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USAGE OF CHIA SEEDS IN THE COMPOSITION OF DIETARY SEMI-FINISHED MINCED PRODUCTS

ВИКОРИСТАННЯ НАСІННЯ ЧІА У СКЛАДІ ДІЄТИЧНИХ СІЧЕНИХ НАПІВФАБРИКАТІВ

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Abstract. *The article deals with the results of sensory analysis of semi-finished minced fish products with non-traditional raw materials (chia seeds) by the flavor profile method, and establishing their compliance with the hypothetical standard.*

The obtained positive results of organoleptic studies have shown the feasibility of combining chia seed with freshwater fish, as evidenced by high indicators of such indicators as the overall impression, harmonious, fishy, sweet and salty taste. As for their consistency, fish cutlets are plastic and dense on the cut.

The research has established that the addition of non-traditional raw materials allows not only to improve the technology of production of minced semi-finished products, but also to solve the problem of obtaining a product of high nutritional value and dietary purpose.

Keywords. *Fish cutlets, non-traditional raw material, chia, semi-finished products, organoleptic evaluation, sensory characteristics, flavor, descriptors, profilograms.*

Recently the number of people with celiac disease increased. According to the World Gastroenterology Organization – WGO, one man per three hundred in the world suffers celiac disease. For full-fledged physical development and quality of life, people with this disease should continuously consume gluten-free foods.

Rice, buckwheat, millet, corn, and less common in Ukraine amaranth, cinoa, sago, montin, chuma, sorghum are believed to be safe to eat when suffering this disease. A series of non-gluten food products of domestic production was developed. But it is limited with non-protein bread (DSTU-P 4588:2006), gluten free bread (TU 8-22-61-88), “Corn”, “Rice”, “Buckwheat” macaroni (TU 9149-001-17629737, TU 9149-011-17629737), “Non-protein” (TU 9149-006-17629737), “Corn”, “Rice”, “Buckwheat”, “Non-protein” mixtures for baking (TU 9195-002-17629737, 9195-013-17629737), “Tsukrove”, “Kvitkova sumish”, “Garmonia”, “Solene” cookies (TU 9131-007-17629737) [1].

The search for novel foods is a relevant practice worldwide. Salvia hispanica L., also known as chia, is an herbaceous plant cultivated semi-annually, and it belongs to the family Labiatae, division Spermatophyta and kingdom Plantae. Chia seed contains a significant amount of lipids (approximately 40% of the total weight), with almost 60% of the lipids comprising Omega-3 fatty acids. Dietary fiber constitutes more than 30% of the total weight of the seed, and approximately 19% of the seed contains proteins of high biological value [2].

Looking at lipid content of seeds of chia 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].

One of the most dynamically developing branches of the fish industry is the production of semi-finished fish products, which is associated with the problem of "fast food" in the public sphere, with nutrition of schoolchildren, with the requirements of reducing the time for cooking at home. There is a wide range of products made of cutlet-minced meat among the semi-finished fish products: cutlets, schnitzels, minced collops, steaks, zrazy, meatballs, croquettes, klessy, kofta. A topical issue is the improvement of the nutritional value and quality of semi-finished products [3].

The purpose of these studies was the improvement of the technology of semi-finished minced products production (cutlet), using a freshwater fish meat and vegetable raw materials (chia).

Research results. Samples of semi-finished products were selected taking into account the content of their main components: sample 1 – with the addition of 2% of chia; sample 2 – with addition of 5% of chia, sample 3 – with the addition of 8% of chia, control sample without the addition of chia seeds and only with a carp meat.

The process of production of semi-finished minced products (cutlet) consists of the following stages: raw materials receiving, sorting, washing, fillet cutting, chopping, mincing, forming, peeling, frying (steaming), packaging in consumer packaging, packaging in transport containers and sales.

For the production of fish cutlets a special formula has been developed, which are given in Table 1.

Table 1

Formula of fish cutlets, %

Constituent element	The weight of constituent element in samples, g			
	Control	Sample 1	Sample 2	Sample 3
Carp mince	77	75	72	69
Chia seeds	–	2	5	8
Salt	1	1	1	1
Chicken eggs for mince	5	5	5	5
Bread	3	3	3	3
Milk	5	5	5	5
Eggs for liaison	6	6	6	6
Breadcrumbs	3	3	3	3

During the experimental studies, after the development of the formula with the addition of chia seeds in percentages and heat treatment conditions, sensory evaluation was performed in accordance with international ISO standards. For the creation of profiles they used the method described in DSTU ISO 6564:2005 "Sensory research, methodology, methods of creation of a spectrum of a flavor" [4].

The tasting was conducted by an expert panel of 8 people. At the same time, descriptors, which were significant for consumers, were evaluated, and were the part of a complex profile of the flavor of a hypothetical standard. 10 descriptors were proposed to respondents to assess fish cutlets on the given scale, and these descriptors were arranged in descending order of significance.

According to the results of the tasting and after their mathematical processing, the profiles of the developed fish cutlet samples with the addition of chia seeds, and of a control sample – without the addition of plant material, were developed.

Tasting evaluation of samples of fish cutlets was carried out on a 5-point scale of desirability and intensity of sensation of aromatic and taste properties of the product: 0 points – no sign; 1 point – barely defined; 2 points – weak intensity; 3 points – average intensity; 4 points – strong intensity; 5 points – very strong intensity [5].

Based on the results of the research on consumer preferences that were previously conducted by us [5, 6], a set of 10 descriptors for the characterization of the flavor was defined (Table 2).

Table 2

Sensory evaluation of fish cutlets using a flavor profile method

Descriptors	Intensity of characteristics, score		
	standard	control	with chia seeds
Characteristic of aroma and taste: harmonious	5,0	4,0±0,10	5,0±0,20
typical	4,5	3,0±0,01	4,0±0,02
fishy	4,5	4,5±0,10	4,5±0,10
barely defined	3,5	1,0±0,02	3,5±0,01
sweet	3,0	3,0±0,01	3,0±0,01
salty	3,0	3,0±0,01	2,5±0,10
Consistency characteristic: juicy	3,0	3,0±0,10	1,5±0,10
plastic	3,5	3,0±0,10	3,5±0,10
dense	1,0	2,0±0,02	3,0±0,02
Overall impression	5,0	4,8±0,10	5,0±0,10
Total score	36,0	31,3±1,00	35,5±0,40

As a result of the conducted experimental research it was established that a harmonious and typical taste with an intensity of 5 points is inherent to research samples in comparison with the control, which had not high enough intensity and had a strong fishy aftertaste.

By the flavor a research sample had the highest score, and by the "barely defined" descriptor – it exceeds the standard. Negative components of aroma or foreign and sharp odors were not detected.

For the visual perception of the results, detailed profiles of the flavor of developed fish cutlets were made (Fig. 1, 2). Profile analysis enables us to study: due to which intensity of the positive and the presence of negative characteristics of taste and aroma one test sample (control) differs from the other

(experimental). Therefore, a more objective assessment of the organoleptic characteristics of fish cutlets was obtained with the help of the profile analysis.

Fish cutlets (control) were characterized by a light gray color, sweet-salted taste, plastic, dense on the whole consistence mass, which indicate the need to adjust their formula for maximum approximation to the standard (Fig. 1). Comparing the final results in scores, the most approximate to the standard is a sample of fish cutlets with the addition of chia seeds – with 35.5 (Fig. 2).

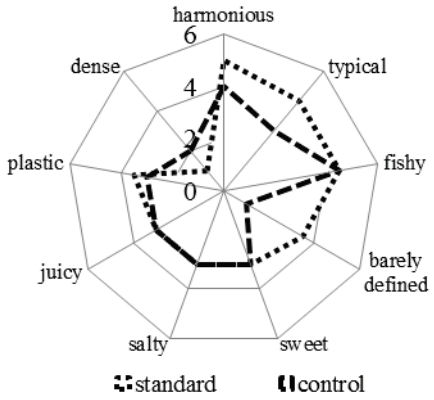

Fig. 1. Flavor Profilogram of Fish Cutlet (Control)

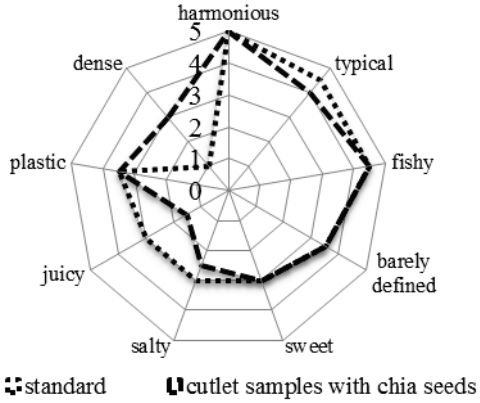

Fig. 2. Flavor Profilogram of fish cutlet with chia seeds

Cutlets with chia seeds are characterized with high indexes of such descriptors as the overall impression, harmonious, fishy, sweet and salty taste. As for their consistency, fish cutlets are plastic and dense on the cut.

A general assessment gives us an opportunity to state, that all the samples of fish cutlets have a positive overall impression, harmonious and fishy taste.

Analysis of the general chemical composition of semi-finished products showed that the protein content in the developed samples (sample 1-3) ranged from 16,20 up to 20,50 % (table 3). This is due to the fact, that all samples contain approximately the same proportion of protein contain-ning ingredients. They differ only by the nature of the origin of the ingredients: in control – the source of the protein is mostly fish raw materials, and in developed samples (sample 1-3) – plant raw materials.

Table 3

Chemical composition of semi-finished products, % (n=5, p≤0,05)

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

Conclusions The developed technology of fish semi-finished products will significantly expand the range of dietary products based on natural components, which will, to some extent, expand the actual problem of processing freshwater

fish. The obtained positive studies results testify to the continuation of the study of this technology and require further development.

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Анотація. *У статті представлені результати сенсорного аналізу січених напівфабрикатів з нетрадиційною сировиною (насінням чіа) методом профілю флейвору і встановлення їх відповідності гіпотетичному еталону.*

Отримані позитивні результати органолептичних досліджень показали доцільність поєднання насіння чіа з прісноводною рибою про, що свідчить високі показники таких показників, як загальне враження, гармонійний, рибний, солодкувато-солонуватий смак. За показником консистенції рибні котлети пластичні та щільні на розрізі.

Дослідним шляхом встановлено, що додавання нетрадиційної сировини дозволяє не лише удосконалити технологію виробництва січених напівфабрикатів, а й вирішити завдання отримання продукту підвищеної харчової цінності та дієтичного призначення.

Ключові слова. *Рибні котлети, нетрадиційна сировина, чіа, напівфабрикати, органолептичне оцінювання, сенсорна характеристика, флейвор, дескриптори, профілограма.*