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IMPACT OF SEA BUCKTHORN EXTRACT ON BREAD INDICATORS

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In the article it can be seen that vegetable raw materials are rich in vitamins, amino acids, minerals, proteins, by carrying out a literary review of scientific research on the chemical composition of plant raw materials in general, including sea buckthorn. An extract is obtained from the leaves of the sea buckthorn berries demonstrating antimicrobial properties, also the influence on microbiological indicators and the improvement of the quality of bread products were studied. The optimal quantity was selected with the addition of extract of leaves of the sea buckthorn berries in the amount of 0.5%, 2% and 4%. The study found that the addition of 2 per cent of the leaves of the sea buckthorn berries extract not only improves the nutritional value of the baked goods, but also extends the shelf life of the final products.

Key words: Production of vegetable raw materials, sea buckthorn, bread, quality, microbiological safety.

ШЫРҒАНАҚ СЫҒЫНДЫСЫНЫҢ НАН КӨРСЕТКІШТЕРІНЕ ӘСЕРІ

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Мақалада өсімдік шикізатының химиялық құрамына, оның ішінде шырғанақ өсімдік шикізаты бойынша ғылыми зерттеулерге әдеби шолу жасай отырып, өсімдік шикізатының дәрумендерге, амин қышқылдарына, минералды заттарға, ақуыздарға бай екенін көруге болады. Микробқа қарсы қасиет көрсететін шырғанақ өсімдік шикізаты жапырағынан сығынды алынды, сонымен қатар нан өнімдерінің сапасын жақсарту және микробиологиялық көрсеткіштерге әсері зерттелді. Шырғанақ өсімдік шикізатының жапырағынан алынған сығындысын 0,5 %, 2% және 4% мөлшерінде қосу арқылы оңтайлы мөлшері таңдалды. Зерттеу барысында шырғанақ өсімдік шикізаты жапырағынан алынған сығындысын 2% мөлшерде қосу нан өнімдерінің тағамдық құндылығын жақсартып қана қоймайды, сонымен қатар дайын өнімдердің жарамдылық мерзімін ұзартады.

Негізгі сөздер: Өсімдік шикізаты, шырғанақ, нан, сапа, микробиологиялық қауіпсіздігі.

ВЛИЯНИЕ ЭКСТРАКТА ОБЛЕПИХИ НА ПОКАЗАТЕЛИ ХЛЕБА

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В статье, проведя литературный обзор научных исследований химического состава растительного сырья, в том числе по растительному сырью облепихи, можно увидеть, что растительное сырье богато витаминами, аминокислотами, минеральными веществами, белками. Получен экстракт из листьев облепихового растительного сырья, который проявляет антимикробные свойства, а также изучено влияние на микробиологические показатели и улучшение качества хлебобулочных изделий. Оптимальная дозировка была выбрана путем добавления экстракта из листьев растительного сырья облепихи в количестве 0,5 %, 2% и 4%. В ходе исследования установлено, что добавление экстракта из листьев растительного сырья облепихи в количестве 2% не только улучшает пищевую ценность хлебобулочных изделий, но и продлевает срок годности готовых изделий.

Ключевые слова: растительное сырье, облепиха, хлеб, качество, микробиологическая безопасность.

Introduction

Justification of the choice of the article, goal and objectives

Food producers are now paying more attention to food safety. The problem of bakery products is related to the high microbiological contamination of grains and low-quality flour [1]. Safety can be improved by adjusting the chemical composition of products using conventional raw materials and by introducing various bioactive food additives that would also produce products with functional properties [2]. Consequently, the search for new natural ingredients capable of preventing microbiological spoilage of whole grain bread in order to improve and maintain its quality is highly relevant [3].

In recent years, there has been a global trend towards the use of natural substances present in foodstuffs as a source of antioxidants and functional ingredients. Natural antioxidants present in food products and other biological materials have attracted considerable interest due to their safety and potential nutrient and therapeutic effects.

Dietary antioxidants include biologically active plant phenols, ascorbates, tocopherols and carotenoids. Natural antioxidants are mainly found in plants, so plant products are the main source of these compounds for humans. Vegetable extracts are known as promising ingredients and vegetable raw materials are a major source of biologically active substances that have even minimal bactericidal effects. This factor is related to the presence in plant material of components such as phenols,

vitamins, flavonoids, carotenoids, phytoncides and tanning agents.

The content of vitamins in bread depends, first of all, on their content in flour. Wheat and rye grains, and the flour that obtained from them, are virtually devoid of vitamins A, C and D. Yeast and soup are an essential source of vitamins in bread. Baked yeast contains a significant amount of vitamins B1, B2 and nicotinic acid compared to grain and flour. The vitamin content of the raw material is an important factor in the final content of a given vitamin in the bread. Vitamin enhancement is a pressing issue. The vitamin value of bread can be increased by fortifying flour with vitamins [4].

Local wild-growing resources, such as sea buckthorn [5], are best used as vegetable raw materials. The aim of this work was to study the possibility of using the sea buckthorn extract in bread-making technology in order to control the quality and improve its microbiological safety.

Sea buckthorn is a thorny plant that is considered a shrub or small tree. The leaf and the flower open at the same time. There is only one species in Kazakhstan. It grows at the foot of the mountains, in the tugai valley, on the banks of rivers and waters, on rocky, stony mountain slopes. The leaf is silvery. It blooms from April to May. At the end of flowering, it bears fruit. The fruits ripen in October. The bitter taste present in the fruits in autumn disappears after the first black cold. The fruits contain 8% sea buckthorn oil and are rich in carotene. The fruits should be stored in wooden barrels, in places sheltered from the sun,

so as not to lose the properties of the vitamins they contain. Beverages, decoctions, preserves are made from sea buckthorn fruits. Sea buckthorn oil fixes wounds and burns on the skin. It improves the functioning of human internal organs and helps to maintain the basic properties of the liver. It is used to treat many malignant tumors, even after surgery. The bush of the plant is dense and hardy. Therefore, it can be sown on a path of moving sands and sown on rocky mountain slopes as a barrier against avalanches in the mountains. In horticulture, it can be sown alone or in groups and grown as a green fence [6].

Looking through the numerous scientific data, one can see that the composition of sea buckthorn berries is rich in proteins, vitamins, macro and microelements. The composition of 100 grams of nutrients (calories, protein, fats, carbohydrates, vitamins and minerals) in sea buckthorn is given below (Table - 1) [7].

The data show that vegetable raw materials are rich in vitamins, amino acids, minerals, proteins.

Materials and Research Methods

It is known that many years of scientific research were carried out on the fruits of vegetable

raw materials. Stems with a leaf of vegetable materials contain chemical compounds that have antimicrobial action. Therefore, the activity of the extracts in relation to groups of microorganisms is very high. The use of herbal extracts is an urgent problem for medicine and the food industry. Therefore, a method for obtaining an extract from vegetable raw materials is being considered.

To obtain an extract from vegetable raw materials, water, ethyl alcohol of various concentrations and other extractants are used, sometimes with the addition of acids, alkalis, glycerin, chloroforms, etc.

In this study, the leaves and stems of sea buckthorn were collected by the end of 2019 in the mountainous regions of the Almaty region. Leaves and stems are thoroughly washed in distilled water and dried at room temperature under sterile conditions. The dried leaves and stems were crushed and extracted with 50% ethanol for 20 hours at room temperature ($25 \pm 2^\circ\text{C}$). The supernatants are dried under vacuum using a rotary evaporator at 50°C and the dry extract remaining at the bottom is removed (Figure 1).

Table 1- Chemical composition of sea buckthorn fruits

Compound in composition	Content
1	2
Protein	14.26 g
Butter	0.39 g
Carbohydrates	77.06 g
Ash content	13
Minerals:	
Calcium, Ca	190 mg
Iron, Fe	6.8 mg
Sodium, Na	298 mg
Vitamins:	
Vitamin C 48.4 mg	
Vitamin A, IU 26822 IU	
Amino acids:	
Threonine	0.358 g
Isoleucine	0.261 g
Leucine	0.456 g
Lysine	0.233 g
Methionine	0.087 g
Cystine	0.144 g
Phenylalanine	0.271 g
Tyrosine	0.222 g
Valine	0.316 g
Arginine	0.722 g
Histidine	0.157 g
Alanin	0.698 g



Figure 1 - Filtration process of extracted vegetable extracts

The vitamins contained in the raw materials under study were determined by capillary electrophoresis. A bread product with sea buckthorn leaf extract was taken as a sample. The vitamins contained in the bakery product were determined by capillary electrophoresis in a Kapel 105k apparatus.

The method of capillary electrophoresis is based on the separation of complex mixtures of components in a quartz capillary when exposed to an electric voltage. The electric field arising in the capillary causes a displacement of the sample location and its splitting. The separation of the sample occurs due to a change in the speed of movement of the charging particles under the action of an electric field.

In the study of the microflora of bread, with the addition of sea buckthorn leaf extract, the following classical methods of microbiological analysis were used:

- methods of sampling and preparation for microbiological analysis [8, 9];
- methods of cultivation of micro-

organisms [10, 11].

Results and their discussion

Among the currently produced medical, preventive and functional products, the leading place is occupied by bakery products - 76.8%, dairy products - 10.2%, followed by beverages - 5.9%, other food products - 7.14% [12].

In this regard, it has been used an extract from sea buckthorn leaves in order to increase the vitamin composition of bakery products and control the effect of bakery products on microbiological indicators.

Extract from sea buckthorn leaves is the richest natural source of natural antioxidants, as well as vitamins B₁, B₂, PP and C. In this study, according to the technological instructions, whole grain bread was baked, in the formulation of which the water required for kneading the dough was partially replaced with extract from sea buckthorn leaves. The effect of sea buckthorn leaf extract on the vitamin composition of products is presented in Table. 2.

Table 2 - Vitamin composition of bakery products

Name	Vitamin content of bread, mg 100 g			
	B ₁	B ₂	PP	C
Control sample	0,14	0,09	4,15	2,74
Bread with the addition of sea buckthorn leaf extract	0,16	0,12	4,42	6,70

Data from Table 2 shows that the introduction of sea buckthorn leaf extract into the bread recipe increases the content of vitamin C by 3.93 mg per 100 g, as well as vitamins B - by 0.02 mg per 100 g, vitamin PP - by 0.26 mg in 100 g.

The use of plant materials with antimicrobial properties reduces microbial contamination of grain in preparation for the production of grain bread and prevents microbial spoilage of bakery products during storage.

There is a constant need to protect stored food from spoilage, loss of food quality during storage, mainly from the effects of fungi and insects. Most of the crops stored in warehouses for replenishment are an important part of the food supply and the entire world.

During the study, sea buckthorn leaf extract was selected. The finished product was made with the addition of sea buckthorn leaf extract in the amount of 0.5%, 2%, 4%.

For making 100 g of dough, 35 ml of water, 59,5 g of flour, 1,5 g of table salt, 2 g of pressed yeast, extract of sea buckthorn leaves in an amount of 2% by weight of water was mixed and left to activate at a temperature of 30°C for 15 minutes.

The prototypes were stored at a temperature of 18-20°C and a relative air humidity of 40-50% for 3 days (Table - 3).

Table 3 - Results of study reflecting the microbiological indicators of final products

Bread samples	The number of mesophilic aerobic and facultative anaerobic microorganisms. Colony-forming units /g, not more		
	24 h	48 h	72 h
Control samples	Not found	3*10 ³	4*10 ³
Bread with 0.5% extract of sea buckthorn leaves	Not found	2*10 ³	3*10 ³
Bread with 2% extract of sea buckthorn leaves	Not found		
Bread with 4% extract of sea buckthorn leaves	Not found		

As a result, it was revealed (Table 3) that in a bread sample with the addition of an extract from 0,5% of sea buckthorn leaves, the number of mesophilic aerobic and facultative anaerobic microorganisms was less than in control samples, where the number of mesophilic aerobic and facultative anaerobic microorganisms increased during storage after 48 and 72 hours. And in samples of bread with the addition of extract from sea buckthorn leaves with 2% and 4% the number of mesophilic aerobic and facultative anaerobic microorganisms were not found.

The results obtained indicate that the inclusion of sea buckthorn leaf extract in bread not only increases the nutritional value of finished products, but also prolongs the shelf life of final products.

Conclusions

By the quality of food products, including bread, it is commonly referred to call the set of characteristics that determine its consumer properties and ensure the safety of the product for humans. Safety, in turn, relates to the absence of toxic, carcinogenic, mutagenic or any adverse effects on the human body during use the product in conventional does.

It can be noted that vegetable raw materials are of significant interest for the medical and food industries. It exhibits antimicrobial activity because of containing the main active ingredients such as flavonoids, tannins, anthocyanins, phenolic compounds, organic acids and inorgan-

ic compounds. In this regard, it is relevant to use extracts of vegetable raw materials, to conduct research on the quality of bread.

Thus, these data confirm the positive effect of sea buckthorn leaf extract on the content of vitamins in bread. Thus, the use of sea buckthorn leaf extract is optimal to obtain high-quality bread with increased volumetric yield and high taste. At the same time, the overall bakery score is improved in accordance with the volumetric yield of bread.

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ҰНДЫ КОНДИТЕР ӨНДІРІСІНДЕ КОМПОЗИТТІК ҚОСПАНЫ ҚОЛДАНУ

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Қазіргі уақытта азық-түліктің биологиялық құндылығын арттыру тенденцияларының үйлесімі өндірушілерді кондитер өндірісі үшін өсімдік шикізатының жаңа дәстүрлі емес көздерін іздеуге мәжбүр етеді. Кондитерлік өнімдерді өндірудің тиімді бағыттарының бірі – печенье өндірісінде композиттік қоспаларды қолдану болып табылады. Мақалада композиттік қоспаның дайын өнімнің органолептикалық және физика-химиялық көрсеткіштеріне тигізетін әсері, алынған созылмалы печеньеңің тағамдық құндылығы зерттелген. Зерттеу нәтижелері бойынша композиттік қоспамен жасалған қосылған созылмалы печеньеде бақылау өнімімен салыстырғанда майдың мөлшері – 1,11 есеге, ақуыз – 1,31 есеге, кальций – 1,29 есеге, калий – 1,21 есеге, темір – 1,84 есеге, фосфор – 1,42 есеге дейін өсетіндігі анықталды. Нәтижесінде композитті ұнды қосу арқылы дайындалған созылмалы печеньеңің тағамдық құндылығы және құрамында адам ағзасында маңызды рөл атқаратын микро- және макроэлементтердің мөлшері жоғары болатындығы дәлелденді.

Негізгі сөздер: бидай ұны, ноқат, жасымық, қант қызылшасының ұнтағы, композиттік қоспалар.

ПРИМЕНЕНИЕ КОМПОЗИТНОЙ СМЕСИ В ПРОИЗВОДСТВЕ МУЧНЫХ КОНДИТЕРСКИХ ИЗДЕЛИЙ

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В настоящее время сочетание тенденций повышения биологической ценности пищевых продуктов заставляет производителей искать новые нетрадиционные источники растительного сырья для производства кондитерских изделий. Одним из наиболее эффективных направлений конди-