FORMULATION OR RECIPES OF FUNCTIONAL FOOD PRODUCTS BASED ON FISH RAW MATERIALS, CHARACTERISTICS OF THEIR CONSUMER PROPERTIES

Ditrikh I. V., Saltan B. A.

INTRODUCTION

The level of development of modern food production technologies allows to organize manufacturing process of products with specified properties in a short time. These properties are provided to food products, depending on the technical and economic tasks facing the manufacturer. The driven forces of the innovation process, including in the area of production of innovative food products, is demand.

The ever-expanding technological opportunities have led to the appearance on the market of food products with a variety of properties, characteristics, functional orientation, differentiated in quality and consumer properties. Among the essentially new products – functional foods, which have adaptogenic functional properties, the ability to adjust the functional parameters of the human body.

The modern approach to the development of functional food products recipes is based on the choice of certain types of raw materials and additional components in ratios that ensure the achievement of the predicted goal-oriented effect of the finished product on the human body[1].

The achievements of biotechnology and nutrition are indicative of the possibility of creating functional food products on the basis of integrated and rational processing of fish raw materials. One of the important components of functional foods based on fish raw materials is vegetable raw materials. Therefore, to increase the nutritional, biological value of fish raw materials, increase the functional and technological properties there is usage of various vegetable fillers, fruit juices, legumes, grains, cereal products, flour of various species.

[1] Івашків Л.Я. Нові класи інгредієнтів продуктів харчування та їхні функціональні властивості. *Проблеми харчування.* 2010. № 3-4. С. 61–66.

1. Fish preserves of functional purpose

Fish refers to raw materials with high content of complete proteins, polyunsaturated fatty acids, minerals, and vitamins. However, in its natural form, it can not be called a balanced food, which fully satisfies the human need for plastic substances and energy. In this regard, the creation of functional fish-based products with the addition of ingredients compatible with fish raw materials for organoleptic and technological properties, primarily plant origin, allows you to obtain a balanced composition of a high-nutritional food product.

Recently, a wide range of fish preserves in Ukraine has been produced in a variety of fillings and sauces, which are characterized by high nutritional value and good taste characteristics. However, traditional methods of producing fish preserves do not take into account all the possibilities of using juices of various fruits to enhance biological value and improve the organoleptic properties of finished products[2].

The modification of the recipes of fish preserves in fruit and berry sauce, due to the introduction of orange and cherry juice into it, allows you to obtain products with original organoleptic characteristics and high biological value. The expediency of using natural orange and cherry juice as a raw material for fruit and berry fats in the production of fish preserves is due not only to their organoleptic properties, but also the ability to enrich new products with biologically active substances, in particular, vitamins, macro and microelements.

For the production of fish preserves in orange juice "Neptune" and preserves in cherry sauce "Neptune Cherry" as a fish raw material use frozen herring Pacific[3]. Raw materials and auxiliary materials must meet the requirements of the current normative and technical documentation. The organoleptic evaluation of the quality of new types of preserves was carried out by the method of description (qualitative) and the method of profile analysis (quantitative). Organoleptic parameters were studied based on the developed 5-point scale. The mass fraction of protein, fat, cooking salt,

[2] Івашків Л.Я. Нові класи інгредієнтів продуктів харчування та їхні функціональні властивості. *Проблеми харчування.*2010. № 3-4. С. 61–66.

[3] Скурихин И.М., Тутельян В.А. Химический состав пищевых продуктов: справочник. Москва: ДеЛи принт, 2002. 236 с.

sodium benzoate, and dry substances were determined according to standard methods.

The chemical composition of the Pacific herring per 100 g of product is shown in Table 1[4].

Table 1

The chemical composition of the Pacific herring (per 100 g of product)

Product	proteins	fats	carbohydrates	NLC	Mineral substances			Vitamins			Energy value
					K	P	Na	B_1	B_2	A	
	г				mg/%						kJ
Pacific herring	17,4	17,1	0	3,7	115	230	5380	0,03	0,18	30	811,2

The recipe of fish preserves in orange juice "Neptune" contains following ingredients – sugar, sodium benzoate, freshly prepared orange juice. The choice of vegetable raw material is made because of the juice which is used as one of the ingredients of fruit and berry sauce of fish preserves, is due to the fact that,firstly, oranges are brightly colored fruits, this will allow to give the product an attractive appearance and color diversity, and secondly, the juice of orange is a source of many biologically active substances, in particular beta-carotene (50 μg / 100 g) and vitamin C (60 mg / 100 g), and minerals that allow the development of a product enriched with a vitamin-mineral complex[5] [6].

[4] Скурихин И.М., Тутельян В.А. Химический состав пищевых продуктов: справочник. Москва: ДеЛи принт, 2002. 236 с.

[5] Скурихин И.М., Тутельян В.А. Химический состав пищевых продуктов: справочник. Москва: ДеЛи принт, 2002. 236 с.

[6] Дітріх І. В., Марченко Ю. І. Апельсиновий сік як харчова добавка у виробництві рибних пресервів. *Харчові добавки. Харчування здорової та хворої людини*: матеріали VI міжнар. міжгалуз. наук.-практ. конф. (м. Донецьк, 21-22.03. 2013 р.). Донецьк, 2013. С. 113–114.

Fish preserves in orange juice “Neptune” are prepared according to the technological instruction[7]. Fish raw material – peeled fillet-pieces of the Pacific herring, prepared according to the requirements of the technological instruction and poured with orange sauce. To prepare the sauce, use freshly made juice without pulp, which is heated to a temperature of 40-50 ° C, then add sugar and sodium benzoate, all components are thoroughly mixed and cooled.

To determine the harmony of the taste of the finished product in souce recipe, orange juice with a concentration of dry matter in the amount from 12,0% to 24,5% was added. The introduction of orange juice with a minimum concentration of dry matter (12,0%) led to the non-harmonic and unexpressed taste of the finished product. If the dry matter content of juice is increased to 24,5%, then the orange sauce gives sweet preserves with orange flavor without a taste of fish. The highest harmony of taste is determined in specimens containing 18,5% of dry matter in juice[8].

Based on the data obtained, a profilogram of organoleptic properties of samples was constructed, which shows that the best quality indicators have a sample of fish preserves in an orange sauce containing 18,5% of dry substances of orange juice[9] (Fig. 1).

[7] Сборник технологических инструкций по производству рыбных консервов и пресервов. Ленинград, 1989. Ч. III. С. 48.

[8] Рибні пресерви в апельсиновому соусі “Нептун”: пат. 76930 Україна: МПК A23L 1/325. / І.В. Дітріх, Ю.І. Марченко. № u 2012 07203; заявл. 13.06.2012; опубл.25.01.2013, Бюл. № 2.

[9] Дітріх І.В., Марченко Ю.І. Дослідження споживних властивостей нових рибних пресервів в апельсиновому соусі “Нептун”. *Вісник Чернігівського державного технологічного університету. Серія Технічні науки*". 2014. № 1(71). С. 224–228.

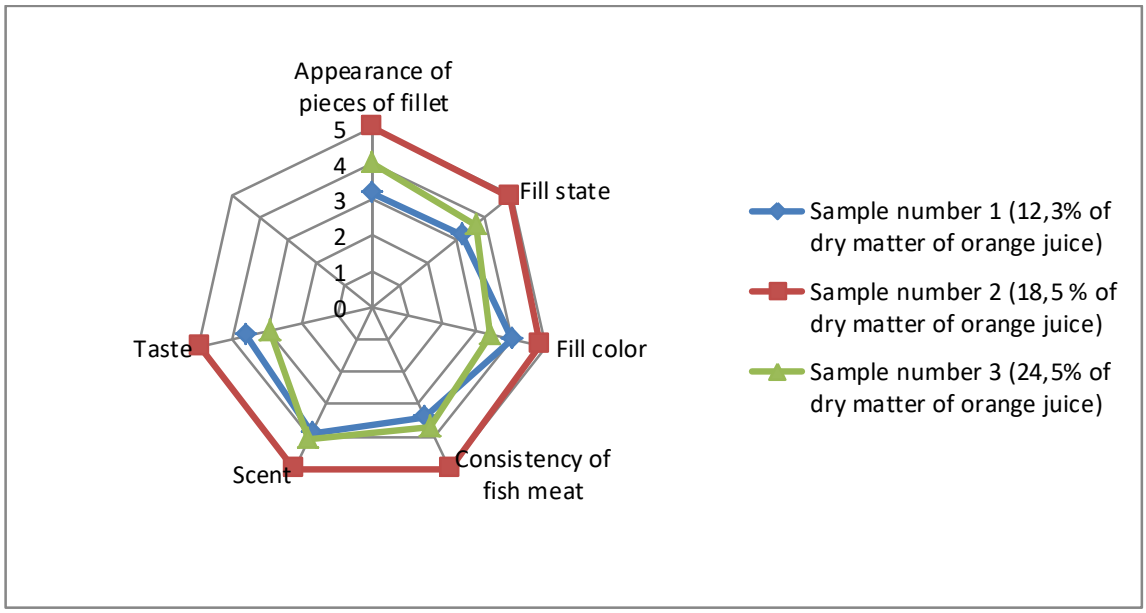

Fig. 1. Profilogram of organoleptic properties of fish preserves in orange juice "Neptune" with different content of dry substances in orange juice

Thus, the new type of fish preserves "Neptune" has the following prescription composition,%: herring (fillet slices) – 80, orange juice – 10,26, sugar – 9.6, sodium benzoate – 0.14.

The quality of new fish preserves was evaluated in accordance with the requirements of GOST 7453-86 "Preserves from fish. Technical specifications"[10] (Table 2).

[10] ГОСТ 7453-86. Межгосударственный стандарт. Пресервы из разделанной рыбы. Технические условия. [Дата введения 1988-01-01]. Москва: Стандартинформ, 2008. С. 16.

Table 2

Quality evaluation of fish preserves in orange juice "Neptune"

Characteristic	Requirements GOST 7453-86	Sample of fish preserves "Neptune"
Condition of the skin	Whole. It is allowed slight damage to the skin in fillet bits	Fillet bits are whole with even cuts. No mechanical damage
Filling status	Proper to this species	Homogeneous throughout the mass, without flakes
Consistency of fish meat	Tender, juicy	Tender, juicy
Scent	Pleasant, peculiar ripe fish with scent flavor	Pleasant, peculiar ripe fish, slightly orange
Taste	Pleasant, peculiar ripe fish, pouring	The taste of fish is a pleasant, harmonious, characteristic herring, with orange flavor. Taste of sauce – nice orange-sweet, pronounced, without taste
Fill color	Not normalized	Slight yellow-orange
Mass fraction of kitchen salt in fish meat,%	5,0 – 8,0	5,5
Mass fraction of fat in fish meat,%, not less	12,0	15,0
Mass fraction of sodium benzoic acid,%, not more	0,15	0,14

The results of the studies presented in Table 2 show that the characteristic feature of the fish preserves "Neptune" is the light taste and aroma of orange juice, which are well in harmony with the taste and smell of herring. The slightly yellow-orange color of the sauce gives the product an attractive appearance. Thus, the use of orange juice in the production of fish preserves contributes to a significant improvement in their organoleptic properties and the expansion of the range of this type of product [11] [12].

[11] Рибні пресерви в апельсиновому соусі "Нептун": пат. 76930 Україна: МПК A23L 1/325 / І.В. Дітріх, Ю.І. Марченко. № u 2012 07203; заявл. 13.06.2012; опубл.25.01.2013, Бюл. № 2.

The main component of the Preserve Sauce "Neptune Cherry" is selected fruit juice of cherries containing amino acids (mg / 100g): serine – 415, proline – 67,5, aspartic acid -27,5, glutamic acid – 33; Organic acids-1.7 such as: wine, citric, apple and hay; vitamins (mg / 100g): PP (0.2 mg / 100 g), beta-carotene – 0,05, C – 7,4, B_1 – 0,01, B_2 – 0,02, B_9 – 0,23. Vitamin B_9 (folic acid) together with vitamins of group B prevents the development of atherosclerosis and hypertension.

From macronutrients cherry juice contains (mg / 100g): calcium – 17, magnesium – 6, sodium – 10, potassium – 250, phosphorus – 18; from trace elements: iron – 0,3 and copper 1,2. The high content of folic acid and iron contributes to the improvement of blood composition, increasing the number of red blood cells and hemoglobin levels, and also strengthens the walls of the blood vessels.

Due to its antioxidant properties, the fruit juice of cherries has a fairly rare ability to destroy streptococci and staphylococci, as well as to influence the pathogens of dysentery. Cherry juice improves metabolic processes in the human body and strengthens its immunity[13] .

Fish preserves in "Cherry Neptune" cherry sauce are prepared according to the technological instruction[14]. Fish raw material (peeled fillets-pieces of Pacific herring, prepared according to the requirements of the technological instruction), are filled with cherry sauce. To prepare the sauce, freshly prepared juice without pulp is used which is heated to a temperature of 40-50 ° C and added sugar and sodium benzoate, all components are thoroughly mixed and cooled.

To establish the harmony of the taste of finished fish preserves in the formulation of the sauce added cherry juice with a concentration of dry substances in the amount from 7% to 15%. Preserves with a mass fraction of dry matter in cherry sauce in the amount of 7% and 15%, according to

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[12] Дітріх І.В., Марченко Ю.І. Дослідження споживних властивостей нових рибних пресервів в апельсиновому соусі "Нептун". *Вісник Чернігівського державного технологічного університету. Серія "Технічні науки"*. 2014. № 1(71). С. 224–228.

[13] Скурихин И.М., Тутельян В.А. Химический состав пищевых продуктов: справочник. Москва: ДеЛи принт, 2002. 236 с.

[14] Сборник технологических инструкций по производству рыбных консервов и пресервов. Ленинград, 1989. Ч. III. С. 48.

organoleptic quality indicators, were inharmonious. Preserves with a mass fraction of dry matter in cherry sauce in the amount of 11% have a harmonious cherry taste and smell; the fill color is saturated, cherry, original; the color of fillet-pieces is pleasant, uniform, cherry[15].

According to the results of the study, Profilogram of the quality rating of new fish preserves "Neptune Cherry" (Fig. 2) was constructed, which shows that the best organoleptic quality indicators have a sample of fish preserves in cherry sauce containing 11% of dry matter in cherry juice[16].

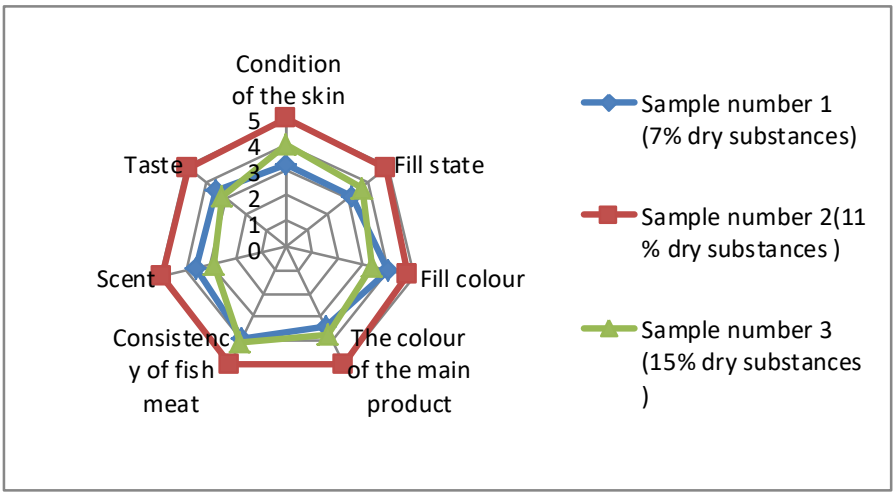

Fig. 2. Profilogram of ball quality grade fish preserves in cherry sauce "Neptune Cherry" with different content of dry substances in cherry juice

The quality of new preserves was evaluated according to the requirements of GOST 7453-86[17]. The results of assessing the quality of fish preserves in "Neptune Cherry" are given in Table 3.

The results of the organoleptic quality assessment presented in Table 3 show that the characteristic feature of the new preserves "Neptune Cherry"

[15] Рибні пресерви у вишневому соусі "Нептун Cherry": пат. 85903 Україна: МПК A23L 1/325 / І.В. Дітріх, Ю.І. Марченко. № u 2013 05093; заяв. 10.12.2013; опубл. 10.12.2013, Бюл. № 23.

[16] Дітріх І.В., Марченко Ю.І. Оцінка показників якості нових рибних пресервів у вишневому соусі "Нептун Cherry". *Прогресивні техніка та технології харчових виробництв ресторанного господарства і торгівлі. Збірник наукових праць.* 2015. Вип. № 1(21). С. 450–457.

[17] ГОСТ 7453-86. Межгосударственный стандарт. Пресервы из разделанной рыбы. Технические условия. [Дата введения 1988-01-01]. Москва: Стандартинформ, 2008. С. 16.

is a cherry flavor and a slightly cherry smell, which are in perfect harmony with the taste and smell of the mature herring. Due to the fact that cherry juice contains pigments in its composition, the new product has an original color: the fill gets a rich, cherry tint; the color of the main product – attractive, uniform, cherry[18].

Table 3

Results of quality evaluationof preserves in cherry souce "Neptune Cherry"

Characteristic	Requirements GOST 7453-86	Sample of fish preserves "Neptune Cherry"
1	2	3
Condition of the skin	Whole. It is allowed slight damage to the skin in fillet bits	Fillet bits are whole with even cuts. No mechanical damage
Filling status	Proper to this species	Small presence of weighed particles
Consistency of fish meat	Tender, juicy	Tender, juicy
Scent	Pleasant, peculiar ripe fish with scent flavor	Well defined, harmonious, slightly cherry
Taste	Pleasant, characteristic ripe fish, pouring	The taste of fish – a pleasant, harmonious, characteristic mature herring, with a cherry flavor. The taste of the sauce is pleasant, cherry, without any foreign taste
Fill color	Not normalized	Saturated, cherry, origina
Color of the main product	Not normalized	Pleasant, uniform, cherry
Mass fraction of kitchen salt in fish meat,%	5,0–8,0	5,8
Mass fraction of fat in fish meat,%, not less	12,0	14
Mass fraction of sodium benzoate,%, not more	0,15	0,14

[18] Дітріх І.В., Марченко Ю.І. Оцінка показників якості нових рибних пресервів у вишневому соусі «Нептун Cherry». *Прогресивні техніка та технології харчових виробництв ресторанного господарства і торгівлі. Збірник наукових праць*. 2015. Вип. № 1(21). С. 450–457.

When creating functional foods, the common trend is to replace sugar with honey, which, unlike sugar, cleanses blood and prevents pathogens from entering the digestive tract. Sugar creates an additional burden on the liver and can lead to its fatty degeneration, as well as sugar contributes to the deposition of fats and creates favorable conditions for the development of pathogenic microorganisms in the intestine, which complicates the synthesis of lactic acid, which possesses bacteriostatic properties. Honey has a bactericidal, immunobiological and stimulating effect, promotes the removal of toxins from the body[19].

Honey contains minerals in quantities (mg / 100 g of dry product): K – 25, Ca – 4; Mg – 2, Na – 25, Fe – 1,1. Honey contains a significant amount of nutrients, namely: (mg / 100 g of dry product) 85-79% of dry matter, about 82% of dry matter of fructose and glucose, sucrose not more than 6%, 0.25-0.64% proteins, also honey contains vitamins (mg / 100 g of dry product):C – 2; B1 – 0,01; B2 – 0,03; PP – 0,20[20]. From the data provided, it follows that honey has in its composition components that determine its nutritional and biological value, which makes it used as raw material in the food industry, as well as a biologically active additive to enhance the nutritional and biological value of the products.

A recipe for the mustard-honey sauce of herring preserves has been developed, which contains the following ingredients: mustard powder, acetic acid, vegetable oil, salt, water, honey (Table 4).

Table 4

Content of prescription components of mustard-honey sauce (g per 100 g)

№	Components	Raw material content
1	2	3
1	Mustard powder	8,8
2	Honey	16,6
3	Acetic acid	3,0
4	Vegetable oil	10,3
5	Salt	4,6
6	Water	6,43

[19] Младенов С. Мед и медолечение. София: Земиздат, 1971. 228 с.

[20] Скурихин И.М., Тутельян В.А. Химический состав пищевых продуктов: справочник. Москва: ДеЛи принт, 2002. 236 с.

The amount of honey to replace sugar in the recipe was chosen based on the organoleptic properties of the finished product, because its content affects the taste quality of preserves. To establish a harmonious combination of mustard and honey, it was added to the product in a quantity from 23 to 43%. The content of honey in the amount of 23% has led to an over-satiated mustard taste. With a maximum content of honey (43%), the product has a sweetened sweet taste. At the content of honey in a sauce 33%, there is a harmonious combination of mustard and honey, the taste is unusual at the same time sweet and sharp, slightly sour[21].

According to the results of the research, a profilogram of assessment of preserves in mustard-honey sauce (Fig. 3) was constructed, which shows that the optimal content of honey is 33% (16,6 g per 100 g of finished product).

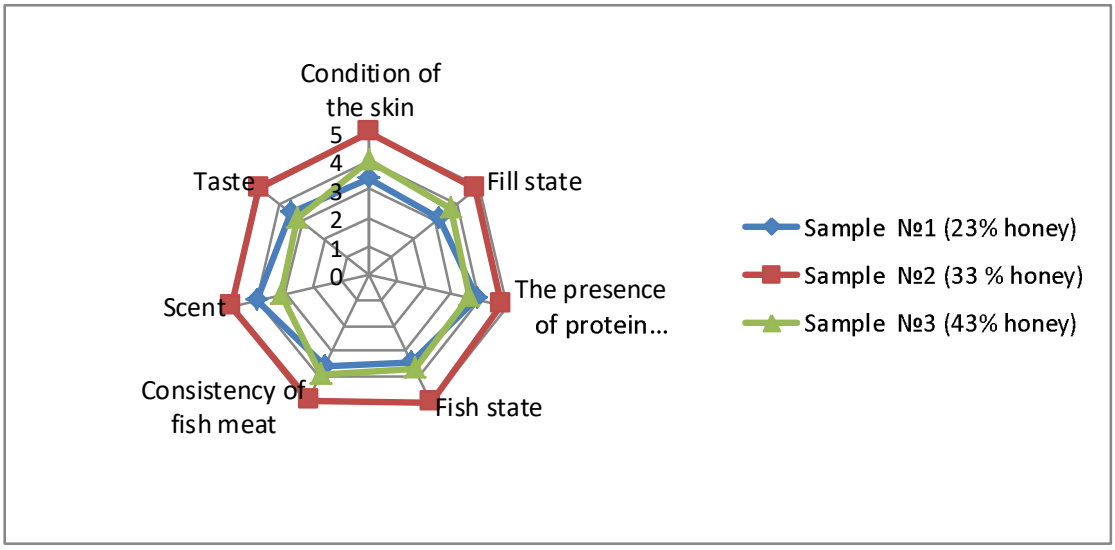

Fig. 3. Profilogram of organoleptic properties of preserves in mustard-honey sauce, depending on the content of honey

Indicators of quality of preserves of herring in mustard-honey sauce are given in Table. 5.

[21] Пресерви з оселедця у гірчично-медовому соусі: пат. 87824 Україна: МПК A22C 25/00. / І.В. Дітріх, Т.Ю. Мальцева. № u2013 08809; заявл.15.07. 2013; опубл. 25.02.2014, Бюл. № 4.

In preserves of herring in a mustard-honey sauce, there is a harmonious combination of mustard and honey. Using honey for making preserves in mustard– honey sauce helps to improve its organoleptic properties and increase biological value[22].

Table 5

Results of quality evaluation of fish preserves from herring in mustard-honey souce

Characteristic	Requirements GOST 7453-86	Herring preserves in mustard-honey sauce
1	2	3
Condition of the skin	Whole. It is allowed slight damage to the skin in fillet bits	Fillet bits are whole with even cuts
Filling status	Proper to this species	Liquid, opaque
Consistency of fish meat	Tender, juicy	Tender, juicy
Scent	Pleasant, peculiar ripe fish with scent flavor	Pleasant, typical for mature fish with a subtle flavor of honey and mustard
Taste	Pleasant, characteristic ripe fish, pouring	Pleasant, typical for mature fish. Has a harmonious mustard-sweet taste, without foreign flavors
Fill color	Not normalized	Pleasant amber-yellow color
Color of the main product	5,0–8,0	6,1
Mass fraction of kitchen salt in fish meat,%	12,0	14,8
Mass fraction of fat in fish meat,%, not less	0,1	0,09
Mass fraction of sodium benzoate,%, not more		

[22] Пресерви з оселедця у гірчично-медовому соусі: пат. 87824 Україна: МПК A22C 25/00. / І.В. Дітріх, Т.Ю. Мальцева. № u2013 08809; заявл.15.07. 2013; опубл. 25.02.2014, Бюл. № 4.

2. Functional semi-finished and culinary products from fish raw materials

To increase the biological value, to improve the organoleptic characteristics of fish semi-finished products can be by adding to the product of crushed fresh leaves of spinach. This vegetable raw material is used as a component in the formulation of frozen molded fish semi-products "Fish Cutlets with Spinach".

The leaves of spinach contain 8,8 g of dry substances, of which vitamins and minerals make up 13,3%, namely: beta-carotene – 0,05%; vitamin C – 0,63%; Na-0,7%; K – 8,8%; Ca – 1,2%; Mg – 0,93%; P – 35 0,94%; Fe – 0,03 %[23]. Beta-carotene protects the human body from free radicals, improves stress, helps the body to adapt more quickly in unusual and difficult conditions, softens the effects of radiation, electromagnetic and chemical contaminations, strengthens immunity and increases the ability to resist the body to infections. Vitamin C provides immune protection and stabilizes the human psyche. Potassium and sodium are interconnected functionally and perform the following functions: create conditions for the emergence of membrane potential and muscle contractions, maintain osmotic blood pressure and acid-alkaline balance, normalize the water balance[24].

Due to its properties, spinach is used as a dietary product, as well as a food component in the production of products, in diseases of the nervous system, exhaustion, anemia, hypertension, diabetes mellitus, gastritis, enterocolitis; It has a light tonic, diuretic and anti-inflammatory effect. Almost all the useful substances of spinach are cooked, frozen and preserved[25].

Products with spinach include in the diet of patients with diabetes, patients with disorders of the nervous system, even pregnant women and

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[23] Скурихин И.М., Тутельян В.А. Химический состав пищевых продуктов: справочник. Москва: ДеЛи принт, 2002. 236 с.

[24] Собко А. Використання свіжого шпинату в технології желе функціонального призначення. *Товари і ринки.* 2008. № 1. С. 67–73.

[25] Собко А. Використання свіжого шпинату в технології желе функціонального призначення. *Товари і ринки.* 2008. № 1. С. 67–73.

children, because this product is very well absorbed by the body. Spinach has an anti-inflammatory effect[26].

In the formulation of shaped fish semi-finished products "Fish Cutlets with Spinach" includes minced hake (fresh, chilled or frozen), salt, fish bouillon or water, bread crumbs, crushed leaves of fresh spinach, with the ratio of the components given in Table 6.

The content of chopped fresh leaves of spinach was chosen based on the

Table 6

Content of components of shaped fish semi-finished products "Fish cutlets with spinach" (g per 100 g)

№	Components	Raw material content
1	Stuffing	54,9
2	Sated onion	17,5-12,5
3	Protein soya food (flour) prepared	10,0-15,0
4	Leaves spinach	29,4
5	Salt cooking	1,5
6	Fish soup or water	6,5
7	Breadcrumbs	8

organoleptic properties of the finished product. The optimum content of the spinach ingredient is 50% of the total fish weight. With reduced amounts of spinach to 20% in ready-made cutlets, the taste is not pronounced. With an increase in its amount to 80% of the total fish weight, the aroma of the product is not harmonious, too intense expressed taste of spinach. The results of the studies presented in the profilogram (Fig. 4) show that the best organoleptic parameters are half-finished products with a spinach content of 50%[27].

The proposed proportions of all components give the shaped fish semi-finished products "Fish Chips with Spinach" harmonious organoleptic properties (Table 7).

[26] Собко А. Використання свіжого шпинату в технології желе функціонального призначення. *Товари і ринки.* 2008. № 1. С. 67–73.

[27] Заморожені формовані рибні напівфабрикати "Рибні котлети зі шпинатом": пат. 87827 Україна: МПК A22C 25/00. / І.В. Дітріх, В.С. Барабаш. № u2013 08857; заяв.15.07.2013; опубл. 25.02.2014, Бюл. № 4.

When combining spinach with fish raw material, in the production of fish semi-finished products "Fish Cutlets with Spinach" the taste and smell of finished products become harmonious with a slight flavor and aroma of spinach, with a delicate juicy consistency. The biological value of semi-finished products is increasing. Products are enriched with mineral elements K, Ca, Mg, P, Fe, β-carotene, vitamin C, fiber and organic acids[28].

As a functional component in the frozen fish food semifinished "Indigo", chopped red cabbage "Topaz" is used. It contains 8,3-11,8% of dry matter, of which 2,1% carbohydrates, proteins – 1,7%, fats – 0,4%, organic acids – 0,2%, starches –0,5%, fiber – 10%. The composition of the red cabbage includes biologically active substances, namely (per 100 g): selenium – 0,1-2,0 µg, ascorbic acid – 18,2-61,8 mg, calcium – 53 mg, vitamin K – 149 µg , beta-carotene – 100 µg, manganese – 140,0-260,0 µg, glutamic acid – 0,36 g, flavonoids – 150 mg[29]. The coloration of red cabbage is due to the presence of flavonoids, which are strong antioxidants, which promote the removal of harmful substances from the body, toxins, and also salts of heavy metals.

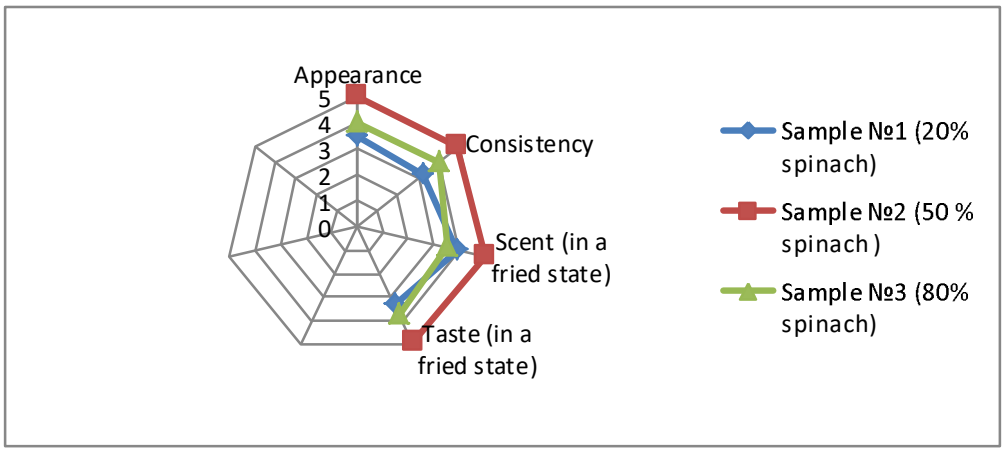

Fig. 4. Profilogram of the organoleptic properties of semifinished products "Fish Cutlets with Spinach" depending on the content of spinach

[28] Заморожені формовані рибні напівфабрикати "Рибні котлети зі шпинатом": пат. 87827 Україна: МПК A22C 25/00. / І.В. Дітріх, В.С. Барабаш. № u2013 08857; заяв.15.07.2013; опубл. 25.02.2014, Бюл. № 4.

[29] Скурихин И.М., Тутельян В.А. Химический состав пищевых продуктов: справочник. Москва: ДеЛи принт, 2002. 236 с.

Table 7

Characteristics of organoleptic indicators of shaped fish semi-finished products "Fish Cutlets with Spinach"

Indexes	Frozen Molded Semi-Foods "Fish Cutlets with Spinach"
Appearance	Not glued, not deformed, the shape of the oval is flattened, the surface is evenly closed by bending, without broken edges
Taste and aroma (in roasted form)	The taste is characteristic of fish cutlets, pronounced, with a slight flavor of spinach, harmonious. The smell is well-defined, harmonious
Consistence	Dense, roasted – juicy, tender, homogeneous

In the formulation of the frozen fish food semifinished "Indigo" includes minced hack (fresh, chilled or frozen), red cabbage "Topaz", wheat bread, milk, salt, pepper, bread crumbs, with the ratio of the components given in Table 8.

Table 8

Content of components of fish-oil semi-finished products "Indigo" (g per 100 g)

№	Components	Raw material content
1	Heck (fillet)	37,08
2	Cabbage reddish	24,72
3	Wheat bread	12,3
4	Milk	17,0
5	Black pepper	0,1
6	Salt	1,0
7	Breadcrumbs	7,8

The optimum content of the red cabbage ingredient is recognized in the amount of 40% of the total weight of the fish mass, which consists of fish,

wheat bread and milk, that is, without taking into account the mass of breadcrumbs[30].

Organoleptic parameters of the product are given in Table 9.

Table 9

Characteristics of organoleptic indicators of fish-based semi-finished products “Indigo”

Indexes	**Frozen fish-stuffed semi-finished products “Indigo”**
Appearance	Not glued, not deformed, the shape is oval-flattened, the surface is uniformly covered with panning, without broken edges
Taste and aroma (in roasted form)	The taste is typical of fish cutlets, pronounced, with a slight flavor of red cabbage, harmonious. The smell is typical, well pronounced, with a slight flavor of red cabbage
Consistence	Dense, roasted – juicy, tender, homogeneous
Colour	Attractive purple, with a purple shade

Thus, the product has the original organoleptic properties enriched with ascorbic acid, beta-carotene, vitamin K, calcium, selenium, fiber.

Chestnut and buckwheat flour is a promising food ingredient in the development of recipes for culinary fish products. The greatest advantage of these types of flour among others is the lack of gluten, which allows them to be used in the diet of patients with celiac disease.

Chestnut flour contains 100 g of product: fats – 5 g, carbohydrates –70 g, food fibers – 7 g, proteins – 6 g, vitamin C – 15,1 mg, thiamine – 0,4 mg, vitamin B6 – 0,7 mg, potassium – 991 mg, phosphorus – 137 mg, magnesium – 74 mg, iron – 2.4 mg, copper – 0.7 mg, manganese – 1,2 mg[31].

Buckwheat flour is the most valuable food product obtained by grinding buckwheat groats. It is considered to be dietary. Buckwheat flour combines flavor and beneficial properties. It has a delicate nutty taste, is easy to digest and is useful for the human body[32].

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[30] Заморожені рибоовочеві напівфабрикати "Індіго": пат. 108896 Україна: МПК A23L 17/00. / І.В. Дітріх, І.О. Груба. № u2015 11778; заяв. 30.11.2015; опубл. 10.08.2016, Бюл. № 15.

[31] Каштан съедобный. *Что мы едим*: http://prokalorijnost.ru/kashtan-sedobnyj-polza-i-vred.

[32] ГрищенкоА.М., Дробот В.І. Технологічні властивості безглютенових видів сировини. *Наукові праці ОНАХТ.* Вип. 46.Т. 1. С. 162–165.

Buckwheat flour contains: protein – 13,5%, sugar – 1,47%, starch – 74,7 g, food fiber – 6,49 g. Buckwheat flour proteins have the greatest biological value from all grain crops. Figure 5 shows the contents of essential amino acids in the protein of buckwheat flour[33].

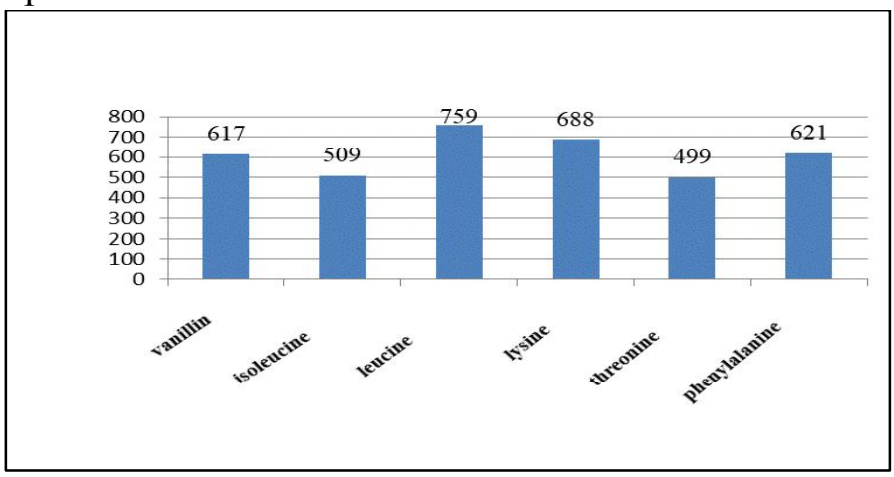

Fig. 5. the content of essential amino acids in buckwheat flour (mg per 100 g of dry weight)

The recipes of the coulibiac "Coulibiac from chestnut flour" and "Coulibiac from buckwheat flour" have been developed.

The recipe of coulibiac made from chestnut flour is given in Table 10.

Table 10

Recipe of coulibiac made from chestnut flour

Recipe components	Component ratio,%
Chestnut flour	30
Cod (fillet)	41,5
Sugar	1,7
Margarine tableware	6
Melange	1,3
Salt	0,5
Yeast	1
Water	12
Onions	5
Parsley (greens)	1

[33] Скурихин И.М., Тутельян В.А. Химический состав пищевых продуктов: справочник. Москва: ДеЛи принт, 2002. 236 с.

Coulibiac from chestnut flour has a golden color, the consistency is soft, tender, and juicy, the taste is harmonious, the ratio of dough and minced meat is balanced, without foreign flavors and odors.

Coulibiac from chestnut flour can be recommended as a product of functional nutrition for patients with intolerance to gluten.

The recipes with buckwheat flour are presented in Table 11.

Coulibiac from chestnut flour has a golden color, the consistency is soft, tender, juicy, the smell and taste are harmonious, the ratio of dough and minced meat is balanced, without foreign flavors and odors.

Coulibiac with buckwheat can be recommended for celiac disease and type 2 diabetes. Replacing the wheat flour in this dish on buckwheat provides an opportunity to solve the problem of the lack of essential amino acids in human nutrition.

Table 11

Receip Coulibiac from buckwheat flour

Recipe components	Component ratio,%
buckwheat flour	29-31
Cod (fillet)	38,1-43,2
Sugar	1,6-1,8
Margarine tableware	5,5-6,5
Melange	1,5-1,3
Salt	0,4-0,6
Yeast	0,7-0,9
Onion	6,0-6,5
Parsley	1,1-1,3
Water	other

CONCLUSIONS

The choice of natural physiologically functional raw material for the manufacture of fishery products of functional purpose is substantiated.

The expediency of using raw materials of vegetable origin such as orange juice and cherries, honey to optimize the consumer properties of fish preserves from herring herring has been proved. Created recipes of fish preserves in orange juice “Neptune”, cherry souce “Cherry Neptune” and preserves of herring in mustard-honey sauce. The use of juice from orange

fruits, cherries and honey in the production of fish preserves contributes to a significant improvement in their organoleptic properties, increasing biological value and expanding the range of this product. Patents of Ukraine have been obtained for this product.

In order to increase the biological value and improve the organoleptic characteristics of fish semi-finished products based on minced meat, the use of spinach and red cabbage as functional ingredients in the formulation of recipes “Fish cutlets with spinach” and fish-based semifinished products “Indigo” has been established and confirmed. The resulting products have original organoleptic properties and enriched with cinnamon nodules. Patents of Ukraine are obtained for these products.

The possibility of using chestnut and buckwheat flour as an unconventional ingredient in the development of recipes of fish and wheat culinary dishes of functional purpose (for example, fish Coulibiac from chestnut flour and fish Coulibiac from buckwheat flour) has been explored. Coulibiacfrom chestnut flour and buckwheat flour can be recommended for celiac disease patients. The combination of fish raw materials with buckwheat flour will solve the problem of the lack of essential amino acids in human nutrition.

A complex of data describing the quality of the developed food products has been obtained, its high organoleptic characteristics and increased biological value have been proved.

SUMMARY

The article provides justification for the expediency of using raw materials of vegetable origin for the production of fishery products of functional purpose. Prescription composition of fish preserves in orange sauce “Neptune”, cherry sauce “Neptune Cherry”, preserves of herring in mustard-honey sauce, shaped fish semi-products “Fish cutlets with spinach” and fish-based half-finished products “Indigo”, fish Coulibiac from chestnut flour and Coulibiac made of buckwheat flour. According to research results, it has been established that this foodstuff has improved organoleptic properties and increased biological value and can be included in the range of products of targeted action on the human body.

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Information about authors:

Ditrikh I. V.,
Candidate of Chemical Sciences, Associate professor
Department of Technology of Restaurant
and Ayurvedic Products
National University of Food Technologies
68, Volodymyrska Str., Kyiv, 01601, Ukraine

Saltan B. A.,
Master, Department of Technology of Restaurant and Ayurvedic Products
National University of Food Technologies
68, Volodymyrska Str., Kyiv, 01601, Ukraine