

quality, and drying parameters]. LWT - Food Science and Technology. 15 August 2023

12. Castro A., Díaz L., Mayorga E., Moreno F. Quintanilla-Carvajal M. [Convective drying of feijoa fruits: Pretreatment methods and target]. Journal of Hygienic Engineering and Design, 37 (555) (2021), pp. 116-124

13. Chikpah S., Korese J., Sturm Barbara, Oliver Hensel [Colour change kinetics of pumpkin (Cucurbita moschata) slices during convective air drying and bioactive compounds of the dried products]. Journal of Agriculture and Food Research. Volume 10, December 2022, 100409

14. An-An Zhang, Jia-Bao Ni, Alex Martynenko, Chang Chen, Xiao-Ming Fang, Chang-Jiang Ding, Jun Chen, Jian-Wei Zhang, Hong-Wei Xiao [Electrohydrodynamic drying of citrus (Citrus sinensis L.) peel: Comparative evaluation on the physicochemical quality and volatile profiles]. Food Chemistry. Volume 429, 15 December 2023. 136832

15. Casim S., Contigiani E., Mazzobre F., Rocío Romero-Bernal A. [Design of apple snacks – A study of the impact of calcium impregnation method on physicochemical properties and structure of apple tissues during convective drying]. Innovative Food Science & Emerging Technologies vol 85, pp. 1-10, 2023.

ӘОЖ 664.681.9
FTAXP: 65.33.35

<https://doi.org/10.48184/2304-568X-2024-2-70-77>

DEVELOPMENT OF GALETTE TECHNOLOGY USING PECTIN CONCENTRATE AND WHOLE-GROUND FLOUR FROM CEREALS

ZH.A. ZHARYLKASYNOVA* , G.K. ISKAKOVA ,
M.P. BAIYSBAYEVA , N.B. BATYRBAYEVA 

(Almaty Technological University, Kazakhstan, 050012, Almaty, Tole bi str., 100)
Corresponding author e-mail: Zh_zhuldiz@mail.ru*

The food industry, covering industries that produce goods for consumption by the population, is a central link in ensuring food security. In this regard, high-quality, medically balanced and safe nutrition is of utmost importance. In this regard, the use of pectin substances as natural detoxifiers and whole-ground flour in the production of galets will solve the problem of meeting the needs of the population in safe food products with high nutritional and biological value. The aim of the work was to develop galettes of increased nutritional value using pectin concentrate and whole-ground flour from cereals. The article examines the effect of beetroot pectin concentrate on the quality of galettes made from a mixture of wheat and whole-ground corn, buckwheat flour. The optimal dosage of whole-ground corn flour of 15%, buckwheat flour - 20.0% in the production of galets from wheat flour of the first grade, in which the quality of finished products is similar to control samples, is justified and determined. It was found that the nutritional and biological value of the developed galettes is higher than in the control samples, the products obtained meet the safety requirements of TR CU 021/2011.

Keywords: pectin concentrate, whole-ground corn flour, whole-ground buckwheat flour, galettes, quality, safety.

ПЕКТИН КОНЦЕНТРАТЫ МЕН ДӘНДІ ДАҚЫЛДАРДАН АЛЫНҒАН ТҰТАС ҰНТАҚТАЛҒАН ҰНДЫ ПАЙДАЛАНЫП ГАЛЕТАЛАР ТЕХНОЛОГИЯСЫН ӘЗІРЛЕУ

Ж.Ә. ЖАРЫЛҚАСЫНОВА*, Г.К. ИСКАКОВА,
М.П. БАЙЫСБАЕВА, Н.Б. БАТЫРБАЕВА

(Алматы технологиялық университеті, Қазақстан, 050012, Алматы, Төле би көш., 100)
Автор-корреспонденттің электрондық поштасы: Zh_zhuldiz@mail.ru*

Халық тұтынуы үшін тауар өндіретін салаларды қамтитын тамақ өнеркәсібі азық-түлік қауіпсіздігін қамтамасыз етудің орталық буыны болып табылады. Осыған байланысты медициналық нормаларды ескере отырып, сапалы, теңдестірілген және қауіпсіз тамақтану өте маңызды. Осыған байланысты пектинді заттарды табиғи детоксикация ретінде және тұтас ұнтақталған ұнды галеталар өндірісінде пайдалану, халықтың тағамдық және биологиялық құндылығы жоғары қауіпсіз тағамға деген қажеттіліктерін қанағаттандыру мәселесін шешуге мүмкіндік береді. Жұмыстың мақсаты пектин концентратын және дәнді дақылдардан алынған тұтас ұнтақталған ұнды қолдану арқылы тағамдық құндылығы жоғары галеталар өндіру болып табылды. Мақалада қант қызылшасынан

алынған пектин концентратының тұтас тартылған жүгері, қарақұмық және бидай ұндарының қоспасынан жасалынған галеталардың сапасына әсері зерттелді. Бірінші сұрыпты бидай ұнынан жасалынған галеталар өндірісінде тұтас ұнтақталған жүгері ұнының 15%, қарақұмық ұны - 20,0% оңтайлы мөлшерлемесі анықталды, бұл жағдайда дайын өнімнің сапасы сынамаға ұқсас болады. Өндірілген галеталардың жаңа түрінің тағамдық және биологиялық құндылығы сынамаға қарағанда жоғары екендігі дәлелденді, сонымен қатар алынған жаңа өнімнің қауіпсіздік көрсеткіштері ТР ТС 021/2011 талаптарына сай келді.

Негізгі сөздер: пектин концентраты, тұтас ұнтақталған жүгері ұны, тұтас ұнтақталған қарақұмық ұны, галеталар, сапа, қауіпсіздік.

РАЗРАБОТКА ТЕХНОЛОГИИ ГАЛЕТ С ИСПОЛЬЗОВАНИЕМ ПЕКТИНОВОГО КОНЦЕНТРАТА И ЦЕЛЬНОСМОЛОТОЙ МУКИ ИЗ ЗЕРНОВЫХ КУЛЬТУР

Ж.Ә. ЖАРЫЛҚАСЫНОВА*, Г.К. ИСКАКОВА,
М.П. БАЙЫСБАЕВА, Н.Б. БАТЫРБАЕВА

(Алматинский технологический университет, Казахстан, 050012, Алматы, ул. Толе би, 100)
Электронная почта автора корреспондента: Zh_zhuldiz@mail.ru*

Пищевая промышленность, охватывающая отрасли, производящие товары для потребления населением, является центральным звеном в обеспечении продовольственной безопасности. В этом плане чрезвычайное значение приобретает качественное, сбалансированное с учетом медицинских норм и безопасное питание. В связи с этим использование пектиновых веществ, как природных детоксикантов, и цельносмолотой муки в производстве галет позволит решить проблему удовлетворения потребностей населения в безопасных продуктах питания с высокой пищевой и биологической ценностью. Целью работы была разработка галет повышенной пищевой ценности с использованием пектинового концентрата и цельносмолотой муки из зерновых культур. В статье исследовано влияние свежечичкового пектинового концентрата на качество галет из смеси пшеничной и цельносмолотой кукурузной, гречневой муки. Обоснована и определена оптимальная дозировка цельносмолотой кукурузной муки 15%, гречневой муки - 20,0% при производстве галет из пшеничной муки первого сорта, при которых качество готовых изделий аналогично контрольным образцам. Установлено, что пищевая и биологическая ценность разработанных галет выше, чем контрольных образцов, а также полученные изделия соответствуют по показателям безопасности требованиям ТР ТС 021/2011.

Ключевые слова: пектиновый концентрат, цельносмолотая кукурузная мука, цельносмолотая гречневая мука, галеты, качество, безопасность.

Introduction

Confectionery products, including flour products, with their appearance, taste and smell, are sweets intended to bring joy to people both on holidays and in everyday life. No special day can be celebrated without a holiday cake or other confectionery. Since confectionery products are a part of people's daily diet and have a certain influence on human health, they must meet all standard requirements and be made from high-quality raw materials, including technological processes that enable the production of high-quality products. Products for children and dietetic purposes are particularly important [1, 2].

One type of cookie is galettes. Galettes are made from elastic dough made from wheat flour with the use of yeast and chemical leavening agents (without sugar and fat). Galettes are made in a square shape and are intended to be used instead of bread. There are three types of galettes: plain, fat-enriched, and diet with fat and sugar.

Plain galettes are made from first, second, and plain flour for long-term storage. They contain minimal amounts of sugar and no fat. Enhanced galettes contain 10% fat. Dietary galettes are divided into high-fat and low-fat depending on the amount of fat they contain. Galettes are a rare type of cookie that can retain its freshness and original quality. This confectionary wonder is intended to be eaten on many occasions, and this characteristic of the product explains its centuries-old popularity [3-6].

Taking into account the perspective for the coming years, one of the urgent problems of the modern development of Kazakhstan is ensuring food security. In this regard, taking into account medical standards, quality, balanced, and safe nutrition is very important.

Recent research results show that the use of substances found in natural foods is optimal: they do not cause adverse effects and have a protective effect. Such substances include pectin, which has a

beneficial effect not only in the case of acute exposure to metals, but also in case of their long-term penetration into the body, which is typical of the environmental burden of industrial areas and residents of modern metropolises. The effect of pectin's therapeutic effect is related to the features of its chemical structure. In the polymer chain of polygalacturonic acid, the presence of chemically active free carboxyl groups and alcohol hydroxyls contribute to the formation of strong insoluble complexes called chelates with polyvalent metals, which remove heavy metals and nuclides from the body. In the literature, there are data showing that under the influence of pectin, the antioxidant effect of the blood and liver tissues is increased [7-11].

Thus, the analysis of literary sources showed that pectin substances have the ability to bind and remove stable and radioactive metals from the human body. In addition, low-esterified pectin substances have the best complexing properties, one of them is pectin from sugar beet. At the same time, they can increase the effect of some medicines and reduce their toxic and negative effects on the human body. Beet pectin is slightly inferior to apple and citrus pectins in its gelling capacity, but it has much better complexing properties, which are very important for the production of products with therapeutic and preventive purposes.

In recent years, with the growth of the population's well-being and the development of the global information field, the need for proper and personalized nutrition has begun to emerge in society, which has not affected the flour market. Within the research community and among a segment of consumers, a prevailing notion has emerged suggesting that the utilization of highly refined and processed flour as a primary food ingredient has contributed to the depletion of formerly beneficial properties in food products. This stems from the fact that such flour predominantly comprises the endosperm of the grain, with a significant portion of the bran and germ discarded during the milling process. Yet, these discarded components harbor valuable fiber and essential micronutrients. Consequently, there has been a resurgence in interest towards products crafted from whole grain flour, driven by a desire to harness the nutritional benefits inherent in these unadulterated grain constituents.

During the production of whole flour, all parts of grain are used - endosperm, embryo, grain shell. These food groups contain a large amount of protein, complex carbohydrates, dietary fiber, B, A, E and PP vitamins. It is also rich in elements

such as potassium, sodium, molybdenum, phosphorus, iodine, iron and calcium. Cellulose, lignan, pectin, dietary fibers, etc. - a high amount is found in the main physiologically active compounds. The presence of all protein, fiber, vitamins, and minerals necessary for the human body allows the use of whole flour to solve the problem of providing the population with food products of high nutritional and biological value [12-16]. The world's leading scientists recommended the inclusion of cereals in the national food supply, as well as the promotion of their consumption with all efforts.

All the above information showed the importance of the research work and its direction. The use of sugar beet pectin concentrate and whole grain flour in the production of galettes paves the way for the production of safe food products with clear functional properties.

Materials and research methods

Research materials are beet pectin concentrate from the "Ardan" variety sugar beet, whole ground corn and buckwheat flour, and galettes.

The organoleptic indicators of galettes (color, surface condition, shape, crumb, taste, and smell) were determined according to GOST 5897-90. The physicochemical indicators — humidity, acidity, and water absorption — were also evaluated. The humidity was determined according to GOST 5900-2014, the acidity according to GOST 5898-87, and the water absorption according to GOST.

The quantity of ash present in the cookies was determined per the specifications set forth in GOST 5901-2014. The amount of fat was quantified under the guidelines outlined in GOST 31902-2012, while the protein content was assessed following the standards outlined in GOST 10846-91. The determination of the amount of calcium and magnesium is based on the mineralization of the sample at a temperature of 4500°C, followed by the dissolution of the ash and the titration of the ash solution with edetate disodium solution in the presence of chromic acid until a dark blue color is achieved. The quantity of iron was determined per the specifications outlined in GOST-26928-86. The vitamin C content was determined in accordance with GOST 24556-89, while the vitamin E content was determined in accordance with GOST 54634-2011. The β -carotene content was determined by GOST 54058-2010, while the vitamin K content was determined in accordance with GOST 14148-2015.

The quantity of toxic elements (cadmium, lead, and zinc) was determined in accordance with GOST 30178-96.

The GOST 10444.15-94 standard was employed to identify the mesophilic aerobic and facultative anaerobic microorganisms (QMAFAnM). Groups of Escherichia coli bacteria (coliform bacteria) were determined according to GOST 31747-2012.

The quantity of aflatoxin B1 was determined in accordance with the standards set forth in GOST 33780-2016. The amount of pesticides (α , β and γ - HCG, DDT and its metabolites, HCB, Hg - pesticides, 2,4 D) was determined by the gas-liquid chromatography method according to GOST 32689-2014.

Results and discussion

It was important to determine how the quality of the finished product changes for the production of galettes using pectin concentrate from "Ardan" sugar beet, wholemeal flour from cereals and first grade wheat flour. The study of the effect of 5.0, 10.0, and 15.0% pectin concentrate on the composition of galette made from first-grade wheat flour demonstrated that 10.0% pectin concentrate has a beneficial impact on the mass of first-grade wheat flour and the quality of the galette. In this regard, we studied the effect of pectin concentrate at the rate of 10.0% on the quality of galettes made from a mixture of first-grade wheat flour and whole-

milled corn and whole-milled buckwheat flours in the ratio of 95.0:5.0; 92.5:7.5; 90.0:10; 87.5:12.5; 85.0:15; 82.5:17.5; 80.0:20; 77.5:22.5 and 75.0:25. To study the effect of pectin concentrate on the quality of galettes made from mixtures of wheat and wholemeal flours, we prepared the dough using the yeast method. A galette made with first-class wheat flour without adding pectin concentrate and without using wholemeal flour was used as a sample. Table 1 shows the results of the effect of pectin concentrate on the quality of galettes prepared from a mixture of wheat and wholemeal corn flour.

The research results revealed that incorporating pectin concentrate obtained from "Ardan" sugar beet during the kneading of dough made from a mixture of wheat and whole ground corn flour improved the organoleptic and physicochemical qualities of the galettes, compared to samples without pectin concentrate. The best quality of galettes was achieved using 10% pectin concentrate and 15.0% whole wheat flour by mass of first-grade wheat flour.

Table 2 shows the results of the effect of pectin concentrate on the quality of galettes prepared from a mixture of wheat and whole buckwheat flour.

Table 1. Effect of sugar beet pectin concentrate on the quality of galettes made from a mixture of wheat and whole ground corn flours.

Ratio of corn and wheat flours, %	Color	Surface	Moisture content, %	Acidity, degree	Water absorption, %
Sample	Wheat color, yellow	Smooth with holes, no extraneous spots or cracks	10,0	2,0	205,0
No pectin concentrate added					
92,5:7,5	light yellow	smooth with holes, no cracks	10,0	2,0	210,0
90:10	light yellow	smooth with holes, no cracks	10,0	2,0	180,0
87,5:12,5	light brown	slightly rough	10,0	2,5	160,0
85:15	light brown	slightly rough	10,0	2,5	165,0
82,5:17,5	dark brown	rough	10,0	3,0	159,0
80:20	dark brown	rough	10,0	3,5	150,0
10% pectin concentrate added					
92,5:7,5	light yellow	smooth with holes, no cracks	10,0	2,0	210,0
90:10	light brown	smooth with holes, no cracks	10,0	2,0	200,0
87,5:12,5	light brown	smooth with holes, no cracks	10,0	2,5	188,0
85:15	light brown	smooth with holes, no cracks	10,0	2,5	180,0
82,5:17,5	dark brown	slightly rough	10,0	3,0	165,0
80:20	dark brown	rough	10,0	3,5	156,0

As can be seen in Table 2, the quality indicators of the galette showed the best results when

10.0% pectin concentrate and 20.0% whole buckwheat flour were added to first-class wheat flour.

Table 2. Effect of sugar beet pectin concentrate on the quality of galettes made from a mixture of wheat and whole buckwheat flours.

The ratio of buckwheat and wheat flours, %	Color	Surface	Moisture content, %	Acidity, degree	Water absorption, %
Sample	Wheat color, yellow	Smooth with holes, no extraneous spots or cracks	10,0	2,0	205,0
No pectin concentrate added					
92,5:7,5	bright	smooth with holes, no cracks	10,0	2,0	210,0
90:10	light brown	smooth with holes, no cracks	10,0	2,5	180,0
87,5:12,5	light brown	slightly rough	10,0	2,5	168,0
85:15	light brown	slightly rough	10,0	3,0	165,0
82,5:17,5	dark brown	rough	10,0	3,0	158,0
80:20	dark brown	rough	10,0	3,5	150,0
10% pectin concentrate added					
92,5:7,5	light brown	smooth with holes, no cracks	10,0	2,0	214,0
90:10	light brown	smooth with holes, no cracks	10,0	2,5	208,0
87,5:12,5	light brown	smooth with holes, no cracks	10,0	2,5	200,0
85:15	light brown	smooth with holes, no cracks	10,0	3,0	195,0
82,5:17,5	light brown	smooth with holes, no cracks	10,0	3,0	185,0
80:20	brown	smooth with holes, no cracks	10,0	3,0	175,0
80:22,5	dark brown	rough	10,0	3,5	160,0

The study of the nutritional and biological value of galettes determines the expediency and validity of using new types of raw materials in the

technology of galette production. The results of the study of the chemical composition of newly produced galettes are presented in Table 3.

Table 3. The chemical composition of galettes prepared from whole wheat flour and sugar beet pectin concentrate.

Nutrients	Amount in 100 g of product		
	1-grade wheat flour galette (sample)	Whole wheat flour galette using whole wheat flour (15%) and sugar beet pectin concentrate (10%)	Galettes made from 1st grade wheat flour using whole wheat buckwheat flour (20%) and sugar beet pectin concentrate (10%).
Protein, g	9,8	9,68	9,85
Fats, g	1,17	1,44	1,21
Carbohydrates, g	67,8	67,0	67,4
Ash, g	0,78	0,92	0,85
<i>Essential amino acids</i>			
isoleucine	493	482	488
valine	501	494	497
leucine	804	839	844
lysine	229	234	240
methionine	131	136	142
threonine	317	315	316
tryptophan	114	109	119
phenylalanine	580	572	575
<i>Minerals, mg</i>			
Ca	20,1	25,8	24,7
Mg	45,0	49,1	46,2
Fe	1,65	2,12	2,23
K	161,0	167,7	163,5
<i>Vitamins, mg</i>			
β-carotene	-	0,019	-
E	2,50	2,39	2,38
C	-	0,25	0,38
PP	1,02	1,26	1,41

The results of the research showed that the amount of vitamins and minerals in the galettes prepared with beet pectin concentrate and whole-ground corn flour increased compared to the sample. The amino acid composition of the galettes depends on the technology of preparation of the galettes, composition and consumption of ingredients, type and grade of flour used for the preparation of the galettes, chemical composition. According to the results presented in Table 3, it can be seen that the content of amino acids in t

he galettes prepared with whole-ground corn flour and sugar beet pectin concentrate is not inferior to the control sample.

Wholemeal corn, buckwheat flour and sugar beet pectin concentrate are new raw materials for the formulation of galettes, therefore the safety indicators of galettes prepared using wholemeal flour and sugar beet pectin concentrate were investigated. The results of the safety indicators study are presented in Table 4.

Table 4. Safety indicators of galettes made using wholemeal flour and sugar beet pectin concentrate

Safety indicator, unit of measurement	Results		
	1-grade wheat flour galette (sample)	Galettes from first-grade wheat flour using whole-grain corn flour and sugar beet pectin concentrate.	Galettes made from 1st grade wheat flour using whole wheat buckwheat flour and sugar beet pectin concentrate.
QMAFAnM, CFU/g, no more than	0,08×10 ¹	1×10 ¹	1×10 ¹
Escherichia coli group bacteria, in 1,0 g of product	not detected	not detected	not detected
Lead	0,100	0,093	0,108
Cadmium	0,020	0,015	0,02
Mercury	not detected	not detected	not detected
Arsenic	0,020	0,015	not detected
HCG (α-, β-, γ- isomers)	not detected	not detected	not detected
Heptachlor	not detected	not detected	not detected
DDT and its metabolites	not detected	not detected	not detected
Aflatoxin B1	not detected	not detected	not detected
Deoxynivalenol	not detected	not detected	not detected
Zearalenone	not detected	not detected	not detected
T-2 toxin	not detected	not detected	not detected

Analysis of the results of the galettes made from wholemeal flour and sugar beet pectin concentrate showed that they are safe and meet the requirements of Technical Regulation of the Customs Union 021/2011.

Conclusion

The research results revealed that the organoleptic and physical-chemical quality indicators of galettes with pectin concentrate obtained from "Ardan" sugar beet, when kneading dough from a mixture of wheat and whole ground corn flour, improved compared to samples without pectin concentrate. The best quality of the galettes was achieved by using 10% pectin concentrate and adding to the mass of first grade flour 15.0% of the mass of whole-grain corn flour and 20.0% of whole-grain buckwheat flour.

The study of the nutritional value and safety of galette determines the feasibility and validity of the use of new types of raw materials in the technology of galette production. It was found that the nutritional and biological value of the galette

produced according to the new recipe is significantly higher compared to the control sample, and the resulting product meets all the requirements of the Technical Regulations of the Customs Union "On the safety of food products" CO TR. 021/2011 in terms of safety indicators.

Thus, the use of pectin concentrate obtained from beet and whole-grain flour obtained from cereals in the production of galette opens wide prospects for the creation of new safe food products with distinct functional properties.

REFERENCES

1. Дайрашева С.Т., Батырбаева Н.Б. Қантты кондитер өнімдерінің технологиясы (учебник). - Алматы: «AdalKitap», 2023. -336 с.
2. Рензьева Т.В, Назимова Г.И., Марков А.С. Технология кондитерских изделий. - СПб: Лань, 2022. - 156 с.
3. Zhuldyz Zharylkasynova, Galiya Iskakova, Meruyet Baiysbayeva, Assel Izembayeva, Anton Slavov. The influence of beet pectin concentrate and whole-ground corn flour on the quality and safety of

hardtacks//Potravinarstvo Slovak Journal of Food Sciences. - 2022. - Vol. 16. - P. 603-621. <https://doi.org/10.5219/1780>

4. Искакова Г.К., Байысбаева М.П., Изембаева А.К. и др. Технологический регламент по производству галет «Сарбаздар» с длительным сроком хранения. - Алматы: АТУ, 2017. - 75 с.

5. Корячкина С. Я. Технология мучных кондитерских изделий: Учебник / С. Я. Корячкина, Т. В. Матвеева. - СПб.: Троицкий мост, 2011. - 400 с.: ил.

6. Созаева Д. Р. Разработка технологии производства галет, обогащенных пищевыми волокнами // Известия Кабардино-Балкарского государственного аграрного университета им. В. М. Кокова. - 2022. - № 4(38). - С. 122-129.

7. Kizatova M.Zh., Iskakova G.K., Azimova S.T., Nabieva J.S., Alibaeva B.N. Establishment of mode parameters of extraction of pumpkin pectin-containing extract by enzyme method. Eurasia J Biosci. - 2020. - 14. - P. 4261-4269.

8. Хрундин Д.В. Некоторые аспекты применения пектиновых веществ в технологии пищевых производств // Вестник технологического университета. - 2015. - Т.18, № 24. - С. 143-147.

9. Кондратенко В.В., Кондратенко Т.Ю. Особенности формирования сорбционных свойств пектиновых веществ из разных видов тыквы // Вестник Южно-Уральского государственного университета. Серия: Пищевая технология. - 2019. - №4. - С.5-12.

10. Phillips L. Pectin chemical properties, uses and health benefits. - New York: Nova Science Publishers, 2014. -284p.

11. Rahimzadeh M.R., Rahimzadeh M.R., Kazemi S., Moghadamnia A.A. Cadmium toxicity and treatment: An update// Caspian journal of internal medicine. - 2017. - №3, Vol.8. - P. 135-145. doi: 10.22088/cjim.8.3.135

12. Науменко Н.В., Потороко И.Ю., Велямов М.Т. Цельнозерновая мука из пророщенного зерна пшеницы как пищевой ингредиент в технологии продуктов питания // Вестник ЮУрГУ. Серия «Пищевые и биотехнологии». - 2019. - Т. 7, № 3. - С. 23-30.

13. Науменко Н.В., Потороко И.Ю., Калинина И.В., Малинин А.В., Цатуров А.В. Совершенствование технологии производства хлебобулочных изделий, полученных с использованием ингредиентов растительного происхождения // Вестник Воронежского государственного университета инженерных технологий. - 2019. - 2(80). - С. 108-113. IDR: 140246324 | DOI: 10.20914/2310-1202-2019-2-108-113

14. Магомедов Г.О., Зацепилина Н.П., Журавлев А.А., Чешинский В. Л. Разработка сбивного хлеба функционального назначения из муки цельнозернового зерна пшеницы, ржаных и пшеничных отрубей // Вестник ВГУИТ. - 2015. - №4. - С. 104-108.

15. Хагуаев Р.О., Попов В.И., Клепиков О.В., Магомедов Г.О. Гигиеническая оценка применения сбивных хлебобулочных изделий без дрожжей как

перспективного продукта профилактического питания // Hygiene & Sanitation. - 2018. - № 97(8). - С. 767-771. DOI: <http://dx.doi.org/10.18821/0016-9900-2018-97-8-767-771>

16. Патент RU 2569832. Способ производства сбивного бездрожжевого хлеба из муки цельнозернового зерна пшеницы. Заявл. 2014141186/13, 2014.10.13. Опубл. 2015-11-27.

REFERENCES

1. Dairasheva S.T., Batyrbaeva N.B. Kantty confectonier onimderininin technologiyasy (textbook) [Technology of sugar confectionery products]. - Almaty: "Adal Kitap", 2023. -336 p. (in Kazakh)

2. Renzyaeva T.V., Nazimova G.I., Markov A.S. Tekhnologiya konditerskih izdelij [Technology of confectionery products]. - SPb: Lan, 2022. - 156 p. (In Russian)

3. Zhuldyz Zharylkasynova, Galiya Iskakova, Meruyet Baiysbayeva, Assel Izembayeva, Anton Slavov. The influence of beet pectin concentrate and whole-ground corn flour on the quality and safety of hardtacks [Vliyanie koncentrata svekol'nogo pektina i kukuruznoj muki cel'nogo pomola na kachestvo i bezopasnost' suharej].-//Potravinarstvo Slovak Journal of Food Sciences. - 2022. - Vol. 16. - P. 603-621. <https://doi.org/10.5219/1780>

4. Iskakova G.K., Baiysbaeva M.P., Izembayeva A.K. and others. Tekhnologicheskij reglament proizvodstva galet "Sarbazdar" s dlitel'nyim srokom hraneniya [Technological regulations for the production of galettes "Sarbazdar" with a long shelf life].- Almaty: ATU, 2017. - 75 p. (In Russian)

5. Koryachkina S.Y. Tekhnologiya muchnyh konditerskih izdelij: Textbook [Technology of flour confectionery products].- S. Y. Koryachkina, T. V. Matveeva. - St. Petersburg: Troitsky Most, 2011. - 400 p.: il. (In Russian)

6. Sozaeva D. R. Razrabotka tekhnologii proizvodstva galet, obogashchennyh pishchevymi voloknami [Development of technology for the production of galettes enriched with dietary fiber].- Izvestia Kabardino-Balkarian State Agrarian University named after V. M. Kokov. - 2022. - № 4(38). - P. 122-129. (In Russian)

7. Kizatova M.Zh., Iskakova G.K., Azimova S.T., Nabieva J.S., Alibaeva B.N. Establishment of mode parameters of extraction of pumpkin pectin-containing extract by enzyme method [Ustanovlenie rezhimnyh parametrov ekstrakcii tykvennogo pektinsoderzhashchego ekstrakta fermentativnym metodom].- Eurasia J Biosci. - 2020. - 14. - P. 4261-4269.

8. Khrundin D.V. Nekotorye aspekty primeneniya pektinovyh veshchestv v tekhnologii proizvodstva pishchevyh produktov [Some aspects of the application of pectin substances in the technology of food production].- Vestnik of Technological University. - 2015. - Т.18, № 24. - P. 143-147. (In Russian)

9. Kondratenko V.V., Kondratenko T.Yu. Osobennosti formirovaniya sorbcionnyh svoystv

pektinovyh veshchestv iz raznyh vidov tykvy [Features of formation of sorption properties of pectin substances from different types of pumpkin].- Bulletin of South Ural State University. Series: Food technology. - 2019. - №4. - P.5-12. (In Russian)

10. Phillips L. Pectin chemical properties, uses and health benefits [Himicheskie svoystva, primeneniye i pol'za dlya zdorov'ya pektina]. - New York: Nova Science Publishers, 2014.-284 p. (In English)

11. Rahimzadeh M.R., Rahimzadeh M.R., Kazemi S., Moghadamnia A.A. Cadmium toxicity and treatment [Toksichnost' kadmiya i lecheniye].- An update// Caspian journal of internal medicine. - 2017. - №3, Vol.8. - P. 135–145. doi: 10.22088/cjim.8.3.135

12. Naumenko N.V., Potoroko I.Yu., Veliamov M.T. Muka cel'nomolotogo pomola iz proroshchennogo zerna pshenicy v kachestve pishchevogo ingredienta v pishchevoj tekhnologii [Whole-milled flour from sprouted wheat grain as a food ingredient in food technology].-Bulletin of SUSU. Series "Food and biotechnology".- 2019. - T. 7, № 3. - P. 23-30. (In Russian)

13. Naumenko N.V., Potoroko I.Yu., Kalinina I.V., Malinin A.V., Tsaturov A.V. Sovershenstvovanie tekhnologii proizvodstva hlebobulochnykh izdelij, poluchennykh s ispol'zovaniem ingredientov rastitel'nogo proiskhozhdeniya [Improvement of bakery products production technology obtained using

ingredients of plant origin].- Vestnik Voronezh State University of Engineering Technologies. - 2019. - 2(80). - P. 108-113. IDR: 140246324 | DOI: 10.20914/2310-1202-2019-2-108-113 (In Russian)

14. Magomedov G.O., Zatsepilina N.P., Zhuravlev A.A., Cheshinsky V. L. Razrabotka sbivnogo hleba funkcional'nogo naznacheniya iz muki grubogo pomola, rzhanyh i pshenichnyh otrubej [Development of functional purpose knocked-down bread from flour of whole-milled wheat grain, rye and wheat bran].-Vestnik VGUIT. - 2015. - №4. - P. 104-108. (In Russian)

15. Khatuaev R.O., Popov V.I., Klepikov O.V., Magomedov G.O. Gigienicheskaya ocenka ispol'zovaniya sдобnyh hlebobulochnykh izdelij bez drozhzhey v kachestve perspektivnogo produkta profilakticheskogo pitaniya [Hygienic evaluation of the use of bunched bakery products without yeast as a promising product of preventive nutrition].-Hygiene&Sanitation. - 2018. - № 97(8). - P. 767-771. DOI: <http://dx.doi.org/10.18821/0016-9900-2018-97-8-767-771> (In Russian)

16. Patent RU 2569832 Sposob proizvodstva osnovnogo bezdrozhzhevogo hleba iz muki grubogo pomola iz zerna pshenicy [Method of production of staple yeast-free bread from flour of whole-milled wheat grain].-Appl. 2014141186/13, 2014.10.13. Published 2015-11-27. (In Russian).

ӘОЖ:664.6/.7
ҒТАХА 65.33.03

<https://doi.org/10.48184/2304-568X-2024-2-77-83>

ӨСІМДІК СЫҒЫНДЫЛАРЫНЫҢ АСТЫҚТЫҢ МИКРОБИОЛОГИЯЛЫҚ КӨРСЕТКІШТЕРІНЕ ӘСЕРІ

И.Н. КУРМАНБАЕВА *, Ж.С. НАБИЕВА , Б.Ж. МУЛДАБЕКОВА ,
Ш.А. ТУРСУНБАЕВА , А.Е. КУРАЛБАЕВА 

(Алматы технологиялық университеті, Қазақстан, 050012, Алматы қ., Толе би к-сі. 100)

Автор-корресподенттің электронды поштасы: Indira_kurmanbaeva@mail.ru*

Мақалада қазіргі уақытта тамақ өнімдерінің жоғары сапасы мен қауіпсіздігін қамтамасыз ету ұтымды тамақтанудың, денсаулықты сақтаудың, ақыл-ой мен физикалық өнімділіктің және дененің қорғаныс жүйелерін қолдаудың маңызды шарты болып табылады. Қазіргі экологиялық жағдай халықтың тамақтану жағдайын анықтайтын факторлардың бірі болып табылады. Өсімдік шикізаты ретінде итмұрын, шырғанақ және бөріқарақат жапырақтары мен сабақтарының сығындылары қолданылды. Бұл өсімдік шикізатын пайдалану олардың жапырақтары мен сабақ сығындыларының құрамында антиоксидантты, микробқа қарсы және канцерогендік қасиеттері бар полифенолдар болуымен түсіндіріледі. Өсімдік шикізаттарынан алынған сығындыларының тиімді мөлшері анықталды. Алынған сығындылар қатты заттарының массасынан 0,05 % мөлшерде енгізілді. Ылғалдандыру оңтайлы ұзақтығы 6 және 12 сағатты құрайды, бірақ уақыт тиімділігіне байланысты – 6 сағат. Астық 23°C температурада ылғалдандырылды (бөлме температурасы). Өсімдік сығындыларының астықты сіңдіру және өндіруге дайындау кезінде астықтың микробиологиялық себілуіне әсері және сақтау кезінде нан-тоқаш өнімдерінің микробтық бұзылуының алдын алу зерттелді. Ал итмұрын жапырақтары мен теңіз шырғанақ сабағының сығындылары Penicillium тұқымдасының саңырауқұлақтарына қарсы айқын микробқа қарсы әсер көрсетті. Бұл нан ауруларын жояды және оның реологиялық қасиеттерін жақсартады.

Негізгі сөздер: бидай, нан, микробиологиялық көрсеткіштер, өсімдік шикізаты, сығынды