Technology and Equipment of Food Production ranges from 10 to 50 °C, and, in the model apparatus, from 4 to 24 °C. The temperature difference from the center to the near-wall layer, depending on the processing time in the traditional way, is 15...17 °C at the contact surface and 8 °C at the center. For the processing, is 4...6 W, and, at 25...30 °C, it is, respectively, 1.5...3 W. A comparative analysis has been performed of the heat treatment of meat delicacy involving the heating of the working surface with a flexible film resistive electric heater of radiative type has been developed. Culinary meat products, in particular, delicacies, account for a significant share of the diet in many countries of the world, predetermining the need to introduce innovative solutions for the production of products of a wide range of use with original taste properties.

Culinary meat products, in particular, delicacies, account for a significant share of the diet in many countries of the world, predetermining the need to introduce innovative solutions for the production of products of a wide range of use with original taste properties.

The temperature for a traditional machine, after 5 minutes of processing, is 4...6 W, and, at 25...30 °C, it is, respectively, 1.5...3 W. A comparative analysis has been performed of the heat treatment of meat delicacy involving the heating of the working surface with a flexible film resistive electric heater of radiative type has been developed. Culinary meat products, in particular, delicacies, account for a significant share of the diet in many countries of the world, predetermining the need to introduce innovative solutions for the production of products of a wide range of use with original taste properties.

The temperature for a traditional machine, after 5 minutes of processing, is 4...6 W, and, at 25...30 °C, it is, respectively, 1.5...3 W. A comparative analysis has been performed of the heat treatment of meat delicacy involving the heating of the working surface with a flexible film resistive electric heater of radiative type has been developed. Culinary meat products, in particular, delicacies, account for a significant share of the diet in many countries of the world, predetermining the need to introduce innovative solutions for the production of products of a wide range of use with original taste properties.

The temperature for a traditional machine, after 5 minutes of processing, is 4...6 W, and, at 25...30 °C, it is, respectively, 1.5...3 W. A comparative analysis has been performed of the heat treatment of meat delicacy involving the heating of the working surface with a flexible film resistive electric heater of radiative type has been developed. Culinary meat products, in particular, delicacies, account for a significant share of the diet in many countries of the world, predetermining the need to introduce innovative solutions for the production of products of a wide range of use with original taste properties.

The temperature for a traditional machine, after 5 minutes of processing, is 4...6 W, and, at 25...30 °C, it is, respectively, 1.5...3 W. A comparative analysis has been performed of the heat treatment of meat delicacy involving the heating of the working surface with a flexible film resistive electric heater of radiative type has been developed. Culinary meat products, in particular, delicacies, account for a significant share of the diet in many countries of the world, predetermining the need to introduce innovative solutions for the production of products of a wide range of use with original taste properties.

The temperature for a traditional machine, after 5 minutes of processing, is 4...6 W, and, at 25...30 °C, it is, respectively, 1.5...3 W. A comparative analysis has been performed of the heat treatment of meat delicacy involving the heating of the working surface with a flexible film resistive electric heater of radiative type has been developed. Culinary meat products, in particular, delicacies, account for a significant share of the diet in many countries of the world, predetermining the need to introduce innovative solutions for the production of products of a wide range of use with original taste properties.

The temperature for a traditional machine, after 5 minutes of processing, is 4...6 W, and, at 25...30 °C, it is, respectively, 1.5...3 W. A comparative analysis has been performed of the heat treatment of meat delicacy involving the heating of the working surface with a flexible film resistive electric heater of radiative type has been developed. Culinary meat products, in particular, delicacies, account for a significant share of the diet in many countries of the world, predetermining the need to introduce innovative solutions for the production of products of a wide range of use with original taste properties.
The British Retail Consortium Global Standard for Food Safety enjoys great popularity among food industry companies, the number of companies with the certified standard is rising every year. The packaging used for food packaging has a very large impact on the safety and quality of the packaged food. The purpose of the study was to indicate the requirements of the standard in relation to packaging, which should be implemented firstly by enterprises of the food industry. In the research part, the AHP analysis was conducted on the basis of the experts’ recommendations. Decision matrices for every criterion: hazard analysis concerning packaging, purchase procedure, packaging acceptance procedure were developed. A decision matrix for the main criterion as a result of criteria decision matrix was developed, global decision hierarchy was also developed. Research clearly showed that the most important activity (among the proposed) is hazard analysis, with a 0.517 weighted sum value. In many of the detailed requirements of the standard, hazard analysis and risk assessment (0.333 weighted sum value) are the basis for many activities, including establishing a packaging procedure (0.163 weighted sum value), accepting packaging (0.297 weighted sum value), or many others. The relevance of this study is the identification of the hierarchy of importance of activities performed within the framework of ensuring the quality and safety of food packaging. A reasonable approach is presented. The AHP method allows indicating the sequence of activities during the implementation of the BRC standard, as evidenced by pilot studies carried out on the basis of procedures related to the safety of packaging. The standard sets up requirements for packaging in the form of packaging management procedure, in which it should be stated how the site operates with packaging. Moreover, there are requirements concerning hazard analysis in relation to packaging.

Keywords: BRC Food Safety, BRC standard, food packaging, food safety assurance.

References

1. Luning, P. A., Marcelis, W. J., Rovira, J., Van der Speigl, M., Uytendaele, M., Jacxens, L. (2009). Systematic assessment of core-assurance activities in a company specific food safety management system. Trends in Food Science & Technology, 20 (6–7), 300–312. doi: https://doi.org/10.1016/j.tifs.2009.03.003
2. Evans, J. R., Lindsay, W. M. (2005). The management and control of quality:Thomson Corporation South Western, Ohio.
3. Luning, P. A., Marcelis, W. J. (2007). A conceptual model of food quality management functions based on a techno-managerial approach. Trends in Food Science & Technology, 18 (3), 159–166. doi: https://doi.org/10.1016/j.tifs.2006.10.021
4. Luning, P. A., Marcelis, W. J. (2009). Food quality management. Technological and managerial principles and practices. Wageningen Academic Publishers, 426. doi: https://doi.org/10.3920/978-90-8686-116-3
5. Manning, L., Soon, J. M. (2016). Food Safety, Food Fraud, and Food Defense: A Fast Evolving Literature. Journal of Food Science, 81 (4), R832–R834. doi: https://doi.org/10.1111/1750-3841.13256
6. Tarczyńska, A. (2013). Determinants of improving quality management systems and food safety in the dairy industry. Publisher of the University of Warmia and Mazury in Olsztyn.
7. Mitenius, N., Kennedy, S. P., Busta, F. F. (2014). Food Defense. Food Safety Integrity, 105–114. doi: https://doi.org/10.1533/9780857090621.2.105
8. Soon, J. M., Manning, L., Smith, R. (2019). Advancing understanding of pinch-points and crime prevention in the food supply chain. Crime Prevention and Community Safety, 21 (1), 42–60. doi: https://doi.org/10.1057/s41300-019-00059-5
9. Kawecka, A. (2014). Factors determining the safety of packaging intended for contact with food. Cracow: Cracow University of Economics Publishing House. Available at: https://wysawnictwo.uek.krakow.pl/index.php/monografie-prace-doktorskie/133-czyzniki-determinujace-bezpieczenstwo-opakowan-preznaaczonych-do-kontaktu-z-zywnoscia
10. Cholewa-Wójcik, A., Kawecka, A., Sikora, T. (2018). Legal requirements on food contact materials. Food. Science. Technology. Quality, 3 (116), 163–171. Available at: https://journals.crcpress.com/api/file/viewByField/435406.pdf
11. Butler, F. (2011). Ranking hazards in the food chain. Food Chain Integrity, 105–114. doi: https://doi.org/10.1533/9780857090621.2.105
12. Whiting, R. C. (2011). What risk assessments can tell us about setting criteria. Food Control, 22 (9), 1525–1528. doi: https://doi.org/10.1016/j.foodcont.2010.07.011
13. Global Standard. Food Safety (2018). British Retail Consortium. Available at: http://www.medagri.org/docs/group/108/free_locked_BRC%20Food%20Standard%20Web_English.pdf

14. Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC (2004). Official Journal of the European Union. Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32004R1935

15. Urban, W., Ratter, E., Wangwacharakul, P., Poksińska, B. (2018). Coexistence of the BRC Standard for Packaging and the Lean Manufacturing technology. Engineering Management in Production and Services, 10 (3), 51–61. doi: https://doi.org/10.2478/emj-2018-0016

16. Mensah, L. D., Julien, D. (2011). Implementation of food safety management systems in the UK. Food Control, 22 (8), 1216–1225. doi: https://doi.org/10.1016/j.foodcont.2011.01.021

17. Rincon-Ballesteros, L., Lannelongue, G., González-Beníto, J. (2019). Implementation of the BRC food safety management system in Latin American countries: Motivations and barriers. Food Control, 106, 106715. doi: https://doi.org/10.1016/j.foodcont.2019.106715

18. Vaidya, O. S., Kumar, S. (2006). Analytic hierarchy process: An overview of applications. European Journal of Operational Research, 169 (1), 1–29. doi: https://doi.org/10.1016/j.ejor.2004.04.028

19. Saaty, T. L. (2008). Decision making with the analytic hierarchy process. International Journal of Services Sciences, 1 (1), 83. doi: https://doi.org/10.1504/ijssci.2008.017590

20. Saaty, T. L. (2008). Decision Making for Leaders. The Analytic Hierarchy Process (AHP) Method. Advances in Finance, Accounting, and Economics, 657–670. doi: https://doi.org/10.4018/978-1-59960-005-4.ch036

21. Saaty, T. L. (2008). Decision making with the analytic hierarchy process. International Journal of Services Sciences, 1 (1), 83. doi: https://doi.org/10.1504/ijssci.2008.017590

22. AHP Online System. Available at: https://ahpmq.com/ahp-online-system/

23. Cabala, P. (2010). Using the Analytic Hierarchy Process in evaluating decision alternatives. Operations Research and decisions, 1, 5–23. Available at: https://www.researchgate.net/publication/227653945_Using_the_Analytic_Hierarchy_Process_in_Evaluating_Decision_Alternatives

24. Guo, J., Zhang, Z., Sun, Q. (2008). Applications of AHP method in safety science. Journal of Safety Science and Technology, 4 (2), 69–73.

25. Manning, L., Soon, J. M. (2013). Mechanisms for assessing food safety risk. British Food Journal, 115 (3), 460–484. doi: https://doi.org/10.1108/00070701311314253

26. Jaccsens, L., Uyttendaele, M., Luning, P., Allende, A. (2017). Food safety management and risk assessment in the fresh produce supply chain. IOP Conference Series: Materials Science and Engineering, 193, 012020. doi: https://doi.org/10.1088/1757-899X/193/1/012020

27. Ersoy, Y. (2021). Supplier Selection in Food Industry Using Analytic Hierarchy Process (AHP) Method. Advances in Finance, Accounting, and Economics, 657–670. doi: https://doi.org/10.4018/978-1-7998-4459-4.ch036

DOI: 10.15587/1729-4061.2021.241526

THE STUDY AND SCIENTIFICAL SUBSTANTIATION OF CRITICAL CONTROL POINTS IN THE LIFE CYCLE OF IMMUNOSTIMULATING PRODUCTS SUCH AS PASTILA AND MARMALADE (p. 20–28)

Olga Belozertseva
Almaty Technological University, Almaty, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0002-1234-5678

Lyazzat Baibolova
Almaty Technological University, Almaty, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0002-8118-1581

Yuliya Pronina
Almaty Technological University, Almaty, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0003-0395-3379

Alberto Cepeda
University of Santiago de Compostela, Lugo, Spain
ORCID: https://orcid.org/0000-0002-9324-1342

Dina Tlevlesova
Almaty Technological University, Almaty, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0002-5084-6587

Based on the study results, this paper reports a technology to produce natural fruit and berry pastila and marmalade of improved nutritional and biological value with a long shelf life. Critical control points of product safety have been identified and scientifically substantiated. The technological process to prepare pastila and marmalade involves exposing the raw materials to high and low temperatures while maintaining certain indicators of the content of dry substances. The identification feature of marmalade products is the content of a certain type of fruit raw materials, which poses risks throughout the life cycle of product manufacturing despite the fact that the preparation and storage of the raw materials implies the temperature range from 0 °C to minus 15 °C. Problematic issues of mold occurrence have been considered. It was established that the moisture content in the product above 15 % leads to an increase in the content of mold fungi and significantly reduces its shelf life. This paper gives the results of a study to identify the preservation of vitamin C in products prepared from fresh berries and from berries subjected to freezing. It was revealed that in the process of storing the raw materials at a temperature of minus 15 °C, the amount of vitamin C in the resulting product decreased by 11.3 % compared to the product prepared from fresh raw materials. The maximum limit of the high preparation temperatures of 108 °C did not significantly affect the loss of vitamin C. Studies were conducted to determine the sugar content in products whereby a high fructose content was identified. Critical control points at all stages of production were determined, which has made it possible to choose the optimal technological modes and parameters for the safety and quality of the product.

Keywords: critical control points, marmalade-pastila products, vitamin C, reducing substances.

References

1. Dymova, Yu. I., Reznichenko, I. Yu. (2019). Tovarovedenie i ekspertiza tovarov rastitel'nogo proiskhozhdeniya. Razdel 2: Tovarovedenie i ekspertiza konditerskih izdeliy. Kemerovo: KemGU, 84. Available at: https://e.lanbook.com/book/135247

2. Belozereva, O., Bajbolova, L., Alberto, C., Litel'yeva, R. (2020). Comparative characteristics of fruit pastiles for food value relating to safety in diabetes. Vestnik Gosudarstvennogo universtiteta imeni Shakhara goroda Semey. 3 (91), 15–20. Available at: http://rmebrk.kz/magazine/4787/

3. Pskumenko, K. R., Popov, V. G. (2020). Trends in production of functional marmalade. Proceedings of the Voronezh State University of Engineering Technologies, 82 (2), 72–76. doi: https://doi.org/10.20914/2310-1202-2020-2-72-76

4. Obzory rynkov - Rynok konditerskih izdeliy. Mir. 2013 god. Available at: http://www.marketing.vc/view_markets.php?num=35290

5. Statistics of industry. Available at: https://stat.gov.kz/official/indus try/151/statistic/3

6. Raskina, S. I., Nesterova, O. V., Biryukova, N. V., Kondrashev, S. V. (2018). Development of marmalade formulation with viburnum extract. Meditsinskoe obrazovanie i vuzovskaya nauka, 3 (15) - 4 (14),...
Pumpkin seed protein is a high-quality plant protein, which has all essential amino acids for the human body and can also supply essential amino acid histidine for children. When it is introduced to food products, it needs to meet some functional properties, such as solubility, emulsifying ability, foaming ability, and so on. Among them, solubility is very important because it has a great influence on other functional properties of protein. In this study, pH-shifting treatment, which is a novel method to modify protein, is applied to improve the solubility of pumpkin seed protein isolate (PSPI). PSPI treated by pH-shifting method to modify protein, is applied to improve the solubility properties of protein. In this study, pH-shifting treatment, which is a novel method to modify protein, is applied to improve the solubility property of pumpkin seed protein isolate (PSPI). PSPI treated by pH-shifting method to modify protein, is applied to improve the solubility properties of protein.
treatment was investigated at different pH values (pH 2, pH 4, pH 6, pH 8, pH 10, and pH 12), which were labeled as PSPI 2, PSPI 4, PSPI 6, PSPI 8, PSPI 10, and PSPI 12, respectively. Compared to that of control PSPI (45.6 %), only the solubility of PSPI 8 (55.5 %) showed increased (p<0.05) value, while the solubility of PSPI 2 (13.7 %), PSPI 4 (10.8 %), PSPI 10 (41.8 %), and PSPI 12 (13.4 %) showed decreased (p<0.05) value. Then the average particle size, zeta potential of the soluble protein in PSPI were analyzed, and sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) was performed. PSPI 2, PSPI 4, and PSPI 12 decreased (p<0.05) average particle size after the pH-shifting process. And PSPI 2, and PSPI 12 showed decreased (p<0.05) zeta potential. While other samples didn’t show any significant difference in these two indicators. Besides, the molecular weight of the increased abundance of soluble protein bands was observed at 33 kDa and 25 kDa of PSPI 8. As the solubility of PSPI 8 increased (p<0.05) significantly, it might suggest the PSPI after pH-shifting treatment under pH 8 has more advantages to be used in the food industry.

Keywords: pumpkin seed protein isolate, solubility, pH-shifting treatment, molecular weight

References

1. Global Soy Food Market - Key Drivers and Forecast from Technavio. Business Wire. Available at: https://www.businesswire.com/news/home/20170619006091/en/Global-Soy-Food-Market--Key-Drivers

2. Countries With The Highest Rates Of Vegetarianism. WorldAtlas. Available at: https://www.worldatlas.com/articles/countries-with-the-highest-rates-of-vegetarianism.html

3. Report of market demand and investment planning analysis on China vegetable protein beverage industry (2021-2026). Forward business information Co., Ltd.: Shenzhen. Available at: https://bg.qianzhan.com/report/detail/1703060910109797.html

4. Melnik, B. (2009). Milk consumption: aggravating factor of age and promoting of chronic diseases of Western societies. Journal Der Deutschen Dermatologischen Gesellschaft, 7 (4), 364–370. doi: https://doi.org/10.1111/j.1610-0387.2009.07019.x

5. Vinayashree, S., Vasu, P. (2021). Biochemical, nutritional and functional properties of protein isolate and fractions from pumpkin (Cucurbita moschatia var. Kashi Harit) seeds. Food Chemistry, 340, 128177. doi: https://doi.org/10.1016/j.foodchem.2020.128177

6. Protein and amino acid requirements in human nutrition (2007). World Health Organization Technical Report Series, 935, 1–265. Available at: https://pubmed.ncbi.nlm.nih.gov/18350140/

7. Renz, L., Chibani, F., Chouaib, M., Dalgalarromdo, M., Hessini, K., Guéguen, J., Hamdi, S. (2013). Pumpkin (Cucurbita maxima) Seed Proteins: Sequential Extraction Processing and Fraction Characterization. Journal of Agricultural and Food Chemistry, 61 (32), 7715–7721. doi: https://doi.org/10.1021/jf402323a

8. Periçin, D., Radulović, L., Trivić, S., Dimić, E. (2008). Evaluation of solubility of pumpkin seed globulins by response surface method. Journal of Food Engineering, 84 (4), 591–594. doi: https://doi.org/10.1016/j.jfoodeng.2007.07.002

9. Bučko, S., Katona, J., Popović, L., Petrović, L., Milinković, J. (2016). Influence of enzymatic hydrolysis on solubility, interfacial and emulsifying properties of pumpkin (Cucurbita pepo) seed protein isolate. Food Hydrocolloids, 60, 271–278. doi: https://doi.org/10.1016/j.foodhyd.2016.04.005

10. Jiang, J., Chen, J., Xiong, Y. L. (2009). Structural and Emulsifying Properties of Soy Protein Isolate Subjected to Acid and Alkaline pH-Shifting Processes. Journal of Agricultural and Food Chemistry, 57 (16), 7576–7583. doi: https://doi.org/10.1021/jf901385n

11. Jiang, S., Ding, J., Andrade, J., Rababah, T. M., Almajwal, A., Abulmeaty, M. M., Feng, H. (2017). Modifying the physicochemical properties of pea protein by pH-shifting and ultrasound combined treatments. Ultrasonics Sonochemistry, 38, 835–842. doi: https://doi.org/10.1016/j.ultsonch.2017.03.046

12. Wang, Q., Jin, Y., Xiong, Y. L. (2018). Heating-Aided pH Shifting Modifies Hemp Seed Protein Structure, Cross-Linking, and Emulsifying Properties. Journal of Agricultural and Food Chemistry, 66 (41), 10827–10834. doi: https://doi.org/10.1021/acs.jafc.8b03901

13. Li, J., Wu, M., Wang, Y., Li, K., Du, J., Bai, Y. (2020). Effect of pH-shifting treatment on structural and heat induced gel properties of peanut protein isolate. Food Chemistry, 325, 126921. doi: https://doi.org/10.1016/j.foodchem.2020.126921

14. Liu, C., Wang, X., Ma, H., Zhang, Z., Gao, W., Xiao, L. (2008). Functional properties of protein isolates from soybeans stored under various conditions. Food Chemistry, 111 (1), 29–37. doi: https://doi.org/10.1016/j.foodchem.2008.03.040

15. Songwatdigalj, J., Hemung, B-O. (2010). Structural Changes and Functional Properties of Thredalin Bream Sarcoplasmic Proteins Subjected to pH-Shifting Treatments and Lyophilization. Journal of Food Science, 75 (3), C251–C257. doi: https://doi.org/10.1111/j.1750-3841.2010.01530.x

16. Abdollahi, M., Rezaei, M., Jafarpoor, A., Undeland, I. (2018). Sequential extraction of gel-forming proteins, collagen and collagen hydrolysate from gutted silver carp (Hypophthalmichthys molitrix), a biorefinery approach. Food Chemistry, 242, 568–578. doi: https://doi.org/10.1016/j.foodchem.2017.09.045

17. Chen, W., Wang, W., Ma, X., Ls, R., Balaso Watharkar, R., Ding, T. et al. (2019). Effect of pH-shifting treatment on structural and functional properties of whey protein isolate and its interaction with (-)-epigallocatechin-3-gallate. Food Chemistry, 274, 234–241. doi: https://doi.org/10.1016/j.foodchem.2018.08.106

18. Li, Y., Cheng, Y., Zhang, W., Yang, M., Mintah, B. K., Dabbour, M. et al. (2020). Modification of rapeseed protein by ultrasound-assisted pH shift treatment: Ultrasonic mode and frequency screening, changes in protein solubility and structural characteristics. Ultrasomics Sonochemistry, 69, 105240. doi: https://doi.org/10.1016/j.julsont.2020.105240

19. Chen, Y., Sheng, L., Gouda, M., Ma, M. (2019). Impact of ultrasound treatment on the foaming and physicochemical properties of egg white during cold storage. LWT, 113, 108303. doi: https://doi.org/10.1016/j.lwt.2019.108303

20. Jiang, J., Xiong, Y. L., Chen, J. (2011). Role of β-Conglycinin and Glycinin Subunits in the pH-Shifting-Induced Structural and Physicochemical Changes of Soy Protein Isolate. Journal of Food Science, 76 (2), C295–C302. doi: https://doi.org/10.1111/j.1750-3841.2010.02035.x

21. Stanley, D. W. (1981). Non-bitter Protein Hydrolysates. Canadian Institute of Food Science and Technology Journal, 14 (1), 49–52. doi: https://doi.org/10.1016/s0315-5463(81)72676-2

22. Pojić, M., Mišan, A., Tiwari, B. (2018). Eco-innovative technologies for extraction of proteins for human consumption from renewable protein sources of plant origin. Trends in Food Science & Technology, 75, 93–104. doi: https://doi.org/10.1016/j.tifs.2018.03.010

DOI: 10.15587/1729-4061.2021.240175

NUTRITIONAL VALUE OF A DRY SOLUBLE GERODIETIC PRODUCT FOR ENTERAL NUTRITION (p. 35–42)

Dmytro Antiushko
Kyiv National University of Trade and Economics, Kyiv, Ukraine
ORCID: https://orcid.org/0000-0002-4135-6439

Tetiana Bozhko
Kyiv National University of Trade and Economics, Kyiv, Ukraine
ORCID: https://orcid.org/0000-0002-2261-4527
Results of conducted experimental studies of the nutritional value of the developed dry soluble gerodietic product for enteral nutrition are presented. Content of proteins, fats, and carbohydrates (22.8, 11.8, and 56.4 g/100 g of dry product, respectively) was determined and calorific value (422.8 kcal/100 g) and mass fraction of macronutrients were calculated and 56.4 g/100 g of dry product, respectively) was determined and mass fraction of macronutrients were calculated and

Keywords: product for enteral nutrition, dry soluble product, gerodietic purpose, nutritional value.

References

1. Global Health and Aging. WHO. Available at: https://www.who.int/ageing/publications/global_health.pdf
2. Emekcioglu, C. (2019). Nutrition and longevity – From mechanisms to uncertainties. Critical Reviews in Food Science and Nutrition, 60 (18), 3063–3082. doi: https://doi.org/10.1080/10408398.2019.1676698
3. Amarantos, E., Martinez, A., Dwyer, J. (2001). Nutrition and Quality of Life in Older Adults. The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 56, 54–64. doi: https://doi.org/10.1093/gerona/56.suppl_2.54
4. Antushko, D. P., Nezdoly, A. O. (2017). The biological activity of the composition with glucosamine in the diet of rats in the modeling of cartilage and connective tissue damage. Voprosy pitanii [Problems of Nutrition], 86 (1), 72–75. doi: https://doi.org/10.24411/0042-8833-2017-00023
5. Kritchewsky, S. B. (2016). Nutrition and Healthy Aging. The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 71 (10), 1303–1305. doi: https://doi.org/10.1093/gerona/glw165
6. Grigorov, Yu. G., Kozlovskaya, S. G. (1988). Pitanie i fenomen dolgoletyi. Kyiv: Znannya, 48.
7. Shikany, J. M., Barrett-Connor, E., Ensrud, K. E., Cawthon, P. M., Lewis, C. E. et. al. (2013). Macronutrients, Diet Quality, and Frailty in Older Men. The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 69 (6), 605–701. doi: https://doi.org/10.1093/gerona/glt196
8. Stišlová, P., Štefánková, R., Zvárová, I. (2011). Nitrogen-to-Protein conversion factors for edible invertebrates on the Czech market. Food Chemistry, 126 (1), 140–145. doi: https://doi.org/10.1016/j.foodchem.2010.05.030
9. Stišlová, P., Štefánková, R., Zvárová, I. (2011). Nitrogen-to-Protein conversion factors for edible invertebrates on the Czech market. Food Chemistry, 126 (1), 140–145. doi: https://doi.org/10.1016/j.foodchem.2010.05.030
10. Antushko, D. P. (2020). Evaluation of gerodietic product’s for enteral nutrition protein value. Journal of chemistry and technologies, 28 (2), 161–167. doi: https://doi.org/10.15421/082011
11. Piryutskh, N. V., Karpenko, P. O., Antushko, D. P., Havalko, Yu. V. (2016). Patent No. 116754 UA. Sumish dlia enteralnoho kharchuvannya. No. u201609484; declareted: 14.09.2016; published: 12.06.2017, Bul. No. 11. Available at: https://uapatents.com/7-116754-sumish-dlya-entalnogo-kharchuvannya-gerodiehtichnogo-pryznachennia.html
12. ISO 707:2008. Milk and milk products – Guidance on sampling. Available at: https://www.iso.org/obp/ui/#iso:std:iso:707:en
13. ISO 9896-1:2014. Milk and milk products – Determination of nitrogen content – Part 1: Kjeldahl principle and crude protein calculation. Available at: https://www.iso.org/obp/ui/#iso:std:iso:9896-1:ed-2:v1:en
14. ISO 1736:2008. Dried milk and dried milk products – Determination of fat content – Gravimetric method (Reference method). Available at: https://www.iso.org/obp/ui/#iso:std:iso:1736:ed-4:v1:en
15. ISO/DIS 22184. Milk and milk products – Determination of the sugar contents – High performance union exchange chromatographic method (HPAEC-PAD). Available at: https://www.iso.org/obp/ui/#iso:std:iso:22184:ed-1:v1:en
16. Boulou, S., Tändler, A., Nyström, L. (2020). Nitrogen-to-Protein Conversion Factors for Edible Insects on the Swiss Market: T. molitor, A. domestica, and L. migratoria. Frontiers in Nutrition, 7. doi: https://doi.org/10.3389/fnut.2020.00089
17. Kozarenko, T. D., Zuev, S. N., Mulryan, N. F. (1981). Imunoobmennyaya hromatografiya aminokislot (Teoreticheskie osnovy i praktika). Novosibirsk: Nauka. Sib. otd-nie, 160.
18. Sharer, J. D., De Bias, I., Matern, D., Young, S., Bennett, M. J., Tolun, A. A. (2018). Laboratory analysis of amino acids, 2018 revision: a technical standard of the American College of Medical Genetics and Genomics (ACMG). Genetics in Medicine, 20 (12), 1499–1507. doi: https://doi.org/10.1038/s41436-018-0328-6
DOi: 10.15587/1729-4061.2021.241969

IMPROVING MARSHMALLOw PRODUCTION TECHNOLOGY BY ADDING THE FRuIT AND VEGETABLE PASTE OBTAINED BY LOW-TEMPERATURE CONCENTRATION (p. 43–50)

Mariana Bondar
Vinnytsya National Agrarian University, Vinnytsya, Ukraine
ORCID: https://orcid.org/0000-0001-8154-0612

Alla Solomon
Vinnytsya National Agrarian University Vinnytsya, Ukraine
ORCID: https://orcid.org/0000-0003-2982-302X

Natalia Fedak
State Biotechnological University, Kharkiv, Ukraine
ORCID: https://orcid.org/0000-0002-7468-3213

Mariia Paska
Dnipro State Agrarian and Economic University, Dnipropetrovsk, Ukraine
ORCID: https://orcid.org/0000-0003-3887-3192

Lyudmila Polozhynshynkova
Poltava University of Economics and Trade, Poltava, Ukraine
ORCID: https://orcid.org/0000-0002-5373-3115

Denys Mironov
Poltava University of Economics and Trade, Poltava, Ukraine
ORCID: https://orcid.org/0000-0002-8185-8580

Larisa Kushch
Poltava University of Economics and Trade, Poltava, Ukraine
ORCID: https://orcid.org/0000-0001-7493-5800

A formulation composition and a low-temperature technique have been devised for concentrating fruit and vegetable puree with the following component content: 20 % apple; 20 % pumpkin; 15 % beets; 15 % cranberries; 15 % hawthorn. The puree is concentrated in a rotary evaporator to a solids content of 50 % at a temperature of 50...56°C under vacuum. The processing time was reduced to 1...2 min, which is several times less compared to conventional single-case pump vacuum evaporators (60...90 mins). Reducing the temperature influence of concentrating contributes to an increase in the organoleptic and physicochemical parameters of the resulting paste. To determine the effect of the contribution of each component to the structure of the paste, the structural and mechanical properties of the puree from each raw material and concentrated semi-finished products were investigated. The devised paste has an increased strength of the structure with a dynamic viscosity value of 394 Pa⋅s, which is 2.5 times more than that in the control sample. The devised blended fruit and vegetable paste has an increased content of physiologically functional ingredients and good organoleptic parameters, unlike control (apple paste).

It was established that the partial replacement of apple puree in the formulation composition of marshmallow with 75 % of the devised multicomponent fruit and vegetable paste gives the product original properties. The dynamic viscosity value of the marshmallow in which 75 % of apple puree was replaced with the devised paste has increased, compared to the control sample (marshmallow without additives), from 408 Pa⋅s to 908 Pa⋅s. The color of the marshmallow mass where 75 % of apple puree were replaced is bright pink with a wavelength of 596.7 nm and a brightness of 62.3 %. The data reported here make it possible to improve the quality of original marshmallow products when adding fruit and vegetable semi-finished products whereby an increase in functional properties is provided.
Keywords: low-temperature concentrating, multicomponent fruit and vegetable paste, marshmallow mass, structural and mechanical properties, structure formation.

References
1. Funktsional'nye produkti pitaniya. Available at: http://www.cnshb.ru/news/vex_fpp.shtm
2. Munekata, P. E. S., Pérez-Alvarez, J. A., Pateiro, M., Viuda-Matos, M., Fernández-López, J., Lorenzo, J. M. (2021). Satiety from healthier and functional foods. Trends in Food Science & Technology, 113, 397–410. doi: https://doi.org/10.1016/j.tifs.2021.05.025
3. Pap, N., Fidelis, M., Azevedo, L., de Carvalho, M. A. V., Wang, D., Mocan, A. et al. (2021). Berry polyphenols and human health: evidence of antioxidant, anti-inflammatory, microbiota modulation, and cell-protecting effects. Current Opinion in Food Science, 42, 167–186. doi: https://doi.org/10.1016/j.cofs.2021.06.003
4. Miza, N. N., Koubas, M., Roohinejad, S., Juliano, P. A., Alpas, H., Iniçio, R. S. et al. (2017). Landmarks in the historical development of twenty first century food processing technologies. Food Research International, 97, 318–339. doi: https://doi.org/10.1016/j.foodres.2017.03.001
5. Marcus, J. B. (2013). Chapter 11 - Life Cycle Nutrition: Healthful Eating Throughout the Ages: Practical Applications for Nutrition, Food Science and Culinary Professionals. Culinary Nutrition, 475–543. doi: https://doi.org/10.1016/978-0-12-391882-6.00011-x
6. Ruiz Rodriguez, L. G., Zamora Gasga, V. M., Pescuma, M., Van Nieuwenhove, C., Mozi, F., Sánchez Burgos, J. A. (2021). Fruits and fruit by-products as sources of bioactive compounds. Benefits and trends of lact acid fermentation in the development of novel fruit-based functional beverages. Food Research International, 140, 109854. doi: https://doi.org/10.1016/j.foodres.2020.109854
7. Mykhaylov, V., Zahorulko, A., Zagorulko, A., Liashenko, B., Dudnyk, S. (2021). Method for producing fruit paste using innovative equipment. Acta Innovations, 39, 15–21. doi: https://doi.org/10.32933/actainnovations.39.2
8. Cherevko, O., Kiptelaya, L., Mikhaylov, V., Zagorulko, A., Zagourulko, A. (2015). Development of energy-efficient IR dryer for plant raw materials. Eastern-European Journal of Enterprise Technologies, 4 (6 (76)), 36–41. doi: https://doi.org/10.15587/1729-4061.2015.47777
9. Zahorulko, A., Zagorulko, A., Fedak, N., Sabadash, S., Kaza-kov, D., Koloshchenko, V. (2019). Improving a vacuum-evaporator with enlarged heat exchange surface for making fruit and vegetable semi-finished products. Eastern-European Journal of Enterprise Technologies, 6 (11 (102)), 6–13. doi: https://doi.org/10.15587/1729-4061.2019.178564
10. Chernenkova, A., Leonova, S., Nikiforova, T., Zagarinchayaya, A., Chernenkov, E., Kalugina, O. et al. (2019). The Usage of Biologically Active Raw Materials in Confectionery Products Technology. OnLine Journal of Biological Sciences, 19 (1), 77–91. doi: https://doi.org/10.3844/ojbsci.2019.77.91
11. Zahorulko, A., Zagorulko, A., Kasabova, K., Shmatchenko, N. (2020). Improvement of zefir production by addition of the developed blended fruit and vegetable paste into its recipe. Eastern-European Journal of Enterprise Technologies, 2 (11 (104)), 39–45. doi: https://doi.org/10.15587/1729-4061.2020.185684
12. Mykhaylov, V., Samokhvalova, O., Kucheren, Z., Kasabova, K., Simakova, O., Gorainova, I. et al. (2019). Influence of microbial polysaccharides on the formation of structure of protein-free and gluten-free flour-based products. Eastern-European Journal of Enterprise Technologies, 6 (11 (102)), 23–32. doi: https://doi.org/10.15587/1729-4061.2019.184464
13. Dolores Alvarez, M., Canet, W. (2013). Time-independent and time-dependent rheological characterization of vegetable-based infant purees. Journal of Food Engineering, 114 (4), 449–464. doi: https://doi.org/10.1016/j.jfoodeng.2012.08.034
14. Makroo, H. A., Prabhakar, P. K., Rastogi, N. K., Srivastava, B. (2019). Characterization of mango puree based on total soluble solids and acid content: Effect on physico-chemical, rheological, thermal and ohmic heating behavior. LWT, 103, 316–324. doi: https://doi.org/10.1016/j.lwt.2019.01.003
15. Polyveoda, Y. A., Hurych, A. J., Kutasy, V. M. (2016). Patterns of changing settings of the temperature field at vapour-contacting heating by sterilizing products in cylindrical containers. INMATEH, 50 (3), 65–72. Available at: http://oaji.net/articles/2016/1672-1481993020.pdf
16. Mardani, M., Yeganeshad, S., Pichikina, N., Kodatsky, Y., Klukina, O., Nepovinnykh, N., Najibabasi, S. (2019). Study on foaming, rheological and thermal properties of gelatin-free marshmallow. Food Hydrocolloids, 93, 335–341. doi: https://doi.org/10.1016/j.foodhyd.2019.02.033
17. Bashit, A., Kovachuk, V. (2014). Method of health improvement zephyr obtaining development. Kharkov promyshlovist, 16, 37–41. Available at: http://aibuvgevua.UJRN.Khp_2014.16_10
18. Aboua, A. B., Baybatyrova, T. A., Ambetova, G. K., Chinarova, E. R. (2015). Primenenie innovatsionnyh tehnologiy v proizvodstve muchnyh konditerskih izdeliy. Evrazhskiy Sozyu Uchenyh, 11 (20). Available at: https://cyberleninka.ru/article/n/primenenie-innovatsionnyh-tehnologiy-v-proizvodstve-muchnyh-konditerskih-izdeliy
19. Cherevko, O., Mikhaylov, V., Zahorulko, A., Zagorulko, A., Gordinenko, I. (2021). Development of a thermal-radiation single-drum roll dryer for concentrated food stuff. Eastern-European Journal of Enterprise Technologies, 1 (11 (109)), 25–32. doi: https://doi.org/10.15587/1729-4061.2021.224990
20. International Commission on Illumination. Available at: https://en.wikipedia.org/wiki/International_Commission_on_Illumination
21. Cherevko, O. I., Mykhaylov, V. M., Kiptela, L. V., Zakharenko, V. O., Zahorulko, O. Ye. (2015). Protesy vyrobnostiv bahanokomponentnykh past iz orhanichnoi syrovyny. Kharkiv: KhDUKhT, 166.
22. Cherevko, O., Mykhaylov, V., Zagorulko, A., Zahorulko, A. (2018). Improvement of a rotor film device for the production of high-quality multicomponent natural pastes. Eastern-European Journal of Enterprise Technologies, 2 (11 (92)), 11–17. doi: https://doi.org/10.15587/1729-4061.2018.126400
23. Magomedov, G. O., Zhuravlev, A. A., Plotnikova, I. V., Shevyakova, T. A. (2015). Optimization of marshmallow gelatin functional purpose. Vestnik Voronezhskogo gosudarstvennogo universiteta inzhenernykh tehnologiy, 1 (63), 126–129. Available at: https://elibrary.ru/item.asp?id=23478375

DOI: 10.15587/1729-4061.2021.241877
DETERMINING THE OPTIMAL PARAMETERS OF ULTRA-HIGH-FREQUENCY TREATMENT OF CHICKPEAS FOR THE PRODUCTION OF GLUTEN-FREE FLOUR (p. 51–60)

Aigul Omaraliyeva
Kazakh University of Technology and Business, Nur-Sultan, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0003-4432-8828

Zhanar Bobayeva
Kazakh University of Technology and Business, Nur-Sultan, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0001-7716-9240

Merek Agedilova
Kazakh University of Technology and Business, Nur-Sultan, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0001-6413-2086
This paper describes the materials and results of studying the properties of such a leguminous crop as the chickpea variety Miras 07 of Kazakhstan selection in order to obtain gluten-free flour and further process it to produce confectionery products.

The research involved the ultra-high-frequency (UHF) treatment of chickpea grain to improve quality indicators and reduce anti-alimentary factors.

A change in the protein fraction of chickpeas was determined under exposure to ultra-high-frequency processing. The study has proven the effectiveness of ultra-high-frequency treatment of chickpea for 180 seconds.

Based on chemical analysis, it was found that the exposure to ultra-high-frequency treatment fully preserved the vitamin and mineral complex, compared with untreated chickpeas. When chickpea grain is heated for 180 seconds, up to 20% of the starch contained in the grain passes into dextrin, which is easily absorbed by humans while the toxic substances are destroyed.

The change in the protein fraction of chickpeas during ultra-high-frequency processing was determined. With ultra-high-frequency treatment of chickpea flour at 180 seconds of exposure, the protein fraction content remains unchanged at 79.8%. The result based on the IR spectrum data indicates that ultra-high-frequency processing did not affect the protein-amino acid composition of the examined Miras 07 chickpea variety.

The current study has confirmed the effectiveness of ultra-high-frequency chickpea treatment, which leads to the intensification of biochemical processes in the processed product due to the resonant absorption of energy by protein molecules and polysaccharides.

Under the influence of ultra-high-frequency treatment, there is a decrease in the microbiological contamination of raw materials while the organoleptic indicators improve. According to the microbiological indicators of chickpea flour, the content of microorganisms was 1×10³ CFU/g, which meets the requirements for sanitary and biological indicators of chickpea flour, the content of microorganisms while the organoleptic indicators improve. According to the micro-poly saccharides.

1. Abilova Meruyert
Saken Seidullin Kazakh Agrotechnical University, Nur-Sultan, Republic of Kazakhstan ORCID: https://orcid.org/0000-0001-7201-9534

2. Aidana Zhanaidarova
Kazakh University of Technology and Business, Nur-Sultan, Republic of Kazakhstan ORCID: https://orcid.org/0000-0002-1391-8481

References
1. V Kazalstane rastet spros na produkty pitania, ne soderzhaschie gljuten – uchenye. Available at: https://kazakh-zerno.net/158824-v-kazalstane-rastet-spros-na-produkty-pitania-ne-soderzhaschie-gljuten-uchenye/
2. Arraza, E., Fernández-Bañares, F., M. Rosell, C., Rodrigo, L., Peña, A. S. (Eds.) (2015). Advances in the Understanding of Gluten related Pathology and the Evolution of Gluten-Free Foods. OmniaScience:
3. Kazantseva, I. L. (2016). Nauchno-prakticheskoe obosnovanie i tekhnologiya, 5-6, 7–10.
4. Muslimov, N. Z., Borovskiy, A. Y., Kizatova, M. E., Sultanova, M. Z., Omaraliyeva, A. M. (2020). Flour receipt based on grain legumes. Eurasian journal of biociences, 14 (1), 1287–1297. Available at: https://www.elibrary.ru/item.asp?id=45312510
5. Kudimov, P. L., Schekoldina, T. V., Slizkaya, A. S. (2012). Current status and structure of vegetable protein world resources. Pishchevaya tekhnologiya, 5, 6, 7–10.
6. Abilova Meruyert
7. Kalorinost' Nut (tureckiy goroh). Himicheskij sostav i pischevaya tsen-
8. Hanmaa, Ch. T., Gomcharuk, O. V. (2020). Obosnovanie podkhodov k sor-
danju bezglyutenowych mnych konditerskikh izdeliey s ispol'zovaniem
votorestnemykh vidov muki. Innovativni v pishevoy promyshlennosti: obrazovanie, nauka, proizvodstvo. Materialy 4-y vserossijskoy nauchi-
9. Popov, V. G., Hajrullina, N. G., Sadykova, Kh. N. (2021). Trends in the use of gluten-free flours in the production of functional products. Proceedings of the Voronezh State University of Engineering Technologies, 83 (1), 121–128. doi: https://doi.org/10.20914/2310-1202-2021-1-121-128
10. Medvedeva, N. A., Belozerova, S. V. (2021). Journal of water and land development, 49 (IV-VI), 74–78. doi: https://doi.org/10.20914/2310-1202-2021.137098
11. Muslimov, N. Z., Borovskiy, A. Y., Kizatova, M. E., Sultanova, M. Z., Omaraliyeva, A. M. (2020). Flour receipt based on grain legumes. Eurasian journal of biociences, 14 (1), 1287–1297. Available at: https://www.elibrary.ru/item.asp?id=45312510
12. Ling, B., Cheng, T., Wang, S. (2019). Recent developments in applications of radio frequency heating for improving safety and quality of food grains and their products: A review. Critical Reviews in Food Science and Nutrition, 60 (15), 2622–2642. doi: https://doi.org/10.1080/10408398.2019.1651690
13. Shalagina, Yu. A. (2016). Izmenenie obema krupy pri svch obrabotke. Evrazyskiy Soyuz Uchenykh, 4-4 (25), 49–52. Available at: https://www.elibrary.ru/item.asp?id=27440101
14. Crop Alimentantus (2018). Available at: http://www.fao.org/3/CA1176RU/ca1176ru.pdf
15. Crop Alimentantus (2018). Available at: http://www.fao.org/3/CA1176RU/ca1176ru.pdf
16. Novye fiziko-himicheskie i biotekhnologicheskie metody obrabot-
ki pishevogo sryva i produktov (2019). Persianovskiy: Dons-
17. Ushenya. Available at: https://www.dongau.ru/obuchenie/
nachynaya-biblioteka/ucheb_posobiya/2019/Novye_fiziko-
18. Begeulov, M. Sh. (2006). Osnovy pererabotki semyan soi. Mos-
cow: DeLi print, 181.
19. Sujka, K., Koczon, P., Ceglinska, A., Reder, M., Cierniewska-
yzkiewicz, H. (2017). The Application of FT-IR Spectroscopy for Quality Control of Flours Obtained from Polish Producers. Journal of Analytical Methods in Chemistry, 2017, 1–9. doi: https://doi.org/10.1155/2017/4315678
20. Ferreira, D. S., Galão, O. F., Pallone, J. A. L., Poppi, R. J. (2014). Comparison and application of near-infrared (NIR) and mid-
infrared (MIR) spectroscopy for determination of quality parameters in soybean samples. Food Control, 35 (1), 227–232. doi: https://doi.org/10.1016/j.foodcont.2013.07.010
21. Magomedov, G. O., Sadigova, M. K., Lukina, S. I., Kustov, V. Yu. (2013). Effect of disintegration wave grinding on fractional protein and amino acid composition of chickpea. Proceedings of the Vorone-
zh State University of Engineering Technologies, 1, 94–97. Available at: https://www.venstik-russt.ru/vgsst/article/view/135
The paper is devoted to solving the problem of the nutritional and biological value of rye-wheat bread by enriching it with non-traditional local plants raw materials – linseed flour and rice husk fiber. Rice husks as a partial replacement for wheat flour on the characteristics of dough rheology and bread quality. Journal of the Science of Food and Agriculture, 29 (1), 147–162. doi: https://doi.org/10.1016/j.jscfa.2020.02.015

Biotransformation of rice husk into organic fertilizer through vermicomposting. Ecological Engineering, 41, 60–64. doi: https://doi.org/10.1016/j.ecoleng.2012.01.011

Bishit, N., Gophe, P. C., Rani, N. (2020). Rice husk as a fibre in composites: A review. Journal of the Mechanical Behavior of Materials, 29 (1), 147–162. doi: https://doi.org/10.1515/jmbm-2020-0015

Liu, T., Duan, H., Mao, X., Yu, X. (2020). Influence of flaxseed flour as a partial replacement for wheat flour on the characteristics of Chinese steamed bread. RSC Advances, 10 (47), 28114–28120. doi: https://doi.org/10.1039/d0ra05742h

Koca, A. F., Amil, M. (2007). Effect of flaxseed and wheat flour blends on dough rheology and bread quality. Journal of the Science of Food and Agriculture, 87 (6), 1172–1175. doi: https://doi.org/10.1002/jsfa.2739

Martin, K. R. (2007). The chemistry of silica and its potential health benefits. The journal of nutrition, health & aging, 11 (2), 94–97.

Silicon dioxide. National Center for Biotechnology Information. Available at: https://pubchem.ncbi.nlm.nih.gov/compound/Silicon-dioxide#section=Information-Sources

Keywords: rye-wheat bread, linseed flour, rice husk fiber, rheology, recipe optimization.

References

1. Baiysbayeva, M., Izkhenbayeva, S., Zhubayeva, A., Batyrbayeva, N., Dikhanbayeva, F., Daribayeva, G. (2021). Development of technology for macaroni products based on flour of grain crops and ion-zoned water. Eastern-European Journal of Enterprise Technologies, 1 (11 (109)), 51–60. doi: https://doi.org/10.15587/1729-4061.2021.225001

2. Baiysbayeva, M. P., Izkhenbayeva, A. K., Daartkanova, D. R., Baisatyrov, T. A. (2014). Ways and processing method of baking the Kazakh national flatbread. Advances in Environmental Biology, 8 (16), 248–251.

3. Baiysbayeva, M. P., Zhiyenbayeva, S. T., Rustemova, A. Zh., Batyrbayeva, N. R., Izkhenbayeva, A. K., Irmatova, Z. K. (2019). The effect of formulating supplements on the quality, nutritional value, safety and microbiological parameters of butter cookies. Eurasian Journal of Biosciences, 13 (2), 2015–2021. Available at: http://www.ejobios.org/download/the-effect-of-formulating-supplements-on-the-quality-nutritional-value-safety-and-microbiological-7368.pdf

4. Karavay, L. V., Levchikina, L. V. (2008). Gigrolizovannaya risovaya sheluha dlya proizvodstva muchnyh izdeliy. Pischevaya promyshlennost', 11, 53. Available at: https://cyberleninka.ru/article/n/gidrolyzovannaya-risovaya-sheluha-dlya-proizvodstva-muchnyh-izdeliy

5. Urotsko, A. V., Driker, B. N., Zemunukha, L. A., Galimova, A. R. (2007). Resursosberegayuschaya tehnologiya poluchenia chelyulvy pri kompleksnoy pererabotke solomy risa. Himiya rastitel'nogo svesy, 2, 21–25. Available at: https://cyberleninka.ru/article/n/resursosberegayuschaya-tehnologiya-poluchenia-tcellyulozy-pri-kompleksnoy-pererabotke-solomy-risa

6. Kalinina, I. V., Fatkulillin, R. I., Naumenko, V. N. (2014). On the use of flax meal in bread and pastry production. Bulletin of the South Ural State University. Series “Food and Biotechnology”, 2 (4), 50–56. Available at: https://vestnik.susu.ru/food/article/view/3038/2850

7. Arjmandi, R., Hassan, A., Majeed, K., Zakaria, Z. (2015). Rice Husk Filled Polymer Composites. International Journal of Polymer Science, 2015, 1–32. doi: https://doi.org/10.1155/2015/501471

8. Lim, S. L., Wu, T. Y., Sim, E. Y. S., Lim, P. N., Clarke, C. (2012). Biotransformation of rice husk into organic fertilizer through vermicomposting. Ecological Engineering, 41, 60–64. doi: https://doi.org/10.1016/j.ecoleng.2012.01.011

9. Bishit, N., Gophe, P. C., Rani, N. (2020). Rice husk as a fibre in composites: A review. Journal of the Mechanical Behavior of Materials, 29 (1), 147–162. doi: https://doi.org/10.1515/jmbm-2020-0015

10. Liu, T., Duan, H., Mao, X., Yu, X. (2020). Influence of flaxseed flour as a partial replacement for wheat flour on the characteristics of Chinese steamed bread. RSC Advances, 10 (47), 28114–28120. doi: https://doi.org/10.1039/d0ra05742h

11. Koca, A. F., Amil, M. (2007). Effect of flaxseed and wheat flour blends on dough rheology and bread quality. Journal of the Science of Food and Agriculture, 87 (6), 1172–1175. doi: https://doi.org/10.1002/jsfa.2739

12. Martin, K. R. (2007). The chemistry of silica and its potential health benefits. The journal of nutrition, health & aging, 11 (2), 94–97.

13. Silicon dioxide. National Center for Biotechnology Information. Available at: https://pubchem.ncbi.nlm.nih.gov/compound/Silicon-dioxide#section=Information-Sources
The composition of legumes and sugar beet contains a large number of useful mineral and vitamin substances. The use of composite flour from leguminous crops for the preparation of bakery products helps increase food and biochemical properties. The main objects of this research are chickpea flour, bean flour, dry sugar beet powder, and wheat flour of the first grade. The main problem is an insufficient amount of minerals and vitamins, so the purpose of this work is to enrich bakery products and replace sugar in the recipe with sugar beet powder. The results showed that composite flour and sugar beet increased calcium content by 13.54 mg/100 g, iron by 0.57 mg/100 g, potassium – by 141.03 mg/100 g, phosphorus – by 38.89 mg/100 g, vitamin A – by 0.002 mg/100 g, vitamin B2 – by 0.016 mg/100 g, vitamin E – by 0.32 mg/100 g, and vitamin PP – by 0.405 mg/100 g. Microbiological indicators meet the established norms and requirements; the amount of mesophilic aerobic and facultative-anaerobic microorganisms, yeast, and mold in the test bun was the least compared to the control sample. As a result, it was proved that the use of composite flour of leguminous crops contributes to an increase in the nutritional and biological values of bakery products, and the application of dried sugar beet powder makes it possible to completely exclude sugar from the formulation of the resulting product. Employing this technology and formulations for obtaining bakery products makes it possible to expand the range of bakery products, reduce the duration of the manufacturing process, improve the quality of finished products, increase labor productivity. That also contributes to the improvement of the socio-economic indicators of bakery and confectionery enterprises.

**Keywords:** composite flour, bakery products, legumes, technology, baking, sugar beet.

**References**

1. Agengo, F. B., Onyang, A. N., Serrem, C. A., Okoth, J. (2020). Efficacy of composting with small meat powder on protein nutritional quality of sorghum–wheat buns using a rat bioassay. Journal of the Science of Food and Agriculture, 100 (7), 2963–2970. doi: https://doi.org/10.1002/jsfa.10324

2. Catapang, R. G. (2019). Acceptability of veggie-steamed bun. International Journal of Scientific & Technology Research, 8 (8), 1643–1647.

3. Cevoli, C., Nallan Chakravartula, S. S., Rosa, M. D., Fabbri, A. (2019). Drying of coating on bun bread: Heat and mass transfer numerical model. Biosystems Engineering, 181, 1–10. doi: https://doi.org/10.1016/j.biosystemseng.2019.02.009

4. Zhu, F., Li, J. (2019). Physicochemical properties of steamed bread fortified with ground linseed (Linum usitatissimum). International Journal of Food Science & Technology, 54 (5), 1670–1676. doi: https://doi.org/10.1111/ijfs.14043

5. Ponzocht, L., Kotikov, Z., Orsák, M., Lachman, J., Martinek, P. (2019). Carotenoid changes of colored-grain wheat flours during bun-making. Food Chemistry, 277, 725–734. doi: https://doi.org/10.1016/j.foodchem.2018.11.019

6. Bostic, J. N., Palafox, S. J., Rottmueller, M. E., Jahren, A. H. (2015). Effect of baking and fermentation on the stable carbon and nitrogen isotope ratios of grain-based food. Rapid Communications in Mass Spectrometry, 29 (10), 937–947. doi: https://doi.org/10.1002/rcm.7178

7. Sacristán-Pérez-Minayo, G., López-Robles, D. J., Rad, C., Miranda-Barroso, L. (2020). Microbial inoculation for productivity improvements and potential biological control in sugar beet crops. Frontiers in Plant Science, 11. doi: https://doi.org/10.3389/fpls.2020.64898

8. Aksu, G., Altay, H. (2020). The Effects of Potassium Applications on Drought Stress in Sugar Beet. Sugar Tech, 22 (6), 1092–1102. doi: https://doi.org/10.1007/s12355-020-00851-w

9. Magomedov, M. G. (2014). The technology of paste from sugar beet obtaining. Vestnik Voronezhskogo gosudarstvennogo universiteta izucheney technologii, 3, 138–141.

10. Ursunbayeva, S. A., Iztayev, R., Gomedov, R., Yakiyayeva, A., Uldabekova, B. Z. (2019). Study of the quality of low-class wheat and bread obtained by the accelerated test method. Periódico Téhic Quimica, 16 (33), 899–822. doi: https://doi.org/10.52571/pq.v16.n33.2019.824_periodico33_pgs_899_822.pdf

11. Iztayev, A., Baibatyrov, T. A., Iztayev, A. M., Zhakatayeva, A. N., Baibatyrov, T. A. (2021). Method for the safe storage of sugar beets using an ion-ozone mixture. Acta Scientiarum Polonorum Technologia Alimentaria, 20 (1), 25–33. doi: https://doi.org/10.17306/j.als.0865
into the kneading body of the unit, then the dough was replaced for unit. The recipe components (raw materials) of the dough were loaded in a safe way under pressure in a kneading-beating ion-ozone cavitation whey and natural starter have been developed. The dough was prepared vitamins, etc. On the basis of the obtained research results, a recipe and including short-chain organic acids, dietary fiber, essential amino acids, the course of their life enrich bread with the most valuable compounds, flour, water and sugar is considered healthy. Any starter obtained by accelerated technology, natural culture.

De Bellis, P., Rizzello, C., Sisto, A., Valerio, F., Lonigro, S., Conte, A. et. al. (2019). Use of a Selected Leuconostoc Citreum

Auyelbek Iztayev
Science Research Institute for Food Technologies, Almaty, Republic of Kazakhstan
Almaty Technological University, Almaty, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0002-7385-482X

Mariam Alihammadova
Almaty Technological University, Almaty, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0003-4861-7862

Bauyrzhan Iztayev
Almaty Technological University, Almaty, Republic of Kazakhstan
Tole bi str., 100, Almaty, Republic of Kazakhstan 050012

Mira Yerzhanova
M. Kh. Dulyat Taraz Regional University, Taraz, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0002-6496-2603

Ulbala Tungeshbayeva
Almaty Technological University, Almaty, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0002-6200-0528

Rausan Izteliyeva
Almaty Technological University, Almaty, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0001-9129-2798

Sholpan Tursunbaeva
Almaty Technological University, Almaty, Republic of Kazakhstan
ORCID: https://orcid.org/0000-0001-9645-3634

Natural baking starter made from common ingredients such as flour, water and sugar is considered healthy. Any starter obtained by spontaneous fermentation is always a symbiosis of lactic acid bacteria and yeast. Lactic acid bacteria and yeast get along well together and in the course of their life enrich bread with the most valuable compounds, including short-chain organic acids, dietary fiber, essential amino acids, vitamins, etc. On the basis of the obtained research results, a recipe and technological modes for preparing dough for no yeast bakery products from wheat flour of the first grade with the use of ion-ozonized water, whey and natural starter have been developed. The dough was prepared in a safe way under pressure in a kneading-bearing ion-ozone cavitation unit. The recipe components (raw materials) of the dough were loaded into the kneading body of the unit, then the dough was replaced for 5 minutes at a kneading body rotation frequency of 5 s⁻¹ in different rotation modes and times. Then the ion-ozone treatment was carried out using an excess pressure of 0.40 MPa (cavitation) and the dough was knocked down. The nutritional value, safety and shelf life of the developed no yeast bakery products with the addition of whey, starter and ion-ozonized water have been determined. It was found that in terms of organoleptic and physicochemical indicators, bread samples prepared from first grade wheat flour and ion-ozonized water without yeast and using whey are almost 2 times inferior to the quality of the control sample. As a result, it was found that churning for 3–5 minutes at a kneading body rotation frequency of 4–5 s⁻¹ will be the optimal mode for obtaining a no yeast dough made from first grade flour on starter with the addition of whey and ion-ozonized water.

Keywords: ion-ozonized water, no yeast bread, wheat flour, accelerated technology, natural culture.

References
1. De Bellis, P., Rizzello, C., Sisto, A., Valerio, F., Lonigro, S., Conte, A. et. al. (2019). Use of a Selected Leuconostoc Citreum

Strain as a Starter for Making a “Yeast-Free” Bread. Foods, 8 (2), 70. doi: https://doi.org/10.3390/foods8020070
2. Ruttaratanamongkol, K., Wagner, M. E., Rizvi, S. S. H. (2011). Properties of yeast free bread produced by supercritical fluid extrusion (SCFX) and vacuum baking. Innovative Food Science & Emerging Technologies, 12 (4), 542–550. doi: https://doi.org/10.1016/j.ifset.2011.07.006
3. Musatti, A., Mapelli, C., Foschino, R., Picozzi, C., Rollini, M. (2016). Unconventional bacterial association for dough leavening. International Journal of Food Microbiology, 237, 28–34. doi: https://doi.org/10.1016/j.ijfoodmicro.2016.08.011
4. Kapcsándi, V., Hanczéni Lakatos, E., Sik, B., Linka, L. Á., Székely-hidi, R. (2021). Antioxidant and polyphenol content of different Vitis vinifera seed cultivars and two facilities of production of a functional bakery product. Chemical Papers, 75 (11), 5711–5717. doi: https://doi.org/10.1007/s11696-021-01754-0
5. Magomedov, G. O., Shevyakova, T. A., Chernysheva, Yu. A., Mazin, E. A. (2013). Poluchenie shlych biskovot putem mezhchemekh- ogo razryblenyeniya. Mezhduunarodnozhajna naucho-technicheskaya kon- ferenciya (zaoczchnaja) «Innovecnonnje tehnologi v pishevoy promyslenosti: nauka, obrazovanie i proizvodstvo», sbornik mate- rialov. Voronezh: VGUIT, 355. Available at: https://www.elibrary.ru/item.asp?id=22716962&pf=1
6. Popadynets, N., Shulst, S., Barna, M. (2017). Differences in con- sumer buying behaviour in consumer markets of the EU member states and Ukraine. Economic Annals-XXI, 166 (7-8), 26–30. doi: https://doi.org/10.21003/ea.v166-05
7. Sun, Y., Wang, Q., Ji, H., Li, Z., Sheng, L. (2021). Impact of ozone-induced oxidation on the textural, moisture, micro- rheology and structural properties of egg yolk gels. Food Chemistry, 361, 130075. doi: https://doi.org/10.1016/j.foodchem.2021.130075
8. Li, M., Peng, J., Zhu, K.-X., Guo, X.-N., Zhang, M., Peng, W., Zhou, H.-M. (2013). Delineating the microbial and physical–chemi- cal changes during storage of ozone treated wheat flour. Innovative Food Science & Emerging Technologies, 20, 223–229. doi: https://doi.org/10.1016/j.ifset.2013.06.004
9. Maemerov, M. M. (2004). Povyshenie roli ozona, kak ekologicheskis chistoja metodja obrabotki rastitel'noj sorya. «Strategiya razvitija pishevoj i legkoy promyslenosti» materialy konf. Almaty, 59–60.
10. Maemerov, M. M., Izaev, A. I., Kulazhanov, T. K., Iskakova, G. K. (2011). Nauchnye osnoveny ionoozonnoy tehnologii obrabotki zerna i produktov eego preerabotki. Almaty, 246.
11. Fuchikova, L. I. (2004). Laboratornyj praktikum po tehnologii hlino- pekarskogo proizvodstva. Sankt-Peterburg: GIORD, 264.
12. Iztayev, A., Baibatyrov, T., Mukasheva, T., Mulkabekova, B., Ya- kiyayeva, M. (2020). Experimental studies of the baisheshke bar- ley grain processed by the ion-ozone mixture. Periódico Tchê Quimica, 17 (35), 239–258. doi: https://doi.org/10.52571/qtq.v17.n35.2020_22_iztayev_pgs_239_258.pdf
13. Ursunbayev, S. A., Iztayev, R., Gomonedov, R., Yakiyayeva, A., Uldabekova, B. Z. (2019). Study of the quality of low-class wheat and bread obtained by the accelerated test method. Periódico Tchê Quimica, 16 (33), 809–822. doi: https://doi.org/10.52571/qtq.v16.n33.2019.824_periodico33_pgs_809_822.pdf
14. Zhakatayeva, A., Iztayev, A., Mulkabekova, B., Yakiyayeva, M., Hriv- na, L. (2020). Scientific security assessment of safety risk of raw sugar products. Periódico Tchê Quimica, 17 (34), 352–368. doi: https://doi.org/10.52571/qtq.v17.n34.2020.369_p34_pgs_352_368.pdf
15. Iztayev, A., Kulazhanov, T. K., Yakiyayeva, M. A., Zhakatayeva, A. N., Baibatyrov, T. A. (2021). Method for the safe storage of sugar beets using an ion-ozone mixture. Acta Scientiarum Polono- rum Technologia Alimentaria, 20 (1), 25–35. doi: https://doi.org/10.17306/j afs.0865
А. Н. Загорулько, А. І. Черевко, А. Е. Загорулько, М. А. Янчева, Н. В. Будник, Ю. Г. Наконечная, Н. В. Олейник, Н. В. Новгородская

Кулинарні м'ясні вироби зокрема деликатеси займають вагому частину рациоу харчування багатьох країн світу, обумовлюючи потребу в впровадженні інноваційних рішень для виробництва продукції широкого спектра від інкогнітою смаковими властивостями.

Розроблена конструкція апарату для низькотемпературної обробки м'ясніх деликатесів з обігрівом робочої поверхні гнучким пласниковим резистивним електронагрівачем випромінювального типу. Контроль температури здійснюється за допомогою голоштової термопари. Забезпечується можливість охолодження деликатесу до 25...30 °C автономними вентиляторами при перетворенні вторинної теплої енергії елементами Пельтье. Встановлено, що пікову вогну напруга при температурі 70...80 °C становить 4...6 Вт, а при 25...30 °C відповідно 1,5...3 Вт. Проведено порівняльний аналіз термічної обробки м'ясного деликатесу традиційним способом та у розробленому апараті при досягненні в центрі виробу 71...75 °C.

Температура після 5 хв обробки для традиційного апарата становить 15...17 °C на контактній поверхні та у центрі 8 °C. Для модельної конструкції температура контактної поверхні становить 7...8 °C, а в центрі 4...5 °C. Після 25 хв обробки традиційним спосою температура у центрі становила 17...18 °C в пристінних шарах 60 °C. У модельній конструкції 8...9 °C з температурою пристінних шарів 25 °C. Передув вироби від центра до пристінного шару в залежності від тривалості обробки за традиційним способом становити від 10 до 50 °C, а в модельному апараті від 4 до 24 °C. Модельний апарат забезпечує рівномірне тепловідведення за умов досягнення 71...75 °C у центрі виробу зі зменшенням питомих витрат в 2,6 рази порівняно з традиційним способом. Шинка, отримана в розробленому апараті, характеризується рівномірним забарвленням, соковитістю та природним оригінальним смаком.

**Ключові слова:** м'ясні деликатеси, апарат низькотемпературної обробки, температурне поле, вторинна енергія, елементи Пельтье.

DOI: 10.15587/1729-4061.2021.239858

Анотації, Technology and equipment of food production

Олга Белоцерстева, Lyazzat Baibolova, Yuliya Pronina, Alberto Cepeda, Dinara Tlevlessova

За результатами провідних досліджень розроблено технологію виробництва натуральної фруктово-ягідної пастили та мармеладу з підвищеною харчовою та біологічною цінністю, з та тривалим терміном зберігання. Визначено  нові та забезпечені критичні контрольні точки виробництва, зокрема з високі та низькі температури, витримування певних показників вмісту сухих речовин. Ідентифікаційною ознакою мармеладної продукції є вміст певного виду фруктової сировини, що несе в собі ризик на всьому життєвому циклі виробництва продукту, незважаючи на те, що підготовка та зберігання сировини відбувається в інтервалі температури від 0 °C до мінус 15 °C. Розглянуто проблемні
питання виникнення цвілі. Встановлено, що вміст вологи в продукті вище 15 % призводить до підвищення вмісту цвілевих грибів і значно скорочує його термін придатності. У роботі наведені результати досліджень з виявлення збереження вітаміну С в продуктах, приготовлених зі свіжих ягід і з ягід, підданних заморозкуванню. Виявлено, що в процесі зберігання сировини при температурі мінус 15 °C кількість вітаміну С в кінцевому продукті зменшилася на 11,3 %, в порівнянні з продуктом, приготованим зі свіжої сировини. Максимальна межа високих температур приготування 108 °С значно не вплинула на втрату вітаміну С. Проведено дослідження з визначення вмісту цукру в продуктах з виявленням високої відмінності фруктози. Визначено критичні контрольні точки на всіх етапах виробництва, що дозволило підбрати оптимальні для безпеки та якості продукту технологічні режими та параметри.

Ключові слова: критичні контрольні точки, морозо-пастільні вироби, вітамін С, редукуючі речовини.

DOI 10.15587/1729-4061.2021.241969
УДОСКОНАЛЕННЯ ТЕХНОЛОГІЇ ЗЕФІРУ З ДОДАВАННЯМ ПЛОДООВОЧЕВОЇ ПАСТІ ОТРИМАНОЇ НІЗЬКОТЕМПЕРАТУРНИМ КОНЦЕНТРАВАННЯ (с. 43–50)

М. М. Бондар, А. М. Соломон, Н. В. Федак, М. З. Наска, А. С. Готовьська, Л. О. Положинько, Д. А. Миронов, Л. І. Куч

Розроблено рецептурний склад та спосіб низькотемпературного концентрування плодово-овочевого сиропу з вмістом компонентів: 20 % волога; 15 % гарбуз; 15 % журавлина; 15 % глоду. Концентрування сиропу здійснюється у роторному випарникові до вмісту сухих речовин 50 % за температурою 50...56 °C під вакуумом. При цьому зменшено час обробки, який становить 1...2 хв, що в
Довідка. Technology and equipment of food production

рази менше порівнюючи з традиційними однокорпусними вакуум-випарними апаратами (60...90 хв.). Зменшення температурного впли- 
ву концентрування сприяє підвищенню органолептичних і фізико-хімічних показників отриманої пасті. Для встановлення впливу 
внеску кожного компонента на структуру органолептичні й фізико-хімічні властивості пасті досліджено структурно-механічні 
властивості пасті в реальному масі. Оптимальною виявилось структура зі значеннями динамічної в'язкості ~ 394 Па·с, що 2,5 рази 
більше контрольного зразка. Розроблена захисова підancodeвеча відноситься до беззахисового від біологічної відповідної пасті.

Ключові слова: низькотемпературне концентрування, багатокомпонентна підancodeвеча паста, зефірна маса, структурно-механі- 
чні властивості, структуроутворення.

DOI: 10.15587/1729-4061.2021.241877

ВИЗНАЧЕННЯ РАЦІОНАЛЬНИХ ПАРАМЕТРІВ НАДВИСОКОЧАСТОТНОЇ ОБРОБКИ НУТУ ДЛЯ 
ВИРОБНИЦТВА БЕЗГЛЮТЕНОВОГО БОРОШНА (с. 51–60)

Aigul Omaraliyeva, Zhanar Botbayeva, Mereke Agedilova, Meruyert Abilova, Aidana Zhanaidarova

Наведено дослідження з надвисокочастотної (НВЧ) обробки зерна нуту для поліпшення якісних показників і зменшення антіа-

ліментарних факторів. У досліджень доведена ефективність надвисокочастотної обробки нуту при 180 секундах. На підставі 
хімічного аналізу встановлено, що при надвисокочастотній обробці повністю зберігається вітамінний та мінеральний комплекс 
в порівнянні з необробленим нутом. При нагріванні зерна нуту за 180 секунд, до 20 % крохмалю, що міститься в нуті, пере-
ходить в декстрини, які легко засвоюються людиною, руйнуються токсичні речовини.

При надвисокочастотній обробці нутового борошна при 180 секундні витримці вміст білкової фракції знижується без змін − 
79,8 %. Отриманий результат за даними ІЧ спектру свідчить про те, що надвисокочастотна обробка не вплинула на білково-амінокис- 
лотний склад досліджуваного нуту сорту «Мирас 07».

У дослідженнях доведена ефективність надвисокочастотної обробки нутового борошна, яка призводить до інтенсифікації біохімічних процесів 
оброблюваному продукту внаслідок резонансного поглинання енергії молекулами білка та полісацеридів.

Під впливом надвисокочастотної обробки відбувається зниження мікробного обсіменення сировини, а також поліпшуються 
органолептичні показники. За мікробіологічними показниками нутового борошна вміст мікроорганізмів склав ~ 10^3 КУО/г, що 
органолептичні показники. За мікробіологічними показниками нутового борошна вміст мікроорганізмів склав ~ 10^3 КУО/г, що 
інгредієнтів та гарними органолептичними показниками на відміну від контролю (яблучна паста).

Забезпечується збільшення величини динамічної в'язкості зефіру з вмістом внеску кожного компонента на структуру пасти досліджено структурно-механічні властивості.

Ключові слова: зернобобова культура, нут сорту «Мирас 07» надвисокочастотна обробка, безглютенове борошно.

DOI: 10.15587/1729-4061.2021.242648

ВИВЧЕННЯ МОЖЛИВОСТЕЙ ВИКОРИСТАННЯ ЛІЯНОГО БОРОШНА І КЛІТКОВИНИ РИСОВОГО 
ЛУШПИННЯ ЯК ДОДАТКОВОГО ДЖЕРЕЛА СИРОВИНИ В ХЛІБОПЕКАРСЬКІЙ ПРОМИСЛОВОСТІ (с. 61–72)

Zilikha Moldakulova, Meruyet Bayisbayeva, Galiya Iskakova, Fatima Dikhanbayeva, Assel Izembayeva, Viera Sottnikova

Робота присвячена вирішенню проблеми харчової та біологічної цінності житньо-пшеничного хліба шляхом його збагачення 
нестрадійними міцезявою рослинною сировиною – лляним борошном і клітковиною рисового лушпиння. Рисове лушпиння рідко 
при вирощуванні використовується у виробництві хлібобулочних виробів і в більшості випадків його обробка не проводиться. Однак в даному до-
сліджені були визначені рівні амінокислотних комплексів, а також поліпшенням органолептичних показників. За мікробіологічними показниками нутового борошна вміст мікроорганізмів склав ~ 1х10^3 КУО/г, що 
інгредієнтів та гарними органолептичними показниками на відміну від контролю (яблучна паста).

Забезпечується збільшення величини динамічної в'язкості зефіру з вмістом внеску кожного компонента на структуру пасти досліджено структурно-механічні властивості.

Ключові слова: житньо-пшеничний хліб, лляне борошно, клітковина рисового лушпиння, реологія, оптимізація рецептури.

DOI: 10.15587/1729-4061.2021.241877
У складі зернобобових культур і цукрових буряків міститься велика кількість корисних мінеральних і вітамінних речовин. Використання композитного борошна з зернобобових культур для приготування хлібобулочних виробів сприяє підвищенню харчових та біохімічних властивостей. Основними об’єктами дослідження є нутове борошно, квасолеве борошно, сухий порошок цукрових буряків і пшеничне борошно першого сорту. Основною проблемою є недостатня кількість мінеральних речовин і вітамінів, тому метою роботи є збагачення хлібобулочних виробів і заміна в рецептурі цукру на порошок цукрових буряків. Результати показали, що композитне борошно та цукровий буряк підвищують вміст кальцію на 13,54 мг/100 г, заліза на 0,57 мг/100 г, калію до 141,03 мг/100 г, фосфору на 38,89 мг/100 г, вітаміну А 0,002 мг/100 г, вітаміну В2 на 0,016 мг/100 г, вітаміну Е на 0,32 мг/100 г і вітаміну РР на 0,405 мг/100 г. Мікробіологічні показники відповідають встановленим нормам і вимогам, в тому числі зміст мезофільних аеробних і факультативно-анаеробних мікроорганізмів, дріжджів і цвілі в досліджуваній булці показали найменші результати, в порівнянні з контрольним зразком. В результаті було доведено, що використання композитного борошна зернобобових культур сприяє підвищенню харчової та біологічної цінності хлібобулочних виробів, а використання сушених порошків цукрових буряків дозволяє повністю виключити цукор з рецептурі одержуваного продукту. Застосування даної технології отримання хлібобулочних виробів і рецептур у виробництві дозволяє зменшити витрати на асортимент хлібобулочних виробів, скоротити тривалість технологічного процесу виробництва, поліпшити якість готової продукції, збільшити продуктивність праці. Це також сприяє підвищенню соціально-економічних показників хлібобулочних та кондитерських підприємств.

Ключові слова: композитне борошно, хлібобулочні вироби, зернобобові культури, технологія, випічка, цукрові буряки.

Натуральна хлібобулкова закваска, приготована зі звичайних компонентів – борошна, води та цукру, вважається корисною. Будь-яка закваска, приготована шляхом спонтанного бродіння, завжди є симбіозом молочнокислих бактерій та дріжджів. Молочнокислі бактерії та дріжджі відмінно уживаються разом і в процесі своєї життєдіяльності збагачують хліб найціннішими сполуками, що включають коротколанцюгові органічні кислоти, харчові волокна, незамінні амінокислоти, вітаміни та ін. На підставі отриманих результатів досліджень розроблено рецептуру та технологічні режими приготування тіста для бездріжджових хлібобулочних виробів із пшеничного борошна першого сорту із застосуванням іон-озонованої води, сироватки та натуральної закваски. Тісто готувалося безпарним способом під тиском в місильно-збивальній іон-озоновій кавітаційній установці. Рецептурні компоненти (сировину) тіста було завантажено в місильний корпус установки, потім тісто замішувалося протягом 5 хвилин при частоті обертання місильного органу 5 с–1 в різних режимах обертання та часу. Потім була проведена іон-озонова обробка за допомогою надлишкового тиску 0,40 МПа (кавітація) та проведено збивання тіста. Визначено харчову цінність, безпеку та терміни зберігання розроблених бездріжджових хлібобулочних виробів відповідно до встановлених нормативних документах. Встановлено, що за органолептичними та фізико-хімічними показниками зразки хліба, приготовані з пшеничного борошна першого сорту та іон-озонованої води, приготовані без дріжджів, та з застосуванням сироватки поступаються майже в 2 рази якості контрольного зразка. В результаті було встановлено, що збивання протягом 3–5 хвилин при частоті обертання місильного органу 4–5 с–1 буде оптимальним режимом для отримання бездріжджового тіста, приготовленого з борошна першого сорту на заквасці з додаванням сироватки та іон-озонованої води.

Ключові слова: іон-озонована вода, бездріжджовий хліб, пшеничне борошно, прискорена технологія, натуральна закваска.