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## BEVERAGE WITH COLLAGEN HYDROLYZATE

**Abstract.** This article explores the development of a technology for producing dry drinks based on collagen hydrolysate. It covers the selection of components for these drinks, the creation of prototypes, and the determination of their qualitative characteristics.

Collagen hydrolysate was chosen as the primary ingredient, with strawberries and raspberries serving as auxiliary raw materials. These raw materials met the requirements of current regulatory documentation, hygienic standards for food safety and nutritional value, and relevant legal regulations, all supported by documentation certifying their safety and quality. The ratios of the components for the dry drinks were determined empirically. Through experimental tests, the optimal ratios were identified, enabling the development of formulations for the dry drinks.

**Keywords:** collagen hydrolyzate, dry drink, vegetable raw materials.



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**Introduction.** Nutrition performs the most important biological function that implements the connection of a person with the external environment through the digestive tract and has a decisive influence on health, performance, resistance of the body to the effects of environmentally harmful factors of nature and the environment. In this regard, the problem of nutrition has always been and remains extremely relevant.

However, recently in many countries of the world, the structure of nutrition has deteriorated significantly, mainly due to a decrease in the consumption of the main food groups – sources of biologically complete and active substances. The norms of a complete protein are satisfied by only a little more than 70%, 90% of the studied residents were found to be deficient in vitamin C, 30-40% – vitamins of group B, P – carotene, vitamin E [1].

Global pollution of the surface of waters and land, local radioactive contamination lead to the saturation of food with toxic elements, antibiotics, pesticides, radionuclides. Consumption of contaminated products weakens the body's defenses, primarily reducing the antitoxic function of many important organs [2].

Solving the problems of healthy and corrective nutrition is associated with many tasks, primarily with complex studies of the chemical composition, nutritional and biological value of food products, the development of principles and ways of enriching food products with micronutrients, dietary fiber, probiotics and other important components, the creation of products of a given chemical composition (functional products); development of specialized food products, including for enteral, medical, sports nutrition [3]. When solving the problem, an important role is given to drinks based on natural raw materials, which satisfy the body's needs for fluid, make up for the deficiency of vital nutrients, and act as an effective tool for the prevention of common alimentary-dependent diseases. Drinks are also an excellent basis for artificial enrichment with vitamins, microelements, dietary fiber, proteins, amino acids and other natural substances and can be used to provide the human body with micronutrients [4].

Progressive technologies for processing vegetable raw materials make it possible to obtain concentrated bases (extracts and juices), on the basis of which various types of carbohydrate-containing drinks are produced. Protein-containing drinks are produced mainly on the basis of raw materials from the dairy industry and are represented by milk and products of its processing. At the same time, the assortment of such drinks is still insufficient, and the natural local resources remain in little demand or insufficiently unclaimed. There are especially few developments in the field of rational and targeted use of protein-rich secondary resources of the meat processing industry, as well as liquid protein hydrolysates enriched with biologically active substances.

As you know, for the normal and versatile functioning of the body, nutrients are needed: proteins, fats, carbohydrates, vitamins, minerals, water in certain dosed quantities and certain ratios in accordance with gender, age, physiological status, professional activity, and living conditions [5].

Regardless of the source, the main requirement for food products is their safety and nutritional value. Nutritional value is the properties of a food product that can satisfy the physiological norms of a person with normal metabolism. It consists of the nutritional properties of nutrients and their digestibility. In turn, the nutritional properties of the constituent parts of food depend on their energy and biological properties. Nutritional value in products is determined in practice by calculating the percentage of compliance of each of the most important components of products with a balanced nutrition formula. Among nutrients, the most important role is given to proteins in connection with their plastic function. In fact, it is difficult to imagine any act of life without proteins. Suffice it to say that the genetic code of an organism is realized through the synthesis of specific proteins [6].

Proteins are biological catalysts for all processes in the body, and finally, the person himself is a macroprotein body, since its dry matter consists mostly of protein, forming almost all organs, tissues, and communication systems. In practice, proteins themselves are not indispensable components; information about the presence of certain essential amino acids in them is important, which determines the quality of a protein that contains the entire set of essential components in the required ratios. Among natural proteins, animal proteins contained in milk, meat, fish, and eggs are closest to it. Plants are significantly inferior to them [7]. A deficiency of at least one of the essential amino acids causes serious pathologies associated with mental and physical fatigue, and long-term diets lead to death [8]. Therefore, in ensuring a healthy diet, the search for substitutes is an urgent task.

**Materials and methods.** The following methods were used to determine the total chemical composition of raw materials, semi-finished products and finished beverages:

- Physical and chemical indicators of liquid drinks according to GOST 28188-89 “Non-alcoholic drinks”, general specifications [9].
- Protein content – by the Kjeldahl method and by Lowry.
- Determination of amine nitrogen – by the method of formol titration.
- Active acidity was determined potentiometrically on pH meter RN121.
- Syrup color – spectrophotometrically.
- To determine the titratable acidity, the samples were titrated with 0.1 N NaOH solution until 4 drops of the sample, when mixed with 2 drops of red phenolphthalein, ceased to discolor it.
- Microbiological indicators were monitored using an MBI-3 microscope in accordance with the methods described in the “Instructions for the sanitary and microbiological control of brewing and non-alcoholic production” IK 10-04-06-140-87 and “Instructions for microbiological control of the production of highly resistant non-alcoholic beverages” IK 10-5031536-105-91. Microbiological studies were carried out according to SanPiN 2.3.2.1078-01 “Hygienic requirements for the safety and nutritional value of food products” [10].

Collagen hydrolysate from horse tendons obtained by enzymatic method and freeze-dried was used in the work.

**Research results.** The purpose of our research is to develop a technology for producing dry drinks based on collagen hydrolyzate.

To achieve this goal, the following tasks were solved:

- selection of components for obtaining dry drinks based on collagen raw materials;
- obtaining prototypes;
- determination of qualitative characteristics (organoleptic, physicochemical, microbiological and safety indicators) of the obtained dry drinks.

To obtain dry drinks, collagen hydrolyzate was chosen as a base, the flavor of hydrolysates is itself neutral, perfectly combined with various herbal supplements: fruits, berries, flowers, leaves, rhizomes, medicinal plants, etc. In connection with the foregoing, as an auxiliary raw material in the production of dry drinks based on collagen hydrolyzate, we have chosen strawberries and raspberries

The above raw materials used to produce dry drinks met the requirements of the current regulatory documentation, hygienic requirements for the safety and nutritional value of food products and the requirements established by regulatory legal acts and was accompanied by documentation certifying its safety and quality.

The ratio of the components of dry drinks was selected empirically, and as a result of the experimental tests, the optimal ratios were determined, which made it possible to develop formulations of dry drinks.

**Discussion.** The optimal ratio of components of dry drinks provides a tonic and restorative effect of the resulting product, and the synergistic effect and combination of components made it possible to increase the biological value of the product due to the content of a large number of bnks, macro- and microelements, vitamins, fats, carbohydrates, which play an important role in human life, and also to give the product an attractive appearance and natural taste, smell and aroma of the feedstock.

Organoleptic characteristics of some types of obtained dry drinks are given in Table 1.

Table 1

Evaluation of the organoleptic characteristics of a collagen drink with strawberry and raspberry flavor

Name	Description
Appearance	Powder
Color	White pink
Taste and smell	Has a fruity aroma of strawberry and raspberry

As a result of the research, a product with high organoleptic characteristics was obtained: natural color, taste and smell, characteristic of the type of plant material used.

The microbiological, physicochemical and safety indicators of the developed dry drinks were also determined. The results were compared with the requirements of the Technical Regulations of the Customs Union, which entered into force on July 1, 2013 (Tables 2, 3) and found that the resulting dry drinks fully meet the hygienic requirements of food safety and comply with international standards.

Table 2

Physical and chemical parameters and nutritional value of a drink with collagen hydrolyzate

Name	Indicators	Norm according to GOST 36621-2019
Moisture content, %	6.4	7.5 no more
Protein content in dry matter, %	72.3	50.0-80
Mass fraction of fat, %	12.4	No more than 20 will include
Mass fraction of carbohydrates, %	8.9	No more than 10
Solubility index, cm <sup>3</sup>	4.00	4.00

Table 3

Microbiological parameters of the drink with collagen hydrolyzate

Name	According to TR TS 21/2011 "Food Safety"	Indicator value
Pathogenic microorganisms, including salmonella 25 cm	-	Not found
In the mass of the product (g) there should be no Escherichia coli	5	Not found
In the mass of the product (g) there should be no sulfite-reducing clostridia	1	Not found
Yeast, PFC/g, not high	50	Not found
Mold CFP/g, not higher	10	Not found
Number of mesophilic aerobic and facultative anaerobic microorganisms, p/g, not higher	$5 \times 10^4$	1

The conducted research on the production of dry drinks and the high quality characteristics of the final product made it possible to develop a technology for the production of dry drinks. The technological process meets the safety requirements in accordance with GOST 12.3.002, and the equipment used meets the requirements of GOST 12.2.003 and the rules for safety and industrial sanitation for food industry enterprises. The developed technology for obtaining dry drinks provides for mixing fruits, berries, collagen hydrolyzate according to the recipe, packing and packaging. The resulting dry drinks have a balanced composition that

favorably affects the functioning of the vital systems of the body, correcting and normalizing their work.

The composition of the obtained dry drinks includes a large amount of proteins, vitamins, biologically active substances, macro- and microelements necessary for the body, which provides a general strengthening effect. Since the drink does not contain caffeine, it is perfect for frequent use, providing a tonic effect, as well as an effect due to the properties of the components used.

Safety studies were also carried out in accordance with the Technical Regulations of the Customs Union TR TS 021/2011 “On Food Safety” (Table 4).

Table 4

## The amount of toxic elements in a drink with collagen hydrolysis

Name	Norm according to the technical regulation of the Customs Union TR TS 021/2011 “On food safety of products”, mg/kg, not higher	Index
Lead	5.0	Not found
arsenic	3.0	Not found
Cadmium	1.0	Not found
Mercury	1.0	Not found
HCG pesticides ( $\alpha$ , $\beta$ , $\gamma$ and isomers)	0.1	Not found

Dry drinks are stored in rooms protected from direct sunlight at a temperature not exceeding 20°C and relative humidity in the room not exceeding 70% for two years, without losing their quality characteristics. Thus, as a result of the experimental studies, dry drinks were obtained, which made it possible to significantly expand the range of food products in this group.

**Conclusion.** Qualitative characteristics (organoleptic, physico-chemical, microbiological indicators and safety indicators) of the resulting dry drinks were determined and it was found that the product has high quality characteristics that meet international requirements for food products in accordance with the Technical Regulations of the Customs Union TR TS 021/2011 “On food safety products”.

Studies have shown that a collagen drink can make up for the lack of protein in the diet. Also, the body will compensate for the lack of protein due to collagen in order to support the functioning of vital body systems, for example, the musculoskeletal system. A powdered drink is convenient to consume throughout the day

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#### **КОЛЛАГЕН ГИДРОЛИЗАТЫ СУСЫНЫ**

**Аңдатпа.** Бұл мақалада коллаген гидролизатына негізделген құрғақ сусындарды өндіру технологиясының дамуы зерттелді. Коллаген шикізаты негізінде құрғақ сусындарды алу үшін компоненттерді таңдау, тәжірибелік үлгілерді алу, алынған құрғақ сусындардың сапалық сипаттамаларын анықтау қарастырылды. Құрғақ сусындарды алу үшін коллаген гидролизаты таңдалды, ал коллаген гидролизаты негізінде құрғақ сусындарды өндіру үшін көмекші шикізат ретінде құлпынай мен таңқурай таңдалды. Құрғақ сусындарды өндіру үшін пайдаланылған жоғарыда аталған шикізат қолданыстағы нормативтік құжаттаманың талаптарына, тамақ өнімдерінің қауіпсіздігі мен тағамдық құндылығына қойылатын гигиеналық талаптарға және нормативтік құқықтық актілерде белгіленген талаптарға сай болды және оның қауіпсіздігі мен сапасын кәуәландыратын құжаттамамен бірге жеткізілді.

Құрғақ сусындардың құрамдас бөліктерінің арақатынастары анықталды, олар эмпирикалық жолмен таңдалды және тәжірибелік сынақтардың нәтижесінде құрғақ сусындардың рецептураларын жасауға мүмкіндік беретін оңтайлы арақатынастар анықталды.

**Тірек сөздер:** коллаген гидролизаты, құрғақ сусын, өсімдік шикізаты.

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### **НАПИТОК С ГИДРОЛИЗАТОМ КОЛЛАГЕНА**

**Аннотация.** В данной статье рассмотрена разработка технологии производства сухих напитков на основе гидролизата коллагена. Рассмотрены вопросы выбора компонентов для получения сухих напитков на основе коллагенового сырья, получения опытных образцов и определения качественных характеристик полученных сухих напитков. Для получения сухих напитков выбран гидролизат коллагена, а в качестве вспомогательного сырья для производства сухих напитков на основе гидролизата коллагена выбраны ягоды клубники и малины. Вышеуказанное сырье, используемое для производства сухих напитков, соответствовало требованиям действующей нормативной документации, гигиеническим требованиям безопасности и пищевой ценности пищевых продуктов и требованиям, установленным нормативными правовыми актами, и сопровождалось документацией, удостоверяющей его безопасность и качество.

Определены соотношения компонентов сухих напитков, они подобраны опытным путем, в результате экспериментальных испытаний определены оптимальные соотношения, что позволило разработать рецептуры сухих напитков.

**Ключевые слова:** гидролизат коллагена, сухой напиток, растительное сырье.