

BIOACTIVE COMPOUNDS IN HUMAN NUTRITION

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Abstract. Bioactive compounds are natural complexes containing minerals, vitamins, nutritional fibers, plant extracts, unsaturated fatty acids, amino acids. They eliminate deficiencies in nutrition, increase the absorption of healthy substances and increase the internal strength of the body, reducing the risk of many diseases.

When nutraceuticals are added to food or drink, they enrich them with important substances (amino acids, vitamins, minerals, polyunsaturated fatty acids, dietary fibers, etc.) and support certain physiological functions of the human body and the systems of the human body regulates. They can be consumed in different forms (extracts, ointments, tinctures, concentrates).

Keywords: bioactive compounds, natural, minerals, vitamins, nutritional fibers, plant extracts, unsaturated fatty acids, amino acids.

БИОАКТИВНЫЕ СОЕДИНЕНИЯ В ПИТАНИИ ЧЕЛОВЕКА

Аннотация. Биоактивные соединения представляют собой природные комплексы, содержащие минералы, витамины, пищевые волокна, растительные экстракты, ненасыщенные жирные кислоты, аминокислоты. Они устраняют недостатки в питании, повышают усвоение полезных веществ и повышают внутреннюю силу организма, снижая риск многих заболеваний.

При добавлении нутрицевтиков в пищу или питье они обогащают их важными веществами (аминокислотами, витаминами, минералами, полиненасыщенными жирными кислотами, пищевыми волокнами и т. д.) и поддерживают определенные физиологические функции организма человека и регулируют системы организма человека. Их можно употреблять в разных формах (экстракты, мази, настойки, концентраты).

Ключевые слова: биологически активные соединения, природные, минеральные вещества, витамины, пищевые волокна, растительные экстракты, ненасыщенные жирные кислоты, аминокислоты.

INTRODUCTION

Bioactive compounds and elements, as the name suggests (from the Greek "bios" meaning life and the Latin "activus" meaning dynamic or full of energy), are substances that directly affect living organisms. It is characterized by a certain biological activity. Interactions can be positive or negative depending on the nature of the substance, its dose and bioactivity. Bioactive compounds can act as antioxidants, enzyme inhibitors and inducers, inhibitors of receptor activity, and inducers and inhibitors of gene expression, among other actions, and they play important roles in many biochemical reactions and are important building blocks of some enzymes and proteins. Nevertheless, although bioactive components of human nutrition are not necessary to meet basic nutritional needs like nutrients, they still play an important role in human nutrition (Agnieszka Zgoła-Grześkowiak, 2021).

Bioactive compounds are found in many plant foods such as fruits, vegetables, grains, and legumes, but usually in small amounts. Among the active compounds found in plants, several important groups can be mentioned: flavonoids, anthocyanins, tannins, betalains, carotenoids, plant sterols and glucosinolates. In addition, some non-vegetable foods such as

meat, fish, milk, eggs, etc. are also sources of bioactive compounds. For example, meat, although not widely studied, contains important bioactive compounds. These include amino acids and peptides obtained from meat proteins by enzymatic hydrolysis. The concentration of these bioactive substances in meat and meat products contributes to the quality and taste of meat products.

MATERIALS AND METHODS

There are a number of technological processes in the production of modern phytochemical preparations. These processes are preparation of raw materials for extraction, grinding of raw materials and finished product, separation of product from liquid extract, purification of medicinal substances.

In order to prepare the plant raw materials for extraction, the grinding process is usually carried out first. The most convenient fraction for grinding in extraction is to grind the raw material to a size of 3-6 mm (fayllar.org, 2022). In plant tissue, alkaloids are often combined with organic (oxalate, apple, lemon, wine), mineral (sulfate, phosphate, etc.) and sometimes plant specific (lycane, quinine, xylidone) acids. occurs as salts. Pure (basic) alkaloids are soluble in organic solvents and insoluble in water. Their compounds formed with acids - salts of alkaloids are well soluble in water, but insoluble in organic solvents. Alkaloids in base and salt form are equally soluble in alcohol. At the same time, there are pure alkaloids (cytisine, methylcytisine, caffeine, etc.) that are well soluble in water and organic solvents, as well as alkaloid salts that are poorly soluble in water (quinine sulfate, tannin sulfate). Because the first flavonoid isolated from plants was yellow, this group of compounds was named flavonoids (derived from the Latin word flavum - yellow). Pure flavonoids (glycosides and aglycones) isolated from plants are colorless or golden and yellow crystalline substances. The glycosides of flavonoids are well soluble in alcohol, poorly soluble in cold water, insoluble in ether, chloroform and other organic solvents, while their aglycones are well soluble in alcohol, ether and acetone and reprecipitate after the water cools. Anthocyanins and their aglycones - anthocyanidins color solution (or cell juice) depends on the conditions. Usually, this group of compounds is red, pink, golden in acidic conditions, and purple, blue, and bluish in alkaline conditions. Under the influence of UV and blue-violet rays, flavonoids are colored in different colors. This reaction depends on the level of oxidation of the -B ring in their molecule and the number and location of functional groups in the molecule. Flavonoids are brown and dark brown (for example, rutin and other flavonoids), dark red (taxifolin), yellow (quercetin, auronones and most flavonoids), green-yellow (aureuzidin and other auronones) under the influence of UV light), colored with dark green and golden (xanthones) and other colors. Most flavonoids are optically active and deviate to the right or left of the plane of polarized light. The glycosides of flavonoids are hydrolyzed under the influence of dilute acids. O-glycosides are more easily hydrolyzed than S-glycosides. S-glycosides are difficult to hydrolyze even under very harsh conditions. Flavonoids are widespread in nature and are found in almost all higher plants. Especially, legumes (Fabaceae), Asteraceae (Compositae), celery - Apiaceae (Umbelliferae), Ranunculaceae, Polygonaceae, Rosaceae, Hyacinth.

RESULTS

Flavonoids

Flavonoids are the largest group of bioactive compounds. Their structures are based on the flavan skeleton, and depending on the differences in their central ring, flavan-3-ols,

flavanones, flavanols, flavones, isoflavones, flavonoids, anthocyanidins and their sugar derivatives can be combined into anthocyanins and chalcones with an open central flavan ring. Each subgroup of flavonoids contains many active compounds found in a variety of plants, including fruits, vegetables, and tea. Many of these compounds are known to neutralize free radicals, have anti-inflammatory properties and reduce the risk of cancer. They have also been reported to provide antidiabetic properties, prevent cardiovascular disease, and even fight the influenza A virus (A. N. Panche, 2016).

Phenolic Acids

Phenolic acids are derivatives of hydroxybenzoic and cinnamic acids that differ in the number and positions of hydroxy and methoxy groups in the aromatic ring. They often occur in bound form - hydroxybenzoic acid derivatives are limited to hydrolyzed tannins, and hydroxycinnamic acid derivatives are glucose or quinic acid, including caffeic and dicaffeoylquinic acids. Unbound phenolic acid is found in fruits, cereals and beverages, including the most commonly consumed tea and coffee, and is known for its anti-cancer properties and ability to scavenge free radicals.

Tannins

Tannins contain three or more phenolic subunits and are classified as condensed and hydrolyzable. Condensed tannins are chemically condensed proanthocyanidins composed of flavonoids, hydrolyzable substances contain central sugars condensed into halotannins and ellagitannins, depending on the type of bond connecting the esterified and acidic units with gallic acid. Tannins can be found in various fruits, spices, cocoa and tea. They have a positive effect on the human body, including improving the urinary tract, reducing cardiovascular diseases and antioxidant properties.

Methylxanthines

Methylxanthines, including caffeine, theophylline, and theobromine, are synthesized by many plant species and are widely studied for their various health benefits. Caffeine stimulates the central nervous system - it improves motor function and improves attention, alertness, activity and performance. While it usually improves mood and reduces aggression, chronic administration of high doses of caffeine (as well as theophylline) induces aggressive behavior. Reports of hand and arm tremors induced by caffeine have also been published

Carotenoids

Carotenoids are made up of eight isoprene units linked together. Conjugate double bonds make them the yellow, orange, and red pigments commonly used in industry. There are several hundred carotenoids, which are divided into two groups: carotenes and xanthophylls. Carotenes contain only carbon and hydrogen atoms in their molecules and include lycopene, carotene, and carotene-carotene, while xanthophylls contain oxygen atoms in hydroxy and carbonyl groups at one or both ends of the molecules, and lutein and zeaxanthin, among other compounds. Carotenoids are found in many plants, algae and some animals. For example, carotene is abundant in carrots, fennel, kale, parsley, spinach, and sweet potatoes; lycopene in tomatoes, papaya and watermelon; as well as lutein and zeaxanthin in fennel, spinach and egg yolk. Carotenoids have been shown to have antioxidant properties and reduce the risk of atherosclerotic disease. on the other hand, lutein is important in preventing age-related vision loss.

DISCUSSION

Capsaicinoids

Capsaicinoids, mainly capsaicin and dihydrocapsaicin, are found in plants of the genus *Capsicum* and are responsible for their pungency. Capsaicin has many therapeutic properties, including the treatment of obesity, diabetes, hypertension and other diseases. Its anticancer properties are also being studied, including suppressing carcinogenesis in prostate, skin, breast, colon, lung, and human bladder, but some reports suggest that it has carcinogenic and co-carcinogenic activity. Capsaicin in high doses can cause cardiovascular diseases, weakness and breathing, mental depression, and ultimately death. Different tested mammals have different sensitivities to capsaicin, but the lethal dose or lethal concentration values are usually several tens of mg per kg. These values are high, but supplementation with capsaicinoids suggests that they should be done with caution (Agnieszka Zgoła-Grześkowiak, 2021).

Peptides

Peptides are important because they are crucial materials for protein biosynthesis and are also used as a source of energy. They can be obtained from food proteins by enzymatic hydrolysis, microbial fermentation or food processing. Alternatively, they can be synthesized from amino acids. Among them, bioactive peptides can be found; they are usually short peptides of 2-20 amino acids that exceed the expected nutritional value (C) of biological activity. Large amounts of protein can be found in plant and animal materials. Rich sources of bioactive peptides include grains, soy, eggs, meat, and milk (C). Both isolated bioactive peptides and hydrolyzates containing them have positive effects that can be anticancer, antioxidant, hypertensive, antimicrobial, antiplatelet, antidiabetic and osteoprotective.

CONCLUSION

However, there is also a risk associated with the use of bioactive peptides, since in the absence of solid pharmacokinetic data, it is impossible to determine the correct dose and frequency of administration. In addition, hydrolyzates may contain immunogenic proteins and peptides, which may cause allergic reactions in some people (A. N. Panche, 2016) (Agnieszka Zgoła-Grześkowiak, 2021).

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