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1. FOOD SCIENCE AND TECHNOLOGIES

НТБ ОНАХТ

DEVELOPMENT OF COMPOSITIONS AND TECHNOLOGIES OF CULINARY CONFECTIONERY PRODUCTS WITH DETOX PROPERTIES FOR INTRODUCTION IN MODERN ESTABLISHMENTS OF THE RESTAURANT INDUSTRY

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Abstract. *The technologies of preparation of culinary confectionery products (CCP) with pronounced detox properties are presented and the formulations of CCP using collagen hydrolysate and high content of dietary fiber are developed. Such CCP can be positioned as preventative nutrition for people with intellectual work.*

The objective functions in the optimization of the compositions of the CCP was a balanced ratio of the basic macroelements and their amino acid composition.

The chemical composition of CCP was investigated, organoleptic, physico-chemical, microbiological and nutritional and biological values were determined.

The ALST analysis was performed to predict the terms and conditions of storage of CCP, the production and storage of which were carried out under the same conditions, changing the storage parameters according to the established test plan, in conditions similar to modern establishments of the restaurant industry. It is established the created CCP will be competitive in the consumer market of Ukraine.

The results of this work were presented at the XII All-Ukrainian Scientific-Practical Conference of Young Scientists and Students with International Participation "Problems of Forming a Healthy Lifestyle in Youth" (2019). 2 scientific publications have been published. Received 2 patents for utility model and submitted 1 application. The elaborated CCP formulations were introduced into production at the Beer Garden Restaurant in Odessa.

Keywords: *protein; collagen hydrolysate; balanced nutrition; ALST test; competitiveness; culinary product.*

I. Introduction

Nutrition plays a major role in the absorption of basic nutrients of food, their distribution in the human body and accumulation [1].

For the modern man, the main issue is nutrition, especially balanced and healthy. However, the diet contains a high amount of carbohydrate products and contains virtually no sources of complete nutritional protein, fiber, micronutrients.

Low content of easily digestible protein in the diet leads to impaired protein metabolism in the human body and the development of diseases of the pancreas and intestines, reducing the body's resistance to various diseases [2]. All developed countries have raised the issue of healthy nutrition at the level of state policy [3-5]. Today in Ukraine, given the socio-economic conditions, it is becoming urgent as a vital necessity for the formation of state policies in the field of healthy nutrition.

The actual problem today is osteoporosis and osteochondrosis, as well as the slagging of the human body. In Ukraine and in the world, niche products with detoxifying properties are poorly developed. There are dietary supplements with de-

toxifying properties, but no products, so it is important to design and develop recipes for new products with detoxified properties with high protein and dietary fiber con- tent.

Nowadays, CCP are quite popular among different categories of the popula- tion. Particular attention is paid to biologically active substances (BAS) among most of the products and raw materials used for their preparation. This is due to the better transfer of natural compounds compared to synthetic ones, as well as the fact that natural compounds have a more complete effect. Such qualities are absent in the artificial components used for the preparation of CCP.

The purpose of this work is to develop formulations of CCP with detox properties.

II. Analytical review of the literature

The diet of modern man is rich in high-carbohydrate foods, while at the same time characterized by a reduced content of sources of high-grade protein, fiber, micronutrients [2].

All healthy foods contain ingredients that give them functional properties. According to D. Potter's theory, the modern market is effectively utilizing the basic types of functional ingredients: edible fibers (soluble and insoluble); vitamins and minerals, including macro and microelements; polyunsaturated fats (vegetable oils, fish oil, ω3 and ω6 fatty acids); antioxidants: β-carotene, vitamin C, vitamin E; oligosaccharides as substrates for beneficial bacteria [6].

The confectionery market is segmented. By sales, the largest of the segments are flour confectionery, among which muffins and cupcakes are more popular. To ensure the competitiveness of flour confectionery products, it is equally important to expand the range of products by introducing the functional ingredients listed above. [7].

The dietary fibers of beet pulp and wheat germ were considered as food fibers in the production of flour confectionery with functional properties [8].

The dietary fiber has a different granulometric composition and is characterized by a high water- absorbing and fat-holding abilities. Formulations and technologies of cupcakes with functional properties were developed using functional protein raw materials - chicken egg powder, powders of sour milk cheese and yogurt, skimmed milk powder [9].

As an additive with high water absorption properties, we used citrus fiber “Herbacel AQ Plus - type N”, which reduced the energy value of the product. Zucchini puree was used as a source of dietary fiber in the development of flour confectionery for healthy eating [10]. When designing the recipe, the flour was re- placed with an equivalent mass of zucchini puree. The introduction of courgette mashed potatoes has improved such indicators as volume, porosity, shelf life and reduced the time of whipping the dough. Serum was used as a milk base and a protein source for dessert preparation [11].

Vegetable raw materials - dietary fiber Citri-Fi - made it possible to obtain fine oxygen foam for desserts, which increased the stability of the finished product to the destruction of the polydisperse system. The rational quantity of the introduced additive is determined and substantiated, the technological scheme of preparation of the "Sirny" cupcake is developed. The composition of the flour confectionery was made of reconstituted persimmon powder in the amount of 4%, 6%, 8%, 10%. It has been

established that a cupcake made with the addition of 8% persimmon powder is a functional food product in terms of dietary fiber content [12].

Known functional composition CCP containing wheat flour, white sugar, margarine, chicken eggs, kefir or yogurt, salt, baking powder, flavoring, in addition as a source of dietary fiber beet fibers (lighted or unlit), and reduced the amount of white sugar. [13].

The known composition of the ingredients, having a detoxifying effect and as a source of dietary fiber contains activated carbon fiber material and food fiber ce- reals. [14]. Known composition of ingredients for the production of CCP, containing as a source of protein the animal origin collagen drug, as a source of dietary fiber - raisins and candied fruits. [15].

Known composition CCP functional purpose, containing as a dietary supplement for the enrichment of dietary fiber "Meal (Shrot) of wheat germ" [16], which provides increased nutritional value of the product. Ingredients of CCP are known to contain oat bran as a source of dietary fiber [17], which helps to improve the structure and organoleptic characteristics of the product and to increase nutritional value. In addition, it was considered the formulations of gluten-free CCP in which wheat flour (containing gluten) was replaced by corn flour [18] and rice flour, while obtaining a healthy food product with functional properties. From the above data, it follows the relevance of the development of products with balanced chemical composition; with low energy value; with reduced content of sugar and saturated fatty acids; increased content of healthy and healthy ingredients of functional and health-preventive value; be absolutely safe for humans. One of the basic principles of the concept of healthy nutrition is the position that nutrition should not only meet the needs of the human body for nutrients and energy, but also to fulfill preventive and curative goals [19].

Food fibers exhibit a variety of physico-chemical properties: water-holding capacity, water solubility, formation of solutions of different viscosity, ability to create gel, sorption, ion-ex- change and radio-protective properties [19]. Fish raw materials waste are sources of collagen and its hydrolysis products. Fish collagen is hypoallergenic because it is 96% identical to human protein [20-22].

Collagen and its hydrolysis products are widely used in the food industry, including as additives in bread-baking and confectionery industries [23].

Any protein is characterized by biological value, which characterizes its qual- ity, ability to provide plastic processes and synthesis of metabolically active sub- stances, and is conditioned by the presence of essential amino acids in them, their ratio with substitutes and digestibility in the gastrointestinal tract. Collagen is formed by the breakdown of proteins from foods. If at least one essential amino acid is absent, protein production stops. When forming your diet, it is important to con- sume products that enhance collagen synthesis. Although collagen is not a complete protein, its benefit is the presence of two rare amino acids: oxyproline and oxylysine. It acts as a source of glycine (up to 30%) [24].

Due to the absence of tryptophan, collagen is a protein of low biological value. Based on the physiological action of collagen can be attributed it to dietary fibers. It is proved that with optimal combination of muscle proteins and collagen, the rate of pure protein uptake is maximal [20, 23]. Collagen hydrolysis products (glutin, gelatin, etc.)

have a positive effect on the state and function of beneficial intestinal microflora, actively stimulate the secretory and movement functions of the stomach and intestines [23].

In this regard, it is important to develop scientifically sound technologies for products containing collagen hydrolysate and dietary fiber. Given that CCP in the Ukrainian food market among flour confectionery products is in high demand, therefore, it is promising to develop recipes for new types of CCP, enriched with collagen hydrolysate and dietary fiber.

III. Object, subject and methods of research

The object of the study is the technologies of manufacturing new types of CCP with detox properties and high protein content.

The subject of the study was formulations of high-protein CCP and with high content of dietary fiber.

Research methods. Collagen hydrolysate was obtained by alkaline treatment of collagen-containing fish raw materials (fish scales) according to the method de- scribed in the patent of Ukraine for utility model No. 79357 [see patent of Ukraine for utility model No. 79357, publ. 25.04.2013, bul. №8]. Collagen hydrolysate is white in color, odorless and tasteless, allowing it to be used as a biologically active additive to a variety of foods.

Vitamin composition was determined by high-performance liquid chromatography on a column (4 × 150 mm) filled with a 7-μm Separon C-18 sorbent (ZAT Nauchpribor, Russia) with an elution rate of 1.1 cm3 / min.

The mineral composition of the product was determined by annealing the sus- pension. Dry insulation was carried out at a high temperature (about 500 ° C) in the crucible in a muffle furnace under conditions that eliminate the loss of ash elements for 6 hours. The solids content of the solution was determined using an RL-3 refractometer (Poland). Microbiological parameters were determined according to the regulatory documents presented in table 1.

Table 1 - Microbiological indicators for cupcakes

Indicators	Regulatory document
Coliform E. coli bacteria, CFU in 0,1 cm^3	GOST 10444.15
Pathogenic microorganisms, including *Salmonella,* in 25 g of product	Instruction №1138
Number of molds, CFU in 1 g of product, not more	GOST 10444.12
The amount of yeast, CFU in 1 g of product, not more	GOST 10444.12
Staphylococcus aureus, in 0,01 g of product	GOST 10444.2

According to DSTU ISO 6658: 2005, organoleptic analysis was performed by analytical evaluation using a descriptive method (profiling method) and the method of using scales and categories (scoring using a point scale).

The competitiveness of the products was determined as follows. When calculating the future competitiveness of a product, the price and safety of the product are taken into account: Competitiveness is calculated using the formula:

$$K = Б \cdot \frac{\sum m_i \cdot g_i}{Ц}$$

where $\Sigma m_i g_i$ is the total complex indicator of the quality level, expressed in points (m_i is the coefficient of weight and g_i is the indicator of quality of the its property); C - price per unit of product; B - product safety.

Formulas (1) - (2) were used to formulate the complex quality index, where weight coefficients and relative quality indicators were taken into account. Considering the importance of individual indicators, the functional dependence of a comprehensive quality indicator is as follows:

$$K_0 = f(M_i \cdot K_i)$$

where M_i is the importance factor of the individual indicators, the sum of which must be equal to 1; K_i is the coefficient of evaluation of these indicators.

To study the detox properties of collagen hydrolysate, we used IR spectroscopy, which is based on the phenomenon of absorption by chemicals of IR radiation with simultaneous excitation of vibrations of molecules. Spectrophotometers are used for the study, which record oscillation data and as a result we obtain IR spectra.

In the IR spectroscopy use the middle part of the IR region, namely: 4000-200 cm^{-1}. When decrypting the IR spectra, reference materials were used and meant that the IR spectra of the polypeptides and proteins revealed some relatively strong ab- sorption bands, which, as a rule, relate to the vibrations of the –CO – NH– peptide group, as a general structural component of protein molecules.

IV. Research results

3.1 Determination of the detox properties of collagen hydrolysate

To date, scientists in Ukraine and the world are trying to solve the problem of contamination of the human body with heavy metals by creating dietary supplements for adsorption of heavy metals on the surface of the biological matrix and the removal of the formed complex compound from the human body. This is the principle of detoxification of the body.

Often used from natural polymeric carriers for complexing is agar is a polysaccharide consisting of agarose and agaropectin. Immobilization of enzymes on protein carriers can be carried out both in the absence and in the presence of cross-linking agents. In proteins that can be carriers, among the disadvantages are their high immunogenicity (except for collagen, collagen hydrolysate and fibrin). The development of effective matrices for the immobilization of heavy metal ions and their excretion from the human body is an urgent task, which will allow to expand the range of dietary supplements, dishes and culinary products in restaurants.

The most important functional properties of collagen hydrolysate include solubility and swelling, the ability to stabilize dispersed systems (foams, emulsions, suspensions), to form gels, to improve the adhesion and rheological properties of food systems. To confirm the ability of collagen hydrolysate to complex with heavy metals, that is, its detox properties, a corresponding study was conducted, which resulted in a number of IR spectra. Some of them are as follows: collagen hydrolysate, an immobilized form of heavy metal (Pb).

The data obtained showed a broad absorption band in the range 3200-3800 cm^{-1}, which is characteristic of collagen and its hydrolysis products. Analysis of the IR spectra of collagen hydrolysate showed the presence of a peak at 3500 cm^{-1}, indicating

that collagen hydrolysate is a product of collagen hydrolysis (amide A), peaks 1670,24 cm^{-1}, 1550 cm^{-1} characterize the presence of amide I and amide II. The presence of valence vibrations of the C = I group of nonionized and ionized acids is characterized by an absorption band at 1620 cm^{-1}.

In the collagen hydrolysate spectrum, an intense broad band with a maximum absorption at 3400 cm^{-1} is observed, which is shifted to the low-frequency region in comparison with the frequency of free OH- groups, which indicates the presence of hydroxyls in the hydrogen bonding system. The absence of an absorption band at 3650 cm^{-1} indicates that virtually all hydroxyl groups are included in the hydrogen bond. The density and strength of the hydrogen bond network were investigated us- ing a characteristic absorption band of 3400 cm^{-1}, which corresponds to the valence vibrations of the hydroxyl groups. For this purpose, the bandwidth was determined according to the wave numbers of the studied region of the spectrum.

The results of IR spectroscopy make it possible to position the collagen hydrolysate as an enterosorbent and prove that it has detox properties.

Using the results of the study above, as a dietary supplement in the production of CCP used the collagen hydrolysate, which has a high content of oxyproline and oxylysine. The collagen hydrolysate supplies the body with important material to create and strengthen articular cartilage, connective tissue, skin, hair and nails. Its regular intake also promotes skin elasticity and connective tissue strength.

3.2 Development of CCP formulations

Mathematical modeling (optimization) of the formulations of the CCP was performed according to the method described in [11] as follows.

The main task was to build an appropriate mathematical model, which includes the following steps: determining the purpose of the study; choice of optimality criterion; identifying major constraints; mathematical formalization.

A goal function is a research goal written mathematically as a function of variables. The aim of the CCP design was to maximize the nutritional value of the product being designed, which is defined as the sum of the nutritional value of the components of the PI whose mass consists of the formulation.

The nutritional value of the recipe ingredients of the banana CCP «Gluten-free» is presented in Table 1.

Table 1 – The nutritional value of the recipe ingredients of the banana CCP «Gluten-free»

Nutrients	Quantity of nutrients of prescription ingredients, g / 100g					
	Flour buck-wheat	Bananas	Butter	Walnut	Kefir	Chicken eggs
White	13,6	1,5	0,8	16,2	2,9	12,7
Carbohydrates	71,9	21	1,3	11,1	4	0,7
Fat	1,2	0,5	72,5	60,8	2,5	11,5
ω 3	0,071	0,027	0,07	7,1	0,023	0,101
ω 6	0,877	0,046	0,91	33,3	0,078	1,784
Total	87,65	23,07	75,6	128,5	9,5	26,8

To develop CCP, the objective functions are as follows:

- the banana CCP «Gluten-free»: $F(x) = (87,65 \cdot x_1 + 23,09 \cdot x_4 + 75,6 \cdot x_5 + 128,6 \cdot x_6 + 9,5 \cdot x_7 + 26,8 \cdot x_8)/100 \rightarrow \max$;

- CCP «Bubble»: $F(x) = (82,4 \cdot x_1 + 99,8 \cdot x_2 + 75,6 \cdot x_3 + 26,8 \cdot x_4 + 89,0 \cdot x_5 + 74,0 \cdot x_7 + 81,5 \cdot x_8 + 85,0 \cdot x_9 + 98,5 \cdot x_{10} + 70,0 \cdot x_{11} + 99,8 \cdot x_{12})/100 \rightarrow \max$;

- CCP «Snowball»: $F(x) = (30,6 \cdot x_1 + 82,4 \cdot x_2 + 80,3 \cdot x_3 + 99,8 \cdot x_4 + 75,6 \cdot x_5 + 128,5 \cdot x_6 + 74,0 \cdot x_7 + 70,0 \cdot x_9)/100 \rightarrow \max$;

- CCP «Nasinynka»: $F(x) = (82,4 \cdot x_1 + 99,8 \cdot x_2 + 98,5 \cdot x_3 + 26,8 \cdot x_4 + 104,8 \cdot x_5 + 80,3 \cdot x_6 + 128,5 \cdot x_7)/100 \rightarrow \max$

The resulting formulations of all CCP are presented below:

1. Developed recipe composition the banana CCP «Gluten-free»" contains buckwheat flour - 31,0 g; bananas - 40.5 g; chicken eggs - 15,0 g; kefir - 10.6 g; butter - 10.3 g; walnuts kernels - 10,0 g; vanilla sugar - 3.0 g; stevia - 1.6 g; baking soda - 2.0 g; table vinegar - 5.0 g;
2. Developed recipe composition CCP "Bubble" includes wheat flour - 43,9 g; sugar - 14.6 g; butter - 12.6 g; mélange - 4,9g; baker's yeast - 1.0 g; table salt 0.2 g; raisins - 5.8 g; candied fruit - 2.9 g; hazelnuts kernels - 7.7 g; vanilla powder - 0.9 g; collagen hydrolysate - 5.0 g; refined powder - 0.5 g;
3. Developed recipe composition CCP "Snowball" contains skimmed milk cheese - 41,0 g; wheat flour - 27,0 g; sesame black - 3.5 g; sugar - 3.5 g; butter - 7.0 g; walnuts –5,5 g; raisins - 4.8 g; table salt - 0.7g; collagen hydrolysate - 7.0g;
4. Developed recipe composition CCP "Nasinynka" includes wheat flour - 17.5 g; sugar - 27.4 g; vanilla sugar - 0.5 g; chicken eggs - 37.4 g; pumpkin seeds - 5.4 g; black sesame - 5.4 g; walnut kernels –5.4 g.

In the section of the CCP “Bubble”, it is seen that when the collagen hydrolysate is added to the formulation, the structure of the finished product also changes significantly. This increases the size of the pores and the color improves significantly (from light golden to golden). CCP “Bubble” has a glossy surface with a crispy crust. In the control sample, the surface is darker (from dark gold to light brown). The introduction of collagen hydrolysate promotes a uniform distribution of moisture, thereby the weight of the dough when baking is reaches a ready 10 minutes faster than in the control sample.

The analysis of organoleptic indicators of CCP showed their high-quality characteristics. We observe a drier structure of CCP, because of the presence in them of dietary fibers that have a water absorption capacity. The use of vegetable raw materials helps to increase the fiber content.

3.3 Investigation of the nutrient composition of CCP

The use of vegetable raw materials helps to increase the content of monosaccharides and dietary fiber, as well as minerals. The introduction of collagen hydrolysate in the formulations of CCP "Bubble" and "Snowball" allows you to enrich them with rare amino acids oxylysine and oxyproline, which play a major role in the human body in the formation of connective fibers. Created CCP can be called is having

functional properties, due to the content of its functional ingredients, are those whose content in the product meets from 10% to 50% of the daily requirement of the human body.

CCP "Snowball" has a high content of fats, vitamins of group B (B6, B2, B1), A, PP; minerals (P, K, Na, Fe, Mg, Ca), the energy value of the product meets 22.3% of the person's daily energy requirement. CCP "Bubble" is high in protein (however less than in CCP "Snowball"), fats and carbohydrates (mainly starch), as well as vitamin A and mineral P, the energy value of the product satisfies 10.5% of the daily human need for energy. In CCP "Nasinynka" we note the high content of protein, carbohydrates (mostly complex - starch), fiber, minerals (P, Fe and K), vitamins (A, B6 and B2), the energy value of the product satisfies by 12, 4% of a person's energy needs. In the banana CCP «Gluten-free», we note the high content of carbohydrates (mainly complex - starch), fats, fiber, minerals (P, Na, Fe and K), vitamins (A, PP and B1), the energy value of the product satisfies by 10.3% of a person's daily energy requirement. CCP "Nasinynka" and the banana CCP «Gluten-free» contain fiber, which are dietary fiber. Dietary fiber is a prebiotic that is not digested by endogenous secretions of the gastrointestinal tract of humans.

Dietary fiber has numerous physiological effects that determine the normal functioning of the body: stimulate the intestinal motor function; prevent cholesterol absorption; have a positive effect on the normalization of the composition of the gut microflora, slow down putrefactive processes; affect lipid metabolism, the violation of which leads to obesity; adsorb bile acids; contribute to the reduction of the content and removal of toxic substances.

The ratio of basic mineral substances for their highest degree of absorption meets the requirements for healthy nutrition and is: Ca: Mg: P = 2,9: 1: 3,4 - for CCP "Bubble", Ca: Mg: P = 1: 3: 0, 9 for CCP "Snowball". A study on the content of amino acids showed the presence of all essential amino acids, the limiting amino acid is methionine (amino acid score CCP "Bubble", "Snowball", "Nasinynka" and the banana CCP «Gluten-free» is 29.2%; % and 46.7% respectively).

3.4 Investigation of organoleptic and microbiological parameters of CCP during storage

In order to predict the terms and conditions of storage of the CCP, an ALST analysis was performed. Production and storage of CCP was carried out under the same conditions, changing the storage parameters in accordance with the established test plan ALST, in conditions similar to modern establishments of the restaurant industry.

To predict the actual shelf life of the CCP, we used the dependence of the process of changing commodity and CCP security indicators on the time and storage temperature. According to the ALST test, were investigated during storage micro-biological and organoleptic parameters. According to microbiological indicators, the developed CCP meet the requirements of the current sanitary legislation of Ukraine. E. coli bacteria (coliforms), pathogens, including bacteria of the genus Salmonella, S. Aureus were not detected in any specimen during storage. Research of organoleptic parameters. Optimal shelf life in conditions similar to the conditions of modern establishments of the restaurant industry for the banana CCP «Gluten-free» is 3 days, "Bubble" and "Snowball" - 4 days, and "Nasinynka" - 10 days without change of

organoleptic and microbiological parameters.

3.5 Sensory parameters research and competitiveness evaluation of CCP

The conditions of development of economy and society in the modern world make it necessary to assess the competitiveness of new foods. Competitively called products that are in demand by a large number of consumers and have a correspondingly higher level of quality than known counterparts, but different from the latest elements of innovation in the form of intellectual property: patents, etc. The competitiveness of a product can only be determined by comparing its properties with those of competitors or with a hypothetical standard product.

As the consumer first and foremost pays attention to organoleptic characteristics and nutritional value, the above competitiveness criteria were given a higher weighting factor. The competitiveness of CCP "Bubble", "Snowball", "Nasinynka", and the banana CCP "Gluten-free" is 65.5; 58.8; 51.1 and 54.2 points, respectively. From the presented results, it follows that all developed CCP will be competitive in the consumer market of Ukraine due to the improvement of organoleptic characteristics, high content of protein, vitamins and minerals, the presence of preventive properties, which is very important for children, for people with intellectual work and the elderly. In addition to the above the banana CCP "Gluten-free" does not contain gluten, which allows you to recommend this CCP to people with celiac disease.

Conclusions

1. Investigation of the ability of collagen hydrolysate to form a complex with heavy metal, according to the results of IR spectra, confirm its detox properties;
2. Developed compositions and technologies for the production of CCP "Bubble" and "Snowball", which are enriched with collagen hydrolysate; "Nasinynka" and the banana CCP "Gluten-free";
3. Determined the qualitative composition of nutrients (micro- and macronutrients, vitamins);
4. Characterized the qualitative composition of the protein by the balance of amino acids. A limited amino acid is methionine.;
5. Competitiveness studies have shown that CCP developed will be competitive in modern establishments of the restaurant industry;
6. The critical term of realization of the banana CCP «Gluten-free» is 3 days, CCP «Bubble» and «Snowball» - 4 days, CCP «Nasinynka» - 10 days.

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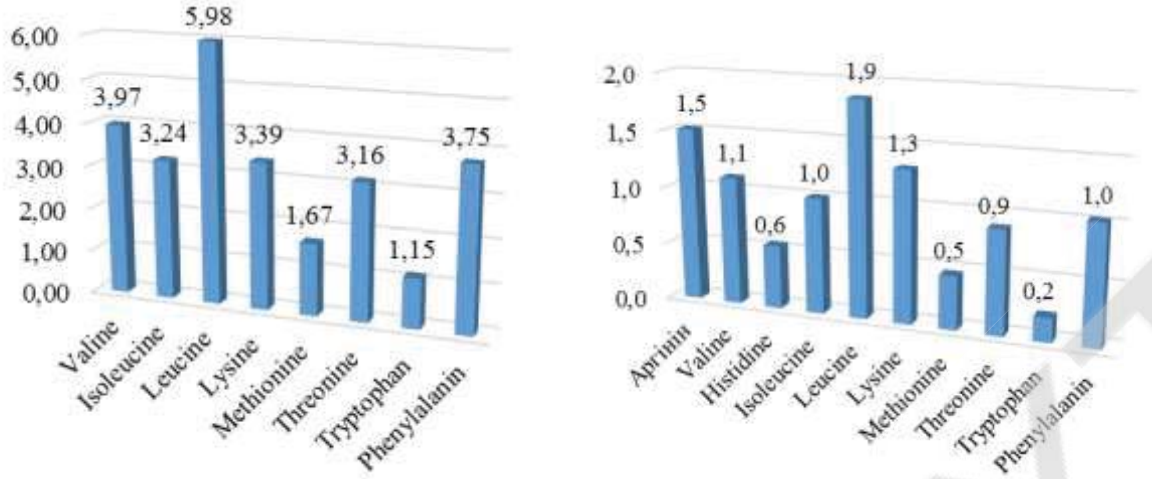
Application A

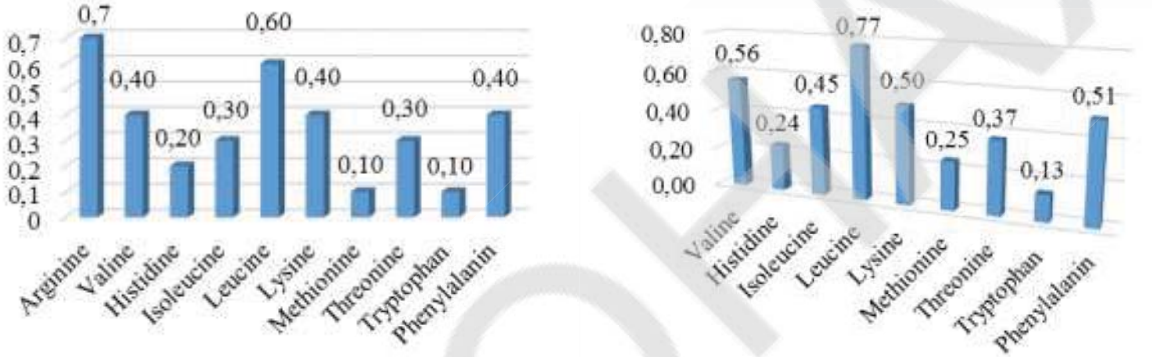
Table 1 - Chemical composition and satisfaction of CCP "Snowball", "Bubble", "Nasinynka" and the banana CCP "Gluten-free" daily requirement in nutrient rents, %

Indicator		CCP "Snowball"		CCP "Bubble"		CCP "Na-sinynka"		the banana CCP "Gluten-free"		Adequate intake of g, mg / day
		100 g content	satisfaction of daily requirement, %	100 g content	satisfaction of daily requirement, %	100 g content	satisfaction of daily requirement, %	100 g content	satisfaction of daily requirement, %	
Water, g		50,4	3,5	41,3	2,8	34,4	2,2	46,3	3,1	1500…2000
Protein, g		22,2	24,7	11,6	12,9	9,6	10,6	6,6	7,3	58…117
Fat, g		13,2	12,0	11,2	10,2	10,8	9,8	14,1	15,7	60…154
Carbohydrates, d. including:		12,2	4,9	35,3	31,4	43,6	25,5	10,09	3,4	257…586
monosaccharides, g		10,8	3,1	14,9	4,3	31,1	8,9	4,7	1,9	207…486
starch, g		1,4	1,8	20,4	27,1	12,5	16,6	6,2	8,9	50…100
Cellulose, g		2,0	13,1	0,6	4,1	1,6	10,4	1,7	13,1	10…15
Mineral substances, mg per 100 g	Na	852,1	21,3	14,0	0,4	61,3	1,5	344,6	6.9	4000…6000
	K	393,0	24,6	142,7	8,9	164,3	10,3	132.2	4.4	2500…5000
	Ca	329,0	11,0	18,9	0,6	97,8	3,3	29.4	3.7	800
	Mg	111,3	13,9	15,4	1,9	65,0	8,1	28.5	7.1	400
	P	377,0	94,3	61,7	15,4	196,1	49,0	76.5	6.4	1200
	Fe	2,8	18,7	0,8	5,0	2,6	17,3	1.2	8	10…18
Vitamins, mg per 100 g	A	0,1	74,9	0,5	74,9	0,1	74,9	0,1	0.02	800…1000
	β-carotene	0,1	1,7	0,1	0,8	0,0	0,2	0,1	1,2	5…10
	B1	0,3	17,3	0,1	5,3	0,1	9,3	0,2	10,0	1.1…2.1
	B2	0,4	20,6	0,1	2,8	0,2	12,8	0,1	7.7	1.3…2.4
	B6	0,4	190,0	-	-	0,2	75,0	-	-	0,1…0,2
	E	1,0	6,5	-	-	1,4	9,5	0,5	3,3	12…15
	PP	6,8	33,9	0,7	3,3	1,6	7,8	1,7	8,5	14…28
	C	1,9	2,4	0,4	0,5	0,3	0,4	2,8	3,5	70…100
Energy value, kcal		558,2	22,3	261,8	10,5	310,7	12,4	198,7	9,9	1800…4200



A B

Fig. 1 - Amino acid profile CCP "Bubble" (A) and "Snowboll" (B), mg / 100 gr



A B

Fig. 3 - Amino acid profile CCP "Nasinynka" and the banana CCP "Gluten-free", mg / 100 gr

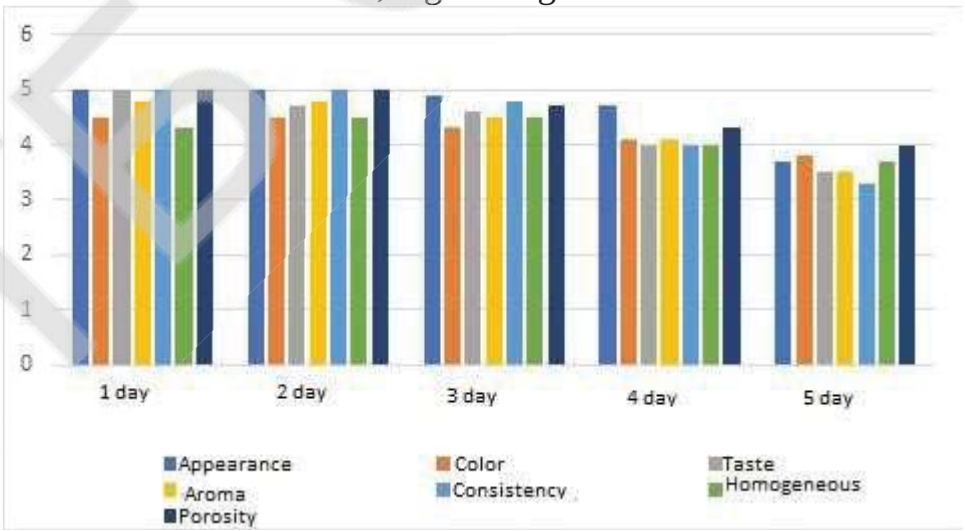


Fig. 5 - Organoleptic profile of CCP "Bubble" during storage

Fig. 6 - Organoleptic profile of CCP "Snowball" during storage

НТБ ОНАХТ

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