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**Sea buckthorn (lat. Hippóphaë)**

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**Abstract**. The article discusses the main properties of sea buckthorn and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of berries are indicated, the use of sea buckthorn in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of sea buckthorn on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its application are considered.

*Keywords:* sea buckthorn, benefits, harm, beneficial properties, contraindications

**Beneficial features**

Table 1. Chemical composition of sea buckthorn (according to Food+ ).

| **Main substances (g / 100 g):** | **Fresh Sea Buckthorn contains [1]** |
|---|---|
| Water | 83 |
| Carbohydrates | 5.7 |
| Alimentary fiber | 2 |
| Squirrels | 1.2 |
| Fats | 5.4 |
| Calories (kcal) | 82 |
| **Minerals (mg/100 g):** | |
| Potassium | 193 |
| Magnesium | thirty |
| Calcium | 22 |
| Phosphorus | 9 |
| Sodium | four |
| **Vitamins (mg/100 g):** | |
| Vitamin C | 200 |
| Vitamin E | 5 |
| Vitamin B 3 | 0.4 |

| | |
|---|---|
| Vitamin B 2 | 0.05 |
| Vitamin B1 | 0.03 |

The vitamin and mineral composition of sea buckthorn depends very much on its variety, place of growth, and even harvest time. So, during the fall, more minerals accumulate in the berries and leaves of the plant than in the August harvest. But this rule is not universal. Potassium, magnesium iron in autumn in sea buckthorn fruits, on average, more than in summer, and, for example, sodium, calcium and phosphorus - less.

Of the fifteen sea buckthorn minerals among the macronutrients, the content of potassium and calcium is most significant in the berry, and among the microelements - iron. Sea buckthorn leaves collected at the end of summer can serve as a good source of zinc. By the way, the bark is considered one of the best plant sources of serotonin.

Depending on the varieties and conditions, the vitamin composition varies markedly. But, on average, 100 grams of sea buckthorn berries “fit” about 2-3 norms of the daily requirement of the body for vitamin C, half the norm of vitamin B6, a third of the daily norm of vitamin E and beta-carotene, a precursor of vitamin A. There are also vitamin P in berries , as well as phenolic compounds with P-vitamin activity. Together with vitamin C, they provide a synergistic effect in the prevention of atherosclerosis. Thus, sea buckthorn can indeed be called a "vitamin treasury" without much exaggeration.

100 grams of berries per day "closes" and 100% of a person's need for organic acids (malic, tartaric, citric, oxalic, etc.), which are involved in many biochemical reactions. Sea buckthorn is one of the few plant foods in which all the omega fatty acids known today have been found, including the relatively recently discovered Omega-7.

Sea buckthorn oil also preserves active substances. Ripe seeds contain 8-20% oil, the pulp - about 20-25%, and the remains of the fruit after squeezing the juice - about 15-20%. These oils have high concentrations of lipophilic components, most often unsaturated fatty acids, phytosterols and vitamins A and E. That is, they include components that have a multifunctional effect on human health: antioxidant, anti-inflammatory and antidepressant properties. At the same time, fatty acids play an important role in changing cerebrovascular and cardiovascular diseases.

**Medicinal properties**

Numerous studies of sea buckthorn have shown that both its fruits and plant parts, depending on the conditions, systemically exhibit antioxidant, anti-inflammatory, antitumor, anti-stress, anti-thrombotic, adaptogenic, neuroprotective, antibacterial, cytoprotective, immunostimulating properties.

This means that plant extracts can potentially be successfully used in the treatment of various tissue injuries and pathologies, diseases of the gastrointestinal tract, liver and kidneys, blood vessels and heart, and joints. They can be used relatively safely to expand the physical capabilities of the body and improve cognitive functions.

- Heart and blood vessels

The use of sea buckthorn fruits increases the adaptive capacity of the cardiovascular system and reduces cardiovascular risk.

Thus, the beneficial effect of sea buckthorn flavonol-aglycones on risk factors for heart disease has been established in human studies. Sea buckthorn flavonoids are thought to scavenge free radicals,

reduce blood viscosity, and improve heart function. Although the degree of severity of the effect may be different. [one]

Experiments with rats have shown that sea buckthorn flavonoids are also able to lower the "upper" blood pressure indicators no worse than the drugs enalapril and hydrochlorothiazide. [2] Sea buckthorn seeds can also reduce “upper” pressure. The antihypertensive effect appears to be due to improved insulin sensitivity and angiotensin blocking by the flavones of the plant seeds. [3]

Created by Indian researchers, sea buckthorn wine in animal experiments showed high activity in capturing free radicals, which made it possible to observe a pronounced protective effect against oxidative stress. In addition, high-cholesterol mice given sea buckthorn wine experienced a 197% increase in "good" cholesterol relative to "bad" low-density lipoprotein. [four]

The extracted seed oil has been tested in the treatment of coronary disease in experiments on rabbits. Feeding animals with this oil for 18 days caused a significant reduction in "bad" cholesterol. In addition, the vasodilating activity of the aorta was significantly increased, which allowed scientists to consider the oil extract as a drug with high cardioprotective activity. [5] Sea buckthorn pulp oil also protects against myocardial ischemia-reperfusion. [6]

- Liver and kidneys

With hepatitis, which in the experiment of Russian scientists was provoked in animals by the introduction of paracetamol, the complex use of dry leafy extracts of sea buckthorn was able to reduce the process of lipid oxidation, which helped to normalize blood biochemical parameters and the structure of liver tissues. [7]

Dry sea buckthorn leaves can protect the kidneys from the effects of some of the toxins that molds produce. By affecting the parenchyma and glomerular apparatus, they can cause disturbances in the functioning of the kidneys, but the addition of 2% leaf powder to the feed of quail chicks under laboratory conditions provided partial protection of birds from nephropathy. [eight]

In addition, sea buckthorn extracts can mitigate the negative effects of certain drugs. One of the side results of antitumor treatment, for example, methotrexate, can be an inflammatory lesion of the mucous membranes of the gastrointestinal tract, pharynx, mouth, etc. (mucositis). The concomitant use of sea buckthorn extracts prevents such a reaction. [9] Such extracts also prevent the damaging effect of arsenic salts on the internal organs of mice, although sea buckthorn salts themselves do not remove them from the body. [10] At the same time, it was found that sea buckthorn preparations in therapeutic doses (up to 250 mg/kg of body weight/day) are non-toxic and in laboratory experiments (where 100 mg of sea buckthorn were given to rodents per kg of body weight for 3 months) showed no side effects. [eleven]

Both seed oil and sea buckthorn fruits prevent liposaccharides from damaging liver tissue cells, and also stop the development of fatty hepatosis in rats fed a high lipid diet. [12]

- Physical ability

Fruits (including the juice squeezed out of them) and sea buckthorn leaves can positively influence the metabolic parameters of laboratory animals and improve their physical abilities. Experiments with rats showed that the intake of aqueous extracts of dried leaves increased the endurance of animals during exhausting physical exertion and prevented oxidative processes. [13]

In another experiment, sea buckthorn juice demonstrated the ability to increase aerobic endurance. Thanks to the supplements in animals, levels of hemoglobin and testosterone increased, and the amount of antioxidant enzymes in skeletal muscles significantly increased. [fourteen] In the future, these properties of sea buckthorn components can be used to increase human strength and endurance.

A special effect of the use of sea buckthorn is observed in high mountains. Here, eating berries and especially their extracts helps the body adapt to extreme conditions. The intake of extracts leads to a change in the metabolism of anaerobic type to aerobic, weakening the symptoms of altitude sickness (altitude hypoxia). The mechanism is explained by the fact that extracts of sea buckthorn leaves interfere with the passage of plasma from the blood vessels of the lungs into the tissues of the internal environment (parenchyma), which also reduces the severity of altitude sickness. [fifteen]

In addition, sea buckthorn helps maintain a healthy state of many other systems and organs:

- Several studies have been devoted to the effect of sea buckthorn on eye health. In particular, seed preparations helped prevent light-induced aging of the retina, fruit oil helped with dry eye syndrome, leaf extracts prevented the development of cataracts.
- With functional disorders in children, berries restored appetite and restored digestive functions. [16]
- Applications of sea buckthorn oil in combination with ozone therapy help treat periodontitis in smokers. [17]
- Leafy extracts of the plant reduce the degree of inflammation in diseases of the joints. [eighteen]
- Sea buckthorn oil has shown therapeutic properties for ulcers and erosions of the stomach. [19] .
- Both oil and leaves are able to reduce radiation damage and prevent the manifestation of behavioral pathologies in animals under the influence of radiation gamma radiation. [twenty]
- The use of sea buckthorn berries in food, although it did not reduce the duration of infectious diseases, nevertheless, reduced the concentration of C-reactive protein in the blood of patients. [21]
- The results of numerous studies indicate the effectiveness of sea buckthorn extracts in the healing of wounds of various nature.

Thanks to the active component isorhamnetin, sea buckthorn extracts help to cope with the effects of toxins leading to a systemic inflammatory response. [22] This isorhamnetin has been shown to inhibit tumor growth in lung cancer [23] and colon cancer through different mechanisms. [24]

The antitumor properties of sea buckthorn seeds are also manifested due to procyanides, which have an inhibitory effect on human breast cancer cells by suppressing fatty acid synthases. [25] These enzymes are overexpressed in many human cancers. Therefore, the ability to inhibit their expression makes sea buckthorn seeds a very promising raw material in the creation of drugs for other oncological diseases. It is only necessary to recall that it is impossible to transfer the results obtained in vitro and animals without additional studies to humans.

**Use in medicine**

In pharmacology and modern medical practice, concentrates from the fruits and leaves of the plant are used.

A dry extract is made from the leaves of sea buckthorn, which becomes an active substance in medicines with an action aimed at suppressing the activity of certain viruses. An example of such drugs can be Hyporamine.

It belongs to the group of antiviral drugs and is available in five dosage forms (tablets, ointments, suppositories, etc.). As indications, the manufacturer indicated SARS with rhinitis and tonsillitis that developed against the background of infection, influenza types A and B, chicken pox, herpes, shingles.

Sea buckthorn oil, both alone and as part of preparations, is used to heal wounds, restore tissues during frostbite, burns, eczema, and get rid of skin diseases. The oil is also widely used to relieve inflammation of the vaginal mucosa, cervix, and its erosion. Among the most common preparations based on sea buckthorn oil are the following:

- **Olazol.** Produced in the form of an aerosol. When applied to the skin, it forms a yellowish foam. The remedy is often included in lists of the best burn remedies. And the manufacturer himself refers "Olazol" to drugs of a combined type, which have an anesthetic, antibacterial, anti-inflammatory effect. The tool is used to heal infected wounds, trophic ulcers, restore skin tissues. In proctology, it is recommended to eliminate anal fissures and treat chronic proctitis, and in gynecology - to help treat cervical erosion and bacterial vaginosis.
- **"Hyposol".** It is also an aerosol preparation of the same action as Olazol. Among the indications, in addition to burns of 2-3 degrees, as well as gynecological and proctological pathologies, erosive and ulcerative lesions of the oral mucosa and periodontium are indicated.
- **"Oblekop".** The tool is used for the rapid regeneration of the skin as an activator of metabolism and a stimulator of tissue repair.

At the same time, despite the massive use of sea buckthorn remedies in the fight against the effects of burns, not all experts are ready to recommend preparations based on popular sea buckthorn and calendula to provide effective assistance.

**In folk medicine**

Traditional medicine considers multivitamin sea buckthorn a universal remedy that:

- copes with peptic ulcers and stomach pains,
- reduces the symptoms of rheumatism and gout,
- treats cough, pulmonary tuberculosis and pneumonia,
- has a therapeutic effect in diseases of the cardiovascular system,
- stops bleeding
- heals the skin after burns and removes post-burn pigmentation,
- helps in restoring vision,
- raises male potency and saves women from gynecological problems.

Not all traditional medicine recipes can be blindly taken on faith. In particular, during exacerbation of peptic ulcers, organic acids of sea buckthorn berries can cause increased secretion of gastric juice and aggravate the patient's condition. But most of the folk practices associated with the use of sea buckthorn have nevertheless stood the test of time.

Particularly often, sea buckthorn parts are used for wound healing: stopping bleeding, restoring tissues, eliminating post-burn pigmentation. Sometimes, as a preventive measure, to prevent skin problems, children are bathed in a decoction of the leaves. A decoction of the fruit is even drunk to treat skin diseases. But more often, a decoction of the fruit is used for therapeutic purposes for gastrointestinal problems.

It's easy to prepare. 3 tablespoons of berries are poured with boiling water (0.5 liters) and left on low heat for 10 minutes. Sometimes after that they do not filter immediately, but let the broth brew for

another half an hour. Recommended amounts of sea buckthorn broth in different sources vary, ranging from 2-3 tablespoons before meals to 2-3 glasses per day.

Sea buckthorn oil is used to improve visual function and to get rid of the "dry eye" syndrome. However, contrary to popular advice, it should not be instilled into the eyes, because this way the oil can block the lacrimal canal and disrupt tearing. And this will not only not help, but may even provoke the development of dry eye syndrome. Therefore, modern folk healers believe that sea buckthorn oil is best taken orally in gelatin capsules for health benefits.

Oil is also often treated for laryngitis and pharyngitis - usually in a course of 10 procedures. To do this, they are impregnated with a cotton swab, which is then lubricated with the mucous membrane. Oil inhalations are also popular, lasting 10-15 minutes.

Serotonin, which is very rich in the bark of the plant, is called an antidepressant and "hormone of excellent mood." Therefore, decoctions of the bark are often recommended to restore the activity of the nervous system. But even in home treatment it is taken to inhibit the growth of tumors (carcinomas, sarcomas, etc.), normalize pressure, and radiation protection. Usually, for such a decoction, the bark of branches is collected at the end of spring, dried and ground into powder, which is then boiled with boiling water.

With rheumatism and gout, leaves slightly softened in boiling water are applied to diseased joints. For the same purposes, they drink tea brewed on the leaves of the plant. A decoction of the seeds of the plant is used as a laxative.

**in oriental medicine**

Sea buckthorn ingredients were widely used in ancient Chinese and ancient Mongolian medicine. In Tibetan medical treatises, plant constituents have been mentioned since the 8th century. In particular, it is indicated that sea buckthorn is useful for metabolic disorders and diseases of the stomach, which the Tibetans consider the main place for the production of "fiery" heat. Along with other medicinal plants, sea buckthorn should increase heat and eliminate the cold of mucus.

Modern followers of the traditions of Tibetan medicine usually understand the “coldness of mucus” as a decrease in trophotropic processes in the body that need to be activated with the help of certain products. The trophotropic function determines the stability of the internal environment of the body by controlling peristalsis, the degree of expansion of peripheral vessels, sweating and secretion of the salivary glands, and sinus rhythm disturbances. Thus, sea buckthorn, according to Tibetan medicine, has a complex effect on the body, which gave reason to use it also in the treatment of blood and heart diseases, intoxication and purulent inflammation of the pleura.

In Mongolian healing practices, sea buckthorn was also actively used to treat diseases of the lungs and respiratory tract. She was treated for tuberculosis, acute forms of pneumonia and just a cough. It was believed that it also helps with violations of the biliary tract.

In Chinese medicine, sea buckthorn (there it is called Sha Ji) is described as a warm, sour product that affects the meridians of the kidneys and liver. Using berries, Chinese healers treat cough with phlegm, relieve patients of pain and discomfort in the upper abdomen, correct digestive disorders in the stomach and pathologies that occur due to food retention there. In addition, sea buckthorn activates the movement of blood. Therefore, one of the indications for the appointment of sea buckthorn is a long-term absence of menstruation (for women with a previously normal cycle - with a delay of six months, and for girls - in the absence of menstruation up to 16 years).

**In scientific research**

The content and volume of the section "Healing properties" shows that sea buckthorn is studied very actively all over the world. There is a wealth of data on the antioxidant function of extracts. A whole layer of research is devoted to the wound healing abilities and antibacterial properties of sea buckthorn concentrates. A number of works consider the potential of sea buckthorn in protecting the cells of the brain and nervous system under various damaging effects. Experiments demonstrate how this protective action preserves mental adaptability, the ability to navigate in space, memory, and other cognitive functions.

But as an example of scientific research, we will cite the work of scientists devoted to the restoration of visual function with the help of sea buckthorn preparations.

Sea buckthorn oil, when taken orally, reduces symptoms in people with dry eye syndrome. [26]

100 people who participated in the experiment (their age ranged from 20 to 75 years) were divided into groups, representatives of one of which consumed 2 grams of sea buckthorn oil daily during 3 autumn months. After completing the experiment and processing the data, the scientists concluded that sea buckthorn oil stopped the increase in the osmolarity of the tear film during the cold season and had a positive effect on the symptoms of dry eye. At the same time, the burning sensation of the eyes was especially significantly reduced.

Protective effect of sea buckthorn flavones against visible light-induced retinal degeneration. [27]

The protective effect of sea buckthorn flavones against retinal degeneration caused by visible light was tested on laboratory rabbits.

Animals were treated with sea buckthorn preparations at doses of 250 and 500 mg/kg for 2 weeks before light exposure procedures and another week after. Retinal function was quantified by performing electroretinography 1 day before and 1, 3 and 7 days after light exposure. In addition, the thickness of the outer nuclear layer of the retina was measured, enzyme immunoassay and other analyzes were performed.

As a result, it was found that the sea buckthorn preparation reduced retinal oxidative stress, inflammation and cell death caused by intense light.

Evaluation of the therapeutic role of an aqueous extract of sea buckthorn leaves in cataracts. [28]

In this project, experiments were carried out "in vitro" on the lenses of experimental goats. Anti-cataract activity was assessed using the extract in the concentration range of 100, 200, 500 and 1000 μg/ml by evaluating the performance of a number of biochemical markers. The degree of influence of the extract on the performance varied from 63% to 300%. But, in general, an aqueous extract of sea buckthorn leaves has been shown to delay the onset and/or progression of cataracts, at least under in vitro conditions.

**Weight regulation**

There are many legends about the benefits of sea buckthorn for weight loss. The effectiveness of fruits and brewed sea buckthorn leaves is due mainly to the action of two mechanisms:

- the first is based on the fact that eating fruits suppresses appetite, and it is easier for a person to limit the number of calories at each meal;

- thanks to the second, the absorption of fat is reduced and its deposition in the abdominal cavity around the organs slows down.

Indeed, the results of several laboratory studies on animals at once suggest that:

- sea buckthorn foliar extracts reduce obesity, hepatic steatosis, insulin resistance, and inflammation in obesity [29] .
- seed extract reduces obesity caused by a high-fat diet, hypertriglyceridemia, and accumulation of triglycerides in the liver, [30]
- sea buckthorn ethanol extract prevents obesity caused by a "fatty" diet by suppressing the expression of adipogenic and lipogenic genes. [31]

Another study [32] examined the role of powdered sea buckthorn leaf tea in obese mice induced by a high-fat diet. Mice were given two different doses (1% and 5%) for six weeks. Tea suppressed weight gain in a dose-dependent manner and significantly reduced visceral fat, plasma levels of leptin, triglyceride and total cholesterol, and activity in supplemented mice. In addition, sea buckthorn tea reduced the concentration of triglycerides and cholesterol in the liver, reduced the accumulation of lipids and increased their excretion in the feces.

There is evidence that dried sea buckthorn fruits in the experiment helped patients control weight gain due to the same mechanisms of reducing appetite and absorbing fats from high-calorie foods.

In weight loss programs, either the berries of the plant are most often used (usually they talk about 100 g per day), or tea brewed from the leaves and / or dried fruits. This drink is recommended to drink a quarter of an hour before the main meal.

**In cooking**

Back in the middle of the last century, recipes with sea buckthorn in cookbooks described mainly the processes of making preserves and jams from this berry. If some cooks showed the author's initiative and "introduced" sea buckthorn in various forms into the composition of popular dishes, then such finds did not reach the general public. In addition, the abundance of pectin seemed to push the use of sea buckthorn, first of all, in the gelling of various products, in the preparation of jams and jams.

Recently, with the opportunity to popularize any recipe, sea buckthorn began to be used much more widely. People realized that the sour taste of these berries sets off the sweetness of desserts, and serves as a sauce in serving meat dishes. At the same time, yellow berries are able to “share” with other products a pleasant pineapple (sometimes rowan) aroma, leaving a long aftertaste. And red berries of rare red-fruited varieties add grape shades of smell and taste to the dish.

With the need to constantly surprise the public in bars and restaurants, the popularity of sea buckthorn cocktails with dairy products has grown. One of the easiest recipes with milk involves the use of:

- plant fruits - 200 g,
- homemade baked milk - 300 ml (it can be replaced with 250 g of thick fermented baked milk),
- honey with a tart pronounced aroma - 2 tbsp. l.

In this recipe, sea buckthorn is simply ground in a blender and filtered through a sieve, and honey is added to the cocktail poured in layers. In an alternative version, milk is first whipped with a mixer, and then sea buckthorn juice with honey is already added to it.

Sea buckthorn oil is also often used in cooking. Nothing is usually fried on it, but it is added to pastries, mixed with olive oil in a ratio of about ¼ and made dressings for vegetable and / or fruit salads. It is believed that sea buckthorn oil harmonizes especially well with orange.

Traditionally, in some regions, home-made “teas” made from sea buckthorn leaves are common. Currant leaves and/or mint are usually added to the tea "composition" to improve the palatability. However, the Swedish University of Agricultural Sciences suggests considering sea buckthorn leafy raw materials for fermentation on an industrial scale in order to then sell the packaged product in the same way as classic tea. It is also proposed to make natural food preservatives from this raw material, which increase the benefits, for example, of processed meat products.

**In cosmetology**

The protective properties of sea buckthorn are used both in home and professional cosmetology. According to the results of studies by Indian scientists, sea buckthorn emulsion, when applied to the skin of healthy people for a long time, improves its barrier function. In one experiment, cosmetologists measured biometric indicators of skin hydration and transepidermal water loss once a week for 84 days. As a result, it was found that a 5% emulsion mixture of oil and water applied to the skin of the face significantly improved the barrier properties of the skin. [33]

Another experiment (though already laboratory) showed that UV-induced skin aging (wrinkles, flabbiness, pigmentation) is effectively prevented even by oral intake of sea buckthorn fruit mixture for 6 weeks. [34]

Hyperpigmentation and UV damage to the skin are also effectively treated with sea buckthorn whitening emulsions. At least this is legal for people with "Asian" skin. Scientists, studying the density of pigmentation of patients, found a significant decrease in the level of melanin in all participants in the experiment who applied the plant extract to the skin. [35]

All these properties of sea buckthorn are also used in home cosmetology, where recipes for masks, lotions for washing and creams for skin and hair are common. Due to the abundance of vitamin C, sea buckthorn oil promotes hair and nail growth.

A lot of cosmetics manufacturers have also included sea buckthorn concentrates in anti-wrinkle and skin laxity products, as well as in medicinal preparations as an antimicrobial, anti-inflammatory and antiseptic component.

**Dangerous properties of sea buckthorn and contraindications**

If a person does not have chronic diseases and he does not have an individual intolerance or an allergic reaction to sea buckthorn, then this product can be freely consumed without fear for one's health.

With caution, you should practice the use of sea buckthorn concentrates, oil and a large number of berries for people with suspected inflammation of the gallbladder, pancreas, duodenum, liver. In the presence and even more exacerbation of these diseases, berries and sea buckthorn juice are contraindicated. You should not use them for gastrointestinal disorders.

Due to the large amount of organic acids that increase the secretion of gastric juice, sea buckthorn can be harmful for stomach ulcers, duodenal ulcers, and inflammation of the gastric mucosa (hyperacid gastritis). Although sea buckthorn oil can be used as an aid in the healing of ulcers.

Despite the fact that the infusion of leaves and fruits in folk medicine removes excess oxalic and uric acids from the body, alleviating the patient's condition with gout, fresh fruits and juice squeezed from them are not recommended for urolithiasis, since this is associated with an increase in urine acidity.

**Selection and storage**

Fresh sea buckthorn berries begin to arrive at markets and shops from the second half of August and remain there until the beginning of winter. You should choose ripe fruits of bright yellow color, which at the same time retained their density and elasticity. Among them, there should not be crumpled or sticky (glued) berries. There should be no uncharacteristic foreign smell.

On the market, you can also buy a cut branch with sea buckthorn clusters on it. If you put it in a cool place, then hanging berries will retain their freshness even longer than plucked ones. But then you have to shoot them yourself, which, due to the technical complexity of the process, not everyone likes to do.

It is better to store sea buckthorn berries in the refrigerator, using a small basket made of natural materials (from rod or birch bark) for this. The advantage of such containers is that if the berry is damaged, the juice flows through the cracks into the pan, from where it can be easily removed, preventing fermentation. However, fruits can be stored with the same success in plastic bags with technological holes made. It is also popular to store sea buckthorn in a glass jar, but in this case it is advisable to check the contents of the vessel from time to time so that the damaged berries do not flow and the sea buckthorn does not float in its own juice.

For a long period, until the next harvest, sea buckthorn is placed in a freezer for storage. In the frozen state, it does not lose its valuable properties. Some manufacturers immediately pack frozen berries in bags. However, a transparent window is not always provided in such containers, so you can judge the quality of the contents after purchase. The cost of 1 kg of such a berry is about 3-10 dollars (in national equivalent).

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Despite such an unexpected use of sea buckthorn, its main function, of course, remains therapeutic. For the sake of goodness, some people who previously disliked sea buckthorn because of its taste and aroma have learned to cook the berry in new ways. Therefore, it is possible that in the near future we will have not only scientific, but also culinary "sea buckthorn" discoveries.

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**Sea buckthorn - useful properties, composition and contraindications**

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**Abstract**. The article discusses the main properties of sea buckthorn and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of berries are indicated, the use of sea buckthorn in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of sea buckthorn on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its application are considered.

**Asparagus (lat. Aspáragus)**

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**Abstract**. The article discusses the main properties of asparagus and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the plant are indicated, the use of asparagus in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of asparagus on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its application are considered.

*Keywords:* asparagus, benefits, harm, beneficial properties, contraindications

**Beneficial features**

Table 1. Chemical composition of asparagus (according to Food+ ).

| **Main substances (g / 100 g):** | **Fresh asparagus [1]** |
|---|---|
| Water | 93.22 |
| Carbohydrates | 3.88 |
| Sugar | 1.88 |
| Alimentary fiber | 2.1 |
| Squirrels | 2.2 |
| Fats | 0.12 |
| Calories (kcal) | twenty |
| **Minerals (mg/100 g):** | |
| Potassium | 202 |
| Phosphorus | 52 |
| Magnesium | fourteen |
| Calcium | 24 |
| Sodium | 2 |
| Iron | 2.14 |
| Zinc | 0.54 |
| Copper | 0.189 |
| Manganese | 0.158 |
| **Vitamins (mg/100 g):** | |
| Vitamin C | 5.6 |
| Vitamin E | 1.13 |
| Vitamin PP | 0.978 |
| Vitamin B1 | 0.143 |
| Vitamin B2 | 0.141 |
| Vitamin B6 | 0.091 |

The most common asparagus in the world (aka medicinal) is rich in biologically active substances. The roots of the plant contain asparagine (which was first isolated from asparagus), steroidal saponins, flavonoids, organic acids, traces of essential oil. Saponins, coniferin, succinic and chelidonic acids were also found in the grass. Asparagus shoots contain a lot of asparagine and arginine, there is a small amount of carotene, lysine.

Specific compounds found in the young stems of the plant include asparagusic (asparagus) acid, which changes the smell of urine after eating asparagus. The secretions begin to smell very unpleasantly of hydrogen sulfide, which was noted by both ordinary consumers of the product and the first researchers of this plant. Even Marcel Proust wryly wrote that asparagus "turns [his] chamber pot into a bottle of perfume." The comparatively rapid onset of symptoms helped link changes in urine odor to prior consumption of asparagus. The odor begins to change as early as 15 minutes after eating the stems of the plant and is usually excreted only within 4 hours, although the rate of elimination varies greatly (more than 40%) in different people.

**Medicinal properties**

Pharmacy asparagus exhibits diuretic and laxative, analgesic and antispasmodic, anti-inflammatory and antitumor properties. Asparagus extracts can have a beneficial effect on the nervous system and improve cognitive functions, dilate blood vessels and lower blood pressure, improve liver and kidney function, and stimulate the immune and digestive systems. All these and other medicinal properties of asparagus have been used by people for centuries in various therapeutic practices. And today, most of

them are confirmed in laboratory experiments on animals, and some - in clinical studies involving humans.

- Antitumor potential

Saponins derived from old asparagus stalks (which are usually discarded in cooking) actually have potential inhibitory activity against tumor growth and metastasis. This saponin extract reduced the viability of breast, colon and pancreatic cancer cells depending on its concentration in a laboratory experiment. But it proved to be even more effective in suppressing the mobility of tumor cells by modulating the signaling pathway. [2]

A methanolic extract of white asparagus shoots activated the process of human cancer cell death and inhibited colon carcinogenesis in laboratory rats. [3] In addition, asparinin A isolated from asparagus showed antitumor properties in experiments in vitro ("in vitro") and in vivo ("in a living organism"). However, scientists continue to find new active phenolic compounds in asparagus that could potentially show a comparable antitumor effect. [four]

Asparagus polysaccharides (in vitro and in vivo) also had an anticancer effect against hepatocellular carcinoma . Thus, deproteinized asparagus polysaccharide showed strong selective cytotoxicity against human hepatocellular carcinoma cells. Later it turned out that it can also enhance the action of the antitumor antibiotic mitomycin, provoke the death of a cancer cell and stop division in several cell lines. All this makes asparagus polysaccharides potential therapeutic agents for the treatment of liver cancer. [5]

Chinese scientists isolated other active compounds from green asparagus that dramatically reduced the activation of cells leading to fibrous matrix production. The antifibrotic effect was due to the inactivation of fat-storing stellate cells of the liver. [6]

Indian scientists, based on ancient Ayurvedic traditions, considered asparagus extract as a replacement for synthetic chemotherapeutic agents that cause many side effects, have immunosuppressive properties and are cytotoxic. Unlike synthetic drugs, asparagus extract, on the contrary, showed immunomodulatory properties and helped in the recovery of the body after chemotherapy in experiments on mice. [7] Asparagus roots have also shown the ability to have a pronounced immunomodulatory effect on the body, at least in laboratory animals. [eight]

- Gastrointestinal organs

The protective effect of a methanolic extract of fresh asparagus roots was studied in various models of gastric and duodenal ulcers. As a rule, with ulcers provoked by various reasons, researchers found the therapeutic effectiveness of the effect of the extract on the state of the digestive tract. The exception was ulcers caused by aspirin and ethanol, for which asparagus extract was ineffective. At the same time, studies of gastric juice and mucous membranes showed that the root extract still significantly increased the protective factors of the mucous membrane (such as mucus secretion, cell mucus, cell lifespan), and also had a pronounced antioxidant effect. True, at the same time, it practically did not affect such aggressive factors as acid and pepsin. [9]

Asparagus, rich in rutin, reduced the severity of disease and tissue damage after colitis. Modulation of the colonic microenvironment with asparagus nutritional supplements in mice resulted in reduced inflammation, repair of organ mucosal damage, and reduced dysbacteriosis associated with colitis. [ten]

In animal experiments, the scientists also found some antidiarrheal activity in the ethanolic and aqueous extracts of asparagus root. [eleven]

- Kidneys and liver

In a number of animal experiments, ethanolic asparagus extracts prevented kidney stone formation. The asparagus preparation not only reduced the concentration of ions leading to the formation of stones (oxalate, phosphate, calcium), but also increased the level of magnesium, one of the crystallization inhibitors. [12]

Asparagus is considered an effective supplement for relieving alcohol hangovers and protecting liver cells from toxic damage. When comparing the biochemical properties of leaves and shoots of the plant, asparagus leaves rich in amino acids and inorganic minerals demonstrated particular efficiency in these processes. [13]

- Diabetes

Asparagus dietary supplements containing a source of active ingredients may open up new possibilities in the treatment of diabetes. One type of plant, asparagus racemosus, has been found to be able to stimulate insulin secretion and inhibit starch digestion. [14] But asparagus officinalis extract also controlled blood glucose levels by improving insulin secretion and β-cell function. At least, such results have been obtained in laboratory animals with type 2 diabetes. Diabetic rats were treated with asparagus extract at doses of 250 and 500 mg/kg, which reduced elevated blood glucose levels in a dose- and time-dependent manner. [fifteen]

An aqueous extract of the lower basal part of asparagus was useful in preventing diabetic complications associated with hyperglycemia and hyperlipidemia. [16]

A clinical study in which 28 volunteers took 6 g per day of crushed lower "waste" parts of asparagus stalks per day for 10 weeks showed that this significantly reduced fasting plasma glucose levels. In addition, taking asparagus powder led to a decrease in blood pressure and total cholesterol. [17]

- Potency

Various parts of asparagus, as well as many other plants and fruits, have traditionally been used in folk medicine to improve male erectile function. But, unlike many other herbal preparations, asparagus extracts have been tested in the laboratory, where their activity was tested on male albino rats. It turned out that aqueous extracts of asparagus, whose effect was similar to the effect of testosterone, actually increased the erection of the penis and reduced the oscillation time in the phase of attraction to females. In addition, the resting phase after ejaculation was reduced, and the average frequency of mating increased. [eighteen]

There is evidence of a positive effect of asparagus root extracts and on the development of eggs. In one study, asparagus extracts effectively stimulated the secretion of the hypothalamic-pituitary-gonadal system and the number of ovarian follicles in adult female rats. [19]

- Brain and nervous system

A whole body of research (which we will discuss in more detail below) speaks of the positive effect of asparagus preparations on the state of the brain and nervous system. The results show that asparagus has anti-depressant and anti-stress properties. Means based on it improve the quality of sleep and relieve mental stress, improve memory. They have a preventive effect in Alzheimer's disease and a therapeutic effect in cognitive impairment.

- Antivirus activity

Indian experts have found that asparagus extract can exhibit antiviral activity against influenza A virus and herpes simplex virus type 1. [20] However, these results were obtained in the laboratory, "in vitro", so it is premature to say that asparagus "for breakfast" will cure the flu. To make this possible, many additional studies are needed.

**In medicine**

Asparagus extracts in capsules, tablets and other forms from domestic and foreign manufacturers are freely sold among other herbal supplements with biologically active components. The instructions for them recommend the use of asparagus preparations as an adaptogen, immunomodulator, diuretic, tonic and cleanser.

Despite the fact that asparagus is included in the Pharmacopoeias of various countries, including China, France, Bulgaria, Portugal, Venezuela, Mexico, etc., in our country its therapeutic use by representatives of official medicine is episodic. Although there are cases of systemic use by some doctors of asparagus decoctions for the treatment of kidney diseases, cardiac neuroses, and hypertension.

Nutritionists specializing in eco-nutrition willingly "prescribe" asparagus for the treatment of diseases of the liver, prostate, bladder, kidneys, as well as diabetes, gout, atherosclerosis and heart pathologies.

**In folk medicine**

In folk medicine, all parts of the plant are used - from roots to berries, but the harvesting of raw materials takes place at different periods:

- rhizomes are harvested in early spring or late autumn,
- the grass is cut during the flowering period,
- berries - at the time of their full ripening.

Asparagus rhizomes in folk medicine are used in the initial stages of hypertension and venous insufficiency. They are also prescribed to create a diuretic effect and relieve inflammation of the urinary tract. To reduce toothache, healers advise simply chewing pieces of fresh asparagus root. However, most often raw materials from the underground part of the plant are used in the form of decoctions and infusions.

To create an infusion of asparagus roots, they usually take a tablespoon of dried raw materials in a glass of boiling water. When preparing a decoction, the same amount of raw materials is poured into 1.5 glasses of water, which are first brought to a boil, and then kept on low heat for about 2 more minutes.

To prepare a decoction of grass, you will need 2 tbsp. l. dry raw materials for half a liter of water. The grass is first boiled for 5 minutes, and then left to infuse until cool. Take this decoction for half a cup three times a day.

Although many of the healing effects of the underground and aboveground parts of the plant are the same, in folk medicine there is a certain tradition of using asparagus decoctions and infusions, taking into account the disease.

- **Infusion of asparagus rhizomes:** nephrolithiasis, cystitis with difficulty urinating, dropsy, epilepsy, tachycardia. In the latter case, dry grass (2 tsp) is added to the still hot decoction of

the roots (350 ml) and infused for 2 hours, closed. To restore the heart rhythm, take this remedy 3 times a day before meals, 2 tbsp. l.

- **Infusion of young stems and herbs:** diseases of the stomach, kidneys, heart.
- **Infusion of asparagus seeds:** impotence.
- **A decoction of the rhizome:** neurosis and hysteria, pyelonephritis, cystitis, prostate adenoma, urolithiasis, diabetes mellitus.
- **A decoction of rhizomes and young shoots:** inflammatory rashes on the skin, eczema, acne, scrofula.
- **A decoction of asparagus fruits:** diarrhea, dysentery, impotence.

Also in folk medicine in some countries, beautiful, but tasteless asparagus berries are used to treat gout, whooping cough and diabetes. Often, for this they are simply dried, ground, and the resulting powder is used for brewing, replacing coffee with it. However, it should be borne in mind that asparagus berries in large quantities are harmful to health, therefore it is more expedient to take preparations based on them in therapeutic doses - teaspoons rather than glasses.

**in oriental medicine**

Traditional Chinese medicine uses 9 types of asparagus (asparagus). Among them, the species with the most pronounced therapeutic effect is *light asparagus* , also known as *South Vietnamese* or *Cochin asparagus* (after the name of the region in the Mekong Delta). Its Chinese healers have been using it for at least 2 thousand years.

Asparagus is classified in this tradition as a "bitter" and "very cold" product, affecting the Lungs Meridian and the Kidney Meridian. However, it is practically not used on its own, but is part of multicomponent recipes that are prescribed for the treatment of diseases of the respiratory system, spleen, and kidneys.

In particular, asparagus preparations facilitate breathing by moistening the lungs, and are therefore indicated for dry coughs. They are also effective for sticky and/or bloody sputum and are therefore indicated for pulmonary tuberculosis and bronchitis.

Since the condition of the skin indirectly depends on the normal functioning of the lungs, it is believed that long-term use of preparations based on the asparagus root ensures its elasticity and softness.

In order not to harm the digestive tract and the spleen, people who are contraindicated in "cold" should refrain from eating asparagus. According to traditional and modern views, asparagus should also be avoided by pregnant women due to the threat of miscarriage.

In the healing formulas of Chinese medicine, Cochin asparagus can be found next to ginseng, calamus, rhemania, coltsfoot and other herbal ingredients. The following are examples of healing combinations and their purpose:

- **Fu Zi Tian Men Dong San** - to strengthen Qi, prolong activity and slow down the aging process. The formula includes asparagus, aconite, costus, calamus and a number of other plants.
- **San Cai Tang** - to get rid of fluid deficiency, diabetes, dry mouth and fever associated with Yin imbalance. The composition of the product, in addition to asparagus, includes ginseng and sticky rhemania common in the East.
- **Tian Men Dong Wan** - to restore appetite, get rid of pulmonary pathologies caused by typhoid fever, as well as stop coughing and wheezing caused by damage to internal organs. In this recipe, asparagus is “helped” by a wide bell, coltsfoot, black cohosh (cimicifuga), etc.

- **Tian Men Dong Jiu** - to restore the functions of numb limbs, get rid of dryness and sore throat, normalize the activity of the gastrointestinal tract with constipation.

The fruits of asparagus in Chinese traditional medicine restore potency and, in general, improve erectile function. For a therapeutic effect 1 tsp. dry crushed berries are poured with boiling water (200 ml) and insisted for about 7-8 hours in a warm oven (or oven). Take the remedy 3-4 times a day for 30 minutes. before meals 1 tbsp. l.

In Mongolian folk medicine, asparagus berries are already recommended for lumbar pain and swelling (as a diuretic). In traditional Indian therapeutic practices, asparagus racemos roots are used to prepare remedies for the treatment of epilepsy. Also, asparagus (colloquially - shatavari / Shatavari) is mentioned in Ayurvedic ancient Indian texts, in sections devoted to the treatment of stomach ulcers, diarrhea, dysentery, and oncological diseases.

**In scientific research**

Asparagus is a popular subject of scientific research. One of the reasons for this was the wide and effective use of asparagus in folk medicine in different countries, where this plant has created an excellent reputation for itself as a universal remedy. Today, scientists are actively testing the many therapeutic properties that asparagus is popularly known for. And one of the most popular was the topic of the influence of asparagus extracts on the working capacity of the brain and the state of the nervous system. Examples of such work are given below:

***Asparagus root methanol extract has significant antidepressant activity (in laboratory rodent models).*** [21]

To evaluate the effect of the plant root extract on the condition of the animals, they were given preparations of asparagus at doses of 100, 200 and 400 mg/kg daily for 7 days, and then subjected to the "forced swimming test" and "learned helplessness test". In both cases, behavioral factors clearly indicated an antidepressant effect of the extract, which, according to scientists, is mediated by the serotonergic and noradrenergic systems, as well as increased antioxidant protection.

***Aqueous extracts of asparagus stalks prevent memory impairment in mice.*** [22]

The effect of asparagus extracts on memory and acetylcholinesterase-related activity in a scopolamine-induced amnesia model was studied in an experiment with 60 mice divided into 6 groups. In three of them, the animals received low (1.6 ml/kg), medium (8 l/kg) and high (16 ml/kg) doses of the extract. The results showed that the average dose significantly improved cognitive impairment in mice in the novel object recognition test, the Y-maze, and several other tests. Analysis of biochemical parameters confirmed the behavioral parameters and suggested that the asparagus stem extract protected learning and memory function in mice by enhancing the activity of the cholinergic nervous system. Potentially, such an extract could prevent cognitive impairment in age-related diseases such as Alzheimer's disease.

***Fermented asparagus extracts reduce mental stress and improve sleep efficiency in healthy adult males under psychological stress.*** [23]

Japanese scientists conducted a double-blind, placebo-controlled, crossover study that looked at the effects of asparagus on sleep and stress-related hormones. Actual sleep time did not differ significantly between the "asparagus extract" and placebo groups. However, when participants were divided into two categories based on sleep efficiency or average sleep time, it was found that the drug was effective in modulating sleep status among people with low sleep efficiency or excess sleep time.

**Weight regulation**

Due to its low calorie content (about 20 kcal), very little fat (0.12 g/100 g), diuretic properties, as well as a balanced complex of vitamins and minerals, asparagus is considered an excellent product to include in diets aimed at getting rid of extra pounds.

Indirect evidence that eating asparagus can help with weight management comes from the results of experiments with laboratory animals fed a high-fat diet. [24] A high-calorie diet predictably led to obesity and negatively affected the liver of animals. But when the subjects were given supplements of asparagus (water and ethanol extracts) for 8 weeks in parallel, measurements showed that they had a significantly reduced level of weight gain. In addition, the levels of total serum cholesterol and "bad" cholesterol (low density lipoproteins) became significantly lower, the overall antioxidant capacity increased and a number of other indicators improved.

And although it is impossible to directly transfer the results of experiments with animals to humans, reviews of people who have tried a diet with the inclusion of asparagus have allowed some specialized publications to include asparagus in the top 10 best products for weight loss. In addition, due to the abundance of dietary fiber, green asparagus retains a feeling of satiety longer, prevents overeating and simplifies the process of losing weight.

**In cooking**

The unusual sweetish taste of fresh asparagus, giving off a slight aftertaste of sulfur, has been appreciated by people for a very long time. In one of the most ancient cookbooks of the ancient Roman semi-legendary gourmet Apicius "De re coquinaria" you can already find recipes for dishes from this plant. Historians claim that asparagus lovers were Julius Caesar, Louis XIV, Thomas Jefferson, Leo Tolstoy.

Before cooking green asparagus, the lower part of the sprouts is usually broken off, and the remaining stalk is most often cleaned, although this rule is not universal. Some cooks do not clean asparagus, but simply choose the most tender young shoots. At the same time, in any case, the best product is the one that was prepared on the day of harvest.

The simplest and probably the most popular way to cook the plant remains a quick boil for 3-4 minutes. The stems of the plant are tied into a bundle (up to 10 pieces) and lowered vertically into a narrow pan with enough boiling water so that the heads remain on the surface and “reach” for a couple. Overcooked asparagus becomes unpalatable, and this method allows you to synchronize the boil time of the tougher stalks and the more tender tops. However, other methods of preparing stems in our country are also quite common. Today, asparagus is baked, stewed, fried, canned, added to soups and side dishes.

In the classic version, boiled asparagus is served with hollandaise sauce, but it also goes well with cheese, fish, seafood, rice, beans, vegetables, bacon, beef, rabbit, chicken, eggs.

Dessert dishes are also prepared from asparagus, in which this vegetable culture is “friendly” with grapefruit, raspberries, strawberries, and honey. And in Japan and Italy, sweet candies are generally made from the roots of the plant. By the way, in the northern Italian province of Bolzano-Bozen, asparagus is always served as an appetizer for the best wines, since it is believed that its shoots can emphasize the taste and aroma of an exquisite drink.

**In cosmetology**

In medical cosmetology, shoots and roots of medicinal asparagus are used in the treatment of allergic and atopic dermatitis, urticaria, eczema, purulent skin lesions caused by the spread of cocci, as well as psoriasis, lichen planus. Asparagine from various parts of the plant is used in the treatment of vitiligo.

Asparagus contains a lot of folic acid, which makes the skin velvety and prevents the appearance of fine lines. Due to the rejuvenating effect, some spas prepare their own asparagus gruel for restorative procedures. Such a "technology" has survived to this day since the "gallant age". At the same time, the effectiveness of asparagus components in the prevention of skin aging is also scientifically confirmed. In particular, Japanese scientists have found that enzyme-treated asparagus extracts can prevent skin aging by significantly reducing the response to oxidative stress in dermal fibroblasts. [25]

A number of Asian and European brands include asparagus extracts in their products as the main active ingredient. As an example, we can mention face masks from Dr.Jart + (South Korea), Vegetable Beauty fluid cream (Italy), Casmara Renovating Regenerating serum (Spain), etc. For the preparation of masks and creams at home, dry, aqueous and alcoholic extracts of asparagus.

**Dangerous properties of asparagus and contraindications**

Since the asparagus components can irritate the mucous membranes, stimulating the secretory activity of the digestive tract, with chronic inflammation and especially with exacerbations of diseases of these organs, it is better to refuse to use asparagus.

Green asparagus contains a lot of fiber, which is difficult for the digestive system of children to cope with. Therefore, up to 2 years, this vegetable should not be included in the child’s diet at all, and then it is better to start a culinary “acquaintance” not with raw, but with boiled asparagus.

Also, an allergic reaction can sometimes occur to asparagus components in both a child and an adult, with the appearance of urticaria. In rare cases, skin rashes can appear even with a simple touch on young shoots.

**Selection and storage**

When buying asparagus, you should choose evenly colored bright shoots with tightly pressed shiny scales 15-20 cm long and 1-2 cm in diameter. The tops of the shoots should be dense, small in size, and the stem should be elastic to the touch.

To determine the freshness of the product, you can focus on the cut, which will be dry for stale asparagus. This is important, because it is desirable to eat asparagus on the day of harvest to preserve the richness of taste and aroma. If this fails and the preparation of the dish needs to be postponed for a day or two, then it is better to wrap the shoots with a damp cloth and place in the refrigerator. In this case, the asparagus bundle should be untied and the shoots spread out in one layer, otherwise the inner stems in the bundle may begin to rot.

About a week, asparagus can be stored on the middle shelf of the refrigerator, if you cut off the dry ends of the stems, and the stems themselves are immersed 2-3 cm in water and wrapped in cling film. At temperatures from 0°C to -1°C and a humidity of 90%, the shoots can be stored for up to a month, but if the humidity rises during this period, an unpleasant bitterness will appear in the taste.

It is believed that frozen asparagus shoots can lie unharmed until the start of the next season. But not all chefs share this view. Some people believe that when asparagus is thawed, it loses much of its special flavor and is more suitable for stuffing and adding to hot dishes.

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**Asparagus - useful properties, composition and contraindications**

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**Abstract**. The article discusses the main properties of asparagus and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the plant are indicated, the use of asparagus in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of asparagus on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its application are considered.

**Rowan (lat. Sórbus)**

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**Abstract**. The article discusses the main properties of mountain ash and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of berries are indicated, the use of mountain ash in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of mountain ash on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its application are considered.

*Key words:* mountain ash, benefit, harm, beneficial properties, contraindications

**Beneficial features**

Table 1. Chemical composition of rowan (according to Food+ ).

| **Main substances (g / 100 g):** | **Fresh Berries [1]** |
|---|---|
| Water | 81.1 |
| Carbohydrates | 8.9 |
| Sugar | 8.5 |
| Alimentary fiber | 5.4 |
| Squirrels | 1.4 |
| Fats | 0.2 |
| Calories (kcal) | fifty |
| **Minerals (mg/100 g):** | |
| Potassium | 230 |
| Calcium | 42 |
| Magnesium | 33 |
| Phosphorus | 17 |
| Iron | 2 |
| Zinc | 4.34 |
| **Vitamins (mg/100 g):** | |

| | |
|---|---|
| Vitamin C | 70 |
| Vitamin E | 1.4 |
| Vitamin B3 | 0.5 |
| Vitamin B1 | 0.05 |
| Vitamin B2 | 0.02 |

The chemical composition of mountain ash, as well as its yield or fruit size, varies significantly by variety and growing region. But a wide vitamin and mineral complex is characteristic of almost all "modern" mountain ash, since already at the beginning of the 20th century, breeders could boast of noticeable success in breeding resistant large-fruited varieties with a rich chemical composition and improved taste characteristics of berries.

To this day, the variety *Pomegranate has retained its popularity* , which I. Michurin singled out among others. But even in recent history there are "champions". For example, the *Titan* variety is considered the most valuable in terms of anthocyanin content (up to 260 mg/100 g). The same variety is among the best in terms of the content of ascorbic acid, carotene, catechins, but not in all respects it can be called the undisputed leader.

The distribution by the amount of listed nutrients in different popular varieties can be presented in the following list (from largest to smallest, in mg / 100 g, rounded to whole numbers):

- Ascorbic acid: Sorbinka - 141, Vefed - 95, Titanium - 67, Dessert - 55, Ruby - 51.
- Carotene: Sobrinka - 9, Titan - 8, Dessert, Ruby and Vefed - about 6.
- Catechins: Titanium - 915, Dessert - 675, Ruby - 645, Vefed - 360, Sorbinka - 290. [1]

In addition to ascorbic acid, the rich vitamin complex presented in the fruits of mountain ash includes fat-soluble P, A, E, K, PP, B vitamins (in descending order: B3, B1, B2). In terms of the content of flavonoids (quercetin, isoquercetin, rutin, etc.), as well as free amino acids (18 species, 8 of which are essential), mountain ash is ahead of most fruit and berry crops.

Among the sugars in mountain ash, most of all are fructose (up to 4-4.5%), glucose (up to 3.5-4%) and "sugar" alcohol sorbitol (up to 25%). There are also sorbic and parasorbic acids, macro- and microelements, essential oils.

Useful substances are also found in other parts of the plant: in seeds, leaves, bark. The seeds are characterized by an abundance of fatty oils, but also include the tainted glycoside amygdalin. Flavonoids and vitamin C were found in the leaves. The bark, like many other plants, is rich in tannins.

**Medicinal properties**

The medicinal properties of mountain ash are mainly associated with its ability to cause choleretic, laxative and diuretic effects, lower blood cholesterol levels, and also have a general strengthening and tonic effect on the body due to the presence of many vitamins. A number of studies also noted hemostatic, antimicrobial, antifungal, analgesic, anti-inflammatory and antitumor effects (in varying degrees of severity).

Rowan amygdalin increases the degree of acidity of gastric juice, so rowan is used for low acidity and is not recommended for high acidity. Also, this plant glucoside has an X-ray protective effect. In some experiments on animals, he showed analgesic properties (when injected intramuscularly). [2] Pectins in the composition of berries slow down gas formation in the digestive tract. The iodine in the flowers can help with thyroid disorders. Rowan sorbitol can cause a mild laxative effect. Rowan phenols

exhibit pronounced antioxidant activity. [3] In addition, fruits, inflorescences, and leaves of the plant exhibit antioxidant activity. [four]

In studies of recent years, other medicinal properties of rowan extracts are also found:

- Berry and leaf extracts of mountain ash showed antimicrobial activity against gram-negative microorganisms. Therefore, researchers believe that they can be considered as a potential source of new antimicrobial agents specific for Gram-negative bacteria. [5] The emergence of such a plant-based alternative is also important because it helps fight antibiotic resistance in bacteria.
- In an experiment on laboratory mice, the effect of anthocyanin-rich extract of rowan berries on the development of such pathologies as B-16 melanoma and Lewis lung carcinoma was studied. As a result, the antitumor activity of rowan extract and its ability to increase the antimetastatic activity of other antitumor drugs were established. [6] The prospects for the use of rowan anthocyanins in the complex therapy of experimental tumors are being seriously studied. [7]
- Some antifungal properties of sorbic acid extracted from rowan berries have been found. [8] Such extracts are prepared from fresh and dried berries by treatment with potassium hydroxide.

Today, in experimental programs, plant extracts are being tried to treat kidney diseases (glomerulonephritis). With the help of rowan preparations, the body's sensitivity to ionizing radiation is reduced (when used before and after the irradiation procedure). And the biologically active components of ripe rowan fruits neutralize the action of toxins.

It is assumed that for people with diabetes, rowanberry sorbitol helps to safely “sweeten” the menu and become an important source of vitamins C and P, which are important in the prevention of atherosclerosis, hemorrhagic diathesis, and hypertension. In addition, the same sorbitol may help lower blood cholesterol and liver fat.

**Use in medicine**

Official medicine does not systematically use mountain ash preparations as medicines, however, in private, doctors can recommend phytotherapeutic methods of treatment using mountain ash infusions, decoctions, syrups. So, endocrinologists plant preparations with mountain ash are sometimes prescribed as a means of normalizing the function of the glands in hypo- and hyperthyroidism (thyroid conditions with insufficient or excessive production of triiodothyronine and thyroxine), with thyrotoxicosis (excess hormones).

On sale there are both dry packaged berries and biologically active liquids (from different manufacturers). Such liquids are considered an effective vasoconstrictor agent, which can, in addition, activate the coronary circulation. But in general, manufacturers do not reduce the effect of the drug to some specific effect on the body, listing in the description the entire list of therapeutic properties of mountain ash, described, first of all, in traditional medicine.

For example, whole rowan fruits (along with crushed rose hips) are included in the "Vitamin Collection No. 2", which refers to multivitamin preparations of plant origin. It is designed for:

- regulation and normalization of metabolic processes and carbohydrate metabolism,
- decrease in the degree of vascular permeability,
- activation of tissue repair,
- enhancing the synthesis of hormones,

- moderate stimulation of the secretion of the glands of the digestive system, urine and bile secretion.

According to the instructions given, the remedy should be used to recover from colds and infectious diseases, with beriberi of a different nature and during complex therapy with a lack of vitamins C, A, P, K. They take a collection in the form of an infusion, the recipe of which is also widely used in traditional medicine .

In addition, work is underway to create medicines based on rowan berries, and some of these projects are progressing very successfully. In particular, Russian scientists have developed a technology for manufacturing an original dosage form - a dermatological ointment containing vitamins A, E, a phytocomplex of rowan fruits. Biopharmaceutical studies of the optimal composition of the ointment were carried out in in vitro tests ("in vitro"), a hardware-technological scheme for obtaining an ointment based on a lipophilic complex was developed. The results of microbiological and pharmacological studies of the lipophilic complex and ointment demonstrated their strong antimicrobial and anti-inflammatory effects. [9]

**In folk medicine**

Rowan fruits have been used as a folk medicine in Europe since antiquity. First, the ancient Greeks, and then the Romans, ate berries to strengthen the stomach, stop nausea and vomiting, and slow down drunkenness during a feast. And in order to even prevent gastrointestinal upset, rowan clusters were used prophylactically to purify drinking water. It was believed that a branch of a plant thrown into a jug would keep the water fresh longer and provide it with a pleasant taste.

Gradually, the range of use of mountain ash in folk medicine began to expand, including through the exchange of therapeutic practices between peoples. Until now, traces of ancient medicinal traditions of using mountain ash can be found in national herbalists:

- in Austria and Hungary, berries of the plant are used to treat dysentery,
- in Poland - kidney disease and diabetes,
- in Bulgaria and Eastern Europe - rheumatism, nephrolithiasis, diarrhea, gynecological diseases, nervous disorders,
- in Turkey - the leaves of Rowan home (Crimean) are used to treat burns, coughs, abdominal pain, kidney stones, and the fruits - for diarrhea,
- in Scandinavian countries - dropsy, open wounds, fractures (in the form of poultices),
- in Estonian ethno-medical texts, mountain ash is mentioned among natural anti-cancer agents [10] , etc.

In general, in modern folk medicine, various healing properties of mountain ash are used, but, first of all, urine, bile and diaphoretic, laxative and hemostatic. As a result, with the help of rowan home-made drugs, they eliminate rheumatic and gouty pains, restore the functioning of the gastrointestinal tract, and reduce pressure.

In addition, rowan preparations, due to their rich vitamin composition, are recommended for colds, due to the vascular strengthening effect - for atherosclerosis and heart disease, due to the presence of sorbic acid - for microbial and fungal infections. Dying practices include the use of mountain ash as a contraceptive. Therapy in all these cases is carried out mainly with the help of berries, but other parts of the plant (buds, flowers, leaves, bark) are also used.

The fruits of the plant in a number of folk recipes can be used without additional processing. For example, using fresh raw berries, healers recommend eliminating vitamin deficiencies, increasing

appetite and general protective properties of the body. They are also eaten to prevent the formation of liver stones, in diseases of the gallbladder. Unripe fruits with their pronounced astringent properties are considered an excellent remedy for diarrhea. They prevent fermentation and gas formation in the intestines. At the same time, rowan tea, juice, infusion, decoction and syrup in most cases solve the same problems and are equally popular in home therapy.

- Freshly squeezed rowan juice

It is considered an effective choleretic and diuretic that relieves swelling and removes harmful substances from the body. Diluted juice gargle for colds, and also include it in the complex treatment of hemorrhoids.

With low acidity of the stomach, juice is recommended to be taken for the prevention and treatment of gastritis. You need to drink only 1-2 tsp. half an hour before meals.

With hypertension, atherosclerosis and high cholesterol, fresh rowan juice helps and softens drug treatment, having a moderate effect on the cardiovascular system. The dosage and schedule of admission are almost the same as in the previous case - 2 tbsp. l. half an hour before meals.

- Porridge from fruits and leaves

Such a mixed slurry of mountain ash is prepared at home for the treatment of fungal diseases and eczema. First, the fruits are finely ground with leaves into a paste-like mass, and then wrapped with a bandage for a day to the affected areas of the skin. After removing the bandage, the procedure is repeated, after allowing the skin to dry. A longer, daily break is made a week after the start of the procedures. On these days, fungus or eczema is smeared with sea buckthorn oil.

- Rowan infusions

Infusions are drunk to treat a wide range of diseases (and pathological conditions): aretosclerosis, anemia, beriberi, hypoacid gastritis, as well as diseases of the kidneys, liver, and heart. In case of bleeding, the damaged areas are covered with bandages soaked in rowan infusion.

To prepare an infusion of rowan for a full glass of boiling water (250 ml), you will need 25 g of dry or 60 g of fresh rowan berries. In a thermos, the fruits poured with boiling water are infused for about 4-5 hours, and they drink 100 ml half an hour before meals.

- A decoction of rowan

Rowan decoctions are usually intended for the same purposes as infusions, and although they take longer to prepare, they are also stored longer. First, the berries (dry 25 g / fresh 60 g per 250 ml of water) are kept in a water bath for up to 15 minutes, and then they should be infused in a thermos for another 10 hours.

In addition to a decoction of berries, in folk medicine, the use of a decoction of the flowers of a plant is sometimes practiced. For 250 ml, about 10-12 g of raw materials will be needed. Indications for the use of such a decoction are women's diseases, senile sclerosis, goiter, colds, cough. A decoction of the bark is prepared to treat hypertension.

- rowan syrup

In the treatment of diseases of the stomach, bladder and kidneys, traditional healers prescribe 1-2 tbsp. l. rowan syrup. To prepare it, the berries are ground with sugar in a ratio of 10:6 (for example, 1 kg of raw material per 600 g of sugar) and then kept in a dark place for 3 weeks, periodically squeezing out the syrup. Syrup is usually drunk without dilution, but sometimes mixed with vodka or alcohol. About 50 ml of vodka is taken per liter of syrup. Some folk therapists also treat rheumatism and polyarthritis with this remedy.

In some sources, mountain ash is called a male berry, because its diuretic properties and the ability to improve blood circulation are associated with the prevention of prostatitis. In other sources, rowan is considered a female berry due to the fact that it can be used to reduce excessive amounts of menstrual flow. But, perhaps, it is more correct to call mountain ash a universal plant, the fruits of which, in moderation, are useful to almost everyone.

**in oriental medicine**

In oriental medicine, red rowan was not a key medicinal plant, but it was still widely used in Tibet, India, and China. Tibetan monks used mountain ash to prepare choleretic and tonic remedies, especially during periods of epidemics. As a rule, complex drinks and multivitamin teas were prepared. In particular, mountain ash was often combined with wild rose and aronia, similar to red mountain ash.

In addition, in Tibetan medicine, rowan fruits were used to treat diarrhea, paralysis, lung diseases, and even anthrax. Lotions from mountain ash tinctures accelerated healing in case of bone fractures. In Indian traditional medicine, rowan remedies were used for scurvy, liver diseases, and hemorrhoids.

**In scientific research**

Rowan research is currently being conducted in several key areas.

Breeders are interested in the plant's ability to adapt to different growing conditions, the possibility of increasing fruiting and breeding new varieties and hybrids. Technologists and representatives of the food industry - improving the taste and nutritional qualities of berries, the possibility of using mountain ash components in canning products.

In parallel with this, the chemical composition of the fruits of the plant, phenolic and antioxidant profiles of different varieties of mountain ash, as well as changes in the phenolic content and antioxidant activity under different growing conditions and periods (for example, during the growing season) are being actively studied. [11]

However, the most interesting line of research for us is the study of how biologically active substances found in mountain ash can be used in the prevention and treatment of human diseases. There are not very many such projects yet, but a 2019 paper looking at the potential of rowan berry extracts in the treatment of type 2 diabetes can serve as an example. [12]

Scientists have studied the inhibitory activity of rowan berry extract on the digestive enzymes α-amylase and α-glucosidase, since these enzymes are considered important for controlling blood glucose levels in type 2 diabetics.

In the work, 70% acetone extracts of berries of 16 species of mountain ash were tested in vitro (“in vitro”). As a result, the lowest IC50 values against α-amylase and α-glucosidase were obtained in rowan species belonging to Aria subspecies, which had simple leaves compared to pinnately compound leaves of other plant species. Both the carbohydrate and polyphenol fractions were involved

in enzyme inhibition. As a result, scientists came to the conclusion that rowan subspecies Aria could potentially be used to treat type 2 diabetes.

The therapeutic possibilities of mountain ash are also being studied in experiments on laboratory animals. For example, quite recently, in 2020, a group of scientists evaluated the effect of one of the plant species, Sorbus domestica, and its active components on an experimental model of rat colitis caused by acetic acid. [13]

The crude methanolic fruit extract was sequentially fractionated into five sub-extracts; dichloromethane, diethyl ether, ethyl acetate, n-butanol and aqueous extracts. During experiments, the methanol extract and diethyl ether sub-extract resulted in a marked decrease in the levels of MPO, caspase-3, IL-6, TNF-α, MDA, and nitrite in colon tissue and blood. The results of histopathological analysis were confirmed by biochemical parameters.

This led scientists to conclude that the fruits of the plant have important anti-inflammatory and antioxidant activities, making rowan a promising candidate for future use in the prevention and treatment of various diseases, such as inflammatory bowel disease, irritable bowel syndrome, and Clostridium difficile infection.

**Weight regulation**

Given that the red-fruited mountain ash has a low calorie content (50-55 kcal / 100 g) and a low glycemic index (about 25), it is often included in diet programs aimed at weight loss. At the same time, they do not expect any specific action (for example, associated with fat burning) from mountain ash. Rather, this plant product is replaced by multivitamin complexes to enrich the meager diet on fasting days.

A popular remedy that makes it easier to spend fasting days and lose extra pounds without vitamin losses is a complex of rowan and rosehip fruits. For this, the crushed raw materials (usually 2 tablespoons each) are mixed and poured with a glass of boiling water, after which they are transferred to a dark place for 12 hours. After straining, the liquid is divided into 3 parts (approximately 50-70 ml each) and taken in such portions three times a day after meals.

**In cooking**

Today you can find dozens of recipes with red rowan, according to which jams, jams, juices, liqueurs, pickled snacks are made. Fashionable chefs are experimenting with different flavor combinations, adding sour mountain ash to fish (instead of lemon) or meat (in the form of a sweet sauce). But these modern trends also have long historical roots.

So, with the onset of autumn in the Ural and Siberian villages, mountain ash was traditionally harvested in various ways (dried, boiled, pickled, frozen) for the subsequent preparation of jelly, kvass, stuffing for pies and stuffed fish, tinctures, wine. By the way, in Tsarist Russia, mountain ash wines successfully competed with French grape wines. Some even received medals (including gold ones) at the World Exhibition in Paris.

Rowan tincture was very popular. They prepared it from the sweet Nevezhinsky mountain ash, but they called it "Nezhinskaya". There was even a legend that in this way the manufacturers (either Shustov or Smirnov) wanted to confuse competitors and add harmony to the name.

Ukrainian villages also had their own traditional rowan "porridge" - frozen fruits were crushed with spoons and mixed with powdered sugar to a paste-like state. The fruits, frozen and sweetened with frost, mixed with flour and honey, were eaten instead of sweets.

**In cosmetology**

In cosmetology, mountain ash ingredients are used primarily as part of hair care products. But in masks, creams, facial skin tonics, extracts of berries from a number of manufacturers can also be found.

In hair care products, mountain ash is valued for its ability to:

- tone the scalp
- strengthen roots and activate follicles,
- normalize sebaceous secretions,
- eliminate peeling and dandruff.

Hair masks at home are usually made with the addition of a few more natural ingredients: honey, oils (olive, burdock, avocado), flour, etc.

In cosmetics for facial skin, the presence of rowan extracts is due to their antioxidant effect, as well as the ability to:

- prevent the appearance of fine mimic wrinkles,
- reduce sensitivity to the influence of aggressive environmental factors,
- maintain hydrolipid balance.

After applying homemade rowan masks, a “light tan effect” may even occur. This is due to the high content of carotene in the fruit.

And to quickly tone the skin at home, rowan juice is simply frozen in a 1: 1 ratio with distilled water and then the face is rubbed with an ice cube, thereby improving microcirculation, cleansing and narrowing pores.

**Dangerous properties of mountain ash and contraindications**

Mountain ash (due to the presence of vitamin K in the fruits, which is responsible for blood clotting) should be treated with caution by people who have had a stroke, heart attack, as well as patients with other pathologies of the cardiovascular system due to increased blood clotting.

Mountain ash is prohibited for people with high acidity of gastric juice and associated gastrointestinal diseases. Amygdalin, responsible for the increase in acidity, can potentially be dangerous as a poison that can provoke serious poisoning. Decaying, amygdalin is converted into deadly hydrocyanic acid. However, there is still quite a bit of amygdalin in mountain ash, and the human body neutralizes small doses of cyanide on its own. So if you do not abuse rowan, then the risk of poisoning is minimal.

Mountain ash is also contraindicated in case of signs of individual intolerance and an allergic reaction.

**Selection and storage**

The best time to collect mountain ash is the period from late September to early November. By this time, the berries have time to gain the greatest amount of nutrients. Later, mountain ash can also be

harvested, but there is a risk of waiting for frosts, and frozen berries are stored worse. However, many people prefer to collect just such fruits, since the taste of mountain ash only improves after the first frost - with the destruction of sorbic acid glycoside, the characteristic bitterness disappears.

It is best to store the collected berries in a refrigerator or cellar at a humidity not exceeding 70%. By lowering the temperature, you can increase the shelf life:

- 10-15°C - up to 2 months,
- 5-10°C - up to 4 months,
- Around 0°C - before the onset of spring,
- Freezing at -18°C will not only keep the mountain ash until the next season, but will also increase the concentration of carotene.

In any case, before placing in a paper bag or plastic container, the mountain ash should be sorted out, cleaned of leaves, twigs, insects, and damaged berries should be discarded.

An alternative to the "cold" method of storage is drying and drying of berries. Before drying, the berries are washed, and then spread in an even layer on a towel or placed in an oven heated to a temperature of about 70 ° C. At the same time, the door is set aside slightly ajar to allow moisture to escape. A finished product is considered if the berries, with a slight squeeze in a handful, stop sticking together.

Before drying, the berries are also washed and then poured for 3-5 minutes with hot water. After this time, hot water is drained and new, cold water is poured, in which the fruits are soaked for another half a day. Then the mountain ash is dried and mixed with sugar (in the proportion of 1 kg of berries to 2 cups of sugar). A day later, the juice is drained or poured into jars, and then the daily cycle with the addition of 2 cups of sugar and the removal of the juice is repeated again.

Next comes the heat treatment of the product. The berries filled with sugar syrup are boiled (but not boiled) for about 5-7 minutes, the syrup is drained, and the fruits are sent to the oven for drying for half an hour at a temperature of 70 ° C. Sometimes the half-hour drying cycle is repeated twice (after a pause necessary for the mountain ash to cool). Often, then you still have to dry the fruits already at room temperature before laying them out in glass jars.

But there are less time-consuming ways to use sugar as a preservative. For example, mountain ash, sprinkled with sugar in layers, can simply be placed in the refrigerator in a compartment with a temperature of 0-5 ° C, where it will lie for several months without deteriorating quality. In addition, often with sugar, mountain ash is ground into puree (in a ratio of 2: 1), closing in glass jars for up to a year. Or “roll up” compotes.

However, the useful substances originally contained in mountain ash do not “survive” the same way in different ways of storage:

- Flavonols, anthocyanins, tannins almost equally remain in dried mountain ash and compotes.
- Carotene and P-active catechin remain more in compotes, although in some varieties of mountain ash (for example, in Sorbinka) carotene is relatively well preserved even when dried.
- Ascorbic acid in dried rowan is preserved better than in preservation. In addition, in mountain ash compotes, the vitamin composition is richer in quantity and quality than in fruits mashed with sugar.
- If grinding fruits with sugar was nevertheless chosen as a storage method, then please note that the safety of vitamin C, flavonols, carotene and catechins will be higher with a single sterilization for 10-20 minutes in closed jars at a temperature of about 90-95 ° FROM. And

here, too, varietal affiliation plays a certain role. Therefore, for this method of storing mountain ash, the Titan variety is more suitable.
- In mountain ash compotes, vitamins are also better preserved if the product is sterilized once for 10-20 minutes at a temperature of 90 ° C. [fourteen]

At the same time, it is better to consider compotes and, moreover, sugar blanks as a necessary measure, since almost always the presence of biologically active substances in rowan fruits is greater than in prepared solutions.

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**Rowan - useful properties, composition and contraindications**

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**Abstract**. The article discusses the main properties of mountain ash and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of berries are indicated, the use of mountain ash in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of mountain ash on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its application are considered.

**Dates (Phoenix dactylifera)**

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**Abstract**. The article discusses the main properties of the date and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of fruits are indicated, the use of dates in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of dates on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

*Keywords:* dates, benefits, harm, beneficial properties, contraindications

**Beneficial features**

Table 1. Chemical composition of dates (according to Food+ ).

| **Main substances (g / 100 g):** | **Dates [1]** |
|---|---|
| Water | 20.53 |
| Carbohydrates | 75.03 |
| Sugar | 63.35 |
| Alimentary fiber | eight |
| Squirrels | 2.45 |
| Fats | 0.39 |
| Calories (kcal) | 282 |
| **Minerals (mg/100 g):** | |
| Potassium | 656 |
| Phosphorus | 62 |
| Magnesium | 43 |
| Calcium | 39 |
| Sodium | 2 |
| Iron | 1.02 |
| Zinc | 0.29 |
| Copper | 0.206 |
| **Vitamins (mg/100 g):** | |
| Vitamin PP | 1.274 |
| Vitamin B6 | 0.165 |
| Vitamin C | 0.4 |
| Vitamin B2 | 0.066 |
| Vitamin B1 | 0.052 |
| Vitamin E | 0.05 |

In popular literature, dates are often called "bread of the desert", noting its balanced composition, which includes a complex of most vitamins and minerals necessary for a person to live. Oriental legends tell how people ate only dates and water for years without much harm to health. Such an assessment of the date is largely mythologized, but in general, the fruits of the date palm really combine a number of micro- and macroelements, among which copper stands out in a relatively high concentration - approximately 25-30% of a person's daily need, potassium - 20-25%, magnesium - 10-fifteen%.

Still, there are not so many other minerals in dates to eat only these fruits without experiencing a deficiency: zinc - about 2% of the daily requirement, calcium - about 4%, phosphorus 5-6%, iron - 7-10%.

It cannot be said that dates completely cover the needs of a person in terms of vitamins. Vitamins B6 and B3 (PP) in 100 g of the product (without a stone) contains 8-15% and 7-8% of the daily requirement, respectively (the rest is less). Although it should be noted that during the day a hungry person can still eat quite a lot of dates - much more than 100 grams, since one pitted fruit weighs from 5 to 15 grams. However, excessive use is also fraught with consequences.

Date is a very sugary product with 60-65% sugar per unit weight. In fresh fruits, this proportion is slightly less, but solely due to the increase in water. This "sugar content" is often associated with a high glycemic index of the product, but in the case of dates, this is not entirely true.

The Harvard Medical School website [2] provides a table of glycemic indices for various fruits, where the date (fresh) value is 42 ± 4. This is about the same as that of an orange, peach and apple juice, but 20% less than banana, mango and orange juice, 40% less than pineapple, 80% less than watermelon. At first glance, this index may still seem quite high, but when compared with other foods, raw dates are similar in this indicator to boiled carrots and vegetable soup. In general, the glycemic index of dates is considered medium (closer to low) according to this table, due to the high proportion of low glycemic fructose among other sugars. But a large amount of fructose (as well as other sugars) in food can significantly harm health, which is the reason for a significant part of the contraindications when including dates in the daily diet.

The composition of the date is supplemented with useful fiber. But here, too, it must be taken into account that the indicators of the amount of fiber, vitamin C, β-carotene, tannins and the ten most nutritionally important minerals are highest in the early stages of fruit development and decrease during ripening.

In addition to the listed components, amino acids (23 species), flavonoid glycosides luteolin, quercetin, apigenin in various forms [3], diosmetin glycosides, which are considered as a possible component of a diabetes drug, have been identified in date palm fruits.

**Medicinal properties**

Date finger in the Arab countries has long been part of the main diet. The literature describes many pharmacological properties of the plant. According to these data, date fruits, pits, leaves, bark and pollen have anticancer, antioxidant, hepatoprotective, antidiabetic, hypotensive, antiulcer, anti-inflammatory, antiproliferative, antimutagenic, antidiarrheal, antibacterial, antifungal properties. In addition, dates can increase the levels of estrogen, testosterone, red blood cells, hemoglobin, reticulocytes, and platelet count. These fruits can eliminate lead-induced hemotoxicity, methylprednisolone side effects, male and female infertility. They also have cerebroprotective, neuroprotective and hematopoietic effects. [four]

- Digestive organs

Both fresh and dried date palm fruits are known for their ability to relieve constipation and improve the functioning of the digestive tract. This is accompanied by an activation of the defecation process (both frequency and quantity increase) with a parallel decrease in the concentration of ammonia in the stool [ 5] . Since genotoxic substances have mutagenic and carcinogenic potential, damaging cellular genetic material, a reduction in genotoxicity leads to a decrease in the risk of colon cancer.

In animal experiments, this was confirmed and it was shown that palm juice and especially date pulp water extract (depending on the dose) have a stimulating effect on the activity of the gastrointestinal tract [ 6] . At the same time, some studies show that dates do not always have an exclusively stimulating effect on the digestive organs. Gastrointestinal transit can either increase or decrease depending on the method of fruit extraction [ 7] .

Several laboratory experiments have shown that water and ethanol extracts of date fruits and, to a lesser extent, date seeds, were effective in alleviating the severity of gastric ulcers and attenuating the ethanol-induced increase in histamine and gastrin concentrations, as well as in reducing the level of mucin in the stomach [8] .

- Vessels and heart

Date extract, by inhibiting oxidative, inflammatory and apoptotic molecules, alleviates primary diseases of the heart muscle [9] . The result was obtained in an animal experiment, but the researchers believe that date extract has a great potential in terms of human myocardial damage.

An international team of scientists, combining various herbal ingredients well established in traditional medicine, came to the conclusion that the consumption of dates and date seeds along with pomegranate has the most beneficial anti-atherogenic effect on the serum and macrophages of mice [10] . The special effect of preventing the development of cardiovascular diseases is associated with the unique and diverse structure of the components, due to which the oxidative stress of macrophages - cells that absorb harmful and foreign substances, has sharply decreased, the content of serum cholesterol and lipid peroxide has decreased.

Fractions of phenolic acids and flavonols of dates fruits (Phoenix dactylifera L.) were studied in vitro ("in vitro"), studying their antioxidant properties and the ability of these fractions to protect the heart and blood vessels, prevent the formation of cholesterol and atherosclerotic plaques (antiatherogenic properties) [ 11] . Fractions of flavonols, in contrast to fractions of phenolic acids, demonstrated a pronounced ability to restore the antioxidant effect of iron, the ability to scavenge free radicals and suppress the oxidation of low-density lipoproteins ("bad" cholesterol).

The date is distinguished by a sufficiently high content of potassium with a low sodium content, which makes it an excellent food for hypertensive patients. In addition, magnesium in the composition can enhance the effect of drugs against hypertension.

- Brain and nervous system

Since oxidative stress may play a key role in the neuropathology of Alzheimer's disease, scientists have tried to influence this factor by long-term dietary supplementation from date palm fruits. Unfortunately, in this case, too, all the results have been obtained so far only in animal models. But under given conditions, however, date supplements helped restore the activity of antioxidants and membrane-bound enzymes and reduce oxidative stress [12] . Also, fruit extracts were able to protect the nervous system from complications arising from diabetes [13] .

Various varieties of dates (but especially the Ajwa variety) have demonstrated the ability to reduce the feeling of pain, restore the efficiency of nerve cells in disorders of the central nervous system. The observed neuropharmacological and analgesic activity is partly due to the presence of three important plant polyphenols (catechin, epicatechin and transferulic acid), which are known for their neuroprotective activity and the ability to exert antioxidant effects on brain cells [14] .

However, judging by experiments on laboratory mice, not all pain can be effectively relieved with the help of date preparations. Thus, the results of a study by Iranian scientists using water-alcohol extracts of the date palm showed that the date remedy is able to reveal a significant analgesic effect in chronic pain, but it practically did not demonstrate an analgesic effect in acute pain [15] .

- reproductive function

The effect of experimental palm preparations on spermatozoa and spermatogonial stem cells preceding them was studied in several studies at once. Among them, special attention is drawn to those studies that were conducted with the participation of human volunteers.

In particular, in an experiment that studied the effect of palm pollen on sperm parameters of infertile men, scientists came to the conclusion that pollen powder in the amount of 120 mg / kg, taken in capsules for 2 months, increased the quantity and quality of spermatozoa - their mobility and morphology. Scientists have even suggested that male infertility can be cured in this way. Although the number of volunteers who took part in the experiment was relatively small - only 40 people [16].

It is hypothesized that spermatozoa can be protected from damage caused by oxidative stress by saturating them with the antioxidants present in palm pollen. Pollen phenolic compounds, thanks to polyphenols, affect several factors at once, eliminating hydroxyl free radicals and protecting spermatozoa from damage [17].

In addition, steroidal saponins (21 pcs.) were found in the 80% methanol fraction of male date palm flowers. These complex glycoside compounds showed a significant improvement in the number, motility and viability of spermatozoa in male rats. Scientists associated these effects with an increase in the level of sex hormones [18].

In a number of laboratory experiments, it was shown that date pollen extract also increases sperm motility, and is also able to protect the testicular apparatus from the damaging effects of nicotine and thyroid hormones.

In addition to the above, various date extracts can potentially be used in other areas of therapeutic practice.

- **Protecting the liver from damage.** Date palm fruits have been shown to be effective in preventing hepatotoxicity caused by oxidative stress in animals [19]: water extracts - in protection against the negative effects of trichloroacetic acid (formed during the chlorination of drinking water) [20], and seed extracts - from the action of carbon tetrachloride [21].
- **Immunostimulating effect.** The corresponding effects of dates have been documented when testing a number of plants for immunostimulatory activity using the macrophage migration index as a parameter of macrophage activation and cell-mediated immunity and some other parameters [22].
- **Antifungal properties.** Date extracts of not all varieties of palm are equally capable of suppressing fungi, but in some varieties (for example, "Bent-Cherk") this ability was pronounced in the experiment [23].
- **Antiallergic activity.** Mice treated with a hot water extract of ripe date palm fruits sneezed and suffered from a mucosal reaction to an allergen much less frequently than mice from the control group [24].

**In medicine**

In modern European medicine, the components of the date palm are not used as a medicine. In the medicine of the Arab countries, fruits can become part of a restorative diet prescribed after childbirth, past illnesses, and injuries. In addition, the appointment of representatives of official medicine and traditional folk recipes is practiced.

However, some plant palm components that have proven themselves as healing agents can be bought today in our country.

- **Palm pollen.** Manufacturers recommend pollen (extract) of male palm trees in the form of a white powder or capsules for the treatment of impotence, male and female infertility, various kinds of mental disorders, depression, and gastrointestinal disorders.

- **Fruit extract.** It is sold, as a rule, in the form of a packaged dark brown powder. Manufacturers note its immunomodulatory and anti-inflammatory effect, recommending the use of the extract in cosmetics to restore skin elasticity and firmness.
- **complex preparations.** Palm fruit extracts are sometimes combined with other medicinal herbal ingredients: pumpkin seed oil, fenugreek extract, garlic, yarrow, broccoli, etc. The medicinal properties of such collections are usually described as the sum of the properties of individual components.

**In folk medicine**

Since the natural habitat of the date palm is the territory of the countries of the Middle East, North Africa, Pakistan, India, it was in these regions that the principles and options for using different parts of the plant in folk medicine were formed.

A large-scale ethnopharmacological analysis of the date palm healing traditions on the continent showed that this was a very common practice in 35 African countries. Moreover, more than 20 different parts of the plant were used, although, basically, all the same, fruits, oil, roots, seeds and leaves. Researchers have counted more than 700 medicinal uses of the plant in 25 traditional medicines, but most of them dealt with the most common infections and disorders of the digestive system. Moreover, in contrast to the European practice of using medicinal preparations, parts of the date palm were rarely mixed with other plants, and if mixtures were sometimes prepared, then more often with products of animal origin [25] . In Arab countries, however, herbal preparations were often used.

Similar ethnopharmacological studies of plants used in traditional medicine were carried out in other Arab and African countries. The results suggest that dates are used everywhere in several areas of medicine at once, but there are also more pronounced directions for a particular region:

- In Egypt, there are many folk recipes for the use of date components for stomach ulcers in people. Date palm seeds are included in folk remedies for diabetes, liver disease, and gastrointestinal disorders.
- In traditional Persian medicine, date bandage is used as an analgesic.
- In Tunisia, variously prepared fruits are used to treat constipation.
- In Morocco, dates have long been used to treat hypertension and diabetes [26] . Moreover, there are relatively few such plants that can be used to treat both of these diseases at once.
- In traditional Indian medicine, the immune-boosting activity of dry fruits and herbs is used for the recovery of mothers after childbirth and the disabled.

But such regional specificity arose only in certain historical periods and disappeared with the expansion of cultural boundaries. Therefore, we can say that almost everywhere where the date palm grew, its fruits were widely used as a medicine for the treatment of gastric and intestinal disorders and pathologies, fever, edema, bronchitis, for healing wounds and skin diseases, restoring reproductive function in men and women, to relieve psychological stress.

The purpose and recipes of folk remedies could vary in different regions. Thus, in some cultures, a combination of dates and fresh milk was used to treat (and still treat) diseases of the respiratory tract, and in others, they restored male potency. In particular , it was believed that if dates were soaked in milk overnight and cinnamon was added to them, then the man who ate them would regain his “male strength”. True, there was a danger that such a combination could simultaneously provoke a violation of the digestive tract.

Used in traditional medicine and decoctions of different parts of the plant. A decoction of fruits with fenugreek was supposed to help remove stones from the bladder and kidneys, and with rice - to restore strength, saturate, restore fatness to the body.

A decoction of the seeds was also used to remove stones. But, in addition to the decoction, seeds burnt into ashes were used, with which they rubbed ulcers, wounds and treated eye lesions.

**in oriental medicine**

In traditional Chinese medicine, the fruits of the date palm, as a medicine, were almost completely replaced by the fruits of another plant, which is also called a date in the common people. "Chinese date" is smaller than the "classic" and redder. It is also very tasty, and also very healthy (to such an extent that in some ratings it is included in the “five” of the most used Chinese medicine plants). However, it has nothing to do with *Phoenix dactylifera (Date palmate).* The scientific name of this plant is *real Ziziphus* , or *Chinese Yuyuba* .

However, other types of date palm grow in southwest China and some countries in Southeast Asia - for example, the dwarf Robelin date ( *Phoenix roebelenii* ), but it is primarily used as an ornamental, not as a medicinal plant.

**In scientific research**

The bulk of the research that studies the therapeutic potential of the date is carried out in those countries where these fruits have traditionally been used in folk medicine. Based on rich historical experience, scientists in scientific experiments are looking for evidence of the effectiveness of old medical practices.

It is especially interesting to see if modern research confirms the healing effects of dates described in ancient sacred texts. For example, they indicate that Sayyidina Maryam, the mother of the Prophet Isa (who in a number of theological interpretations is identified with the New Testament Jesus Christ), during labor pains to strengthen her strength and improve the condition of eating dates. And the Prophet Muhammad recommended that pregnant women and nursing mothers eat dates for the development of a healthy child.

Modern scientists undertook to check whether the use of dates during the month before childbirth actually simplifies and facilitates this process. During the year (February 2007 to February 2008) at the Jordan University of Science and Technology, the effect of eating date fruits (Phoenix dactylifera) on various indicators of the birth process was studied. The study was conducted on 69 women (Group 1) who were given six dates per day for 4 weeks prior to their due date. Their performance was then compared with that of 45 women (Group 2) who did not eat dates at all. There were no significant differences in gestational age, age, or other biological characteristics between the two groups.

As a result, the following differences between the groups were recorded:

1. Mean cervical dilatation was significantly higher in Group 1: 3.52 cm vs. 2.02 cm. Date eaters also had a higher proportion of intact membranes: 83% vs. 60%.
2. Independent childbirth occurred in 96% of those who used dates, and in 79% of women from the second group.
3. Prostin (a hormone that softens the cervix) and oxytocin (a hormone that increases uterine tone) were used less frequently in Group 1 (28%), compared to 47% in Group 2.
4. The mean latent phase of the first stage of the labor process was also shorter in women who consumed date fruits (510 minutes versus 906 minutes).

According to these data, the scientists concluded that the consumption of dates in the last 4 weeks before childbirth significantly reduced the need for medical intervention and control of the birth process [27].

**Weight regulation**

Using sweet dates in weight loss is a controversial practice, but it finds its supporters.

100 g of dates contains 280-300 kcal. With an average weight of the pulp of one fruit of about 10 g, it can be easily calculated that about 30 kcal comes with just one eaten fruit. Such an amount seems dietary, but, firstly, as a rule, no one is limited to one date, and secondly, the bulk of these calories are provided by sugars.

Over 60% of the mass of even a fresh date is sugar, and in most varieties, fructose is considered the predominant sugar (in some varieties, a high percentage of glucose was found and comparable). In conditions of limited energy intake, fructose-containing foods can be life-saving. However, with a daily nutritious diet, the use of fructose in the composition of dates is likely to lead to the rapid appearance and accumulation of fat in the abdominal cavity. Fructose will simply be transported to the liver and processed there into fat. It will be consumed only if there is no other food.

Thus, in a diet aimed at getting rid of “fat” kilograms, it is better to eat dates separately from the main meal or, in extreme cases, in combination with healthy fats and proteins: nuts, avocados, sour-milk products, unsweetened vegetables. A date eaten as a snack can give energy and distract from hunger. But even in this case, it is better to limit the amount of these fruits to two or three pieces per day.

**In cooking**

At first, the combination of dates with other food products, traditional for the Arab world, may seem strange to a European. In northern countries, sweet fruits are more often perceived as a component of dessert dishes, pies, cakes, muffins, cookies, sweets, etc. But in the East, dates are eaten with meat, fish, milk, bread, butter and cheese. Often the dates are stuffed. Very tasty, for example, is a date stuffed with cheese, garlic and herbs.

The fruit of the date palm has been used to make wine since ancient Egypt. But from the leaves of the Indian species of this plant, palm wine, which is called "tari", has long been prepared. Such date alcoholic beverages are often compared to young grape wines or champagne. At the same time, alcohol is not always present in carbonated date drinks.

In some regions, an analogue of a coffee drink is prepared from roasted and ground date seeds. It also tastes like coffee, so it is not surprising that it is offered in the general menu in some cafes. In particular , in the network of coffee houses "Cafenetto" (Israel), date EspressoDate is served.

**In cosmetology**

Since ancient Egypt, date fruits have been used as a remedy for healing skin lesions and relieving inflammation. Modern research confirms the anti-inflammatory properties of fruit juice, which, according to scientists, accelerates cell proliferation and promotes faster tissue healing. Chemical analysis showed the high total antioxidant capacity of the juice and its free radical scavenging activity [28].

Cosmetologists use the anti-inflammatory properties of date seed juice and oil to prepare various cosmetic products [29]. Creams, serums, lotions, shampoos and conditioners with date fruit extracts are

easy to find on sale today, and this ingredient is used by many manufacturers of both affordable and elite cosmetics.

Such attractiveness of dates is explained by the presence of biologically active substances in the composition of the “five” extract that protect the skin, tighten it, make it more elastic, elastic and “alive”: phytosterols, isoflavones, ursolic acid, beta-carotene, forms of vitamin E (tocopherol, tocotrienol ).

At home, dates are used to make multi-component moisturizing face masks that make the skin silky. There are many recipes for date masks, but the following can be cited as an example: the pulp of 6 dates with the pit removed is ground into porridge and mixed with 20-25 ml of olive oil until smooth, after which the mass is applied to the face for 15-20 minutes.

**Dangerous properties of dates and contraindications**

Representatives of ancient Arabic medicine believed that the fruits of dates can harm people living in areas where date palms do not grow. That is, all Europeans were at risk. It was believed that due to eating unfamiliar fruits, such people could pathologically increase the amount of black bile, clog the hepatic canals, develop fever, headache and toothache.

Modern medicine does not share such concerns, but welcomes the restrictions on the use of date fruits (up to 8-10 pieces per day for a healthy person), linking this to a high content of sugars (mainly fructose) in the fruit. The abuse of dates, which supplement a full-fledged diet, can potentially threaten the appearance of fatty hepatosis, diabetes, atherosclerosis, hypertension, dementia and other diseases. In the short term, excess fructose can cause bloating and abdominal pain.

Allergy can also occur on dates (although this phenomenon is considered quite rare). At risk are those people who develop an allergic reaction to histamine, which is present in a number of dried fruits and dairy products.

Another potential source of danger can be sulfites, which extend the shelf life of fruits. Dates owe these substances to the characteristic sheen on the skin of the fruit. But these same substances can also provoke a disorder in the functions of the digestive tract.

**Selection and storage**

Ideally, when choosing dates, it is better to buy those that have ripened and dried right on the tree. But since dates are an imported product in our country, there are no ideal purchase conditions.

Depending on the characteristics of the collection and preparation of fruits by producers, dates are subjected to various processing methods - from thermal exposure to accelerate ripening, to soaking fruits in sugar syrup. Sometimes, though comparatively rarely in the case of dates, these fruits are treated with sulphurous gas.

To choose dates with a minimum set of "unpleasant" surprises ", you should pay attention to their appearance and skin condition:

1. Fruit color should be dark brown. Light fruits are more likely to be underripe, although shades may also depend on the varietal affiliation of the batch.
2. There should be no cracks in the skin. Their presence indicates the possible heat treatment of fruits. This can also be indicated by peeling the skin, the taste of a fried fruit, or too dark a

color. The pulp of such oven-dried dates will be sticky and will start to stick in your teeth. In boxes, these fruits can be compacted into a homogeneous array.
3. Fruit with sticky skins should not be selected because they have most likely been coated in glucose syrup. An additional sign of such processing are sugar crystals on the surface.
4. Wrinkled fruits with odors of sweetness or fermentation indicate improper storage and / or underdrying of the dates.
5. Too shiny fruits (especially if they leave an oily mark on the fingers) should also be avoided. Dates are often greased, but sellers may do this not only out of a desire to improve the presentation of a quality product, but also in an attempt to hide defects.

Dates must be washed before use. Dried packaged fruits that have already passed the “washing stage” during the preparation of the product for sale can theoretically be eaten without washing. However, since the buyer, as a rule, does not have reliable data on the methods of processing and storing fruits, in practice it is better to at least rinse dried fruits with cool water and then dry them on a paper napkin. Moreover, sugar syrup, which is often used to process fruits, can eventually become a breeding ground for pathogens.

You can store fresh dates for a long time without worrying about their quality outside the refrigerator, but the safe shelf life will be reduced:

- at room temperature, the fruits can lie up to 1.5-2 months,
- on the "warm" shelves of the refrigerator - twice as long - 3-4 months,
- in the freezer at sub-zero temperatures - at least a year.

The shelf life of dried dates at room temperature doubles, and in a refrigerator it can be increased at least 3 times. At the same time, fruits should be packed either in tightly closed glass jars, or in plastic and plastic bags.

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**Dates - useful properties, composition and contraindications**

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**Abstract**. The article discusses the main properties of the date and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of fruits are indicated, the use of dates in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of dates on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

**Chia seeds ( lat . Salvia hispanica)**

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**Abstract**. The article discusses the main properties of chia seeds and their impact on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of chia seeds in various types of medicine and the effectiveness of their use in various diseases are considered. The potentially adverse effects of chia seeds on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with their application are considered.

*Keywords:* chia, chia seeds, benefits, harm, beneficial properties, contraindications

**Beneficial features**

Table 1. Chemical composition of chia seeds (according to Food+ ).

| **Main substances (g / 100 g):** | **Chia seeds [1]** |
|---|---|
| Water | 6.96 |
| Carbohydrates | 28.88 |
| Sugar | 1.55 |
| Alimentary fiber | 27.3 |
| Squirrels | 18.29 |
| Fats | 42.16 |
| Calories (kcal) | 534 |
| **Minerals (mg/100 g):** | |
| Potassium | 813 |
| Phosphorus | 642 |
| Magnesium | 392 |
| Calcium | 255 |
| Sodium | thirty |
| Iron | 5.73 |

| | |
|---|---|
| Zinc | 4.34 |
| Copper | 1.22 |
| **Vitamins (mg/100 g):** | |
| Vitamin PP | 3.08 |
| Vitamin B1 | 1.644 |
| Vitamin C | 0.6 |
| Vitamin B6 | 0.473 |
| Vitamin E | 0.31 |
| Vitamin B2 | 0.161 |

The chemical composition of chia seeds has been analyzed by many researchers, therefore, depending on the source of information, the values \u200b\u200bmay vary slightly. After all, the chemical composition and nutritional value can be influenced by climatic conditions, geographical location, year of cultivation and other factors.

For example, the composition of fatty acids can change depending on climate change and the height of the plant - the higher the region and the colder it is, the greater the content of omega-3 unsaturated fatty acids in the product. But in April-May, due to an increase in temperature, the amount of polyunsaturated fatty acids present decreases.

But even with these variations, we can say that chia seeds contain a large amount of fat (30–33%), carbohydrates (26–41%), dietary fiber (18–30%), proteins (15–25%), vitamins ( A, B, K, E, D), minerals, 32-33% fiber, have pronounced antioxidant properties.

- **Omega-3 and Omega-6.** The name "chia" comes from a Spanish word that means "oily". The main components of this oil are called polyunsaturated fatty acids: α-linolenic class omega-3/ω-3 and linoleic class omega-6/ω-6 [2] . Chia seeds contain 39% oil (by weight of dry seeds), in which up to 68% ω-3 and up to 19% ω-6 fatty acids [3] . The ratio of ω-6 and ω-3 fatty acids is 0.3:0.35 [4] . 100 g of the product of polyunsaturated fatty acids contains about 390-395% of the daily requirement.
- **Squirrels.** The protein content of chia seeds is about 18%, which is higher than the protein content of all other cereals (for example, corn has a protein content of 9.4%, rice has 6.5%, and wheat has 12.6%). Amino acids such as arginine, leucine, phenylalanine, valine and leasinglutamic and aspartic acids, alanine, serine and glycine are found in seed proteins. The absence of gluten protein makes chia seeds a valuable product for patients suffering from celiac disease.
- **Minerals.** Chia seeds contain minerals such as calcium, phosphorus, potassium, and magnesium. The calcium content here is greater than in rice, barley, corn and oats and twice as much as in milk. But the amount of magnesium, potassium and phosphorus in chia seeds also exceeds the amount of these minerals in other cereals.
- **Vitamins.** The seeds contain relatively many vitamins A, K, E, D, B vitamins - mainly B1, B2, niacin (B3 / PP). So, 100 g of the product contains more than 41% of the daily norm of thiamine (B1), almost 45% of the norm of vitamin PP. In addition, 100 grams of seeds provide 120% of the daily vitamin K requirement and about 55% of the vitamin C requirement.
- **Phenolic compounds.** Dry chia seeds contain 8.8-9% phenolic compounds. High levels of caffeic, chlorogenic acid, querntin, rosmarinic, gallic, cinnamic, myricetic, kaempferolic acids are also reported. This is important because some of them exhibit anticarcinogenic, antihypertensive, and neuroprotective effects.

When we talk about chia seeds here, we mean black seeds. And although, in addition to black ones, there are also white ones, their phytochemical profiles practically do not differ and most researchers

describe black and white "seeds" as analogues. A slight difference is found only in morphology: white seeds are larger, thicker and wider than black ones.

**Medicinal properties**

Given this chemical composition, the use of chia seeds as a dietary supplement has the potential to support the digestive system, improve skin condition, strengthen bones and muscles, and reduce the risk of heart disease and diabetes.

Chia seeds and their oil are rich in natural antioxidants such as tocopherols, phytosterols, carotenoids, and polyphenolic compounds.

Polyphenolic compounds are the most important complexes that contribute to the antioxidant activity of chia seeds. They are known to have the ability to scavenge free radicals, chelate ions, and donate hydrogens [5] .

Antioxidant compounds reduce the risk of developing oncology and heart disease, provide protection against diseases such as diabetes, Alzheimer's disease, Parkinson's disease [6] . Omega-3 fatty acids have the ability to block calcium and sodium channel dysfunctions that can cause hypertension, as well as improve heart rate variability and protect against ventricular arrhythmia [7] .

A high amount of fiber reduces the risk of coronary heart disease, the risk of type 2 diabetes and certain types of cancer, and a large amount of dietary fiber in a daily meal reduces hunger.

After conducting test-tube experiments, some researchers suggest that the occurrence of celiac disease and constipation, as well as the risk of kidney disease, can be reduced by additional consumption of whole and ground chia along with seed oil.

If we structure the therapeutic manifestations identified in chia seeds in the course of various clinical studies, we can distinguish two key areas of their potential use in restoring or maintaining human health.

- **Blood pressure and cardioprotective effect.** The effect of chia seed powder on reducing blood pressure and related cardiometabolic factors in hypertensive patients was demonstrated in a randomized, double-blind, placebo-controlled trial [8] . Chia consumption has not caused any gastrointestinal, liver or kidney problems. At the same time, the use of the ground product consistently lowered blood pressure, even in people with hypertension who had previously taken medication. Moreover, this decrease was expressed to the same extent as in patients who had not previously taken drugs for hypertension.
  In addition, consumption of chia seeds (50 g per day for a month) resulted in a decrease in plasma omega-6 levels, which in turn decreased the ω-6:ω-3 ratio, thus creating a cardioprotective effect. .
- **Type 2 diabetes.** The inclusion of dietary fiber and α-linolenic fatty acids in chia seeds in the diet improves the condition of patients with the main and indirect risk factors that occur in type 2 diabetes. Seeds dramatically reduce postprandial glycemia at just 37 grams per day of food and prolong satiety. A comparison of the effects of flax seeds and chia seeds on postprandial glycemia and satiety measures showed that, despite the similarity in nutrient composition, chia appears to have the ability to convert glucose into a slow-release carbohydrate and influence satiety more than flax. , (perhaps due to the higher viscosity of the fiber) [9] .

Also, the seeds were considered as a promising product for inclusion in the composition of laxatives, anticarcinogenic, anti-inflammatory, painkillers. A number of scientists are studying its antidepressant

and sedative properties. Several studies have demonstrated the potential ability of bioactive chia seed peptides to repair damaged tissues.

**In medicine**

Despite numerous promising studies, official medicine does not yet consider chia seeds to be a medicine. But in pharmaceuticals, this product is considered as an element of the ω-3 fatty acid delivery system.

In stores selling dietary supplements, you can now freely buy packaged chia seeds. Manufacturers recommend them as a means to reduce pressure and levels of "bad cholesterol", as well as a food supplement to restore energy and strength.

**In folk medicine**

In traditional folk medicine, the inhabitants of Central America (in the homeland of chia) used the seeds of the plant to treat colds, sore throats, and digestive disorders. Seeds eliminated unpleasant body odor, and powder was sprinkled on wounds for quick healing. In addition, it was believed that it was chia seeds that gave the warriors of the Aztec army stamina and strength.

However, the details of the medical use of chia seeds by pre-Columbian civilizations have practically not been preserved, and those that remain are based on an anonymous document from the middle of the 16th century (the “Code of Mendoza”), the “Florentine Code” of the Spanish monk Bernardino de Sahagun of the same time, and scattered Jesuit chronicles.

In particular, Bernardino de Sahagun, in his work on the history of the Aztecs, writes that from chia seeds mixed with white willow root, a healing drink (porridge) atole is prepared, useful for hemoptysis and coughing. With this drink, you can cure a multi-day and deep chronic cough, as well as purulent diarrhea, if you drink the remedy 2-3 times a day. The juice squeezed from the seed will also help “cleanse the chest”, if you use it on an empty stomach.

The lack of information about the traditional uses of seeds in Indian therapeutic practices is partly due to the unfortunate fate of the plant. It is believed that the European conquerors, conquering new territories, in every possible way eradicated chia plantations, which were so important for the indigenous people, thereby declining the tradition of using seeds in medicine. For centuries, almost no one heard anything about this culture. And only in the second half of the 20th century, interest in chia began to revive again.

Therefore, modern traditional healers in their recommendations rely mainly not on ancient practices, but on the popular opinion today about chia seeds, as a product that can have a beneficial effect on the health of patients:

- with type 2 diabetes,
- with high blood pressure and cardiovascular pathologies,
- with anemia
- with gastrointestinal disorders
- with disorders of the nervous system.

In addition, recommendations for pregnant women to take chia seeds have become popular in folk therapy recently. It is claimed that such a supplement can improve the condition of the future mother and child, as well as ensure a sufficient amount of breast milk after childbirth. But such

recommendations are often objected even among a number of representatives of traditional medicine, as not entirely safe.

With their supposed regenerative abilities, chia seeds have become a favorite among athletes, bodybuilders, and fitness enthusiasts. It is believed that seed-based drinks quickly relieve fatigue and muscle pain, increase stamina and strength.

For therapeutic use, chia seeds are usually either ground into powder or poured with hot water (milk) to be added to the main dish in a quarter of an hour in a swollen form or simply eaten separately.

**In scientific research**

Recently, many new discoveries have been made regarding the nutritional properties, phytochemicals and extraction methods of chia seeds. But of particular interest are clinical studies involving humans. The results of such studies give more reliable ideas about the therapeutic potential of the product. Therefore, we have detailed them in the description of the medicinal properties of chia seeds.

However, it must be admitted that not all the alleged therapeutic effects are experimentally confirmed. For example, researchers studying the effects of chia seed supplementation on risk factors for disease in overweight postmenopausal women found no significant difference in scores in women in the seed group compared with those in the control group [10].

Part of 62 overweight women aged 49-75 received 25 g of crushed seeds per day for 10 weeks. The scientists measured body weight, blood pressure, serum lipid profile, inflammatory markers from fasting blood samples, plasma fatty acids, and metabolic profile. According to the results of the experiment, only an increase in plasma eicosapentaenoic and α-linolenic acid by 39% and 58%, respectively, was recorded.

Other scientists conducted a study on the effect of chia seed oil on performance, which also did not find any benefit from supplements [11].

The experiment involved runners divided into two groups, one of which received 0.5 liters of flavored water (placebo), and the other - 0.5 liters of water with 7 kcal / kg of chia seed oil. Blood sampling was carried out before and after training "to exhaustion".

The results showed that, despite an increase in plasma levels of alpha-linolenic acid, the chia seed oil group (337% compared to the 35% water group) showed no significant difference in either running time to exhaustion or tests for respiratory rate, oxygen consumption, ventilation, perceived exercise, and plasma glucose levels. The seed oil did not interfere with the increase in cortisol levels and the increase in the inflammatory process. As a result, scientists stated the absence of a positive effect of taking chia seed oil on a person's running ability.

**Weight regulation**

The results of the work of scientists studying the issues of weight loss and reducing obesity with the help of chia seeds can also be called contradictory.

For example, that chia seeds do not contribute to weight loss or change risk factors for disease in overweight adults, a group of scientists said after an experiment involving 90 healthy overweight and obese men and women aged 20 to 70 years. [12]. The subjects took 50 g of chia seeds per day for 12 weeks, and indicators of body weight and composition, markers of inflammation from fasting blood samples, markers of oxidative stress, and lipid profile indicators were taken as accounting.

Another group of scientists in their study of 77 patients with type 2 diabetes [13], on the contrary, came to the conclusion that the transition for 6 months to a diet with the inclusion of chia seeds suppressed appetite and led in the group of subjects to weight loss, reduction waist circumference, visceral and general obesity (compared with the control group).

Thus, there is no unambiguous data on the effectiveness of the use of chia seeds in the fight against extra pounds. But despite this, based on their own ideas about effectiveness, people quite widely use chia seeds for weight loss. The calculation, in this case, is often made on the absorbent capacity of seeds. It is known that the seeds of a plant are able to absorb water, 12 times their own weight, while increasing in size and filling the stomach. The same phenomenon is partially associated with the opinion about seeds as a product that can quickly and permanently create a feeling of satiety.

In general, chia seeds are a fairly high-calorie product containing 480-490 kcal per 100 grams. Dietary guidelines published in the US in 2000 even stated that chia seeds can be used as a staple food, but in limited quantities with a recommended daily allowance of no more than 48 grams of seeds.

**In cooking**

In the food industry, chia seeds, which have a slight nutty flavor, can be used in various forms: whole, ground, flour (up to 5% of the total mass), oil and gel. They can be mixed with cookies, pasta, cereal, snacks, yogurts and cakes. They pair perfectly with oatmeal. Sprouted seeds are put in salads.

In Colombia, chia seeds are eaten as an energy drink or, after roasting, they are made into hearty, jelly-like drinks. But since not everyone likes a jelly-like drink made from swollen seeds, smoothies in which seeds are mixed with berries, juice or milk are no less popular. Such drinks are refreshing, and the “mucusiness” is almost not felt in them.

As an example of a refreshing drink, let's take the Chia Fresco recipe. To prepare it in 300 ml of boiled water, you need to dissolve 3 tbsp. l. lemon juice, 2.5 tsp. sugar and 1 tsp. chia seeds. Next, you need to wait 10 minutes and, after the formation of a characteristic gel around the seeds, mix everything well. In this form, "Chia fresco" is ready for use.

Due to their hydrophilic properties, chia seeds are sometimes used as a substitute for eggs and fat. Chia gel can also be used as an alternative to butter or eggs in baking. It has been shown that chia oil can replace about 25% of eggs in cakes [14].

The nutritional value of butter can be increased by mixing it with chia butter at a ratio of 6.5% to 25%, when the concentration of ω-3 fatty acid in the chia-enriched butter is increased from 4.17% to 16.74% [15].

**In cosmetology**

Despite the fact that chia seeds have relatively recently become available to the general consumer, they are already considered an integral part of phytocosmetology and, together with oil, are widely used in home cosmetology for:

- moisturizing and softening the skin,
- elimination of edema, redness, burning and itching,
- hair growth activation
- massage treatments.

Below are examples of recipes for face and hair masks:

- **Mask for the face.** Chia seeds (2 tablespoons) should be poured with 70-80 ml of hot water and left to cool. Water-saturated "gel" seeds are ground in a blender with the addition of honey and olive oil (2 tsp of each ingredient). For a sustainable moisturizing and softening effect, the resulting mixture should be applied to the skin for 15-20 minutes twice a week for a month.
- **Hair Mask.** To add shine to hair, you need 4 tbsp. l. ground chia seeds and half a liter of warm water. The seed powder must be mixed in water and then again after swelling, after 10-15 minutes. Lemon juice 50 ml can be added to the chilled gruel. This mask is applied to the hair for a quarter of an hour, and then washed off with cool water.

**Dangerous properties of chia seeds and contraindications**

Chia seeds have quite a few contraindications. They should be avoided in people with low blood pressure (because chia can aggravate the condition of patients), as well as people who take aspirin, due to the anticoagulant properties of the seeds - it is also believed that here you can get an uncontrolled increase in the effect of the drug that reduces blood clotting. Due to the increased risk of bleeding, it is recommended that pregnant women include chia seeds in their diet only with the permission of a doctor.

In addition, chia seeds can provoke excessive gas formation in the gastrointestinal tract, although, if limited to the recommended 50 g per day, then such a "side" effect is observed only in case of individual intolerance to the product.

**Selection and storage**

Chia seeds come to our country already packaged in sealed packages, so the main task when buying is choosing a reliable brand and country of origin. Today, chia seeds have learned to grow even in the cold UK, but they are commercially produced mainly in Mexico, Peru, Argentina, Bolivia, Ecuador, Chile, Guatemala, Australia and the USA. All plants from South and Central America, thanks to a favorable climate, have time to produce mature seeds with the maximum set of nutrients.

Reliable brands are *Navitas Organics, Earth Circle Organics, California Gold Nutrition, Mamma Chia,* which supply organic products. But domestic companies with high-quality goods are also widely represented on the market. Product compliance with standards is confirmed by quality certificates from the country of origin, as well as national protocols. Therefore, when choosing the best chia seeds, you should pay attention to the presence of these documents.

Seeds of saturated black or white colors with a smooth shiny surface are considered to be of high quality. White seeds may have a serpentine pattern that does not affect product characteristics. It is worse if seeds of a reddish or brownish hue come across. This may indicate unfavorable weather conditions during the growing process, the immaturity of seeds, or violations of storage rules. Such seeds have a bitter taste and it is better to refrain from buying them. But there are practically no fundamental qualitative differences between white and black seeds. It is believed that the former may contain a little more protein, and the latter may contain antioxidants. But this difference is very small.

Another factor to consider when choosing chia seeds is the purity of the package contents. The inclusion of third-party elements (stems, pebbles, grains or other seeds) indicates insufficient control in production. However, it is quite difficult to achieve 100% purity of the collection, and minor accidental inclusions of a “blade of grass” or “leaflet” are generally allowed.

If before buying it is possible to study chia seeds more carefully and compare several options, then to determine the quality, you can conduct a simple experiment - mix the “seeds” with liquid. All chia

seeds, when in contact with water, are covered with a jelly-like mass, but the more it is, the better the product.

Finally, good, ripe, properly stored seeds should have a neutral smell. An unpleasant aroma may appear due to the expiration date, and due to violation of the rules of transportation and storage.

At home, it is better to store chia seeds in an airtight glass dish out of light. If the factory packaging has a zip fastener, then the seeds can not be poured. You can also not put them in the refrigerator. It is enough to provide a storage temperature in the range from +10 to +25°C and adhere to the storage periods indicated on the package. At the same time, it is important not to allow high humidity - unclosed seeds easily become damp and moldy.

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Given that data on the therapeutic efficacy of chia seeds is still ambiguous, it is probably too early to unambiguously call this product a super healthy food. This requires additional research. But the presence of polyunsaturated fatty acids in the composition, as well as the abundance of proteins, microelements and phenolic compounds in seeds, make them one of the most promising candidates for study in this direction.

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**Chia seeds - useful properties, composition and contraindications**

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**Abstract**. The article discusses the main properties of chia seeds and their impact on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of chia seeds in various types of medicine and the effectiveness of their use in various diseases are considered. The potentially adverse effects of chia seeds on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with their application are considered.

**Magnesium (Mg, Magnesium) - description, effect on the body, the best sources of magnesium**

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**Abstract**. The article discusses the main properties of magnesium (Mg) and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The best natural sources of magnesium are indicated. The use of the mineral in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of magnesium on the human body under certain medical conditions and diseases are analyzed separately.

*Key words:* magnesium, Mg , magnesium, benefit, harm, beneficial properties, contraindications

Magnesium (Mg) is one of the most abundant minerals in nature and the fourth most abundant mineral in living organisms. It is involved in many key metabolic reactions such as energy production, nucleic acid and protein synthesis, and oxidative reactions. Magnesium is very important for the health of the immune and nervous systems, for muscles and the skeleton. Interacting with other trace elements (calcium, sodium, potassium), it is very important for the health of the whole organism [1] .

**Foods rich in magnesium**

**Table 1.** List of foods rich in magnesium (according to Food+ ).

| Product | Magnesium content (mg/100 grams) [3] |
|---|---|
| Pumpkin seeds | 592 |
| Flaxseeds | 392 |
| Brazilian nut | 376 |
| chia seeds | 355 |
| Cashew nuts | 292 |
| Almond | 270 |
| Oatmeal | 235 |
| Dark chocolate (70-85%) | 228 |
| Buckwheat | 221 |
| Quinoa | 197 |
| White beans | 190 |
| brown rice | 177 |
| Peanut | 168 |
| Sunflower seeds | 129 |
| Whole grain wheat flour | 117 |
| chickpeas | 79 |
| Barley | 79 |
| Spinach | 79 |
| Mackerel | 76 |
| edamame beans | 61 |
| artichokes | 60 |
| Dates | 54 |
| Tuna | fifty |
| Lentils | 47 |
| Green pea | 33 |
| curly cabbage | 33 |

| | |
|---|---|
| oysters | 33 |
| Avocado | 29 |
| Salmon | 29 |
| Banana | 27 |
| Brussels sprouts | 23 |
| Raspberry | 22 |
| Broccoli | 21 |
| Asparagus | fourteen |
| Orange | fourteen |

**daily requirement**

In 1993, the European Scientific Committee on Nutrition determined that an acceptable dose of magnesium per day for an adult would be 150 to 500 mg per day.

Based on research findings, the US Food and Nutrition Board established a Recommended Dietary Allowance (RDA) for magnesium in 1997. It depends on the age and gender of the person:

| **Life period** | **Age** | **Men: (mg/day)** | **Women: (mg/day)** |
|---|---|---|---|
| babies | 0–6 months | 30 (AI) | 30 (AI) |
| babies | 7–12 months | 75 (AI) | 75 (AI) |
| Children | 1–3 years | 80 | 80 |
| Children | 4–8 years | 130 | 130 |
| Children | 9–13 years old | 240 | 240 |
| Teenagers | 14–18 years old | 410 | 360 |
| adults | 19 - 50 years old | 400 | 310 |
| adults | 51 years and older | 420 | 320 |
| Pregnancy | 18 years and under | - | 400 |
| Pregnancy | 19-30 years old | - | 350 |
| Pregnancy | 31 years and older | - | 360 |
| Breast-feeding | 18 years and under | - | 360 |
| Breast-feeding | 19-30 years old | - | 310 |
| Breast-feeding | 31 years and older | - | 320 |

In 2010, it was found that about 60% of US adults were not getting enough magnesium in their diet. [4] .

The daily requirement for magnesium increases in certain diseases: convulsions in newborns, hyperlipidemia, lithium poisoning, hyperthyroidism, pancreatitis, hepatitis, phlebitis, coronary artery disease, arrhythmia, digoxin poisoning.

In addition, a larger amount of magnesium is advised to use with:

- alcohol abuse: it has been proven that excessive alcohol consumption leads to increased excretion of magnesium through the kidneys;
- taking certain medications;
- breastfeeding multiple babies;
- in the elderly: several studies have shown that magnesium intake in older people is often insufficient - both for physiological reasons and because of difficulties in cooking, shopping for products, etc.

The daily requirement for magnesium decreases with poor kidney function. In such cases, an excess of magnesium in the body (primarily when taking dietary supplements) can be toxic [2] .

**The benefits of magnesium and the effect on the body**

More than half of the magnesium in the body is found in the bones, where it plays an important role in their growth and maintenance of their health. Most of the rest of the mineral is in the muscles and soft tissues, and only 1% is in the extracellular fluid. Bone magnesium serves as a reservoir for normal magnesium levels in the blood.

Magnesium is involved in over 300 major metabolic reactions such as the synthesis of our genetic material (DNA/RNA) and proteins, cell growth and reproduction, and energy production and storage. Magnesium is important for the formation of the body's main energy compound - adenosine triphosphate - which all our cells need [10] .

**Health Benefits**

- Magnesium is involved in hundreds of biochemical reactions in the body. Magnesium is needed by all cells of our body, without exception, for energy production, protein production, maintaining the work of genes, muscles and the nervous system.
- Magnesium can improve the performance of sports. Depending on the sport, the body needs 10-20% more magnesium. It aids in the transport of glucose to the muscles and in the processing of lactic acid, which can lead to pain after exercise. Studies show that supplemental magnesium improves exercise performance in professional athletes, the elderly, and those with chronic medical conditions.
- Magnesium helps fight depression. Magnesium plays a key role in brain function and mood regulation, and low levels in the body have been linked to an increased risk of depression. Some scientists believe that the lack of magnesium in modern foods may be the cause of many cases of depression and other mental illnesses.
- Magnesium is beneficial for people with type 2 diabetes. Studies show that 48% of people with type 2 diabetes have low levels of magnesium in their blood. This can lead to a weakening of insulin's ability to control blood sugar levels. Another study found that people with type 2 diabetes who took high doses of magnesium every day experienced significant improvements in blood sugar and hemoglobin levels.
- Magnesium helps lower blood pressure levels. According to the results of one study, people who took 450 mg of magnesium per day experienced a significant reduction in systolic and diastolic blood pressure. It should be noted that the results of the study were observed in people with high blood pressure, and did not lead to any changes in people with normal blood pressure levels.
- Magnesium has anti-inflammatory properties. Low magnesium intake is associated with chronic inflammation, which is a factor in aging, obesity, and chronic disease. Studies show that children, the elderly, people who are obese, and people with diabetes have lower blood levels of magnesium and elevated markers of inflammation.

- Magnesium may help prevent migraines. Some researchers believe that migraine sufferers are more likely to suffer from magnesium deficiency than others. In one study, supplementing with 1 gram of magnesium helped get rid of an acute migraine attack faster and more effectively than conventional medication. In addition, foods rich in magnesium can help reduce migraine symptoms.
- Magnesium reduces insulin resistance. Insulin resistance is one of the main causes of type 2 diabetes. It is characterized by a weakened ability of muscle and liver cells to properly absorb sugar from the blood. Magnesium plays a critical role in this process. In addition, high insulin levels lead to an increase in the amount of magnesium excreted in the urine.
- Magnesium helps with PMS. Magnesium helps with PMS symptoms such as water retention, abdominal cramps, fatigue, and irritability [5] .

**digestibility**

In the face of increasing magnesium deficiency, the question often arises: how to get enough of it from the daily diet? Many do not know that the amount of magnesium in modern products has decreased significantly. For example, vegetables contain 25-80% less magnesium, and when processing pasta and bread, 80-95% of all magnesium is destroyed. Magnesium sources, once widely consumed, have declined in the past century due to industrial agriculture and dietary changes. The foods most rich in magnesium are beans and nuts, green leafy vegetables, and whole grains such as brown rice and whole wheat. Given current eating habits, one can understand how difficult it is to reach the recommended 100% daily intake of magnesium. Most foods that contain high levels of magnesium are consumed in too small quantities.

Magnesium absorption rates also vary, sometimes as low as 20%. Magnesium absorption is influenced by factors such as phytic and oxalic acids, medications taken, age and genetic factors.

There are three main reasons why we don't get enough magnesium from our diet:

1. industrial food processing;
2. the composition of the soil in which the product is grown;
3. changes in eating habits.

Food processing essentially breaks down plant food sources into components for ease of use and to reduce spoilage. When grain is processed into white flour, the bran and germ are removed. When processing seeds and nuts into refined oils, the products are overheated and the magnesium content is deformed or removed by chemical additives. Refined grains remove 80-97 percent of magnesium, and refined flours remove at least twenty nutrients. Only five of these are added back when "enriched" and magnesium is not one of them. In addition, when processing food, the number of calories increases. Refined sugar loses all the magnesium. Molasses, which is removed from sugar cane during refining, contains up to 25% of the daily value of magnesium in one tablespoon. There is no sugar at all.

The soil in which food is grown also has a huge impact on the amount of nutrients contained in these products. Experts say that the quality of our crops is declining significantly. For example, in America, the content of nutrients in the soil has decreased by 40% compared to 1950. The reason for this is considered an attempt to increase productivity. And when crops grow faster and bigger, they are not always able to produce or absorb nutrients in time. The amount of magnesium decreased in all foods - meat, grains, vegetables, fruits, dairy products. In addition, pesticides destroy organisms that provide plants with nutrients. The number of vitamin-binding bacteria in the soil and earthworms is reduced [6] .

In 2006, the World Health Organization published data that 75% of the adult population consume a magnesium-deficient diet [7].

**Useful Food Combinations**

- **Magnesium + vitamin B6.** Magnesium, found in nuts and seeds, helps regulate blood pressure, prevents hardening of blood vessels, and maintains a regular heart rhythm. Vitamin B6 helps the body absorb magnesium. To increase your magnesium intake, try eating foods such as almonds, spinach; and for higher amounts of vitamin B6, opt for raw fruits and vegetables, such as bananas.
- **Magnesium + Vitamin D.** Vitamin D helps regulate blood pressure and improves heart health. But in order for it to be fully absorbed, it needs magnesium. Without magnesium, vitamin D cannot be converted to its active form, calcitriol. Good sources of vitamin D are milk and fish, combined with spinach, almonds, and black beans. In addition, calcium is required for the absorption of vitamin D [8].
- **Magnesium + vitamin B1.** Magnesium is essential for the conversion of thiamine to its active form, as well as for some thiamine-dependent enzymes.
- **Magnesium + potassium.** Magnesium is needed for the absorption of potassium in the cells of the body. And a balanced combination of magnesium, calcium and potassium can reduce the risk of stroke [9].

Magnesium is an essential electrolyte and is needed in combination with calcium, potassium, sodium, as well as phosphorus and many trace elements contained in mineral and salt compounds. It is highly regarded among athletes, usually in combination with zinc, for its effect on strength endurance and muscle recovery, especially when combined with adequate fluid intake. Electrolytes are important to every cell in the body and absolutely essential for proper cellular function. They are very important in allowing cells to generate energy, to regulate fluids, providing minerals needed for excitability, secretory activity, membrane permeability and overall cellular activity. They generate electricity, contract muscles, move water and fluids in the body, and are involved in a variety of other activities.

The concentration of electrolytes in the body is controlled by various hormones, most of which are produced in the kidneys and adrenal glands. Sensors in specialized cells in the kidneys monitor the amount of sodium, potassium, and water in the blood.

Electrolytes can be excreted from the body through sweat, feces, vomit, and urine. Many gastrointestinal disorders (including gastrointestinal absorption) cause dehydration, as do diuretic therapy and severe tissue injury such as burns. As a result, some people may experience hypomagnesemia, a lack of magnesium in the blood.

**Cooking rules**

Like other minerals, magnesium is not affected by heat, air, acids, or mixing with other substances [10].

**In official medicine**

- High blood pressure and heart disease

The results of clinical studies using magnesium supplements for the treatment of abnormally high blood pressure are conflicting. Long-term clinical trials are needed to determine if magnesium has any therapeutic benefit in people with hypertension. However, magnesium is essential for heart health. This mineral is especially important for maintaining a normal heart rhythm and is often used by doctors to treat arrhythmias, especially in people with congestive heart failure. However, results from

studies using magnesium to treat heart attack survivors have been inconsistent. While some studies have reported reduced mortality as well as reduced arrhythmias and improved blood pressure, other studies have shown no such effects.

- Stroke

Population-based studies show that people with low magnesium in their diets may have a greater risk of stroke. Some preliminary clinical evidence suggests that magnesium sulfate may be useful in the treatment of stroke, or temporary circulatory failure in an area of the brain.

- Preeclampsia

This is a condition characterized by a sharp increase in blood pressure in the third trimester of pregnancy. Women with preeclampsia may develop seizures, which are then called eclampsia. Magnesium given intravenously is a treatment to prevent or treat seizures associated with eclampsia.

- Diabetes

Type 2 diabetes is associated with low levels of magnesium in the blood. There is evidence from a clinical study that a higher dietary intake of magnesium may protect against the development of type 2 diabetes. Magnesium has been found to improve insulin sensitivity, reducing the risk of type 2 diabetes. In addition, magnesium deficiency in diabetics can lower their immunity, making them more vulnerable to infections and disease.

- Osteoporosis

Deficiencies in calcium, vitamin D, magnesium, and other micronutrients are thought to play a role in the development of osteoporosis. Adequate intake of calcium, magnesium, and vitamin D, combined with overall good nutrition and exercise during childhood and adulthood, is the primary preventive measure for men and women.

- Migraine

Magnesium levels tend to be lower in people with migraines, including children and adolescents. In addition, some clinical studies show that magnesium supplements can reduce the duration of migraines and the number of medications taken.

Some experts believe that oral magnesium may be a suitable alternative to prescribing medication for people who suffer from migraines. Magnesium supplements may be a viable option for those who cannot take medication due to side effects, pregnancy or heart disease.

- Asthma

A population-based study has shown that low dietary magnesium intake may be associated with the risk of developing asthma in children and adults. In addition, some clinical studies show that intravenous and inhaled magnesium may help treat acute asthma attacks in children and adults.

- Attention deficit/hyperactivity disorder (ADHD)

Some experts believe that children with Attention Deficit/Hyperactivity Disorder (ADHD) may have mild magnesium deficiency, which manifests itself in symptoms such as irritability and decreased

concentration. In one clinical study, 95% of children with ADHD were deficient in magnesium. In another clinical study, children with ADHD who received magnesium showed a significant improvement in behavior, while those who received only standard therapy without magnesium showed worse behavior. These results suggest that magnesium supplements may be beneficial for children with ADHD.

- constipation

Magnesium intake has a laxative effect, relieving conditions during constipation [20].

- Infertility and miscarriage

A small clinical study of infertile women and women with a history of miscarriage found that low magnesium levels can impair fertility and increase the risk of miscarriage. It has been suggested that one aspect of fertility treatment should be magnesium and selenium.

- Premenstrual Syndrome (PMS)

Scientific evidence and clinical experience show that magnesium supplements can help relieve symptoms associated with PMS, such as bloating, insomnia, leg swelling, weight gain, and breast tenderness. In addition, magnesium can help improve mood in PMS. [4].

- Stress and sleep problems

Insomnia is a common symptom of magnesium deficiency. People who are low in magnesium often experience restless sleep, frequently waking up during the night. Maintaining healthy magnesium levels often results in deeper, more restful sleep. Magnesium plays an important role in supporting deep restorative sleep by maintaining healthy levels of GABA (the neurotransmitter that regulates sleep). In addition, low levels of GABA in the body can make it difficult to relax. Magnesium also plays a key role in regulating the body's response system to stress. Magnesium deficiency is associated with increased stress and anxiety [21].

**During pregnancy**

Many pregnant women complain of cramps and vague abdominal pain that can result from a magnesium deficiency. Other symptoms of magnesium deficiency are palpitations and exhaustion. All of them, as such, are not yet a cause for concern, but, nevertheless, you should listen to the signals of your body and, possibly, get tested for magnesium deficiency. If a severe magnesium deficiency occurs during pregnancy, the uterus loses its ability to relax. Consequently, spasms occur, which can cause premature contractions - and lead to preterm labor in severe cases. With magnesium deficiency, the balancing effect on the cardiovascular system stops and the risk of developing hypertension in pregnant women increases. In addition, magnesium deficiency has been suggested to be a cause of preeclampsia and increased nausea during pregnancy.

**In folk medicine**

Folk medicine recognizes the restorative and calming effect of magnesium. In addition, according to popular recipes, magnesium has diuretic, choleretic and antimicrobial effects. It prevents aging and inflammatory processes [11]. One of the ways magnesium enters the body is through the skin. It is applied by rubbing a magnesium chloride compound into the skin in the form of an oil, gel, bath salts, or lotion. An effective method is also a foot bath with magnesium chloride, since the foot is considered one of the most absorbent surfaces of the body. Athletes, chiropractors, massage therapists apply

magnesium chloride to painful muscles and joints. This method not only provides the medical effect of magnesium, but also the benefits of massaging and rubbing the affected areas [12].

**In scientific research**

- A new method for predicting the risk of preeclampsia. Australian researchers have developed a way to predict the onset of an extremely dangerous pregnancy disease that kills 76,000 women and half a million children every year, mostly in developing countries. It is a simple and inexpensive way to predict the onset of preeclampsia, which can lead to complications in women and children, including maternal brain and liver injury and preterm birth. The researchers assessed the health status of 593 pregnant women using a special questionnaire. Combining measures of fatigue, heart health, digestion, immunity, and mental health, the questionnaire yields an overall "sub-optimal health score." Next, the results were combined with blood tests that measured calcium and magnesium levels in the blood. Researchers were able to accurately predict the development of preeclampsia in almost 80 percent of cases [13].
- New details about the mechanism of protection of cells from infections with the help of magnesium. When pathogens enter cells, our body fights them using various methods. Researchers at the University of Basel were able to show exactly how cells control invading pathogens. This mechanism causes magnesium deficiency, which in turn limits bacterial growth, the researchers report.
  When pathogenic microorganisms infect the body, the defense system immediately begins to fight the bacteria. To avoid "encounter" with immune cells, some bacteria invade and multiply inside the body's own cells. However, such cells have different strategies to keep intracellular bacteria under control. Scientists have found that magnesium is critical for bacterial growth inside host cells. Magnesium starvation is a stress factor for bacteria, which stops their growth and reproduction. Affected cells restrict the supply of magnesium to these intracellular pathogens, thus fighting infections [14].
- New treatment for heart failure. Studies show that magnesium improves a form of heart failure that was previously untreated. In their scientific paper, scientists from the University of Minnesota found that magnesium can be used to treat diastolic heart failure. “We found that cardiac mitochondrial oxidative stress can cause diastolic dysfunction. Since magnesium is an essential element for mitochondrial function, we decided to try a supplement as a treatment,” explained the study leader. "It eliminates the weak cardiac relaxation that causes diastolic heart failure."
  Obesity and diabetes are known risk factors for cardiovascular disease. Researchers found that magnesium supplementation also improved mitochondrial function and blood glucose levels in subjects [15].

**In cosmetology**

Magnesium oxide is often used in skin care products. It has absorbent and mattifying properties. In addition, magnesium reduces the number of acne and inflammation, skin allergies, and also supports the function of collagen. It is found in many serums, lotions and emulsions.

The balance of magnesium in the body also affects the condition of the skin. Its deficiency leads to a decrease in the level of fatty acids in the skin, which reduces its elasticity and hydration. As a result, the skin becomes dry and loses its tone, wrinkles appear. Starting to take care of a sufficient amount of magnesium in the body should be after 20 years, when the level of the antioxidant glutathione reaches its peak. In addition, magnesium supports the health of the immune system, which helps fight against the harmful effects of toxins and pathological organisms on skin health [16].

**Weight regulation**

Although magnesium itself does not directly affect weight loss, it has a great influence on a number of other factors that contribute to weight loss:

- positively affects the metabolism of glucose in the body;
- reduces stress and improves sleep quality;
- charges cells with the energy necessary for sports;
- plays a key role in muscle contraction;
- helps to improve the overall quality of training and endurance;
- supports heart health and rhythm;
- helps fight inflammation;
- improves mood [17] .

**Magnesium harm and warnings**

**Signs of a magnesium deficiency**

Magnesium deficiency in healthy people who eat a balanced diet is quite rare. The risk of magnesium deficiency is increased in people with gastrointestinal disorders, kidney disorders, and chronic alcoholism. In addition, absorption of magnesium from the digestive tract tends to decrease and urinary excretion of magnesium tends to increase with age.

Although severe magnesium deficiency is rare, it has been experimentally shown to manifest as low serum calcium and potassium levels, neurological and muscle symptoms (eg, spasms), loss of appetite, nausea, vomiting, and personality changes.

Several chronic diseases - Alzheimer's disease, type 2 diabetes mellitus, hypertension, cardiovascular disease, migraines and ADHD - have been associated with hypomagnesemia [4] .

**Signs of excess magnesium**

Side effects from excess magnesium (such as diarrhea) have been observed with magnesium supplementation.

Individuals with impaired kidney function are at a higher risk of side effects when taking magnesium.

Elevated levels of magnesium in the blood ("hypermagnesemia") can lead to a drop in blood pressure ("hypotension"). Some of the effects of magnesium toxicity, such as lethargy, confusion, abnormal heart rhythms, and worsening kidney function, are associated with severe hypotension. As hypermagnesemia progresses, muscle weakness and difficulty breathing may also occur.

**Interaction with medications**

Magnesium supplements may interact with certain medications:

- antacids can impair the absorption of magnesium;
- some antibiotics affect muscle function, like magnesium - taking them at the same time can lead to muscle problems;
- heart medications may interact with magnesium's effect on the cardiovascular system;
- when taken simultaneously with drugs for diabetes, magnesium can lead to a risk of low blood sugar;
- care should be taken when taking magnesium with drugs to relax muscles;

When taking any medications and dietary supplements, you should consult your doctor [20] .

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**Magnesium - description, benefits and sources**

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**Abstract**. The article discusses the main properties of magnesium (Mg) and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The best natural sources of magnesium are indicated. The use of the mineral in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of magnesium on the human body under certain medical conditions and diseases are analyzed separately.

**The Mediterranean Diet - Scientific Rationale, Proven Health Benefits, Advantages and Disadvantages**

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**Abstract.** Mediterranean diet is a nutritional system that allows you to improve your health, and get a slim figure as a bonus to protection against cancer and cardiovascular diseases. It's tasty, balanced and varied. Dishes in this diet are rich in carbohydrates, a large amount of fish and seafood, all seasoned with aromatic spices and olive oil, complemented by a glass of red wine. Let's take a closer look at this method of weight loss from a scientific point of view and analyze its effectiveness.

*Key words:* Mediterranean diet, benefits, harms, beneficial properties, contraindications

**Diet for a long life**

The term "Mediterranean diet" first saw the world thanks to the American nutritionists Ansel and Margaret Case, who have been eating according to the principles of the mediterranean diet since the 1940s and have lived no less than 97 and 100 years each. [1] It is the only diet in the world to receive UNESCO Intangible Cultural Heritage status in 2013. Today, the Mediterranean diet is especially popular with celebrities Victoria Beckham, Cameron Diaz, Eva Langoria, Jennifer Aniston.

There is only one minus - this approach to healthy eating should be followed all your life, but, nevertheless, since the mid-1990s, the diet has more and more fans.

Why "Mediterranean"? Studies have shown that attractive figures, longevity and good health of the inhabitants of Greece, northeast Spain, Italy, Portugal, southern France and other countries of the Mediterranean region directly depend on their approach to healthy eating. [2]

**Diet Basics**

The content of carbohydrates, proteins and fats in the diet is, respectively, 60%, 10% and 30% [2] . But the main secret is that the fats and carbohydrates in the diet for weight loss must be correct. Namely - durum wheat pasta, legumes, many types of whole grain bread [3] . Also olive oil, avocado, oily fish. Add to this a salad of fresh vegetables and greens - and a healthy lunch is on the table.

At the same time, there are no strict restrictions or methods, because the main principle of the system is that the products are divided into:

- included in the daily diet;
- consumed 1-4 times a week;
- allowed no more than 1-2 times a month.

**Greens**

Each country has its own preferences for greens, but there are a lot of them on the tables.

So, the Greeks use lettuce leaves as “green pita bread”, wrapping vegetables, meat and cereals in them. Horta is popular as a snack - a mixture of herbs with butter or lightly fried.

The love for spinach comes from France, its neutral taste allows you to use greens both as a main dish and as all kinds of toppings in culinary delights.

And Italians love broccoli, and its most useful part is the leaves, which are eaten raw, balancing the spicy taste with tomatoes and cheese, and fried, seasoned with balsamic vinegar.

**Dairy**

Dairy products are always popular in Mediterranean countries. When used properly, animal milk is a source of calcium, vitamin D, protein and amino acids. And, if France is an adherent of mature and aged cheeses, then Greece is a real lover of yogurts. There they are served with salads, and with meat, and with bread products, and as independent dishes, with or without fruits, herbs.

In the forefront of benefits among cheeses [4] we meet:

- Dietary goat cheese, which is low in calories, but high in B vitamins and trace elements, and easily digestible proteins.
- Feta made from sheep or goat milk helps control blood pressure, calms the nervous system, and gives strength to bones.
- Spicy parmesan is a leader in the content of proteins, vitamins and amino acids.
- Silky provolone is additionally enriched with enzymes that are beneficial to humans, giving it an unusual taste.

**Vegetables**

It is quite expected in the Mediterranean countries a variety of salads on the menu. Nutritionists have always emphasized the need for an abundance of vegetables in the daily diet. This will help improve

digestion and heart function [5] . Fresh vegetables with minimal processing, olive oil, piquancy of herbs... And on your table there is a source of vitamins, organic acids, carbohydrates, proteins and fats - everything the body needs. Add a couple of slices of feta - this is what an authentic Greek salad looks like, a hallmark of Mediterranean cuisine.

**Meat and fish**

If we analyze the ratio of meat and fish dishes, then, despite such delicacies as Parma ham from Italy or jamon from Spain, fish and seafood still dominate. Red meat is rarely found on the menu, because it is from seafood that you can get the maximum amount of saturated fatty acids, vitamins and trace elements.

**Fats**

An important feature of the Mediterranean diet is the reduction in the proportion of saturated animal fats in favor of healthier vegetable oils and unsaturated fats [2] . Vegetable oils are olive oil, nuts, seeds. Unsaturated fats predominate in fatty fish varieties with a maximum content of omega-3 polyunsaturated fatty acid. It helps to maintain the balance of vitamins and trace elements in the body, and elastic skin and shiny hair will become a bonus. [6]

**Olive oil**

Olive oil occupies a special place in the menu of the Mediterranean diet. A few tablespoons of oil daily is a must for this unique approach to healthy eating. Do not be afraid - some nutritionists recommend daily consumption of 60 grams for breakfast. bread moistened with 40 gr. olive oil. No wonder, because the fats of olive oil are similar to the fats of breast milk, so it is recommended to start introducing vegetable oils into complementary foods with it [7] . For an adult gourmet, olive oil improves bone mineralization, improves digestion, and stabilizes blood pressure. Olive oil contains oleic acid (up to 70% by volume). It belongs to Omega-9 unsaturated fatty acids and acts as a powerful natural antioxidant. As a result, the metabolism improves and the aging process slows down. Also, olive oil contains a lot of vitamins E and K, which help to establish immunity and regulate the energy processes of the body.

It should also be understood that not all olive oil is made according to the rules. Many unscrupulous manufacturers fill the market with substandard and fake products. These oils can be extracted and processed by improper methods that destroy delicate nutrients, and some fatty acids can even become rancid or toxic. Therefore, it is worth choosing only high-quality oil, labeled as ***extra virgin*** and, ideally, cold pressed [8] . After all, the uniqueness of olive oil is that it can be consumed raw without any processing. People who are lucky enough to grow olives on their territory can press olives by hand and enjoy the most valuable natural oil.

**Spices, seasonings, aromatic oils**

Mediterranean cuisine is especially adorned with aromatic oils infused with herbs and spices. They can be easily made at home - garlic oil will harmoniously decorate pasta and sauces, mint oil will emphasize the freshness of salads, and lemon oil will add sophistication to fish dishes. At the same time, salt intake is significantly reduced, which also explains the healing effect on the cardiovascular system in particular, and the entire body as a whole. Feel free to use spices and seasonings in your recipes, experiment with combinations and dosage [9] .

**Red wine**

There is also a piquant feature of the diet - red wine is welcome, however, moderate alcohol consumption is emphasized. It is enough from 10 to 50 ml per day to improve the functioning of the heart, cleanse blood vessels, and just have a good mood [10].

**Benefits of the Mediterranean Diet**

Foods for this diet are minimally processed and without the addition of refined sugar

These are olive oil, vegetables and fruits, legumes, nuts, durum whole grains and small portions of animal products that are necessarily "organic" and not shelf-stable. Virtually no GMOs, artificial ingredients, preservatives, flavor enhancers and very little sugar. For desserts, Mediterranean people use fruits or light homemade desserts with natural sweeteners such as honey.

The animal component of the diet is represented by a moderate consumption of cow, goat or sheep cheese and yoghurts and a lot of locally caught fish. It is a source of omega-3 fatty acids and other healthy fats, "correct" cholesterol, which strengthens the walls of blood vessels [11].

- Improvement of the cardiovascular system

High levels of monounsaturated fats and omega-3 foods have been associated with significant reductions in all-cause mortality, especially heart disease. Many studies have shown the positive effects of a Mediterranean diet rich in alpha-linolenic acid (ALA) from olive oil, such as a 30 percent reduction in the risk of death due to cardiovascular disease, as well as a 45 percent reduction in acute heart failure. [12,13]

Also at Warwick Medical School, it was found that people who regularly consume extra virgin olive oil have higher blood pressure lowering values compared to people who consume predominantly sunflower oil. [eleven]

It is also extremely rare for Mediterraneans to have a problem with low levels of “good” cholesterol, as they habitually get a lot of healthy fats from their natural diet.

- Slimming in a healthy way

On this diet, you can eat very varied and tasty food without feeling hungry. Therefore, you can follow this diet for a long time without disruption, regulating weight and reducing fat intake in an easy and natural way. There is room for variation in the Mediterranean diet, whether you prefer to increase your carbohydrate intake or focus on high-quality animal and especially plant-based protein. In any case, this style of eating will help manage weight gain, control blood sugar levels, improve mood and consistently high energy levels.

- Cancer prevention

According to researchers from the Department of Surgery at the University of Genoa, Italy, a balanced ratio of omega-6 and omega-3 essential fatty acids, a high content of fiber, antioxidants and polyphenols found in fruits, vegetables, olive oil and wine, protects DNA from damage, stops cell mutation , reduces inflammation and delays the growth of tumors. Olive oil also reduces the risk of colon and bowel cancer. [fourteen]

- Treatment and prevention of diabetes

The Mediterranean diet controls excess insulin, a hormone that controls blood sugar levels, makes us gain weight and maintains weight at our level, despite the fact that we are on a diet.

There is a lot of evidence that the Mediterranean diet can serve as an anti-inflammatory diet that can help fight diseases associated with chronic inflammation, including metabolic syndrome.

A low-sugar diet with lots of fresh foods and fats is part of the natural lifestyle for diabetics.

A Mediterranean style of eating helps prevent peaks and troughs in blood sugar levels. Carbohydrates – in the form of whole grain breads or durum wheat pasta, often paired with olive oil or cheeses, plenty of greens and vegetables – are a great source of energy for several hours without large spikes in sugar levels and early hunger. [fifteen]

- Protecting Cognitive Health and Good Mood

Healthy fats like olive oil and nuts are known to help fight age-related cognitive decline. They are able to counteract the harmful effects of toxicity, free radicals, inflammation-causing poor nutrition, or food allergies that can contribute to brain damage. [16] Cognitive impairment can occur when the brain does not get enough dopamine, an important chemical needed for proper body movement, mood regulation, and mental activity.

Probiotic foods such as yogurt and kefir promote healthy gastrointestinal function, which has also been linked to cognitive function.

Thus, the Mediterranean style of eating can be a natural treatment and prevention of Parkinson's disease, Alzheimer's disease and age-related dementia. [6,17]

- Promotes longevity

Back in 1988 in Lyon, a study was conducted in which patients after heart attacks were asked to follow a Mediterranean diet with an abundance of monounsaturated fats, or a standard dietary recommendation with a significant reduction in saturated fats. At 4 years after the start of the study, the results of the follow-up examination showed that patients in the first group had 70% less heart disease and a 45% lower risk of death from any cause than in the group with a standard diet. At the same time, there was no big difference in the level of total cholesterol, which proved the absence of its direct relationship with heart disease. The results were so impressive and groundbreaking that, for ethical reasons, the study was terminated at an early stage so that all participants could continue to adhere to the Mediterranean diet for the greatest possible health and longevity. [eighteen]

- Helps relieve stress and relax

Chronic stress significantly reduces the quality of life and negatively affects weight and overall health. The Mediterranean diet encourages you to spend more time in nature and get good sleep. This is a great way to relieve stress and therefore prevent inflammation. And also - there is more time to laugh, dance, relax and engage in hobbies. [19]

- Fights depression

A study published in the journal Molecular Psychiatry in 2018 found that choosing a Mediterranean diet reduced the likelihood of depression. Inflammation is often cited as the root cause of many

disorders and psychiatric conditions, including schizophrenia, obsessive-compulsive disorder, depression, anxiety, fatigue, and social withdrawal [16] . A diet high in nutrients, on the other hand, helps protect the brain from organic and functional changes. Other dietary and lifestyle changes, such as getting enough sleep, mindful eating, pre-planning menus, and limiting stress, lead to mental health stability. [6,19,20]

**What can and how often**

If you decide to try this popular and in many ways unique nutrition system, then from now on your table should have the following products on a daily basis:

- Fresh fruits (apples, bananas, pears, citruses, figs, peaches, apricots, berries, melons, watermelons);
- Vegetables (primarily non-starchy, such as tomatoes, eggplant, artichoke, all kinds of cabbage), greens (especially leafy - spinach, lettuce);
- Whole grain products (brown rice, rye, barley, corn , buckwheat, whole oats, wheat and products from them - bread and pasta);
- Legumes and beans (lentils, chickpeas, beans, peas, peanuts);
- Root vegetables (yam - sweet potatoes, turnips, yams, parsnips, Jerusalem artichoke);
- Nuts and seeds (walnuts, almonds, hazelnuts - hazelnuts, macadamia, cashews, sesame seeds, sunflower seeds, pumpkin seeds);
- Spices and herbs (garlic, nutmeg, cinnamon, pepper, basil, mint, rosemary, sage) - will minimize the amount of salt in the diet;
- Vegetable fats (olive oil, pure avocado and oil from it);
- Clean water about 2 liters per day, tea or coffee is allowed, but sweetened drinks and fruit juices should be avoided;
- Dairy products - cheeses, yogurt or kefir - in moderation;
- Red wine in moderation (but this is completely optional).

**Every week you need:**

- Fish and seafood, give preference to wild varieties of fish over artificially grown ones, shrimps, oysters, clams, mussels, crabs - at least 4 times a week;
- Eggs - in moderation, 2-4 times a week;
- Potatoes - in moderation; [3]
- Some sweets.

**Eat monthly:**

- red meat;
- Poultry (chicken, duck, turkey) and lean meat (rabbit, ham, pork fillet).

**To avoid in your diet:**

- Refined sugar and products containing it (ice cream, sweets, drinks, table sugar);
- Grains with a high degree of processing (white bread, pasta from soft wheat varieties, polished grain);
- Trans fats (margarines and products containing them);
- Refined oils (all types, including soybean, rapeseed, cottonseed);
- Processed meat products (sausages, sausages, semi-finished products);

- Products with additional processing or enrichment (marked on the label as "fat-free", "enriched", "refined"). [21,22]

**Disadvantages and harms of the diet**

The disadvantage of this food system can be called, first of all, the need to change your eating habits - to abandon many processed and refined products in favor of high-quality and often expensive products in our region. Moreover, it is not yet known which factor will be more significant - the high cost or the habit of the old diet.

Also, this diet may not be suitable for people with individual intolerance and allergies to seafood. Caution should be taken when choosing a menu for people with stomach and intestinal ulcers, given the high fiber content in the daily menu. It is also worth abandoning the red wine allowed by the diet for pregnant women and other people to whom alcohol, even in small quantities, can be harmful. [24,25]

**Lose weight on the mediterranean diet**

Many ordinary people doubt whether it is possible to lose weight on such a diet? Indeed, this sparing diet does not give instant results, so it is not suitable for the correction of severe obesity. If the main goal of the diet is weight loss, then you definitely need to connect physical activity. Not every diet associated with dietary restriction allows you to fully train. And here there is a nice bonus - it is the Mediterranean diet that gives strength for sports. This improves the results of weight loss, models a beautiful and fit figure and improves health.

For those who nevertheless decided to lose weight using this technique, the absence of a rigid menu may not seem convenient. You will have to calculate how many calories you need in order not to experience hunger, but at the same time lose weight, independently correlate physical activity and the amount of food consumed. But still, most dieters find it convenient, because severe restrictions are harder to come by.

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**Mediterranean Diet - Full Description, History, Fundamentals and Scientific Evidence, Proven Health Benefits, Advantages and Disadvantages, Diet Formulation Tips**

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**Abstract**: The Mediterranean diet is not a diet in the usual sense, rather it is a certain nutrition system that a person can adhere to all his life. It is important to provide three full meals and two snacks throughout the day. It is thanks to the unique diet - high consumption of olive oil, fruits, nuts, vegetables and cereals; moderate consumption of fish and poultry; low consumption of dairy products, red meat and sweets; and red wine in moderation - reduced rates of chronic disease on the road to longevity.