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USE THE SEEDS OF CHIA SEEDS AS INGREDIENT OF MILLED HALF-FINISHED FOODSTUFFS

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Abstract. There are given results of sensory analysis of flavor and some other properties of milled masses of freshwater fish enriched by the non-traditional raw material (seed of chia seeds). The conclusion on positive effect on properties of proposed compositions over those ones of the standard sample of force-fish was made on comparing of base profiles of their basic properties.

The cutlets made of mass modified by vegetative ingredient had the plastic and dense consistency on their cut. The positive results of their organoleptic analysis evidenced expediency of adding of proposed vegetative ingredient to milled mass of fish. The criteria proved such conclusion were general expression of taste, aroma and harmonicity of flavor of cutlets made of mixes of developed composition.

It was shown experimentally that adding of vegetative raw materials in the mix permits to increase its nutritional value. Absence of negative effects followed after adding of seeds of chia seeds into the minced fish mass permits us to recommend it for consumption as the product of dietetic destination.

Key words. Fish cutlets, vegetative raw materials, chia seeds, semi-finished products, organoleptic testing, sensory characteristics, flavor, taste, profilogram.

Introduction

Physicians fixed last time the tendency of rising of incidences of celiac diseases worldwide. The Global Gastroenterological Organization published the data on its displaying in average at one of three hundred men. To attain the valuable physical strength, ill patients are forced to cease consumption of foodstuffs that contain gluten: rice, buckwheat, millet, corn and such products unusual for Ukrainians as amaranth, quinoa, sago, green foxtail and sorghum.

Formulation of problem

For help them to solve the problem of limiting variety of products in ration, Ukrainian scientists and technologists developed the number of gluten-free foods. However their set include only small quantity of products, e.g. free of albumens bread produced by standard of DSTU-P 4588:2006, free of gluten bread produced by

technical specifications of TU 8-22-61-88, corn, rice and buckwheat macaroni (TU 9149-001-17629737 and TU 9148-011-17629737), albumen-free macaroni (TU) 9149-006-17629737), corn-, rice-, buckwheat- and albumen-free mixes for use in baking (TU 9195-002-17629737 and TU 9195-013-17629737), as well as cookies of "Sugary", "Floral mix", "Harmony" and "Salty" (TU 9131-007-17629737) ones [1].

Analysis of recent research results

To increase the number of products for feeding the patients ill by celiacy, the firms of "DR.SCHAR" (Italy), «BEZGLUTEN» (Poland), «3PAULY» (Germany), produced in Ukraine foodstuffs specially certified for these purposes. However they found here the limited demand because of their expensiveness.

Looking at lipid content of chia seeds have presence of palmitic acid (7%), stearic acid (3.23%) linolenic acid (60.68%) and polyunsaturated fats (PUFA) (81.15%), a lower value for linoleic acid (20.47%) and a higher value for oleic acid (7.48%). The incorporation of ingredients with high PUFA content into the diet provides numerous health benefits. The chia seed can be considered a functional food because it is a source of ω -3 fatty acids, with at least 0.1 g of ω -3 in 100 g of product, and has high levels of total dietary fiber, up to 3 g in 100 g of product and protein [2].

Meantime, one of the most actively developing branches of public economy in Ukraine is the industry by producing of semi-finished meat and fish products. The most known products of such category are cutlets, schnitzels, chops, stakes, zrazy, meat and fish balls, klessy, koftas. The stimulus of such progress is fast increasing the number of public enterprises of "diet nutrition", demand of foods for alimentation the students and schoolchildren, and public interest to products that permit to decrease duration of producing of foods household. At the same time, one of critical problems in progress of such industry is rising of quality and nutritive value of produced foods.

Therefore, the goal we set in our work was optimization the composition of cutlets made of milled meat of freshwater fish by way of its mixing with vegetative raw materials.

Purpose of research

The objects of research were organoleptic and physicochemical properties of mixes made of ground meat of European carp (*Cyprinus carpio*) with milled seed of chia seeds.

Results of research

There were tested four samples of mixes differing by content of their basic components. The mix #1 contained 2 % of milled seeds of chia seeds, the mix #2 – 5 %, and mix #3 – 8 % of this ingredient. The object of control was the ground meat of carp without additives. The process of producing of cutlets of said mixes included operations as follows: taking of raw materials, their sorting, taking of calculated quantities of ingredients, their milling, preparing of forcemeat, forming and breading of cutlets, and their frying (boiling with steam in another variant). The detailed formulations of the control sample of cutlet and compositions based on use of fish modified by vegetative ingredient are listed in Table 1.

To find the optimal formulation of thermally treated mix of fish and chia seeds, there was carried out the sensory evaluation of their properties by norms of international standard of ISO 6564:2005 "Sensory analysis – Methodology – Flavor profile methods" harmonized in Ukraine as DSTU 6564:2005 [3].

The properties of listed compositions by 10 meaningful criteria of quality arranged by order of their

significance evaluated the expert commission of 8 persons. To find the worth of each product, there was used the scale constituted of 5 values intensity in each property as follows: the mark of 0 points meant that display of the sense was absent; 1 point meant its scarce intensity; 2 points meant the weak grade of intensity; 3 points meant the average intensity; 4 points meant that the product was character by intense display of the tested property, and the mark of 5 points showed that the product had the highly intense display of tested characteristic [4, 5].

The most significant index of quality taken into account in expert evaluation was the general impression on adequacy the characteristics of intensity and flavor of the product.

The six ones permitted to identify the grade of manifestation its taste and aroma, and the last three parameters helped to characterize consistency of the product in its touching with receptors of oral cavity. The principal purpose of testing was evaluation of grade of conformity of evaluated parameters of fish products to desirable level of their quality, as well as attesting of grade of displaying of characters of harmonicity of after-tastes of their salinity, and sweetness. The criteria chosen for evaluation of mixes in development were as follows (Table 2).

The nature of taste the products in development was identical with the same parameter of the control sample and results of degustation did not show any negative constituents in parameters of aroma and presence of foreign and sharp odors.

Table 1. Formulations of mixes used in producing of cutlet made of fish meat.

Ingredient	Mass of the ingredient, g			
	Control	Sample 1	Sample 2	Sample 3
Milled meat of carp	77	75	72	69
Chia seeds	–	2	5	8
Salt	1	1	1	1
Hen's eggs	5	5	5	5
Bread	3	3	3	3
Milk	5	5	5	5
Eggs used for liaison	6	6	6	6
Bread-crumbs	3	3	3	3

Table 2. Results of evaluation of sensory characteristics of fish cutlets in use of parameters of their flavor.

Characteristic	Intensity of the characteristic in points		
	standard	control	with chia seeds
<i>Aroma and taste</i>			
harmonicity	5,0	4,0±0,10	5,0±0,20
peculiarity to the product	4,5	3,0±0,01	4,0±0,02
fishy	4,5	4,5±0,10	4,5±0,10
expressed barely	3,5	1,0±0,02	3,5±0,01
sweetness	3,0	3,0±0,01	3,0±0,01
saltiness	3,0	3,0±0,01	2,5±0,10
<i>Consistency</i>			
juiciness	3,0	3,0±0,10	1,5±0,10
plasticity	3,5	3,0±0,10	3,5±0,10
compactness	1,0	2,0±0,02	3,0±0,02
<i>General impression</i>	5,0	4,8±0,10	5,0±0,10
<i>Total score</i>	36,0	31,3±1,00	35,5±0,40

The experimental samples obtained the uppermost marks by characteristic of aroma and surpass by parameter of "expressed weakly" the control one, which intensity was less strong and character by presence of fishy after-taste.

The results obtained in degustation the cutlets of modified composition compared with the same properties of products free of vegetative ingredient were subjected to mathematical treatment to calculate the numeral values of indices of tested parameters. Such method permits to visualize and obtain the objective characteristic the grade of intensity flavor of tested products.

The detailed diagrams of flavor of fish cutlets are shown on Figures 1 and 2 below. It's seen from diagram shown on Figure 1, that the control sample of fish cutlets had the plastic and dense consistency throughout all its mass, was of light grey color and its smell was fortified by salty and sweetish flavors. At the same time characteristics of the control sample were some different of standardized ones, what witnesses that its formulation has to be subjected to some correction to obtain properties of the product maximally close to the standard.

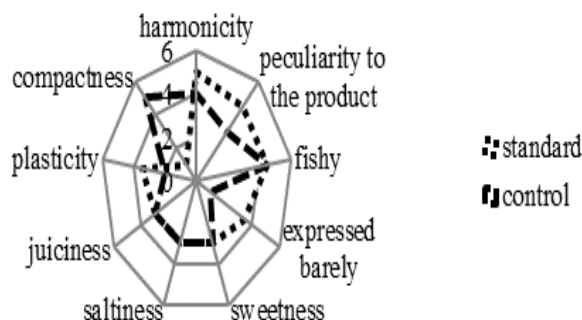


Fig. 1. The profile diagram the flavor of fish cutlets (the standard and control samples).

Unlike the control sample, properties of cutlets modified by seed of chia seeds possess by sufficient plasticity, are dense on their cut and character by sizeable indices of impression and harmonicity of fishy taste fortified in addition by salty and sweetish flavors identical with those ones of the standard sample.

Tasters who took part in evaluation of intensities and adequacy of properties of fish cutlets modified by vegetative ingredient came to the conclusion that the

product the most close by its characteristics to the standard one (the summary mark of 36.0), is the sample modified by the vegetative ingredient (the summary mark of 35.5), see Figure 2.

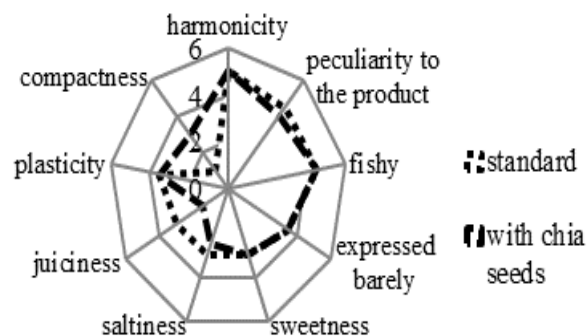


Fig. 2. The profile diagram of flavor of fish cutlets modified by seeds of chia seeds.

The results obtained in determining of values of output of finished products and losses of mass in their preparation at various modes of thermal are given in Table 3.

All samples listed in this Table had harmonic fish aroma and their taste produced the positive impression on tasters.

The results obtained in analysis of their chemical composition showed that content of albumens in products modified by introduction of vegetative ingredient (samples ## 1-3) varied within limits of 16.2÷20.5%.

The only difference and advantage over the composition of control sample is bigger content of albumens, what is the consequence of lesser quantity of this class compounds in fish meat as compared with seeds of chia seeds (Table 4).

Lipids – the one more class of substances crucially necessary for assuring of normal vital activities – are contained in the standard sample in quantity of 4.15 %. Meantime, values of the same parameter vary in the range of 11.63÷15.52 % in the samples ## 1-3 we developed, what permitted to improve their nutritional value, and tasty and juicy characteristics. At the same time results of analysis show that the products ## 1-3 contain 2.58–3.2 % of mineral substances, whereas the control sample contained 2.37 % of such compounds only.

Table 3. Total output of fish cutlets and losses in their preparation.

Sample #	Treatment by steam			Roasting		
	Initial mass, g	Mass after treatment, g	Losses, %	Initial mass, g	Mass after treatment, g	Losses of mass, %
Control	50	32	36	51	29	43
1	51	30	42	52	28	46
2	47	42	11	45	33	27
3	49	34	31	47	32	32

Table 4. Content of some components in formulations of fish cutlets, % (n=5, p≤0,05).

Sample #	Water	Albumens	Lipids	Mineral substances
Control	72,50 ± 5,21	14,87 ± 0,42	4,15 ± 0,28	2,37 ± 0,12
1	70,08 ± 4,67	16,20 ± 0,53	11,63 ± 0,97	2,58 ± 0,17
2	65,70 ± 4,67	17,49 ± 0,53	12,66 ± 0,97	2,92 ± 0,17
3	63,80 ± 6,04	20,50 ± 0,27	15,52 ± 0,72	3,72 ± 0,24

All these arguments allow us to assert that fish products enriched by vegetative ingredient possess by bigger biological value as compared with the non-modified mass of fish.

Conclusions

1. The proposed formulations of fish-based semi-finished products would permit to spread the assortment of dietetic products.

2. The second positive effect of application vegetative raw materials in minced fish masses is finding one of more method of reprocessing the freshwater fish.

3. The R&D work we performed would be continued and should include the stage of development and optimization the technologies of producing the fish products modified by vegetative raw.

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ВИКОРИСТАННЯ НАСІННЯ ЧІА В ЯКОСТІ ІНГРЕДІЄНТА ПОДРІБНЮВАННЯ НАПІВФАБРИКАТІВ ПРОДУКТІВ ХАРЧУВАННЯ

Н. В. Голембовська, Н. М. Слободянюк

Анотація. Наводяться результати сенсорного аналізу смаку і деякі інші властивості подрібненої маси прісноводних риб збагаченого нетрадиційної сировини (насіння Чіа). Висновок на позитивний вплив на властивості запропонованої композиції за ті стандартного зразка форс-риба був зроблений на порівнянні базових профілів їх основні властивості.

Котлети з маси модифікованих рослинних інгредієнтів мають пластику і щільної консистенції на свою частку. Позитивні результати органолептичного аналізу свідчать про доцільність додавання запропонованого рослинного інгредієнта для розмолотої маси риби. Критерії довіри такого висновку було загальне вираження смаку, аромату і гармонійності смаку котлети з суміші розробленого складу.

Експериментально було показано, що додавання рослинної сировини в суміші дозволяє підвищити його поживну цінність. Відсутність негативних наслідків після додавання насіння чіа в рибний фарш мас дозволяє нам рекомендувати його для вживання в якості дієтичного продукту призначення.

Ключові слова: рибні котлети, рослинна сировина, насіння чіа, напівфабрикат, органолептичні випробування, органолептичні показники, аромат, профілограм.

ИСПОЛЬЗОВАНИЕ СЕМЯН ЧИА В КАЧЕСТВЕ ИНГРЕДИЕНТА ИЗМЕЛЬЧЕНИЯ ПОЛУФАБРИКАТОВ ПРОДУКТОВ ПИТАНИЯ

Н. В. Голембовская, Н. М. Слободянюк

Аннотация. Приводятся результаты сенсорного анализа вкуса и некоторые другие свойства измельченной массы пресноводных рыб обогащенного нетрадиционного сырья (семян чиа). Заключение на положительное влияние на свойства предлагаемой композиции за те стандартного образца форс-рыба был сделан на сравнении базовых профилей их основные свойства.

Котлеты из массы модифицированных растительных ингредиентов имеют пластика и плотной консистенции на свою долю. Положительные результаты органолептического анализа свидетельствуют о целесообразности добавления предложил растительный ингредиент для размолотой массы рыбы. Критерии доказал такому выводу было общее выражение вкуса, аромата и гармоничность вкуса котлеты из смеси разработанного состава.

Экспериментально было показано, что добавление растительного сырья в смеси позволяет повысить его питательную ценность. Отсутствие негативных последствий после добавление семян чиа в рыбный фарш масс позволяет нам рекомендовать

его для употребления в качестве продукта диетического назначения.

Ключевые слова: рыбные котлеты, растительное сырье, семена чиа, полуфабрикат, органолептическое испытания, органолептические показатели, аромат, вкус, профилограф.

