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DEVELOPMENT OF TECHNOLOGY AND THE POTENTIAL OF DRINKS WITH «ANTI-AGE» EFFECT

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 to ensure the normalization of physiological and metabolic processes in the human body and prevent 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 of health-improving drinks with long shelf life. The developed approach and technology is a promising form of drinks to improve the living standards of the population of Ukraine and other countries. The developed products will improve immunity, prevent a number of nutritional diseases, improve dietary intake during diet therapy and help restore micronutrient balance in the human body. It has been established that the physiological value of dry drinks according to the described production method is preserved in finished product forms (sticks with a metallized backing, sachets, sachets with a "zip-fastener" and a metallized inlay, plastic cans with a screw cap and with polymer backing as a control against preliminary opening) the entire recommended shelf life is from 12 to 24 months. The mixture is a convenient form for transportation and preparation. When diluted in liquid media (purified drinking water, mineral water, milk, fermented milk drinks, drinks based on plants, cereals, legumes, tea, coffee, cocoa), the specified functional properties are preserved and improved due to the activation of biologically active substances contained in the mixture and dilution media. The novelty of individual technological solutions and the indicated physiological and functional properties lies in the use of extracts of plants, fruits, berries, vegetables, as well as additionally introduced vitamins, mineral salts, amino acids, hydrolysates and isolates of plant proteins, natural bioenhancers and bioactiators with unique anti-age effects.

Key words: dry concentrates, drinks, cocktails, anti-age effect, technologies

Introduction.

The problem of improving the structure of nutrition, quality and safety of food as the basis of human life is today one of the most important both within one country and the planet as a whole. Nutritionists' research shows that in modern society, nutrition only according to traditional canons inevitably leads to certain types of food insufficiency [1]. The reasons for this are well known - protein deficiency, lack of vitamins and other macro- and micronutrients, consumption of refined foods, widespread use of various food ingredients that have no biological value.

Aging is a process in which tissues and organs begin to enter the stage of degenerative changes after growth, development and maturity of the organism, accompanied by a gradual decrease in physiological functions [2]. Poor or irrational nutrition in combination with chronic stress affects a person's appearance, especially on the skin. Yes, a lack of vitamins in the body can cause dull skin, weaken hair and reduce nail strength. In such cases, the real salvation is the use of dietary supplements, called nutricosmetic, used to maintain the structure and functions of the skin. Nutricosmetic products are taken orally in solid form (tablets, capsules) and in liquid form (shot-drinks, liquid concentrates that need to be diluted with water, drinks in packing units with a volume of 150 to 500 ml). Vitamins (A, B6 and E), sterol esters, coenzyme Q10, omega-3 fatty acids, lycopene, soy isoflavones, probiotic microorganisms, provitamin beta-carotene, chondroitin and lutein are considered to be bioactivators of recovery processes in the dermis. These substances are able to protect the dermis from inflammatory processes, damage from ultraviolet light. They have high antioxidant activity, controlling and neutralizing the action of free radicals formed as a result of biochemical reactions.

Nutricosmetics are food products based on biologically active substances and their complexes, which rejuvenate and protect the skin, hair and nails from intense age-related changes, provide fast transformations and restore functions derm.

Currently, the market of nutricosmetics based on omega-3 fatty acids and carotenoids is the fastest growing segment. However, along with the increasing share of innovative nutricosmetics, there is a filling of the market with cheap drugs of low quality, questionable origin, composition and action on the human body. All this reduces the positive perception of consumers about nutricosmetic products and reduces demand for them.

Some of the key factors that can stimulate market growth are the promotion of scientific approaches to the creation of nutricosmetics to increase public awareness and confidence in their usefulness, as well as the development of technologies for new forms of consumption that are more in demand in market niches.

Functional drinks have long been sales leaders in world markets. The dynamics and transformation of drinking forms is constant and growing. Manufacturers model different ingredient compositions, organoleptic profiles, modify design and packaging, thereby responding to every changes in society. Drinks are very easy to adapt to different standards, social and economic effects, as well as to health-related tasks.

The latest innovation in the presentation of nutricosmetics was shot-drinks - drinks that are made and sold to the public in the form of bottles (PET bottles) with a volume of 50... 100 ml.

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Therefore, the purpose of this article is to describe scientific approaches and analysis of factors for the development of shot-drink technology that effectively regulates the aging process of the body in order to slow them down.

Analysis of literature data and problem statement.

The problem of aging has become a major factor in shaping the strategy of production of beverages with «anti-age» effect.

The benefits of drinking such drinks are increasingly influencing the awareness of the individual's ability to promote beauty from within [3]. With age, the hormonal background changes, there are signs of photoaging, due to natural gravity sagging tissues, reduced rate of recovery of skin cells and all metabolic processes in the dermis. Less and less anti-aging substances are produced. For example, already at the age of 35 the content of coenzyme Q10 decreases almost four times. The amount of hyaluronic acid, collagen and elastin, which maintain moisture, elasticity and density of the skin, decreases by 10–12 years earlier. Therefore, moisturizing and nourishing the skin should be maintained at all times, especially with age and especially inside [4]. Anti-aging medicine is a field based on the advanced achievements of genetics, endocrinology, oncology, immunology, nutrition, nutrition therapy, cosmetology and other related fields. This achieves a key effect: improves the quality of life - both physically and psychologically [5].

The phenomenon of population aging is due to a number of reasons. Changes in skin aging include uneven pigmentation, thinning skin, loss of elasticity and strength. As a result, wrinkles and rough texture of the dermis appear.

Ukraine is one of the fastest aging countries in the world. According to forecasts, the share of people over 60 in the total population by 2051 will increase from 20% to 33%. Such trends necessitate the use of increasing resources to maintain the quality of life of the population aged 30-40 years and indicate the need to improve socio-economic policy taking into account demographic trends, including the development of new products with «anti-age» effect [6].

Two types of skin aging have different sources: internal and external; however, their results become synergistic, leading to outdated skin.

External aging is caused by controlled factors and occurs with varying degrees of intensity, due to the negative effects of ultraviolet light, stress, bad habits, poor and unbalanced diet, sleep and rest disorders, deteriorating health [7].

The beverage market is characterized by high competition. Consumers expect non-trivial decisions regarding the composition and organoleptic characteristics. Attractive appearance of packaging and labels, pleasant color and aroma, low calorie and no sugar – these are additional opportunities to use this development to meet the needs of consumers. Therefore, their implementation requires a complex cooking

technology that guarantees the optimal implementation of any color, taste and, of course, the stability of the finished product. In addition, one of the regulating factors of demand and sales is the taste, which is formed due to the content of food acids, sweeteners and plant extracts and / or amino acids; consistency caused by gelling agents of polysaccharide and protein nature, as well as water quality and methods of water treatment.

Presentation of the main material of the study

Modeling of beverages with «anti-age» effect was carried out based on analytical study of the properties of components and their chemical composition, taking into account the quantitative content of biologically active substances that does not exceed acceptable daily norms and provides preventive and / or therapeutic effect. The content of additionally introduced vitamins and mineral compounds did not exceed 50% of the recommended daily norms of physiological needs of the population in basic nutrients (Order of the Ministry of Education and Science № 1073 of 03.09.2017). Synergistic effects were also taken into account.

Collagen is a structural protein, a building material for connective, bone and cartilage tissues. It is a basic component of the heart muscle, blood vessels, and muscle tissue. Responsible for skin turgor, elasticity, resilience, density and shine of hair, nail strength, smoothness and freedom of movement and good posture, ie for signs of external beauty. In addition, collagen improves tissue regeneration.

In nature, there are up to 16 types of collagen, each of which contains a different set of amino acids and plays a role in the body. Experts identify four main types of collagen:

- type I: the most studied and present in the human body form (about 90% of all collagen contained in the human body). This type of collagen is involved in the formation of skin, bones, tendons, teeth, blood vessels and connective tissue;

- type II: has a lower density than collagen type I and is the basis of cartilage, giving flexibility and strength to the joints;

- type III: the second most common type of collagen in the body, the main function of which is to maintain the structure of muscles, blood vessels, large arteries, internal organs, including the intestines; forms the structure of collagen fibers of type I.

- type IV. It is the main component of the basement membranes - the deep layer of skin that connects the dermis and epidermis. In addition, type IV collagen is involved in the «construction» of the lens of the eye. This protein is not able to form collagen fibers. Unlike the first three types, it belongs to the class of non-fibrillar collagen and exists in the form of a thin three-dimensional lattice network [8].

Hyaluronic acid (HA) is an important component in the human body because it has unique physicochemical and biological properties, including biocompatibility and high hydrophilicity.

One of the important functions of HA in the joints is the binding of water, as a result of which the

intercellular fluid acquires the state of a jelly-like matrix. Biocompatibility with collagen fibers, other proteins and components of the intercellular fluid allows you to create a so-called «buffer layer», which determines the strength and elasticity of connective tissues [9].

With a sufficient level of hyaluronic acid, the skin is saturated with moisture and has good elasticity. But over time, the signs of aging are becoming more common, primarily due to the negative effects of ultraviolet light, lack of water in the body, eating disorders and skin care. The synthesis of HA is slowed down, as in the case of collagen. The skin becomes drier and wrinkles are formed.

It is well known that the deficiency of collagen and hyaluronic acid in the body can be supplemented with food and dietary supplements.

Fish collagen is a protein obtained during the processing of scales and skin of deep-sea fish. It is easily absorbed in the intestines and enters the circulatory system, is absorbed one and a half times faster than animal and vegetable. Due to the optimal (low) molecular weight and similarity of chemical composition with human protein, fish collagen belongs to the first and third types of collagen and has a number of useful properties:

- stimulates the natural formation of collagen in the body;
- maintains skin moisture, increasing its elasticity and resilience;
- smoothes fine wrinkles and prevents new ones;
- has a positive effect on the state of the musculoskeletal system [10].

Green tea helps to rejuvenate the body, slows down the aging process, stops the destruction of collagen fibers [11]. Due to the high content of antioxidants, phenolic compounds or tannin-catechin mixture (TCS), caffeine, theobromine, theophylline, essential oils, vitamins (P, C, B1, B2, K, U, PP, etc.) stimulates the brain, reduces the likelihood of development cancer and type 2 diabetes, strengthens the cardiovascular system, helps to normalize weight [12–14].

Grapes, blueberries – contain natural antioxidants that have a powerful rejuvenating effect, protect the skin from the negative effects of free radicals and the environment, even out complexion, remove pigmentation. In addition, grapes are a source of natural flavonoid - quercetin, a powerful bioactivator of brain activity and neutralizer of age-related changes in the brain. Hyaluronic acid is also part of grapes and makes the berry even more focused on rejuvenation [15, 16].

Licorice root contains glycyrrhizic acid (up to 22%), flavonoids (up to 4.0%), organic acids (up to 4.6%), minerals and others. Glycyrrhizic acid has an anti-inflammatory effect, is an effective tool in the fight against colds, infectious diseases, as it inhibits the replication of viruses by stimulating the activity of interferons [17].

Glycyrrhizic acid is 40 times sweeter than sugar, gives the finished drink a pleasant taste and caramel

color and puts them in the category of low-calorie. Glycyrrhizin is one of the most powerful bioenhancers (enhancers of the bioavailability of many organic nutrients).

Vitamin C is the strongest antioxidant and immunomodulator, which protects lipoproteins from oxidation and stimulates interferon synthesis, delays the conversion of glucose to sorbitol, accelerates wound healing, affects the synthesis of a number of hormones, regulates hematopoiesis and normalizes capillary permeability. Vitamin C is actively involved in collagen synthesis, regulates metabolism, rids the body of toxins, prevents oxidation of cholesterol and its deposition on the walls of blood vessels (antiatherosclerotic effect), helps fight the body with dermatological and allergic problems, improves skin condition, slows aging [18].

Sucralose is a sweetener that is 600 times sweeter than sucrose. The method of production of sucralose is the chlorination of sucrose by replacing the hydroxyl groups on chlorine atoms. Due to this modification, the properties of the substance change very much, but it retains a taste identical to sugar, without any unpleasant taste and aftertaste. Sugar substitute is characterized by high solubility in water and stability during heat treatment [19]. Products made with the addition of sucralose are safe to consume, which has been confirmed by numerous studies [20]. The positive effect on the body is due to the zero glycemic index, lack of calories, which allows the use of sucralose in products for diabetics [21].

Beta-carotene is a vital element - provitamin A, a natural dye of orange and yellow. It has antioxidant properties that help ensure healthy skin, hair and nails. Studies show that a diet rich in phytochemicals (including beta-carotene) helps to strengthen the skin's defenses against the sun's ultraviolet radiation. Due to this protection, the skin retains its elasticity, and sun damage (including small and deep wrinkles and freckles) is reduced [22]. Beta-carotene helps prevent acne and skin rashes, promotes cell renewal.

The developed technology of shot drinks, which have a balanced macronutrient composition and reduced nutritional and increased biological and physiological value, consists of the following stages:

And – reception and preparation of dry components; dosing and mixing of components;

II – water preparation, pasteurization at 80-85 °C for 20-25 minutes;

III – adding the dry mixture to the prepared water; homogenization to the formation of a colored homogeneous consistency solution, which allows small insoluble particles of plant extracts;

IV – filtering the finished drink, dosing into the packaging, screw cap, labeling, packaging, storage.

Extracts and powders of plants and berries are obtained ready-made from the manufacturer. Other dry components and water are from suppliers. The prepared dry mixture is sifted through a sieve and dosed into a boiler-homogenizer with prepared water and with

moderate stirring pasteurize the solution at 80-85 °C for 10–15 minutes.

This method ensures the stability of biologically active substances that have the ability to destroy at high temperatures, prevents the emergence of opportunistic and pathogenic microflora, provides stability during long-term storage for 12–18 months.

The introduction of dry components into the homogenizer-mixer is carried out in the following sequence: first load the dry matter in the maximum percentage according to the proposed recipes, then add fruit and berry powders and plant extracts, then all other dry recipe components. The components are thoroughly mixed, after which the resulting mixture is unloaded from the homogenizer-mixer into prepared and aseptically treated containers and sieved.

Shot-drinks are a homogeneous solution with unhigh viscosity and flavor, which provides a pleasant experience of consumption. The color is uniform throughout the volume.

Conclusions and prospects for further development of this area.

1. Based on the results of analytical studies, it is established that the problem of aging is spreading rapidly to different segments of the world, especially in Ukraine, so the development of products high in collagen, hyaluronic acid, low calorie is justified and necessary for prevention aging and various diseases associated with a lack of nutrients that are components of shot drinks.

2. The expediency of introducing raw materials, characterized by antioxidant properties and "anti-age" effect, into the composition of functional drinks is shown.

3. It is established that shot drinks can serve as a semi-finished product or supplement for a number of dishes in restaurants and at home, namely:

- the basis for the preparation of health dishes and drinks by diluting detox waters, mineral and table waters, tea, fruit drinks, lemonades, punches, smoothies, fresh juices, etc., which will benefit the development of the range of health dishes;

- Shot-drinks can be a good addition to sweet dishes and desserts as a topping for jellies, mousses, sambuca, curds, creams, cheesecakes, ice cream, etc. ; or dressings for fruit salads.

Drinks are recommended as a supplement to the main diet, including that formed during diet therapy. The duration of reception depends on the degree of aging, but it is necessary to consume at least one shot daily in the morning or evening for at least 14–30 days. After that, you can reduce the reception - on alternate days, or take a short break of 10 days and repeat the course again or twice. After that, you can consume shot-drinks 2–3 times a week for 6–12 months.

The developed drinks contain a balanced micro- and macronutrient composition, high content of antioxidants and bioflavonoids and proteins that promote anti-aging processes, improve muscle growth, fill the body with energy and give a good mood.

The conducted researches allow to recommend the developed drinks-shots with «anti-age» effect to the diet of those who adhere to diets, do sports and fitness and maintain their beauty and youth.

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РОЗРОБКА ТЕХНОЛОГІЙ ТА ПОТЕНЦІАЛ НАПОЇВ З «ANTI-AGE»-ЕФЕКТОМ

Сучасні тенденції створення напоїв передбачають використання у складі їх основ різних настоїв, екстрактів рослин, а також вітамінно-мінеральних комплексів, органічних кислот та полісахаридів, що дозволяє забезпечити нормалізацію фізіологічних та метаболічних процесів в організмі людини та запобігти низці захворювань та синдромів, що тягнуть за собою зниження працездатності. Основні проблеми при створенні різних питних форм пов'язані з очищенням та підготовкою води, розчиненням компонентів та їх можливою взаємодією один з одним у фасувальній одиниці під час зберігання. Враховуючи викладене, актуальним є створення сухих концентратів напоїв оздоровчого призначення із тривалими термінами зберігання. Розроблений підхід та технологія є перспективною формою напоїв для підвищення рівня життя населення України та інших країн. Розроблені продукти дозволять підвищити імунітет, провести профілактику низки аліментарних захворювань, удосконалити харчові раціони при дієтотерапії та сприяти відновленню мікронутрієнтного балансу в організмі людини. Встановлено, що фізіологічна цінність сухих напоїв за описаним способом виробництва зберігається в готових товарних формах (стиках з металізованою підкладкою, саше, пакетиках з «зіп-застібкою» та металізованою вкладкою, банках пластикових з кришкою, що закручується, і полімерною підкладкою як контроль від попереднього видкриття) весь термін зберігання від 12 до 24 місяців. Суміш є зручною формою для транспортування та приготування. При розведенні в рідких середовищах (вода питна очищена, вода мінеральна, молоко, кисломолочні напої, напої на основі рослин, злакових, бобових, чаю, кави, какао) задані функціональні властивості зберігаються та покращуються за рахунок активації біологічно активних речовин, що містяться у складі суміші та середовищах для розведення. Новизна окремих технологічних рішень та позначених фізіологічних і функціональних властивостей полягає у використанні екстрактів рослин, плодів, ягід, овочів, а також додатково внесених вітамінів, мінеральних солей, амінокислот, гідролізатів та ізолятів рослинних протеїнів, натуральних речовин-біоенхансерів та біоактиваторів, що володіють унікальними «anti-age» ефектами.

Ключові слова: сухі концентрати, напої, коктейлі, «anti-age» ефект, технології.

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РАЗРАБОТКА ТЕХНОЛОГИИ И ПОТЕНЦИАЛ НАПИТКОВ С «ANTI-AGE»-ЭФФЕКТОМ

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 метаболіческих 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 напитков оздоровительного назначения с длительными сроками хранения. Разработанный подход и технология является перспективной формой напитков для повышения уровня жизни населения Украины и других стран. Разработанные продукты позволят повысить иммунитет, провести профилактику ряда алиментарных заболеваний, усовершенствовать пищевые рационы при диетотерапии и способствовать восстановлению микронутриентного баланса в организме человека. Установлено, что физиологическая ценность сухих напитков по описанному способу производства сохраняется в готовых товарных формах (стиках с металлизированной подложкой, саше, пакетиках с «зип-застежкой» и металлизированной вкладкой, банках пластиковых с закручивающейся крышкой и полимерной подложкой в качестве контроля от преждевременного вскрытия) весь рекомендуемый срок хранения от 12 до 24 месяцев. Смесь является удобной формой для транспортировки и приготовления. При разбавлении в жидких средах (вода питьевая очищенная, вода минеральная, молоко, кисломолочные напитки, напитки на основе растений, злаковых, бобовых, чая, кофе, какао) заданные функциональные свойства сохраняются и улучшаются за счет активации биологически активных веществ, содержащихся в составе смеси и средах для разбавления. Новизна отдельных технологических решений и обозначенных физиологических и функциональных свойств заключается в использовании экстрактов растений, плодов, ягод, овощей, а также дополнительно внесенных витаминов, минеральных солей, аминокислот, гидролизатов и изолятов растительных протеинов, натуральных веществ-биоэнхансеров и биоактиваторов, имеющих уникальные «anti-age» эффекты.

Ключевые слова: сухие концентраты, напитки, коктейли, «anti-age» эффект, технологии.