may be recommended for mass nutrition. Conducting the trade studies of the model samples of wafers confirmed the increase of their nutritional and biological value, improved organoleptic characteristics.

Keywords: wafers, non-traditional raw materials, biological value, nutritional value, organoleptic characteristics.

References

1. Sposob proizvodstva vafel: pat. 2431340 Ros. Federaciya, MPK A 21D 13/08. № 2010122856; zayavl. 07.06.2010; opubl. 20.10.2011.

- Krasina, I., Hapakyants B., Dzhimova O. Konditerskiye izdeliya dlya dieticheskogo pitaniya. Materialy 5 Mezhdunarodnoy nauch.-pract. konf., Pyatigorsk, 26-29 marta, 2012. – Ros. Federaciya, Pyatigorsk, 2012, 210-212.
- Fillipova, E., Krasina I. and others (2013). Formirovanie potrebitel-skikh svoystv vafelnykh izdeliy spetsialnogo naznacheniya. Izvestiya vuzov. Pishchevaya tekhnologiya. – 2013, № 2-3, 110-112.
- Danovich, N., Tarasenko, N. (2013). Vafelnye izdeliya s ponizhennym soderzhaniiem zhira. Izvestiya vuzov. Pishchevaya tekhnologiya, № 2-3, 67-68.
- Zayavka 1982598 EPV, MPK A 21 D 13/00. Moisture resistant wafer / S. Nestec, C. Hansen, P. Nicolas, B. Pamiés Valles; № 07106604.7; zayav. 20.04.2010; opubl. 22.10.2011.
- Skobelskaya, Z. (2012). Nachinka dlya vafel, obogashchonnaya rastitelnymi nutrientami. Khlebopekarskoe proizvodstvo, № 6, 38-41.
- Zauavka 2432773 Velikobritaniya, MPK A 23 G 1/54, A 23 G 3/54. Confectionery product comprising different fillings / Mars Inc., Moppett Garry, Joyce Mark. № 0524643.444257822; zauavl. 02.12.2006; opubl. 06.06.2009.
- Rumyantseva, V., Slukina, O. (2012). Ispolzovanie biomodifitsirovannogo prpduktu ovsa v proizvodstve vafel. Khlebobrodukty, № 9, 40-41.
- Budnikova, Gurkeva, G., Nikolaeva, L. (2011). Sposob proizvodstva vafelnogo lista. Khlibopekarska i konditerska promyslovist Ukrainy, № 4, 34-35.
- Kodenchova, V., Vrzhesinskaya, O. (2010). Obosnovanie urovnya obogashcheniya pishchevych prodyktov vitaminami i mineralnymi veshchestvami. Voprosy pitaniya, Vol. 39, № 1, 23-33.
- Mayurnikova, L., Davydenko N., Naumova, N. (2009). Vliyanie pishchevoy dobavki «Seleksen» na kachestvo khlebobulochnykh izdeliy. Khranenie i pererabotka selkhozsyrya, № 4, 36-38.
- Ostroumov, L. A. (2006). Classification and functional food components from whey obtained membrane methods. Healthy Eating – the basis of life: Collected materials scientific conference, 374–375.
- Tverdohle, G. V. (2006). Chemistry and physics of milk and milk products. Moscow, DeLee print, 360.
- Bostwick, E. E., Steijns, J. M., Braun, S. (2000). Lactoglobulins. In: Natural Food Antimicrobial Systems. CRC Press; Boca Raton, 133–158.
- Kraulis, P. (1991). MOLSCRIPT: a program to produce both detailed and schematic plots of protein structures. J. Appl. Crystallogr., 946–950.
- Bull, H. B., Breese, K. (1973). Thermal stability of proteins. Arch. Biochem. Biophys., 681–686.
- Kinsella, J. E., Fox, P. F. (1986). Water sorption by proteins: milk and whey proteins. CRS Crit. Rev. Food Sci. Nutr., 91–139.
- Kuntz, I. D., Kauzmann, W. (1974). Hydration of proteins and polypeptides. Adv. Pritein Chem., 239–345.
- Gordienko, L. A. (2010). Development of technology for dairy beverages using whey protein concentrates obtained by ultrafiltration. Stavropol, 193.
- Phillips, T. A. (2006). Handbook of hydrocolloids. St. Petersburg, 536.
- Aymeson, A. (2012). Food thickeners, stabilizers, gelling agents. St. Petersburg, Profession, 408.
- Tikhomirov, V. K. (1983). Foam. Theory and practice of their production and destruction. Moscow, USSR: Chemistry, 264.
- Kondratova, I. I., Tomasevich, S. E. (2010). Optimization of technological modes of manufacturing aerated confectionery mass. Food Industry: Science and Technology, 1 (7), 38–45.
- Bogdanov, E. (2007). Maltose and glucose-fructose syrups: functionality in the production of jelly products confectionery. Products & Ingredients, 9, 16–17.
- Kruglyakov, I. M., Ekserova, D. R. (1990). Foam and foam films. Moscow, USSR: Chemistry, 432.

USING COMBINED PROTEINS AND HYDROCOLLOIDS FOR CREATING AERATED CANDY MASSES (p. 113-121)

Tatyana Kalinovskaya, Vera Obolkina

The paper deals with studying the functional and technological properties of whey proteins, combined mixtures of whey protein concentrate and egg-whites, additional stabilizers such as gelatin and gum arabic. The influence of combined protein and hydrocolloid systems on forming structural properties of aerated candy masses such as "soft nougatines" with increased aggregate stability is determined.

Theoretical data on functional and technological properties of proteins and hydrocolloids are given.

The technological factors, influencing foam formation and foam stability are considered. Experimental data on the influence of sugar, gelatin hydrocolloids and gum arabic on the structure and properties of foams are given in the paper.

Analyzing these data, the authors have concluded that adding sucrose-glucose syrup to protein foams increases the foam formation of the system. In addition, the positive effect of sugars is caused by the increased viscosity of the bulk phase that reduces the rate of water loss by lamellae and increases the system stability.

Adding complex mixtures of gelatin - gum arabic have a high stabilizing effect due to reducing the surface tension and creating aggregation-resistant layers of the dispersion medium. Owing to such laws, the authors have confirmed the possibility of stabilizing the properties of multi-component disperse systems of aerated candy masses.

The data, given in the paper, show the possibility of further studying of whey protein concentrate properties. Using the combined protein and hydrocolloid system attracts interest when creating a new range of aerated candy masses with the original structure.

Keywords: protein, egg, whey, stabilization, hydrocolloids, gelatin, gum arabic, aerated candy masses.

References

- Zubchenko, A. V. (2001). Physico-chemical fundamentals of pastry. Voronezh, Voronezh. Reg. tehnol. Acad., 389.
- Fennema, O. R., Damodaran S., Parkin K. L. (2012). Food chemistry. St. Petersburg, Profession, 1040.
- Mulvihill, D. M. (1992). Production, functional properties and utilization of milk protein products. Advanced Dairy Chemistry, Elsevier Applied Science, 369–404.
- Mehra, R., Marnila, P., Korhonen, H. (2006). Milk immunoglobulins for health promotion. Inter. Dairy J., 16, 1262–1271.

REGULATION OF STRUCTURAL AND RHEOLOGICAL PROPERTIES OF JELLY AND CREAMED MASSES FOR TWO-LAYER FRUIT JELLY (p. 122-127)

Katerina Iorgachova, Olga Makarova, Karine Avetisyan

The possibility of using starch syrups in a two-layer fruit jelly technology on different jelling agents was studied. The influence of syrups on structural and rheological properties of jelly and foamy masses was defined. Based on the analysis of the carbohydrate profile, technological properties of syrups and formulas of jelly products for replacing sugar components in the pectin jelly formula, it was recommended to use syrup IG-42, and on agar – IG-60. The study of the structural and rheological properties of jelly masses showed that the viscosity change is caused to a large extent by the content of high molecular sugar. Herewith, viscosity of pectin masses depends on the sucrose content, the exception of which leads to its reduction, despite the high content of dextrans in syrup masses. Determining the influence of the used syrups on a yield value of jelly masses showed that replacing the specified amount of glucose, syrup, as well as 50 % of sugar for syrups, a solid structure of marmalade jelly is formed. However, a complete replacement of all the components is accompanied by reducing the strength of jelly products. For regulating their structure, it is proposed to use polydextrose in the amount of 12 % on agar and 9 % on pectin that will allow providing the required jelly strength, expanding the assortment and improving the quality of paste-jelly products.

Keywords: two-layer jelly, agar, pectin, starch syrups, strength, viscosity, density, polydextrose.

References

- Zubchenko, A. V. (2001). Fiziko-himicheskie osnovy tehnologii konditerskikh izdelij. Voronezh. gos. tehnol. akad., 389.
- Polumbrik, M. O. (2011). Vuglevodi v harchovih produktah i zdorov'ya ljudini. Akademperiodika, 487.
- Litvjak, V. V., Pochickaja, I. M., Silich, M. V. (2011). Soderzhanie oksimetilfurfurola v uglevodsoderzhashhiih produktah. Hranenie i pererabotka sel'hozsyr'ja, 5, 20–31.
- Minifaj, B. U. (2005). Shokolad, konfety, karamel' i dr konditerskie izdelija. SPb.: Professija, 808.
- Jamajskim romom pahnut sumerki. Obzor rynka likerovodochnyh izde-lij (2014). Issledovaniya kompanii Intesco Research Group. Available at : www.foodmarket.spb.ru

6. Ladur, T., Lukin, N., Solovbeva, S. (2006). Vysokomal'toznaya patoka kak zamenitel' sahara v proizvodstve karameli i pomadnykh konfet. *Hlibopekars'ka i konditers'ka promislovist' Ukraini*, 1, 34–35.
7. Francis, F. J. (1999). *Wiley encyclopedia of food science and technology*. New York: J. Wiley & Sons, 2816.
8. Iorgacheva, E. G., Tolstyh, V. Ju., Gerasimenko, V. P. (2008). Krahmal'nye siropy kak analogi patoki pri proizvodstve pomadnykh konfetnykh mass. *Hlibopekars'ka i konditers'ka promislovist' Ukraini*, 2, 43–45.
9. Bondarenko, Ju. V., Drobot, V. I. (2008). Vpliv gljukozno-fruktoznogo siropu i mal'toznoi pa-toki na strukturno-mehanichni vlastivosti tista. *Naukovi praci Nacional'nogo universitetu harchovih tehnologij*, Vol. 1, № 34, 150–153.
10. Bogdanov, E. (2007). Ispol'zovanie gljukozno-fruktoznogo siropa v recepturah keksov na himicheskikh razryhliteljah. *Produkty & ingredienty*, 9, 18–20.
11. Stephen, A. M., Phillips, G. O., Williams, P. A. (2006). *Food Polysaccharides and their applications*. Taylor & Francis Group, 160.
12. *Sbornik receptur na marmelad, pastilu, zefir (1987)*. Utv. Otdelom pishh. prom-sti Gosagroproma SSSR 29 dekabrya 1986. Moskva, 47.
13. Fennema, O. R. (1996). *Food Chemistry*. New York: Marcel Dekker, 1088.
14. Iorgacheva, E. G., Avetisjan, K. V., Tol-styh, V. Ju. (2010). Vlijanie uglevodnoj sostavl'jajushhej na strukturnoobra-zovanie zhelejnnykh mass. *Naukovi praci*, Vol. 1, Issue 38, 190–194.
15. Skobel'skaja, Z. G., Gorecheva, G. N. (2002). Tehnologija proizvodstva saharistykh konditerskikh izdelij. *IRPO; ProfObrIzd*, 416.
16. Donchenko, L. V., Firsov, G. G. (2007). Pektin: osnovnye svojstva, proizvodstvo i primenenie. *DeLi print*, 276.
17. Magomedov, G. O., Magomedova, A. K., Mirosnikova, T. N., Lobosova, L. A. (2007). Vlijanie fruktozy na studneobrazovanie pri proizvodstve zefira. *Konditerskoe proizvodstvo*, 2, 31–33.
18. Shubina, O. G. (2005). Polidekstroza – mnogofunkcional'nyj uglevod dlja so-zdaniya nizkokalorijnyh i obogashennyh produktov. *Pishhevaja promyshlennost*, 5, 28–31.
19. *Sweeteners and sugar alternatives in food technology (2006)*. Oxford: Blackwell Publishing, 432.
20. Peuranen, S., Tiihonen, K. (2004). Combination of povidone and lactitol affects microbial ecosystem and immune responses in rat gastrointestinal tract. *British Journal of Nutrition*, 91, 905–914.
21. Iorgacheva, K. G., Danilova, E. I., Avetisjan, K. V. (2012). Vlijanie uglevodnogo sostava na glikemicheskij in-deks pastilo-marmeladnyh izdelij. *Naukovi praci*, Vol. 1, Issue 42, 190–193.
22. Ajmeson, A. (2012). *Pishhevye zagustiteli, stabilizatory, geleobrazovately*. SPb.: ID «Professija», 408.
23. Krugljakov, I. M., Ekserova, D. R. (1990). Pena i pennye pljonki. *Himija*, 432.
24. Tihomirov, V. K. (1983). *Peny. Teorija i praktika ih poluchenija i razrushenija*. Himija, 264.
25. Iorgacheva, E. G., Avetisjan, K. V., Kuc, A. V. (2009). Al'ternativnye vidy syr'ja v tehnologii pastilo-marmeladnyh izdelij. *Hlibopekars'ka i konditers'ka promislovist' Ukraini*, 1, 14–16.

POSSIBILITIES OF USING SYMBIOTIC COMPLEX IN MARSHMALLOW TECHNOLOGY OF FUNCTIONAL PURPOSE (p. 127-133)

Hanna Korkach, Galina Krusir, Iryna Borovik

Synbiotic complex, consisting of microcapsulated bifidobacteria and lactulose was developed in the paper. Comparative analysis of free and immobilized forms of microbial cells, obtained using appropriate immobilization methods, by studying their stability in the model conditions of a real digestion, was performed. The lactulose mass fraction was determined.

The influence of the synbiotic complex on physicochemical and structural-mechanical properties of experimental foam-like masses was studied in the paper. The main physicochemical parameters that determine the marshmallow quality are the content of moisture and reducing substances, density, titratable acidity, foam ratio. The obtained results indicate that the content of moisture and reducing substances grows with an increase in the lactulose mass fraction. This is caused by partial substitution of sucrose by reducing sugar - lactulose in the control marshmallow sample.

The effect of synbiotic additive on the rheological characteristics of whipped masses, in particular on the effective viscosity and adhesive strength, was investigated. The study of the marshmallow mass strength depending on time has revealed that the structure formation duration reduces for all test samples as compared to the control sample by 20-60 minutes.

Theoretical and experimental studies prove the promising nature of using the developed synbiotic complex in the marshmallow technology.

Keywords: probiotics, prebiotics, synbiotics, functional confectionery, marshmallow, structural-mechanical properties.

References

1. Tihomirova, N. A. (2002). Tehnologija produktov funkcional'nogo pitaniya. *OOO «Frantjera»*, 213.
2. Durnev, A. D., Oganeshjanc, L. A., Lisicyn, A. B. (2007). Funkcional'nye produkty pitaniya. *Hranenie i pererabotka sel'hozsyr'ja*, 9, 15–21.
3. Samojlov, A. V. (2008). Razrabotka tehnologii spredov funkcional'nogo naznachenija s sinbioticheskim kompleksom, 170.
4. Kompanija Art-Lajf (2008). Available at: <http://www.artlife.tomsknet.ru/>.
5. Shenderov, B. A. (2001). Medicinskaja mikrobnaja jekologija i funkcional'noe pitanie. Tom III: Probiotiki i funkcional'noe pitanie. *Izd. «Grant»*, 288.
6. Doronin, A. F., Shenderov, B. A. (2002). Funkcional'noe pitanie. *Izd. «Grant»*, 296.
7. Unger, S. (1999). Die Bedeutung von Pro- und Prbiotika in der Ernährung. *J. Ernährungsmed*, 1, 22–29.
8. Aloglu, H., Oner, Z. (2006). Assimilation of cholesterol in broth, cream, and butter by probiotic bacteria. *Eur. J. Lipid Sci. Technol.*, Vol. 108, 709–713.
9. Arjuhova, S. I., Moliboga, E. A. (2005). Izuchenie prirodnoj ustojchivosti mikroorganizmov polikomponentnoj zakvaski molochnyh produktov k antibiotikam. *Voprosy pitaniya*, 6, 34–36.
10. Dracheva, L. V. (2006). Probiotiki i prebiotiki dlja produktov funkcional'nogo pitaniya. *Pishhevyje ingredienty: syr'e i dobavki*, 2, 74–75.
11. Jarkina, Ja. A. (2005). Razrabotka tehnologii bakterial'nogo koncentrata bifidobakterij i bakterij *Lactobacillus casei*, 252.
12. Gomes, A., Malcata, F. X. (1999). *Bifidobacterium spp. and Lactobacillus acidophilus: biological, biochemical, technological and therapeutical properties relevant for use as probiotics*. *Trends in Food Science & Technology*, Vol. 10, 139–157.
13. Cummings, J. H., Roberfroid, M. B., Anderson, H. (1997). A new look at dietary carbohydrate: physiology and health. *Eur. J. Clin. Nutr.*, Vol. 51, 417–423.
14. Morgan, A. J., Mul, A. J., Beldman, G., Voragen, A. G. (1992). *Dietary oligosaccharides – new insights*. *Agro-Food-Industry Hi-Tech*, 35–38.
15. Rjabceva, S. A. (2003). Tehnologija laktulozy. *DeLi print*, 232.
16. Lisserre, A. M., Ines Re, Maria, Bernandette, D. G., Franko, M. (2007). Microencapsulation of *Bifidobacterium animalis subsp. lactis* and evaluation of survival in simulated gastrointestinal conditions. *Food Biotechnology*, Vol. 21, 1–16.

RESEARCH OF QUALITY OF YEAST-LEAVENED DOUGH PRODUCTS AND SHORTBREAD USING CRYPOWDERS MADE OF HERBAL RAW MATERIALS (p. 133-137)

Andrej Chuiko, Marina Chuiko, Oksana Orlova, Sergey Eremenko

Promising and appropriate use of cryopowders made of grape pomace and black chokeberry (*Aronia melanocarpa*) for improving the quality of yeast-leavened dough products and shortbread, and for enhancing their biological value, was considered.

The antioxidant properties of cryopowders were studied, and their ability to inhibit chain free-radical reactions, allowing to use them in manufacturing products, containing fats, to improve the quality and extend the storage life of finished products, was proved.

It was found that introduction of the powders under investigation reveals a strengthening effect on a gluten wheat flour complex, promotes more intensive accumulation of reducing sugars in dough, improves the dough quality, increases the release of products, reduces baking losses and shrinkage of products. It was proved that rational concentrations of additives are 3 % to dough weight.

Studying the influence of cryopowders on organoleptical, physical and chemical indicators of shortbread and yeast-leavened products quality and their changes during storage allowed to improve the quality of the samples under investigation compared to the control ones; herewith, the storage life of shortbread increases by 1.3–1.8 times, of bakery products – for 20–24 hours.

The conducted comprehensive and integrated quality assessment of the shortbread and roll “Vitamina” by the quality control methods has shown that the use of cryopowders enhances organoleptical, struc-

tural, mechanical and functional properties of the products, as well as their cost-effectiveness compared to traditional ones by 4 % and 8 %, respectively, indicating a high level of the finished product quality and determining its benefits in food production.

Keywords: cryopowder, grape pomace, black chokeberry, product quality, shortbread, yeast-leavened dough products.

References

1. Sokol, N. V., Khranova, N. S., Gaidukova, O. P. (2011). Unconventional materials in the production of bread functionality. *Baking in Russia*, 1, 16-18.
2. Milner, J. (2010) Functional foods: The US perspective. *American Journal of Clinical Nutrition*, 71 (6), 1654-1659.
3. Kondratyev, D. V., Sheglov, N. G. (2007). Bioavailability grape marc. Materials I regional scientific-practical conference "Prospects for the use of new raw materials in food technology", Pyatigorsk, 29-33.
4. Sueiro, L., Yusef G. G., Seigler D. (2006). Chemopreventive Potential of Flavonoid Extracts from Plantation-Bred and Wild *Aronia melanocarpa* (Black Chokeberry) Fruits. *Journal of Food Science*, 71(8), 480-488.
5. Lysyuk, G. M., Chuiko, A. M., Shydakova-Kamenyuka, O. G. (2005). Ways to improve the nutritional value of shortbread. *Advanced equipment and technology of food production and restaurant industry trade*, Kharkiv, 1, 207-211.
6. Sokol, N. V., Khrapko, O. P. (2010). The use of secondary raw materials in the production of bread APC therapeutic and prophylactic purposes. *Scientific Journal "University. Science. Ideas and solutions."*, Krasnodar, 1, 218-221.
7. Position of the American Dietetic Association: functional foods (2009). *Journal of American Dietetic Association*, 109 (4), 735-746.
8. Dietary Supplements krias a new generation of foods with high biological value (2010), Kharkov: SPE «Krias-1», 89.
9. Peng, X, Ma J., Cheng K. (2010). The effects of grape seed fortification on the antioxidant activity and quality attributes of bread. *Food Chemistry*, 119 (1), 49-53.
10. Khrapko, O. P., Sokol, N. V. (2012). Use pectin extracts and infusions of medicinal plants in the technology of functional bread. *Proceedings of the VII International Scientific-Practical Conference "Innovation and modern technologies in production and processing agricultural products"*, Stavropol, 160-165.

STABILISATION OF GUMMY GINGERBREAD QUALITY DURING STORAGE (p. 138-143)

Katerina Iorgachova, Olga Makarova, Kateryna Khvostenko

The relevance of searching for solutions, aimed at slowing the staling of bakery products is shown in the paper. The most common ways to ensure freshness of these products, one of which is using waxy wheat flour, starch of which consists only of amylopectin, are considered. Based on the analysis of changes in physicochemical quality indicators of gummy gingerbreads, crumbliness of crumb, its hydrophilic and structural-mechanical properties during storage, the feasibility of using waxy wheat flour in the technology of gummy gingerbreads to stabilize their quality characteristics during storage is shown. Longer preservation of freshness - slowing the moisture loss, less intense change of crumbliness and hydrophilic properties of the crumb, preserving softer consistency of gingerbread products using the amylose-free flour testifies to slowing their staling during storage. This is caused by the technological properties and composition of waxy wheat flour – high water-absorbing and water-binding abilities, lower starch gelatinization temperature, high autolytic activity and starch retrogradation slowing as compared to baking wheat flour.

It is found that using waxy wheat flour is one of the effective ways to solve the problem of fast staling of gummy gingerbreads.

Keywords: waxy wheat flour, amylopectin, gummy gingerbreads, staling, starch retrogradation.

References

1. Drobot, V. I. (2002). *Tehnologija hlibopekars'kogo*. Logos, 365.
2. Petrova, S. N., Stepanova, L. I. (2004). Sposoby zamedlenija processa cherstvenija prjanikov. *Hlebopechenie Rossii*, 6, 30–31.
3. Obolkina, V., Kirpichenkova, O., Alekseenko, N. (2012). Sohranenie kachestva prjanichnyh izdelij v processe ih hranenija. *Produkty & ingredienty*, 10, 23–24.
4. Bilyk, E. A. (2013). Sposoby sohranenija svezhesti hlebobulochnyh izdelij iz pshechnoj muki. *Hranenie i pererabotka zerna*, 2, 52-54.
5. Semenev, O. (2010). Cherstvenie hleba i bor'ba s jetim javleniem. *Hlebopekarnoe i konditerskoe delo*, 2, 12–13.
6. Korjachkina, S. Ja., Ahmedova, D. K. (2013). Sposob zamedlenija cherstvenija hlebobulochnyh izdelij. *Hleboprodukty*, 3, 39–41.
7. Matveeva, I. V. (2012). Prirodnoe reshenie prirodnoj problemy cherstvenija hlebobulochnyh izdelij. *Hleboprodukty*, 9, 26–28.
8. Sharp, T. (2010). The use of enzymes in bakery products. *Ingrediets business*, 7–8, 6–7.
9. Vignali, G., Volpi, A. (2013). Analysis and evaluation of cooking parameters for sweet bakery products. *Advance journal of food science and technology*, Vol. 5 (7), 843–854.
10. Besbes, E. Impact of baking conditions on bread staling. Available at : <http://www.icef11.org/content/papers/fms/FMS771.pdf>.
11. Magomedova, A. (2011). Vlijanie upakovki i uslovij srede na sohranost' muchnyh konditerskih izdelij. *Hleboprodukty*, 1, 42–43.
12. Sargent, K. (2008). A softer approach to improving the quality of refrigerated bakery products. *Cereal foods world*, Vol. 53 (6), 301–305.
13. Nishio, Z. (2009). Influence of amylose content on cookie and sponge cake quality and solvent retention capacities in wheat flour. *Cereal chemistry*, Vol. 86 (3), 313–318.
14. Qin, P. (2009). Effect of waxy wheat flour blends on the quality of fresh and stale bread. *Agricultural sciences in China*, Vol. 8 (4), 401–409.
15. Steele, R. (2004). *Understanding and measuring the shelf-life of food*. Woodhead Publishing, 448.
16. Dragilev, A. I., Sezanaev, Ja. M. (2000). *Proizvodstvo muchnyh konditerskih izdelij*. DeLi, 448.
17. Dorohovich, A. M., Ljubavina, I. V., Ljubars'kij, V. B. (2003). Osoblivosti strukturi sircevo go ta zavarnogo prjanikov. *Naukovi praci ONAHT*, Issue 21, 235–238.
18. Iorgacheva, E. G., Makarova, O. V., Hvostenko, E. V., Il'jushhenko, M. N. (2012). Ispol'zovanie bezamiloznoj muki v tehnologii syrcovyh prjanikov. *Naukovi praci ONAHT*, Vol. 1, Issue 42, 173–177.
19. Nikolaevoj, M. A., Nomofilovoj, N. I. (2003). *Obshhestvennoe pitanie. Spravochnik konditera. Jekonomicheskie novosti*, 640.
20. DSTU 4187:2003. *Virobi konditers'ki prjanikovi. Zagal'ni tehnicni umovi* (2004). Vzamen GOST 15810-96 ; vved. 2003-07-05. *Derzhspovizhstandart Ukraïni*, 14.
21. Vignaux, N. (2004). Grain quality characteristics and milling performance of full and partial waxy durum lines. *Cereal chemistry*, Vol. 81, № 3, 377–383.
22. Iorgachova, K. G., Makarova, O. V., Hvostenko, K. V., Ribalka, O. I. (2012). Vznachennja tehnologichnih vlastivostej boroshna z bezamiloznoj pshecnici za stanom vuglevodno-amilaznogo kompleksu. *Harchova nauka i tehnologija*, 1, 37–40.
23. Pritula, V. I. (1982). Vlijanie sposoba prigotovlenija zavarnih prjanikov na sohranenie ih svezhesti. *Hlebopekarnaja, makaronnaja, drozhzheva ja promyshlennost'*, 3, 13–16.