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INNOVATIVE APPROACHES IN THE CREATION OF TECHNOLOGIES OF DRY CONCENTRATES COCKTAILS WITH INCREASED CONTENT BIOLOGICALLY ACTIVE SUBSTANCES

Modern trends in the creation of drinks provide for the use of various infusions, plant extracts, as well as vitamin and mineral complexes, organic acids and polysaccharides as part of their bases, which allows for the normalization of physiological and metabolic processes in the human body and prevents a number of diseases and syndromes that lead to a decrease in working capacity. The main problems in the creation of various drinking forms are associated with the purification and preparation of water, the dissolution of components and their possible interaction with each other in the packaging unit during storage. Considering the above, it is relevant to create dry concentrates for long-term storage for the preparation of drinks and cocktails as promising drinking forms for normalizing the nutritional status of the population of Ukraine and other countries. It has been established that the physiological value of dry drinks according to the developed method is preserved in ready-made commercial forms (sticks with a metallized substrate) for the entire recommended shelf life – 12 months. The mixture, when diluted, provides the desired functional properties and is a convenient form for transportation and preparation, taking into account the usual dilution with a liquid, mainly drinking water. The novelty of individual technological solutions and the revealed physiologically functional properties lies in the use of extracts of plants, fruits, berries, vegetables with an increased content of biologically active substances, as well as the use of other components that have unique physiotherapeutic properties for humans.

Key words: dry concentrates, beverages, biologically active substances, cocktails, technologies.

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ІННОВАЦІЙНІ ПІДХОДИ У СТВОРЕННІ ТЕХНОЛОГІЙ СУХИХ КОНЦЕНТРАТІВ КОКТЕЙЛІВ З ПІДВИЩЕНИМ ВМІСТОМ БІОЛОГІЧНО АКТИВНИХ РЕЧОВИН

Сучасні тенденції створення напоїв передбачають використання в складі їх основ різних настоїв, екстрактів рослин, а також вітамінно-мінеральних комплексів, органічних кислот і полісахаридів, що дозволяє забезпечити нормалізацію фізіологічних і метаболічних процесів в організмі людини і запобігти низці захворювань і синдромів, що знижують працездатність. Основні проблеми при створенні різних питних форм пов'язані з очищенням і підготовкою води, розчиненням компонентів і їх можливими взаємодіями в ході зберігання в фасувальній одиниці. З огляду на викладене, актуальним є створення сухих концентратів тривалого зберігання для приготування напоїв та коктейлів в якості перспективних питних форм для нормалізації харчового статусу населення України та інших країн. Встановлено, що фізіологічна цінність сухих напоїв за розробленим способом зберігається в готових товарних формах (стіках з металізованою вкладкою) протягом рекомендованого терміну зберігання – 12 місяців. Суміш при розведенні забезпечує задані функціональні властивості і є зручною формою для транспортування і приготування, враховуючи звичайне розведення рідиною, переважно питною водою. Новизна окремих технологічних рішень і виявлених фізіологічно функціональних властивостей полягає у використанні екстрактів рослин, плодів, ягід, овочів зі збільшеним вмістом біологічно активних речовин, а також використанні інших компонентів, що мають унікальні фізіотерапевтичні властивості для людини.

Ключові слова: сухі концентрати, напої, коктейлі, біологічно активні речовини, технології.

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ИННОВАЦИОННЫЕ ПОДХОДЫ В СОЗДАНИИ ТЕХНОЛОГИЙ СУХИХ КОНЦЕНТРАТОВ КОКТЕЙЛЕЙ С ПОВЫШЕННЫМ СОДЕРЖАНИЕМ БИОЛОГИЧЕСКИ АКТИВНЫХ ВЕЩЕСТВ

Современные тенденции создания напитков предусматривают использование в составе их основ различных настоев, экстрактов растений, а также витаминно-минеральных комплексов, органических кислот и полисахаридов, что позволяет обеспечить нормализацию физиологических и метаболитических процессов в организме человека и предотвратить ряд заболеваний и синдромов, влекущих снижение трудоспособности. Основные проблемы при создании различных питьевых форм связаны с очисткой и подготовкой воды, растворением компонентов и их возможным взаимодействием друг с другом в фасовочной единице в ходе хранения. Учитывая изложенное, актуальным является создание сухих концентратов длительного хранения для приготовления напитков и коктейлей в качестве перспективных питьевых форм для нормализации пищевого статуса населения Украины и других стран. Установлено, что физиологическая ценность сухих напитков по разработанному способу сохраняется в готовых товарных формах (стиках с металлизированной подложкой) весь рекомендуемый срок хранения – 12 месяцев. Смесь при разбавлении обеспечивает заданные функциональные свойства и является удобной формой для транспортировки и приготовления, учитывая обычное разбавление жидкостью, преимущественно питьевой водой. Новизна отдельных технологических решений и выявленных физиологически функциональных свойств заключается в использовании экстрактов растений, плодов, ягод, овощей с увеличенным содержанием биологически активных веществ, а также использовании других компонентов, имеющих уникальные физиотерапевтические свойства для человека.

Ключевые слова: сухие концентраты, напитки, кокейли, биологически активные вещества, технологии.

Introduction.

To date, one of the ways to create dry concentrates of beverages is the use of dry extracts, powders of herbs and plants, as well as vitamin-mineral complexes, which provide a positive physiological effect on the human body, optimizing the micronutrient composition [1].

The creation of dry beverage concentrates should take into account the balance of micronutrients and their physiological justification. In addition, the components must complement each other. Therefore, the principles of

combining components require careful attention of developers [2].

Given the above, the development of an algorithm that selects the components of dry beverage concentrates has become relevant. During the development of the algorithm it was necessary to take into account several important factors:

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- the concept of the product, which, ultimately, should have a high nutritional status with a wide range of beneficial effects on the human body;
- high technological characteristics (solubility, flowability, absence of lumps and sticking);
- high organoleptic characteristics;
- synergism of components in the direction of their action on the human body.

The first factor is provided by inclusion in structure of complexes of deficient nutrients allowing to provide the set functional and dietary properties. In addition, it is necessary to preserve the physiological value and quality indicators during storage

The second factor is provided by the introduction of technological media, such as maltodextrin, pectin, lactose, pectins, gums and the like.

Organoleptic characteristics are formed due to aromatic compositions, dyes of natural and synthetic origin, flavor enhancers, organic acids, thickeners, emulsifiers, sweeteners and sugar substitutes.

The latter factor is considered knowledge-intensive and actually forms the "know-how" of the food.

The results of monitoring consumer activity and market supply of similar products in Ukraine and the dynamics of demand in other countries were taken into account when developing recipes for dry concentrates of cocktails (hereinafter – DCC).

From the existing information on consumer motivation in choosing such foods, as well as consumer perceptions of the quality and benefits of beverages, it became clear that the main attention is paid to the quality and naturalness of the ingredient composition of the product. The price practically does not influence a choice, the reputation of the manufacturer and advertising influences more.

It is important to note that a significant number of respondents consider it appropriate and necessary to include in their diet specially designed non-traditional products that contain a complex of physiologically necessary nutrients that have proven antioxidant, immunomodulatory, tonic and other necessary effects. In addition, the basis of demand is the commodity form of the finished product. The most convenient was the product in sticks, the contents of which are diluted with water (100-200 ml) and consumed anywhere - at work, at home, when traveling and more. These products should be intended for periodic use in order to effectively eliminate micronutrient deficiency, strengthen the body under stress, during mental and physical exertion, as well as in the negative impact of the environment.

A survey of experts in the field of functional and dietary nutrition confirmed that dry beverage concentrates are promising basic products for their creation of dietary and functional foods, the direction of physiological effects of which is determined by the composition of micronutrients used base [4].

Physiological and functional properties of dry concentrates are primarily determined by the high content of biologically active substances, which, entering the stomach, are intensively absorbed through the

mucosa and, entering the bloodstream, improve metabolic and regenerative processes, strengthen the body's immune status. As a result of activation of metabolic processes, the assimilation of physiologically valuable macro and micronutrients from the main meals is significantly increased, which allows to significantly increase their activity and provides high efficiency of the total physiological effect.

Analysis of literature data and problem statement. The process of digestion of a food or beverage is determined by the specific features of its prescription components, which affect the level of supply of macro- and micronutrients, useful biologically active components of the consumer's body. The peculiarity of plant raw materials is that different parts of plants do not always contain the same biologically active substances, which leads to the use of appropriate extracts from the corresponding vegetative part in the formulation of a particular type of beverage concentrate. In view of this, it is extremely important to study the characteristics and features of the impact on the human body not only of a particular plant species as a whole, but also of each of its parts separately. The combination of dry plant extracts allows to obtain targeted formulations of beverages intended / recommended for dietary or functional nutrition of different segments of the population both by age and by the specifics of living or working conditions, environmental factors, frequency of stressful situations.

The analysis of literature data allowed us to conclude that the importance and necessity of development in the direction of creating dry concentrates of cocktails.

The author [5] describes the state and prospects of production of dry beverages from natural raw materials given the tonic, stimulating and detoxifying effect of raw components of plant origin. The author bases the development of dry drinks on the law of balanced nutrition, which determines the proportions of individual substances in diets, reflects the full range of metabolic processes in the human body, which are characterized by chemical reactions. The main focus is on food components that cannot be replaced by synthetic raw materials.

Researchers [6] described the development of dry mixes for athletes to reduce thirst and restore the supply of electrolytes lost with sweat, because drinking regime during training and competitions - a prerequisite for maintaining the health of athletes, their activity. forms of dry drink for this segment of the population given the accelerated rhythm of life.

Scientists [7] have developed concentrates of beverages, the feature of which is the bulk density without compaction in the range of 500-600 kg / m³, which can be compared with the bulk density of milk powder. Bulk density with compaction is 20-30% higher than without compaction. The obtained values show that the particles of the components that are part of the concentrates are closely spaced relative to each other. This contributes to the compactness of the container. The increased density of concentrates allows to reduce air

content and to reduce risk of spoilage of a product, owing to contact with oxygen.

The author [8] described the technology of production of dry effervescent beverage concentrate and described the prescription components used in its preparation. The present invention is to reduce allergenicity, increase the energy value and foaming ability of the beverage, eliminate the negative impact on calcium metabolism, increase calcium and magnesium in the salt balance. For this purpose, the concentrate of dry effervescent beverage was proposed to be made on the basis of sodium bicarbonate, dry protein and food acid, characterized in that it contains sodium bicarbonate, calcium carbonate, magnesium carbonate, citric acid, glucose, sugar, dry soy and / or egg white. and flavors.

The researcher [9] developed a technology for the manufacture of a two-component concentrate for the preparation of a beverage, characterized in that the first component contains an aqueous extract of a mixture of plant and wood raw materials, citric acid and dye, and a mixture of plant and wood raw materials used includes St. John's wort, licorice root, eleutherococcus root, rowan berries, oak bark, and the second component of the concentrate is a mixture of essential oils of bay leaf, eucalyptus, lemon, pine and grapefruit.

Scientists [10] have formulated the invention of an instant dry coffee beverage, which when restored provides improved foaming. The patent describes a method of improving foaming in instant beverages.

The authors [11] describe the claims relating to the non-alcoholic, food-concentrating industry and can be used in the diet of the population living in environmentally unfavorable regions. This is a multicomponent concentrate containing extractives of fruit and berry raw materials (black currant berries in combination with the vegetative part of the black currant bush and dry amaranth leaf variety "Valentina"), carbohydrate additive (granulated sugar or maltose molasses) and drinking water.

The researcher [12] described a method of making a dry concentrate for a diet soft drink with perga, iron and vitamin C.

Scientists [13] described the developed technology of dry specialized drinks enriched with vitamins, beta-carotene and pectin. It is shown that the use of the developed mixer in the technology of production of dry fortified beverages allows to obtain a high quality powder concentrate, to solve the problem of lumping and agglomeration of loose dispersed components of raw materials and their uniform distribution throughout the product. The nutritional value of a specialized product designed to optimize the therapeutic and preventive nutrition of workers of metallurgical enterprises is determined.

Other researchers [14] have proposed a formula for making a dry specialized protein-carbohydrate product for athletes, which includes sunflower oil, canola oil, linseed oil, CLA (conjugated linoleic acid). These types of oils are digested slightly differently than other types of fats, and are oxidized as quickly as carbohydrates,

providing a relatively weak synthesis of subcutaneous fat. In addition, the oils in the product are rapidly converted to ketones - by-products of fat metabolism, which are used by some body tissues, including muscle, for energy. However, there is a downside: the use of increased amounts of fat inhibits the body's absorption of protein and carbohydrates. As a result, glycogen recovery and synthesis of new muscle fibers deteriorate.

Scientists [15] have developed a dry protein blend for cocktails for pregnant and lactating women. The invention relates to the food industry. The mixture contains as a protein - soy protein isolate as a source of carbohydrates - a mixture of sugar and maltodextrin, dietary fiber, vitamin and mineral premixes, taurine and other food additives, in the ratio of taurine, sugar and maltodextrin, which improves quality, correction and prevention - energy imbalance.

3. Experimental and calculation part.

The development of recipes for dry concentrates of cocktails was carried out based on data from the monitoring of the nutritional status of the population of the Dnipropetrovsk region. We were guided by the principles of providing the body with micro-nutrients with the exception of chemical antagonism.

On the basis of the conducted researches formulations of dry concentrates of cocktails which are presented in tables 1–6 are developed. As can be seen from the presented data, dry concentrates include physiologically compatible sets of the most optimal extracts, powders and other components containing deficient micronutrients and biologically active substances, the daily dose of which is from 50 to 70% of the recommended adequate level of consumption.

Table 1. Recipe of dry concentrate cocktail based on royal jelly

Ingredient	Weight,%
Lactose	65,0
Maltodextrin	20,0
Succinic acid	5,0
Vanilla Cream Flavor	5,0
Royal jelly	3,5
Ascorbic acid	1,0
Sucralose	0,5
Total	100

Table 2. Recipe of dry concentrate of cocktail based on extracts of chlorella and spirulina

Ingredient	Weight,%
Spirulina extract	36,1
Maltodextrin	22,8
Chlorella powder	18,5
Broccoli extract	6,0
Flax or chia seed extract	4,3
Extract of sprouted wheat grain	3,0
Yeast beta-glucan	3,0
Ascorbic acid	1,8
Blueberry berry extract	1,5
Carrot powder	1,2
Beetroot powder	1,2
Lemon extract	0,6
Total	100

Table 3. Recipe of dry concentrate of cocktail based on екстрактів chaga and chia

Ingredient	Weight,%
Maltodextrin	44,0
Psyllium	20,0
Pumpkin flour	10,0
Chia extract	10,0
Burdock extract	5,0
Apple pectin	5,0
Chaga extract	3,0
Guar gum	1,0
Buckthorn bark extract	1,0
Kaolin	1,0
Total	100

Table 4. Recipe of dry concentrate cocktail based on mixtures probiotic microorganisms and oligosaccharides

Ingredient	Weight,%
Oligosaccharides	79,0
The mixture of probiotic microorganisms is dry lyophilized	7,5
Maltodextrin	7,47
Berry flavoring	5,0
Ascorbic acid	1,0
Coloring	0,03
Total	100

Table 5. Recipe of dry concentrate of cocktail based on L-carnitine

Ingredient	Weight,%
L-carnitine tartrate	30,0
Maltodextrin	20,785
Acetyl L-carnitine	15,0
Flavor	9,0
Coloring	9,0
Green tea extract	6,0
Chlorogenic acids	6,0
Ascorbic acid	2,7
Stevioside	1,2
Vitamin E	0,27
Vitamin B6	0,03
Vitamin A	0,012
Vitamin D	0,003
Vitamin B12	$9 \cdot 10^{-6}$
Chromium picolinate	$9 \cdot 10^{-6}$
Total	100

Table 6. Recipe of dry concentrate of cocktail based on vitamin C and zinc

Ingredient	Weight,%
Maltodextrin	62,5
Ascorbic acid (vitamin C)	25,0
Flavor "Lemon"	5,0
Dye quinoline yellow	5,0
Zinc citrate	1,25
Sucralose	1,25
Total	100

Dry concentrate of cocktail based on royal jelly, containing all 10 essential amino acids, as well as biologically active substances (acetylcholine), vitamins B1, B2, B3, B6, B12, C, H, PP, E, folic acid, biotin, in combination with succinic and ascorbic acids has

antioxidant properties and improves physical and mental performance. In addition to the balance of physiological effects of the complex, optimal organoleptic parameters were also achieved by adjusting the ratios of the main components, as well as adding "Vanilla-creamy" natural flavor. In the table. Figure 2 shows the formulation of a dry cocktail concentrate based on spirulina extract and chlorella powder, which due to their composition perform the functions of a biostimulator of metabolic processes in the body, sources of easily digestible protein and energy for the body without weight gain. Due to the introduction of spirulina and chlorella in the optimal ratio for assimilation (2 : 1), it became necessary to regulate the taste, which was carried out by adding lemon extract as a synergistic in gastronomic parameters of other components of the cocktail.

The cocktail, obtained from a dry multicomponent concentrate based on chaga and chia extracts, is a source of dietary fiber, the action of which is aimed at improving the functioning of the gastrointestinal tract and excretion of xenobiotics [16] from the body, thereby increasing the body's immune status. The content of buckthorn bark extract provides effective evacuation from the body of xenobiotics associated with extracts of fungus, psyllium, gum, apple pectin and kaolin.

Dry concentrate based on dry lyophilized microorganisms, which provide a beneficial effect on the body, normalizing the composition and functions of the microflora of the gastrointestinal tract, and oligosaccharides necessary for the life of probiotic microorganisms, designed to make a cocktail with symbiotic functions. The combination given in table. 4 prescription components make it possible to obtain a finished product with a complex positive effect on the body as a whole, by increasing its resistance to harmful environmental factors, unbalanced diet, high levels of stress. The cocktail, made from a dry concentrate based on L-carnitine, chlorogenic acids and green tea extract, activates the breakdown of fats and their assimilation without deposition in the "depot", increases the level of efficiency. The cocktail should be included in the diets of athletes, with an unbalanced diet with insufficient protein intake, with overweight.

Antioxidant properties and increase the body's resistance to infectious diseases is a cocktail made from a dry concentrate based on ascorbic acid and zinc, the formulation of which is shown in table 6. As can be seen from table 6, the organoleptic properties of the cocktail were experimentally adjusted by using a natural flavor "Lemon". quinoline yellow in the ratios that received the highest score during sample tasting.

When enriching dry mixtures with plant complexes, one of the main tasks is to preserve their physiological activity in the finished product, which is achieved through targeted synergism of the main and auxiliary components, as well as the optimal product form – portion stick with metallized tab, which preserves the activity of components throughout shelf life – 12 months.

It is shown that the consumption of cocktails prepared using the developed dry concentrates, taken in

the amount of 2.0–3.5 g, allows to meet the daily requirement for the main deficient micronutrients by 25–90%, while the body receives biologically active substances, the compositions of which are the most easily digestible.

Conclusions and prospects for further development of this area.

1. Based on the results of analytical studies, it is established that dry beverage concentrates are a promising means of eliminating micronutrient deficiency, which is exacerbated by stress, mental and physical stress, as well as under the influence of adverse environmental factors.

2. The expediency of introducing micronutrient cocktails with antioxidant properties into dry concentrates is shown. Physiologically substantiated compositions of micronutrient complexes for enrichment of dry concentrates of cocktails of functional and dietary purpose.

3. Recipes and technology for obtaining dry concentrates of cocktails that provide high consumer properties and a given physiological and functional orientation of finished products have been developed. Formulations of DCM based on chlorella and spirulina algae, with extracts of chia, fungus and pumpkin seeds, with vitamin complex, with L-carnitine, with royal jelly and lactose, with probiotics and oligosaccharides, providing high consumer properties and a ready-made cocktails

4. When assessing the consumer properties of experimental batches of dry concentrates of cocktails, it was found that in terms of safety they meet the requirements of current regulations. Labile components of micronutrient complexes retain high stability during production and storage. The physiological activity of both freshly made and after 12 months of storage, the main components of cocktails obtained from dry concentrates of the developed recipes remained unchanged. The taste and smell are light and pleasant with notes corresponding to the used plant extract or powder and / or flavor.

5. The prospects of using the developed cocktails in the formation of rations of functional and dietary nutrition in organized groups - canteens and cafeterias of industrial enterprises, educational institutions, for people of physical and mental labor, the elderly and athletes.

6. Sets of technical documentation for DCC have been developed, including technical conditions, recipes and technological instructions.

Recipes and technologies for obtaining the developed DCC are accepted for implementation at Biolight LLC.

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