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ORGANIC BREAD WITH TEF FLOUR
ОРГАНІЧНИЙ ХЛІБ ІЗ БОРОШНОМ ТЕФУ

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The possibility of using the organic teff flour the production of organic bread from the first grade wheat flour is investigated in the article. The influence of the teff flour on the technological process, dough and bread quality has been studied. It was found that the introduction of the teff flour to replace wheat flour, in the amount of 10 and 20% reduces the duration of aging of the dough due to the lack of gluten in its composition.

It is determined that the introduction of 10% of flour from teff, to replace wheat flour of the first grade, provides the appropriate quality of bread and contributes to its enrichment with physiological and functional ingredients.

Keywords: *bread, tefu flour, gluten, gas formation*

Introduction. The development of organic production is quite relevant today due to a number of obvious environmental, economic and social benefits inherent in this area of activity.

Organic products are more beneficial to consumers by minimizing the health effects of toxic and persistent chemicals. The average conventional vegetable and fruit contains more than 20 pesticides, meat and milk, in turn, contain antibiotics, hormones, growth stimulants.

One of the important aspects to pay attention to is caring for the environment. After all, the production of organic products does not contaminate the soil, does not get into it pesticides, growth hormones and other extremely harmful substances, it is completely safe for nature production.

The advantages of organic products: excellent taste, no harmful additives, high standards for organic products have a positive impact on your body, guard your health; organic products are safe for humans and the environment, they are not contaminated by nitrates, heavy metals, residual pesticides, herbicides and other substances of chemical synthesis; organic products contain no pathogens, parasites and allergic components; organic products do not contain genetically modified organisms and substances made on their basis; organic food store nutritional properties, quality, safety and natural composition during processing, since only natural methods of processing and traditional recipes, natural substances and

materials for packaging, prohibited the use of synthetic flavors, preservatives, additives, etc.; use organic products indirectly promotes the preservation of the environment, namely a positive impact on the reproduction of natural soil fertility, promote the growth of natural biodiversity, improves animal health, since they used such methods of detention that are consistent with their natural needs and not cause suffering to animals.

According to research by scientists from different countries, 50% more organic products contain more minerals, vitamins and other nutrients than similar products from industrial farms. Therefore, the world market for organic products is developing rapidly.

Numerous studies have shown that organically derived ingredients contain more nutrients and antioxidants that have anti-cancer properties than their conventionally derived counterparts.

Tef is another name for Abyssinian, Abyssinian grass. Its grains are too small and therefore easily carried by the wind and lost. Tefa grain is covered with a protective film.

The taste of the grains resembles the taste of nuts, a little sweet, so its grains go well with walnuts and hazelnuts.

Cereal tef is an agricultural crop that is widely consumed. For example, Africans make high-quality wholemeal bread from teff. Ethiopian pastries are baked from ground grain. In addition, in Ethiopia, such flour is used to bake both bread and confectionery [1].

Tefu grains contain from: 6.0% to 9.0% of proteins; 70.0% to 74.0% of carbohydrates; 2.2% to 3.5% fat; 2.4% of ash substances [2].

The caloric content of tefa seeds is quite high - 335.2 kcal, which allows you to quickly saturate the body and get rid of hunger, but at the same time this product helps to lose weight.

The plant contains B vitamins, vitamins A, E, D, PP, choline, and especially vitamin C, which is there in large quantities, so tefa has a strengthening and immunostimulating effect. This composition explains the fact that the grains of the plant have long occupied a niche in the food industry, flour and cereals from teff - an indispensable ingredient in cooking.

Teff is also rich in useful macro-and micronutrients: calcium, potassium, magnesium, copper, zinc, manganese, phosphorus, sodium, selenium, iron. It is worth noting that tefa grains are rich in iron. They have 2.5 to 4.8 times more of this mineral than, for example, wheat grains.

Tefa seeds do not contain gluten (fiber), like other cereals, so tefa dishes can be used to feed people with gluten disease (celiac disease).

Materials and methods. The object of research of this scientific work were organic raw materials (wheat flour and tefu flour) and finished products. Methods of research of raw materials: determination of organoleptic parameters, flour size, mass fraction of moisture (accelerated method), flour acidity, quality and quantity of gluten, spreading of dough balls. Research methods of finished products: trial baking and evaluation of bread quality by organoleptic and physicochemical parameters [3].

To establish a rational amount of substitution of premium wheat flour for tefu flour, formulations of prototypes using 10 and 20% of tefu flour were proposed.

The dough was prepared by steamless method. Kneading the dough and forming the products was done manually. The aging was carried out in a stand cabinet at a temperature of 35 ± 1ºC and a relative humidity of 80-85% until ready. Bread was baked in the oven F3-HPK at a temperature of 220-230 ºC. Gas formation in semi-finished products was evaluated by the amount of CO_2, volumetric method [3].

Results. The aim of the research was to determine: quality indicators of raw materials, namely tef flour, rational dosing of tef flour in the production of organic bread from wheat flour and to establish the impact of tef flour on bread quality. Analysis of the quality of tefu flour showed that: the color of the flour is gray with a greenish tinge; smell - raw flour; the taste corresponds to flour; mineral impurities are absent; mass fraction of moisture - 9.3%; size - 90.7%; acidity - 10 degrees; water absorption capacity 428.0%.

The effect of teff flour on the quantity and quality of gluten washed from the dough, with dosages of 10 and 20%, was determined. From the obtained data it can be concluded that the replacement of wheat flour with flour from teff, in the amount of 10 and 20%, reduces the amount of crude gluten during washing, by 0.66 - 1.56%. The lower content of gluten in the samples with the additive compared to the control can be explained by the fact that the flour from teff does not contain gluten proteins, as well as the sufficient content of grain shells, which with wheat dough proteins form complexes lost during washing.

The stability of the dough increases with the addition of 10% flour from teff by 4%, with 20% deteriorates by 17%. The spreading of the dough increases. The acidity of the dough increases with the addition of tefu flour 10 - 20% by 0.8 -1.8 degrees, respectively.

Analysis of the dynamics of gas formation showed that the introduction of tef flour in the amount of 10 and 20% increases the activity of gas formation and prolongs the fermentation time of the dough to 90 minutes, while in the control sample the optimal fermentation time is 60 minutes.

Analysis of finished products showed that with increasing dosage of tefu flour, the color of the crust becomes more intense, the porosity of the crumb is well developed, thick-walled, the color of the crumb acquires a grayish color, the intensity of which increases with increasing dosage of tefu flour, taste and smell supplements.

The results of the study showed that the elasticity of the crumb, compared to the control sample, did not change in almost all samples. A study of the specific volume of bread showed that in finished products with the addition of teff flour 10 and 20%, this figure, compared to the control sample, decreases by 9 and 22%, respectively, and correlates with the data on the spread of the dough. Therefore, increasing the dosage of tefu flour has a negative effect on this indicator and requires adjustment of the technological process.

According to the results of research, a rational dosage of tefu flour in the amount of 10% to replace wheat flour was determined, because at this dosage the finished products have organoleptic and physicochemical parameters closest to the control sample and increased nutritional value.

Analysis of literature sources showed that the enrichment of bakery products with vitamins, micro- and macronutrients, or the introduction of gluten-free flour remains a promising area of expanding the range of organic bread products for therapeutic or prophylactic or even general purposes.

Conclusions. The results of the research made it possible to substantiate the use of tefu flour in the technology of organic bread to improve the quality of finished products and increase their nutritional and biological value.

Bibliography:

1. Волде Е.Б. Экономические проблемы производства зерна в эфиопии. / Волде Еханнес Бесерат; . - Москва, 1998. - 26 с.

2. Полевичка / Большая советская энциклопедия: [в 30 т.] / гл. ред. А. М. Прохоров. - 3-е изд. - М.: Советская энциклопедия, 1969—1978.

3. Дробот, В.І. Лабораторний практикум з технології хлібопекарського виробництва / В.І. Дробот, Л.Ю. Арсеньєва, О.А. Білик та ін. - К.: Центр навч. літератури. 2006. - 341 с.

4. Про виробництво та обіг органічної сільськогосподарської продукції та сировини: Закон України від 03.09.2013 No 425-VII [Електронний ресурс]. Режим доступу: http://zakon4.rada.gov.ua/laws/show/425-18.

5. Фещенко Н.М. Проблемні моменти ринку органічної сільськогосподарської продукції. Інноваційна економіка.2013. №7. С. 141-150.

Анотація. *В статті досліджено можливість використання органічного борошна з тефу для виробництва органічного хліба із пшеничного борошна першого сорту. Вивчено вплив борошна з тефу на технологічний процес, якість тіста та хліба. Встановлено, що внесення борошна з тефу на заміну пшеничному борошну, у кількості 10 та 20 % скорочує тривалість вистоювання тістових заготовок через відсутність глютену у своєму складі.*

Визначено, що внесення 10 % борошна з тефу, на заміну пшеничного борошна першого сорту, забезпечує відповідну якість хліба і сприяє його збагаченню фізіологічно-функціональними інгредієнтами.

Key words: *хліб, борошно тефу, клейковина, газоутворення.*

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