

# *Journal of Healthy Nutrition and Dietetics*

## In issue:



Walnut



Grape



Marrow



Persimmon



Pomegranate



Avocado



Mandarin



Vitamin B9

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## Walnut (lat. *Júglans régia*)

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**Abstract.** The article discusses the main properties of the walnut 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 nut are indicated, the use in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of walnut on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

**Keywords:** walnut, benefit, harm, beneficial properties, contraindications

## Beneficial features

Table 1. Chemical composition of walnut (according to [Food+](#)).

Main substances (g / 100 g):	Walnut [1]
Water	4.07
Carbohydrates	13.71
Sugar	2.61
Squirrels	15.23
Alimentary fiber	6.7
Fats	65.21
Calories (kcal)	654
Minerals (mg/100 g):	
Potassium	441
Phosphorus	346
Magnesium	158

Calcium	98
Zinc	3.09
Iron	2.91
Sodium	2
<b>Vitamins (mg/100 g):</b>	
Vitamin C	1.3
Vitamin PP	1.125
Vitamin E	0.70
Vitamin B6	0.537
Vitamin B1	0.341
Vitamin B2	0.150
Vitamin A	0.006

The high content of vitamin C is especially noticeable in comparison with other vitamin-containing products of plant origin, which are considered by the people to be leaders in this indicator: in an unripe (green) walnut, vitamin C is about 40-50 times more than in a lemon, and 8-10 times more than blackcurrant.

According to the content of zinc, walnuts are included in the top 10 products of plant origin, characterized by a high content of this mineral. Among nuts, it is inferior in this indicator only to cedar.

In addition to the vitamins and minerals listed in the table, walnut kernels contain fatty oil, the main components of which include glycerides of various acids (stearic, palmitic, linolenic, oleic), amino acids such as asparagine, valine, histidine, glutamine, serine, cystine, phenylalanine, as well as essential oil, tannins and proteins.

The leaves also contain essential oil and tannins (for example, caffeic and ellagic acids). In addition, the composition includes flavonoids, naphthoquinones, vitamins (C and B groups), carotenoids. This diversity makes it possible to use various parts of the walnut tree in folk and official medicine.

### Medicinal properties

The beneficial properties of the walnut, due to its chemical composition, are being studied today in the context of the fight against cancer, Alzheimer's disease, oxidative stress, the possibility of improving the functioning of blood vessels and the heart, and normalizing reproductive function is being studied. The walnut is also being researched for its use in various dietary programs to prevent type 2 diabetes.

Researchers from around the world believe that some components of the walnut kernel can, under certain conditions, exhibit antitumor activity and become key components in the creation of new anticancer drugs. This, for example, is evidenced by the studies of a group of Chinese scientists <sup>[2]</sup>.

Spanish experts come to similar conclusions, who believe that the walnut in the early stages helps to inhibit the development of cancer, cardiovascular and neurodegenerative diseases <sup>[3]</sup>. Among the various useful components, scientists have identified the polyphenol ellagitannin, finding that after all the chemical transformations provoked by interaction with the intestinal microflora, ellagitannin has an antioxidant and anti-inflammatory effect. An optimistic forecast for the use of nut components in the fight against breast, prostate and rectal cancer was also given by independent studies by Mexican and Iranian scientists.

Experts recommend including walnuts in your daily diet and to maintain heart health. There are many reasons for the development of cardiovascular diseases, but proper nutrition is one of the most important ways to reduce risks. Walnut in the diet lowers the level of bad cholesterol (by about 9-16%), lowers blood pressure (by 2-3 mmHg), improves the functioning of the endothelium <sup>[4]</sup>.

Reducing the risk of developing cardiovascular diseases is associated with a large amount of alpha-linolenic acid in walnuts. One study showed that the higher the level of this acid, the greater the chance of avoiding the disease <sup>[5]</sup>.

Indirectly, eating walnuts helps prevent the development of type 2 diabetes, which is associated with obesity. This is due to the fact that the nut menu helps to control the appetite and, accordingly, the weight of patients <sup>[6]</sup>.

The ability of walnut polyunsaturated fatty acids, polyphenols and vitamin E to relieve oxidative stress and thereby prevent the occurrence of neurodegenerative diseases and age-related mental disorders is highly valued. Experiments in a test tube and on laboratory animals have shown that antioxidants and polyunsaturated fatty acids not only prevent the development of oxystress and inflammation in brain cells, but also improve interneuronal connections and promote neurogenesis <sup>[7]</sup>. A high concentration of tannins, which have a strong antioxidant effect, was found not only in the kernels, but also in the nut film <sup>[8]</sup>.

Thanks to the regular use of walnuts, reproductive function and sperm quality in men improve. Due to the imbalance of the "typical Western diet" high in fat and fast carbohydrates, fertility is reduced, but animal studies have shown that walnuts can partially correct the effects of even such an unhealthy diet <sup>[9]</sup>.

## **In medicine**

In official medicine, walnuts have been used since the time of Avicenna, who treated tuberculosis with crushed kernels with honey, "suppuration from the ear" with squeezed leaf juice, and eye fistulas, gangrene and erysipelas with oil. Hippocrates used a decoction of green shells to stop bleeding, as well as to remove roundworms parasitic in the human body - ascaris, later switching to walnut oil mixed with wine. Already today (before the discovery of more effective remedies), a preparation based on walnut fruits was used to treat tuberculosis, and a medicine based on walnut leaves was used to treat lupus.

Now, for the production of pharmacological agents and phytocomplexes, various parts of walnut fruits, harvested at different degrees of maturity, are also used. So, raw materials are harvested from unripe nuts for the creation of fortified products and vitamin concentrates, and green peel becomes the raw material basis in the production of juglone.

Juglone is a red-yellow crystalline toxic compound isolated from walnuts in 1851. As early as the beginning of the 20th century, doctors in America prescribed juglone for the treatment of skin diseases. Today, juglone is also part of the ointments and solutions prescribed to get rid of skin tuberculosis, epidermophytosis, staphylococcal and streptococcal infections, eczema, and lichen. In some cases, dentists will prescribe juglone-containing drugs for periodontal disease.

Today there is a drug of the same name - "Yuglon", which is registered as a dietary supplement. It is made from pericarp and leaf extract and is recommended not only for the treatment of skin diseases, but also for improving the functioning of the gastrointestinal tract, getting rid of parasites, and therapeutic effects in gynecological disorders. Claimed as a powerful bactericidal, antioxidant, antitumor agent with adaptogenic properties.



In addition to Yuglon, various companies commercially produce other preparations based on black (American) walnut:

- Black walnut syrup with pericarp juice. Contains 50% juice and sucrose. Manufacturers recommend it as a hemostatic and healing agent that improves the functions of the gastrointestinal tract, increases appetite, and normalizes blood pressure.
- Oil (extract) of black walnut. Claimed as a broader drug, used not only to normalize the gastrointestinal tract, reduce pressure and eliminate allergic reactions, but also as a tool that helps in the fight against anemia and diabetes. Iodine in the composition helps maintain thyroid function. It is used as a massage oil and in cosmetic procedures.
- Alcohol tincture. The list of diseases for which this tincture is recommended by the manufacturer includes multiple sclerosis, arthritis, pyelonephritis, and thyroid diseases.
- "Yugor-2". This juice from the kernels of the leaves of the walnut, obtained by cold pressing, in addition to juglone, contains vitamins, organic acids and tannins. It is recommended by the manufacturer as an antifungal and bactericidal agent to combat parasites.

Preparations and dietary supplements based on walnuts with a similar spectrum of action are widely produced by almost all domestic and foreign companies specializing in the production of products from natural ingredients. The creators of homeopathic remedies did not bypass the walnut.

### **In folk medicine**

The practice of using various parts of the walnut tree in folk medicine extends from the Far East to the British Isles.

- In the countries of Southeast Asia, astringents are made from the leaves of the walnut tree.
- In China, the liver and kidneys are treated with walnuts.
- In Nanai healing practice, the bast of a local variety of walnut is used as a means for healing wounds and as an analgesic.
- In Tajikistan, crushed walnut kernels are mixed with grapes for stomach diseases.
- In Georgia, the juice of green nuts is added to honey, which is used to gargle with sore throat.
- In the Caucasus, eating 2-3 nuts a day is recommended to improve vision.
- In Bulgaria, healers include walnut ingredients in remedies for inflammation of the lymph nodes and gums.
- In England, the kernels of mature nuts are used as an ingredient in drugs in the fight against atherosclerosis and diabetes.

In Slavic folk medicine, walnuts, as well as decoctions and infusions from leaves, shells and partitions, heal wounds, improve digestion and metabolism, cleanse the body of toxins, heavy metals, radionuclides, parasitic organisms, relieve psychological and physical overwork.

The astringent properties of walnut leaves allow them to be used for diarrhea. They are also included in the fees prescribed for diseases of the liver and gallbladder. An infusion of partitions is used to treat varicose veins in the legs and pain in the joints. With gout, rheumatism and skin diseases (eczema, abscesses, rashes), walnut-based rubdown infusions and ointments are applied externally. Nut compositions relieve inflammation of the oral cavity, fight scurvy and eye diseases. Green (immature) walnut fruits are used as a multivitamin remedy for beriberi, and are also used as a diaphoretic.

In the second half of the 20th century, a drug became popular among fans of the treatment of folk remedies, which later received the name "Todikamp" (on behalf of its creator Mikhail Petrovich Todik). There are several ways to make this tool, but one of the simplest is the following.

A three-liter jar is filled with green walnuts in the amount of 80-100 pieces and filled with purified kerosene, which must not be topped up by about 7-10 cm. Then the jar is rolled up and lowered into the basement or buried by 60-70 cm. 10-12-kilogram weight or other weight. In this form, the product is aged for 3 months.

The author argued that despite the toxicity of kerosene, its combination with a nut ceases to be a poison and becomes a medicine. With the help of the drug, M. Todik's patients sought to cure sciatica, prostatitis, arthritis, sclerosis, thrombophlebitis, pyelonephritis, hypertension, schizophrenia, cirrhosis, ischemia, and even oncology. In recent history, some followers of M. Todik replaced kerosene with an alcohol solution, while others began to plant American black walnuts instead of European varieties of walnut. But although the basic idea has undergone a number of changes lately, it remains quite popular today.

### Decoctions

For decoctions in folk medicine, most often they use not walnut kernels, but leaves, a green shell, partitions and shells. Useful substances in the shell are stored for years, without being destroyed, even in the light. However, after hot water releases them, it is recommended to consume the decoction within 2-3 days after preparation. Often, additional ingredients are added to such decoctions that determine their medical purpose.

- Crushed shells of 10 walnuts in combination with 100 grams of dried hazel leaves are poured into water brought to a boil in advance and simmered over low heat with a loose lid for 30-40 minutes. The decoction cools naturally for about 3-4 hours, after which it is used to treat skin diseases twice a day before meals for 10 days.
- Washed in cold water, crushed walnut shells (2 handfuls), dry bean pods (1 handful) and dry white mulberry leaves (1 handful) in decoctions, some folk healers recommend using for the treatment of diabetes. First, the shell is poured into boiling water (3.5 l) for half an hour, then the beans are added there, and five minutes later - mulberry leaves. The whole mixture is aged on fire for another 10 minutes, after which it is cooled in a natural way, filtered and placed in a refrigerator in a glass container. For therapeutic purposes, the decoction is consumed daily in a glass before bedtime.
- Dried walnut leaves, depending on the concentration of raw materials, are used for menstrual irregularities. To do this, take one and a half tablespoons of chopped walnut leaves, infused for 3 hours in 0.5 liters of boiling water. In case of inflammation in the oral cavity, 2 tablespoons of raw materials are poured into 200 ml of water and brought to a boil, after which they insist for another hour.

In a similar way, decoctions are prepared from partitions extracted from their nutshells. With their help, for example, they restore the functioning of the thyroid gland, the problems of which were caused by a lack of iodine in the body. To do this, the partitions are boiled over low heat for about 10 minutes. Raw materials for one serving are taken in the ratio: 1 cup of water (200 ml) per quarter cup of partitions.

### infusions

In folk medicine, green walnut tinctures are used for various purposes: from fighting tuberculosis and diabetes, to protecting the thyroid gland, blood vessels and digestive organs. Most often, the product is

infused in a dark place for 1 to 2 weeks. But there are recipes in which the infusion must be kept in the light during cooking.

- To make a remedy for nodes in the thyroid gland, three dozen green walnuts are cut and poured with 1 liter of alcohol (70%). The mixture is kept in the sun for 2 weeks. After straining, sugar is added to the mixture, with which it is infused for another month.
- For gastritis, a walnut tincture is used, including 0.5 kg of chopped green fruits, a liter of alcohol, 0.5 liters of water and 100 g of sugar. The composition of these ingredients is infused for 3 months. It is used in a tablespoon twice a day for one and a half months. Between courses you need to take a 2-week break. ( In the instant recipe, 2 dozen green nuts are poured into 0.5 liters of vodka and aged for 24 days).
- For problems with the urinary tract and gastrointestinal disorders, traditional medicine recommends honey-nut infusion. Nut kernels are crushed (for example, using a meat grinder) and mixed with the same proportion of honey (enamel or glassware is used for mixing). The jars into which the mixture is poured do not need to be sterilized. The infusion is closed with a lid and sent to a dark, cool place for a month.

Alcohol infusions are also made from walnut shells. Despite its hardness, the shell relatively easily releases coumarin, which can be used for antibacterial treatment, as well as other useful substances. Moreover, unlike decoctions, useful substances are stored in infusions longer, and healing agents are made easier.

### **in oriental medicine**

In traditional Tibetan medicine, the vital functions of the body (health and disease) are controlled by three energies: Wind, Bile and Mucus. One energy can dominate in a person, but two (very rarely three) energies can be combined. Depending on this combination (constitution), a person determines his diet, taking into account the criteria of food: 6 tastes, 5 elements, 17 properties.

Among these properties there is, for example, the "cold-warm" parameter. Thus, "warm" food enhances vital "warmth" and weakens "cold". According to this parameter, a walnut is considered a warm food, which enhances the energy of Bile, weakening Wind and Mucus. And in cold seasons, people with a predominance in the constitution of "Wind" and "Slime", as well as old people who lead a sedentary lifestyle, should use a walnut. Moreover, according to daily biorhythms, it should be eaten from 16 to 20 hours and, in most cases, preferably separately from other products. But this rule does not work for people with the constitution of "Bile".

Such an intricate arrangement of the diet may seem unnecessarily complicated to a European. But it should be taken into account that Tibetan medicine assigns 30% to the share of competent nutrition in matters of health (another 30% is responsible for the mental state and 40% for the spine), so every little thing is important in this science.

### **In scientific research**

Even if scientists already know a lot about the benefits of the chemical elements that make up the nut, experimental confirmation is still needed that these beneficial substances are absorbed by the body when consumed and really have a positive effect on health.

Researchers from the USA tested the bioavailability of the antioxidants contained in the nut in an experimental group. The walnut has been selected as one of the richest sources of ellagitannin and tocopherol in the plant world. As a result, according to the increased amount of  $\gamma$ -tocopherols (but not



$\alpha$ -tocopherols) and catechins, scientists came to the conclusion that walnut does indeed alleviate oxidative stress, but it is still premature to call it an antioxidant panacea <sup>[10]</sup>.

Scientists from the University of California (Los Angeles, USA) in practice tested the widespread belief that regular consumption of walnuts improves sperm quality. The experiment was conducted on 117 healthy volunteers aged 21 to 35 years. For 3 months, men consumed 75 grams of walnuts daily, without changing anything in the rest of the diet, representing the so-called. "typical western diet". The results were compared with those of the control group, whose representatives did not diversify their menu with walnuts. In men of the first group, both the viability and mobility of spermatozoa improved <sup>[11]</sup>.

An experiment involving 194 healthy adults who ate 43 grams of this product every day for 8 weeks demonstrated the improvement in digestion when eating walnuts. Compared to the period when these same people did not consume walnuts, they had an increase in the number of beneficial bacteria <sup>[12]</sup>.

Scientists tried to confirm the therapeutic effect of nuts in preventing oncology of the breast and rectum in a statistical study involving 104 healthy women and 97 patients suffering from breast cancer. The scientists concluded that those women who regularly consumed at least a few nuts had a 2-3 times lower risk of developing cancer. At the same time, the increase in the amount of walnuts eaten was not as significant a factor as the complete rejection of them. <sup>[13]</sup>. These statistics were confirmed in a test-tube experiment by another group of scientists who tested a "nut" preparation that stopped the growth of cancer cells taken from the breast and rectum <sup>[14]</sup>.

The potential of walnuts in the fight against Alzheimer's disease was demonstrated by a 10-month experiment on laboratory rodents, which were fed with 6-9% walnuts (this corresponds to about 28-45 grams of the same product per day for a person). In mice, according to the results of test tasks, memory improved, anxiety decreased, they succumbed to learning better, in comparison with those rodents that did not receive a walnut. Researchers have concluded that a dietary nut supplement may help reduce the risk of developing, delay or slow the progression of Alzheimer's disease <sup>[15]</sup>.

## Weight regulation

Walnut is a high-calorie product. 100 grams contains about 650 kcal. And, nevertheless, with its help you can control weight and keep yourself in shape.

- First, according to a joint team of researchers from the US Department of Agriculture and the Beltsville Center for Nutrition Research, a person absorbs 21% fewer calories and, accordingly, gains weight more slowly than one would expect from such a high-calorie product <sup>[16]</sup>.
- Secondly, when eating nuts, the feeling of hunger decreases, and with faster saturation, a person overeats less. In a collaborative experiment by an Israeli, Boston, and Massachusetts research group, 10 obese people drank a serving of a smoothie containing 48 grams of ground walnuts daily for 8 days. As a result, they had a decrease in hunger compared to those who drank a placebo with the same amount of nutrients and calories <sup>[17]</sup>.

Similar experiments were carried out by other centers with a large number of participants. For example, scientists from San Diego invited almost three hundred women of different ages (from 25 to 72 years old) who lost weight by reducing the amount of calories they consumed. The menu of the first group of women was compiled with the inclusion of 40 g of nuts per day. As a result, by the end of the experiment, the representatives of the first group lost an average of 10% of their weight, while the representatives of the second group lost only 5%. Scientists see the reason that thanks to nuts, women from the first group were satiated faster and did not want to eat for a longer time.

## **In cooking**

As a product, walnuts are universal - they can be used in baking, in meat or fish dishes, in salads, and in sauces. Therefore, recipes with its inclusion are numerous and varied. Caucasian cuisine is considered one of the champions in the use of nuts in cooking. There, the nut component can even be in soups that are thickened with the help of ground kernels. In particular, this is how, for example, Georgian soup with chicken and walnuts is prepared.

Roasting the kernels brings out their flavor and adds nicotine bitterness. However, in addition to fried, pickled and candied kernels can be found on sale. So, in sugar syrup, walnuts can be found, for example, in Vin de Noi or Nocino liqueurs.

In Turkish, Georgian and Russian cuisines, walnuts are often paired with eggplant. In Georgia, small eggplants are divided into two halves, fried and seasoned with a mixture of ground walnuts with garlic, onion, coriander, tarragon, paprika, celery. Sometimes the dish is sprinkled with pomegranate seeds. Similarly, nearly cut eggplants are stuffed with nuts in Lebanon.

In Mexico, there is a special national dish in the colors of the national flag: "Chiles en nogada". It is a stuffed green chili pepper with a white sauce made from ground walnuts, garnished with red pomegranate seeds. A character in one of the novels by the Mexican author Laura Esquivel died after tasting this dish served at the climax of the wedding, because he, without waiting for the prescribed 20 minutes, immediately went to the marriage bed and did not allow Chiles en nogada to sink into the stomach.

## **In cosmetology**

Even in ancient Greece, walnut fruits (more precisely, a solution of ash from the shell) were used by women to remove body hair. Modern women widely use various nut components in cosmetic procedures. For example, walnut shells are included in facial scrubs. However, nut oil extracts are most widely used.

Walnut oil is used as a softening, moisturizing, anti-inflammatory, anti-aging agent that prevents the formation of wrinkles. Its effect helps to strengthen microvessels, which eliminates the formation of a red capillary network. In summer, oil is applied to the skin to even out tan. Baths for nails, including walnut and lemon oils, are "taken" in order to strengthen the nail plate. And adding a few drops of oil to the shampoo helps to strengthen the hair. For their shine, improvement of structure and staining in chestnut color, a special "nut" powder is also produced.

On an industrial scale, a supercritical CO<sub>2</sub> extract is produced from the leaves of the walnut tree. It is an oily mass of a yellowish-brown hue with a specific faint odor. The extract is included in the composition of bactericidal and fungicidal preparations, shampoos, lotions and creams for skin and hair care. Its share in the finished composition is small (from 0.01 to 0.1%), but its role is significant.

There is another non-standard way of using the tannins contained in the nut to protect the skin. In the Far East, when harvesting hay, there was a practice that has survived to this day to rub the palms of walnut leaves to prevent the formation of corns. Although the skin of her hands acquired a brownish tint and coarsened, she was no longer afraid of calluses.

## **Dangerous properties of walnut and contraindications**

Walnut is one of the strongest allergens, which in itself makes it dangerous for people with a severe allergic reaction to this product. There are known cases of the spread of edema in close contact with a

person who had recently eaten several nucleoli. If a child is allergic to this particular nut (and not several other types of nuts), then the chances are high that in the process of growing up the immune system will begin to perceive the product normally, and after 12 years, allergic manifestations will come to naught.

Another, but lesser, threat can occur with intolerance to the nut kernel protein. In this case, the absence in the body of enzymes capable of digesting protein leads to varying degrees of discomfort in the gastrointestinal tract, with extreme manifestations in the form of diarrhea and vomiting.

With caution and after consulting a doctor, you should use a walnut:

- with bowel diseases (irritable bowel syndrome, Crohn's disease, colitis);
- with psoriasis, neurodermatitis and eczema;
- in cases of increased blood clotting and thrombosis;
- with obesity of the 2nd and 3rd types.

A separate serious threat is the use of old rancid nuts, as well as moldy fruits. During long-term storage without a natural shell, fats are oxidized from contact with oxygen (rancidity). Secondary oxidation products are extremely dangerous due to their mutagenic and carcinogenic effects. First of all, the liver, pancreas, and duodenum are hit. In addition, the liver can also become a target for the deadly aflatoxin, an organic compound produced by several types of fungi. Such mold fungi also often develop in walnut fruits.

### Selection and storage

The famous Italian chef Giorgio Locatelli advises to buy unshelled nuts at the maximum of flavor intensity and freshness - from December to February. But how to determine the quality of the kernel without destroying the shell, especially since the shape, thickness and smoothness of the protective shell can be more varietal characteristics? Experts advise to reject "bad" fruits according to the following indicators:

1. **Weight** . An empty nut with a dried kernel will be lighter than expected. In a party where a significant part of the nuts are "dummy", the skill to distinguish a full nut from a hollow one comes very quickly and remains for life. But even without this skill, a nut with a dried kernel is relatively easy to guess.
2. **Sound** . Before buying, the fruit should be shaken and listened to the sound: if the nut rattles, then it is most likely old.
3. **Color and spots** . The color of the shell should be even, without dark spots, which may indicate damage to the kernel inside. But in general, this is not the most reliable way to assess quality, since a trace on the outside of the shell may remain from the green shell. But the color of the kernel clearly indicates the quality - you should refuse to buy dark yellow, wrinkled kernels with dark patches.
4. **Smell** . A rancid or sour smell is a very clear sign of a spoiled nut. But usually the shell (if its integrity is not broken) does not let odors through, and therefore this criterion is more related to the evaluation of already peeled nucleoli.

Although the quality of shelled nuts is much easier to assess, they should be purchased with great care. Firstly, in this form, the kernels lose a significant part of their useful properties. Secondly, it increases the risk of contact of the unprotected kernel with harmful substances (the buyer usually does not know where and under what conditions the kernels were stored). If for some reason it turns out to purchase only already purified kernels, it is better to first buy a little "for testing".

In any case, if in doubt, it's better not to take risks and refuse to buy, because deadly aflatoxins are formed in moldy kernels, which are not destroyed even during heat treatment, so you should not fry such nuts either - this will not help to avoid the threat of intoxication.

GOST allows storage of nuts in shell for no more than a year, and in a purified form - no more than six months, and even then - subject to the requirements for storage conditions. Walnut fruits do not like air or light. Nut fat is relatively easy to oxidize, become rancid, so keep the peeled kernels tightly closed in a glass jar in a dark cabinet or in the refrigerator. For several months, nuts can be stored in the freezer. Inshell nuts can be stored for up to a year in a dry, ventilated and preferably cool place.

### Varieties and cultivation

Walnuts are bred by seeds. At the same time, grafted seedlings grown in nurseries have the most powerful potential. Although this tree is undemanding to soils, if possible, a nut is planted in sandy-stony loose soil rich in lime. So that subsequently the tree does not obscure other plants, it is usually "settled" on the edge of the garden. The crown of the plant is extensive, easily reaching 20 meters in diameter or more.

The plant bears fruit, as a rule, from the age of 7-8 years (sometimes from 4-5 years) and until the end of life - up to about 200-300 years. However, there are also much older fruiting specimens. So, in China (Hotan County), there is a tree that is almost 1400 years old, which gives up to 6.5-7 thousand nuts per year. Especially active fruiting is observed in a separate tree (not in plantations) at the age of one and a half centuries. The average yield of such trees is about 120-150 kg per year. But the literature describes champions capable of producing up to one and a half tons of fruits annually.

Varieties of nuts (except for botanical characteristics and conditions of care) differ in yield, fruit size, shell thickness and grain weight. Experts recommend choosing grafted planting material with a lateral (lateral) type of fruiting, choosing varieties according to growth strength, taking into account agro-climatic zoning, and not to abuse the number of pollinators and varietal mixing in the garden. The most interesting varieties for growing are presented in our rating of nuts.

1. **INTR** . This superlateral variety represents the Ukrainian selection. The walnut is intended for industrial cultivation and is capable of producing up to 25 buds per shoot. The fruits are large (up to 60 g) and this means that about a kilogram of fruits can be collected from a branch, and about 5 bags from a tree.
2. **Pieral-Lara (LARA)** . One of the leaders of the French selection, which gives very large spherical nuts with a flat base and a light kernel. In the harvest, up to 75% are fruits with a caliber of 34-35 mm or more. The shell, although strong, is thin, which allows you to get up to 50% of the total mass at the output. The kernel has a sweet taste.
3. **Cossack** . An even greater percentage of the kernel from the total mass (up to 60%) is demonstrated by the classic tall variety, which represents the Moldovan selection in the ranking. Popularity was added to it by resistance to diseases, low temperatures, combined with high productivity (about 3.5-4 t / ha). Medium-sized fruits are cylindrical in shape.
4. **Chandler** . American breeders (from the University of California) brought out a high-performance, but capricious variety to temperature changes. The tree is characterized by a gradual increase in the percentage of lateral fruiting, which reaches 90% with an increase in growing seasons. Small fruits are oval in shape.
5. **Shebin** . This variety, representing the Turkish selection, is distinguished by abundant fruiting and a wide area of settlement (except for coastal areas). Fruits of 40 mm caliber are collected in clusters and from the total mass give about 50% of the output product. They have a thin shell and a dense core of light yellow color.

Regular use of any kind of nut, even in small quantities, improves the functioning of the brain vessels, increases mental and physical performance, normalizes heart function and reproduction, which, combined with its recognizable taste, explains the unflagging popularity of this product.

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### **Walnut - useful properties, composition and contraindications**

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**Abstract.** The article discusses the main properties of the walnut 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 nut are indicated, the use in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of walnut on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application.



### **Grapes (lat. Vitis)**

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**Abstract.** The article discusses the main properties of grapes 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 in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of grapes on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

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



## Beneficial features

Table 1. Chemical composition of muscat grapes (according to [Food+](#)).

Main substances (g/100 g):	Seed grapes [1]	Seedless grapes (raisins) [2]	Raisins [3]
Water	81.30	80.54	15.46
Carbohydrates	17.15	18.10	79.32
Sugar	16.25	15.48	65.18
Squirrels	0.63	0.72	3.3
Alimentary fiber	0.9	0.9	4.5
Fats	0.35	0.16	0.25
Calories (kcal)	67	69	299
<b>Minerals (mg/100 g):</b>			
Potassium	191	191	744
Calcium	fourteen	ten	62
Phosphorus	ten	twenty	98
Magnesium	5	7	36
Sodium	2	2	26
Iron	0.29	0.36	1.79
Zinc	0.04	0.07	0.36
<b>Vitamins (mg/100 g):</b>			
Vitamin C	four	3.2	2.3
Vitamin PP	0.300	0.188	0.766
Vitamin E	0.19	0.19	0.12
Vitamin B6	0.110	0.086	0.174
Vitamin B1	0.092	0.069	0.106
Vitamin B2	0.057	0.070	0.125
Vitamin A	0.030	0.020	0

From the vitamin-mineral complex contained in grapes, it is difficult to isolate the elements that are present here in abundance. Of course, there are useful substances in the berry, but in relatively small quantities. But the fruits of grapes are rich in simple sugars and carbohydrates, but there is a minimum amount of proteins and coarse fibers in their composition. Note that the differences between different grape varieties (for example, with and without seeds) are insignificant.

But the situation changes dramatically when it comes to raisins. In dried grapes, there are more minerals, fiber, and most importantly, much more sugar and carbohydrates, which leads to a sharp increase in calories. Thus, it is best to consume fresh berries. And it is recommended to exclude raisins from the diet, especially for people who want to lose weight.

## Medicinal properties

As mentioned above, grapes are not considered a vitamin bomb, but their nutrients still make a valuable contribution to the body. For example, copper is involved in energy production, and together with vitamin C, is responsible for the formation of collagen. Potassium, in turn, is important for cellular metabolism. A number of trace elements (calcium, magnesium, phosphorus, manganese) and

vitamin K help strengthen bones. By the way, 100 g of berries provides 28% of the daily requirement of vitamin K, which is necessary for the body not only for bone health, but also for normal blood clotting. In addition, the berries contain small doses of beta-carotene, lycopene, lutein, etc.

Antioxidants contained in grapes help reduce the level of oxidative stress in the body, which is known to be the root cause of many chronic diseases of the nervous and cardiovascular systems. Note that dark berries have a more powerful antioxidant effect, since they contain natural anthocyanin pigments.

In addition to reducing oxidative stress, the flavonoid complex supports the normal functioning of the cardiovascular system in several other ways. First, these substances reduce the risk of thrombosis by preventing platelets from sticking together. Secondly, thanks to the production of nitric oxide, they dilate blood vessels, reducing the risk of heart attack and hypertension. In addition, grapes contain some phytosterol (a plant analogue of animal cholesterol), which prevents the formation of plaques on the walls of blood vessels and thus protects the body from atherosclerosis.

However, the antioxidant substance resveratrol, which belongs to the group of polyphenols, usually attracts the most attention in the composition of grapes. It is credited with anti-cancer and anti-aging properties. In addition, it is believed that resveratrol is able to protect the brain from damage that leads to various neurodegenerative diseases, including Alzheimer's disease. Note that the amount of the substance coming from grapes is not so large as to prevent the development of the pathological process, but it can delay its occurrence.

With regard to the effect of resveratrol on cancer, experiments have shown that drinking juice from dark red grape varieties helped to reduce mammary tumors in rats. Also, this antioxidant slowed down the development of agents that cause colorectal cancer.

Finally, resveratrol, along with zeaxanthin and lutein, has a positive effect on the condition of the visual organs. This substance is involved in protecting the retina from ultraviolet radiation, thereby reducing the risk of developing age-related macular degeneration, glaucoma and cataracts.

It should be noted that a large number of biologically active elements (antioxidants, vitamin E) are concentrated in the seeds and skins of grape berries, therefore, to get the maximum benefit, it is recommended to eat whole grapes. And by the way, do not believe the myths that berries with seeds can lead to appendicitis. Moderate consumption does not provoke inflammation of the appendix.

Interestingly, all the beneficial properties of antioxidants are preserved during the fermentation of grapes, and, accordingly, they can be obtained from wine. True, we note that we are talking about a drink from dark varieties, since white wine is mainly made using grape juice without pulp (skin and seeds).

## **In medicine**

Due to the presence of P-vitamin substances in the composition of red grape leaves, their extract began to be used as the main active ingredient in a preparation called Antistax. It is used for chronic venous insufficiency, hemorrhoidal vein damage, hypertension, various dental pathologies, as well as a neuroprotective and anti-inflammatory agent. This medicine copes well with the elimination of symptoms such as swelling, cramps in the calf muscles, pain in the legs.

In addition, dietary supplements based on grape seed extract from dark varieties are now very popular on the phytopharmacological market. Manufacturers claim that, thanks to phenolic and tannins, as well as unsaturated fatty acids (linoleic and linolenic), these supplements maintain the health of veins and

blood vessels, reduce the risk of thrombosis, activate lymphatic drainage, normalize blood pressure, provide nutrition to brain cells, and reduce age-related visual impairment.

### **In folk medicine**

Grapes, along with other parts of the plant, are used in folk medicine to treat a wide range of ailments and diseases. There is even a separate area - *ampelotherapy* (grape therapy). The plant is used for problems with digestion, vision and blood vessels, as well as for kidney diseases, tonsillitis, bronchitis, periodontal disease, gout, migraine, etc. In addition, the leaves, as well as decoctions and infusions from them, are often used to treat skin diseases (boils, ulcers), wound healing.

Moreover, herbalists advise replacing cabbage leaves with grape leaves when preparing cabbage rolls. Such a replenishment of the diet will help to establish the work of the pancreas and intestines. Surprising as it may seem, even the ashes of the grapevine are used in folk medicine, helping with intestinal ulcers.

- infusions

For gargling with sore throat or washing the mouth with periodontal disease, it is advised to make an infusion of grape leaves: 1 tablespoon of dry chopped raw materials is poured with one liter of boiling water and infused for 2 hours. Then filter and apply several times a day. The same liquid can be used to wipe wounds and ulcers on the skin.

Also, inflammation in the throat is treated with an alcohol tincture of grape seeds. To prepare it, you need to wash 100 g of seeds of dark berries, blot with a napkin and crush in a mortar. Then pour 0.5 l of vodka, close and leave in a dark place for 1 month, shaking regularly. After straining, add a few drops of tincture to the herbal decoction and gargle with this mixture. You can also take this drug 1 teaspoon before meals. This helps to strengthen the walls of blood vessels, helps fight varicose veins and prevents platelets from sticking together.

- Decoctions

Traditional healers offer to treat gout, metabolic disorders and night blindness with a decoction of grape leaves. To prepare it, you need to add 1 tablespoon of dry raw materials to 200 ml of boiling water and leave it on low heat for 10 minutes. After straining, the medicine can be taken 50 ml four times a day. In addition, to speed up the healing process of wounds, it is advised to wipe the affected areas of the skin.

In addition, a decoction can be prepared using the seeds of grape berries: one glass of boiling water is usually taken per tablespoon of seeds, and then placed in a water bath for 20 minutes. After straining, it is recommended to drink this liquid 1 tablespoon three times a day before meals. It has a strong diuretic effect.

- Wine

Grape wines were used as medicines in Ancient Egypt and Ancient Greece. Then they treated both physiological ailments and mental disorders. In addition, for the purpose of disinfection, they were added to water. And by the way, it was not at all useless, since they are really toxic to certain types of bacteria.

To date, wine is also actively used in folk recipes. For example, for headaches and migraines, it is recommended to mix dry red wine, honey and aloe juice in a ratio of 1: 1: 0.5. Take a teaspoon three

times a day for a month. According to another recipe, it is necessary to pour dry red wine into a jar filled with raspberries. Infuse for 3 weeks in a dark place, and then take 50 ml three times a day 30 minutes before meals. By itself, red wine is considered a good remedy for insomnia. Usually it is enough to drink 100-150 ml an hour before bedtime.

Used in folk medicine and white wine. For example, to remove small stones from the kidneys, pour 100 g of marshmallow seeds with two liters of dry white wine and leave to infuse in a dark place for 4 weeks, shaking from time to time. Then you need to boil the liquid over low heat for 30 minutes, strain and consume 50 ml three times a day before meals.

For problems with urination, one liter of boiling dry white wine is poured over 30 g of dry birch leaves and left on low heat for 15 minutes under a lid. Then the liquid must be filtered, add 3 tablespoons of honey and drink 70 ml three times a day an hour after eating.

During an exacerbation of bronchitis, it is recommended to put 4 large leaves of aloe in 0.5 liters of wine and leave to infuse in a dark place for 4 days. Then take 1 tablespoon three times a day.

- Juice

Traditional healers claim that 1 glass of grape juice in the morning can relieve headaches. It is also recommended to treat kidney diseases. For a month, you should drink 1 liter of grape juice daily with the addition of 10-12 drops of lemon juice. With proteinuria (the appearance of protein in the urine), you need to drink such a mixture in one gulp, and the induced urination should flush the urinary tract.

### **in oriental medicine**

In ancient oriental medicine, grapes (both the berries themselves and the rest of the plant) were highly valued for their medicinal qualities. The vineyard was attributed to the cold yin type and was considered a dry product in the II degree, but ripe berries were hot in the I degree and wet. Healers claimed that if young branches of grapes with leaves and tendrils are crushed, and then mixed with barley flour and applied to the body, then you can get rid of a hot headache or hot tumors.

Grape leaf juice helped to get rid of problems with a hot stomach: it stopped vomiting, bilious diarrhea, and healed ulcers. It was believed that it has a diuretic effect, saves from hemoptysis and increases potency. It was recommended to pregnant women as it strengthened the developing fetus. External application of the juice was supposed to stimulate hair growth. Vineyard gum, according to ancient healers, cleansed and dried nature. And together with wine, they cleansed the spleen well and treated eczema.

Used in healing practices and the ashes of the vine. By mixing it with vinegar, they received a cure for hemorrhoids, and when vegetable oil and honey were added to this mixture, they prepared an antidote for snake bites.

Hot berries normalize the disturbed nature and strengthen the organs in the chest area. Grape juice is good for the stomach, kidneys, liver and bladder. Grape oil, in turn, warms up the body well and stops the development of tumors.

### **In scientific research**

Grapes often become the object of scientific research. Most of the attention of scientists is focused on its anti-cancer properties. It is believed that antioxidants, found mainly in the skin and seeds of berries, are effective both as a preventive measure and as an adjunct to oncotherapy if the disease has already

developed. For example, resveratrol, according to scientists, helps reduce oxidative stress and, as a result, protects the colon, breast, prostate, and lungs from cancer <sup>[4]</sup>.

But one of the latest studies showed that grape juice extract with its phenolic composition significantly reduces the viability of pathogenic cells in case of damage to the rectum. In the experiment, raw materials obtained from the berries of the Autumn royal and Ribier varieties were used. By the way, depending on the dose, the extract not only led to cell death, but also reduced their mobility, slowing down the process of metastasis <sup>[5]</sup>. And another experiment showed that in colorectal cancer, infected cells are vulnerable to proanthocyanides isolated from grape seeds. <sup>[6]</sup>.

There are also several scientific papers confirming the effectiveness of various components of the grape berry in the fight against breast cancer. Scientists claim that grape seed extract has a significant effect on cell motility in mouse breast cancer. Thus, they inhibit the formation of metastases in other organs <sup>[7]</sup>. In yet another study, the process of metastasis was halted by extracting polyphenols from grape skins. True, they affected the viability of infected cells to a much lesser extent, mainly limiting their mobility <sup>[8]</sup>.

As for the prostate tumor, after a series of experiments, scientists came to the conclusion that the anthocyanins contained in the dark Muscadine grapes have a devastating effect on pathogenic cells without affecting healthy epithelium. They also help prevent the spread of bone metastases <sup>[9]</sup>.

Note that in all the above studies, the anti-cancer properties of various components from the composition of the grape berry were studied, but each group of scientists focused on a specific substance, not considering it in combination with other components. On the one hand, this made it possible to learn in more detail about all the properties of a particular antioxidant. On the other hand, it did not allow to see the results of its interaction with other substances.

That is why scientists from the University of Wisconsin took as an object of study all the polyphenols that are contained in grapes (resveratrol, quercetin, kaempferol, catechins, anthocyanins, etc.). So, they came to the conclusion that, getting into the body along with other antioxidants, the effectiveness of many of them is enhanced <sup>[10]</sup>. This synergistic effect is important at the stage of preventing the development of cancer.

These studies were confirmed by an experiment conducted by a group of American scientists. For two weeks, 30 people at risk of developing colorectal cancer were given up to 450 grams of grapes per day. As a result, after the end of the experiment, the risk of the disease decreased, especially in people over 50 years old <sup>[11]</sup>. If the pathological process is already running, then, naturally, the amount of polyphenols contained in grapes, and in any other fruit or berry, will not be enough to treat the disease. To achieve the desired effect, it would be necessary to eat tens of kilograms of berries a day.

In addition to studies studying the effect of grapes and its individual components on cancer, a scientific work appeared several years ago in which the Australian David Sinclair claimed that resveratrol isolated from wine slows down the aging process of cells. This discovery quickly spread around the world media, but journalists often missed important nuances. For example, the fact that experiments have so far been carried out only on mice. And the level of resveratrol in the body of rodents was so high that it would take several hundred glasses of wine to reach it.

By the way, the bioavailability of resveratrol is not very high, that is, it is poorly absorbed from food and drinks. Scientists have found that the concentration of this antioxidant is highest in the skins and seeds of dark wine varieties. In addition, frequent rain during grape ripening increases the amount of bioavailable resveratrol in the skin, but does not affect the content of this substance in the stones <sup>[12]</sup>.

However, all this is still not enough for the body to receive a biologically active dose. Scientists from Johns Hopkins University have been monitoring the health of older people in the Chianti region of Italy for 9 years. Their traditional diet includes many foods containing resveratrol. But researchers have never been able to establish a link between lifespan or the rate of aging and resveratrol levels in the body.

But numerous studies of polyphenols from grapes have confirmed that these substances are able to maintain the normal functioning of the cardiovascular system. By lowering cholesterol levels and stimulating the production of nitric oxide, they help prevent the development of atherosclerosis and improve endothelial function <sup>[13]</sup>.

In one experiment, 69 adults were divided into three groups. A participant in one of them was given 500 g of dark grapes daily for eight weeks, participants in the other - 500 g of light varieties of berries, and the rest were completely excluded from the diet of grapes. As a result, those who ate dark varieties had a significant decrease in the level of "bad" cholesterol. White berries were inferior in efficiency, but still led to an improvement in performance compared to the third control group <sup>[14]</sup>.

Despite the fact that grapes contain a lot of sugar, scientists say that they can be useful for patients with type 2 diabetes. In a 16-week experiment, 38 men took 20 g of dark wine grape extract daily, after which their blood sugar levels decreased compared to the control group <sup>[15]</sup>. In addition, resveratrol increases insulin sensitivity, which helps the body process more glucose and thereby help lower sugar levels <sup>[16]</sup>.

## **Weight regulation**

There is no single opinion about the benefits of grapes for weight loss. Some nutritionists call these berries the most useless of all, others willingly include them in various diets. What usually speaks against grapes is that they contain a lot of sugars and carbohydrates. On the other hand, its glycemic index is not that high - 45 units, which means that grapes do not cause a sharp increase in blood glucose levels.

In addition, some of the substances that make up these berries increase insulin sensitivity and, thus, help improve the absorption of sugar in the body. Moreover, American scientists conducted an experiment in which people with significant excess weight took part. They were divided into 3 groups and for three weeks they took daily 30-minute walks. Grape juice was added to the diet of the first group, grapes were added to the diet of the second group, and no changes were made to the third group. As a result, after 3 weeks, the representatives of the first group lost an average of about 1.5 kg of weight, the second - about 2 kg, and the third - about 0.5 kg.

Nutritional researchers concluded that grapes improved insulin metabolism and inhibited fat storage. Berries had the best effect because most of the necessary substances are concentrated in the skin, which usually does not get into the juice. Thus, grapes should not be written off, because with moderate use and in combination with small physical exertion, it benefits the body and helps to gradually get rid of excess weight.

But all this cannot be said about raisins - one of the worst enemies of weight loss. It contains practically no nutrients and 60% consists of sugar, not much different from sweets. The calorie content of raisins (299 kcal) is 4 times higher than the calorie content of grapes (67 kcal).

Note that when losing weight, they usually pay little attention to drinks, mainly trying to limit themselves in products. However, special care should be taken when drinking wine, as the average



glass of 175 ml contains 160 kcal. The calorie content depends on the variety of grapes used and even more on the amount of added sugar, but in any case remains quite high.

### **In cooking**

Grapes are used in all cuisines of the world. In addition to the berries themselves, the leaves of the plant are used, from which, for example, dolma is prepared in the Middle East. In addition, during the preparation of red wine, scallions (twigs to which grapes are attached) are often used along with berries. As for the berries themselves, they are dried, pickled, jams, ice cream, compotes are made from them, they are added fresh to various desserts, salads, and even served with meat.

Grapes are often used to make snacks. Because it pairs well with cheeses and nuts, it can be rolled in soft goat cheese, then drizzled with honey and sprinkled with chopped pistachios. These balls must be put in the refrigerator for 45 minutes, and then you can serve. By the way, if we talk about cheeses, then grapes can be safely served with blue cheese. And the peculiarity of the French cheese Arôme au gène de marc, reminiscent of brie, is that it is kept in grape brandy for 30 days along with the seeds, skins and twigs of grapes left after pressing.

Real balsamic vinegar is made from grape juice. First, it is boiled down to the consistency of a thick syrup, and then aged in barrels for at least three years. Also, a traditional sweet is prepared from the juice of grapes in Transcaucasia, which the Armenians call "sujuk", and the Georgians - "churchkhela". The juice is boiled until its volume is reduced by 3 times, then a little flour is added and nuts strung on a thread are dipped into this syrup. Then the resulting "sausage" is dried in a dark cool place.

Special wine grape varieties are usually grown for making wines, but some winemakers go even further. For example, Tokay wines in Hungary and several expensive wines in France are made from grapes covered with gray mold. This helps the berries get rid of unwanted moisture and increase the concentration of sugar. In addition, there is the so-called ice wine (ice wine), which is made from grapes seized by the first frosts. By the way, frozen grapes are often used as ice. They cool the drink, but do not dilute it with water.

### **In cosmetology**

In cosmetology, grapes have been used for quite a long time and successfully. The beauty industry actively uses extracts and extracts from the skin and pulp of the berry, seed oil, and the antioxidant resveratrol. You can find these components in a variety of products: hand and face creams, facial cleansers, scrubs, anti-cellulite gels, shampoos, lip balms, lipsticks, nail coatings, as well as anti-aging products.

The most common and popular component is grape seed oil. Due to the presence of vitamins A and B, tocopherols, flavonoids and polyunsaturated acids in its composition, it nourishes the skin well and leaves no shine or film feeling on the face. Regular use of products based on this oil stimulates the regeneration of the skin and gives it elasticity.

Products containing grape seed oil are recommended for owners of problem skin. As a rule, they contribute to the narrowing of pores, the normalization of the sebaceous glands and the elimination of acne. You can make a care product at home.

For oily skin:

- mix 2 tablespoons of dark grape juice with egg white and a little starch or flour. This mixture is applied to the face for 15-20 minutes, and then washed off with warm water;
- a handful of dark berries mashed into gruel are mixed with sour cream until a thick mass is obtained. Apply to the face for 20 minutes, and then wash off with a cotton pad dipped in cool milk.

For dry skin:

- combine egg yolk, a tablespoon of honey, half a teaspoon of olive oil, a tablespoon of crushed oatmeal with a tablespoon of red grape juice. Apply to face for 15 minutes, then rinse with warm water.

Cleansing lotion:

- 400 ml of dark grape juice must be mixed with two tablespoons of honey and 200 ml of vodka. Store in the refrigerator in a glass container for up to 7 days. Wash your face twice a day.

### **Dangerous properties of grapes and contraindications**

In moderation, grapes bring exceptional benefits to the body. But too large portions can provoke indigestion and gas formation. In addition, some experts believe that grapes should not be consumed by pregnant women, since resveratrol becomes toxic with an unbalanced hormonal background. In addition, it is not easy for a weakened digestive system to digest the skin of berries. It may not be necessary to completely give up grapes during pregnancy, but its inclusion in the diet should be done with caution.

In the following situations, it is better to refuse the use of grapes:

- exacerbation of stomach ulcers;
- exacerbation of gastritis or colitis;
- diarrhea;
- cirrhosis of the liver;
- taking blood-thinning drugs (such as warfarin).

It is also necessary to give grapes to children under 4-5 years of age with caution. The fact is that babies often swallow whole berries without chewing them. Grapes can get stuck in narrow airways and, due to their soft and smooth surface, create an airtight seal, blocking the flow of air. It is best to cut the berries in half before giving them to a child.

### **Selection and storage**

When choosing grapes, it is necessary to give preference to bunches with whole dense berries without damage, rot and mold. Light brown dots on white grapes indicate that they are very ripe and ready to eat, but will not be stored for a long time even in the refrigerator. You should not refuse to buy grapes if a slight whitish coating is visible on the berries, since this is their protective reaction to external stimuli. Sometimes white traces of chemicals can remain on the berries after processing, so in any case, the grapes should be washed well.

As for storage, ripe berries usually lie in the refrigerator for about 3 days. It's best to put them in a plastic or glass container, as moisture can accumulate in the bag and, combined with the sugar released along with the grape juice, fungal infections can develop. To preserve the harvest for the winter, it is necessary to remove the grapes from the bunch and, spreading them on a tray in one layer, send them

to the freezer. After a while, they can be transferred to any container and stored until the end of winter. This method allows you to save the maximum amount of nutrients.

Pickling, canning and drying deprive grapes of almost all vitamins, minerals and antioxidants. In the case of raisins, there are also questions about the production process, since almost all dried fruits are treated with preservatives (for example, sulfur dioxide) to prevent spoilage and preserve their presentation. If you still decide to buy dried grapes, then you need to soak them for half an hour in cold water, and then rinse well.

### **Varieties and cultivation**

The varieties of grapes are striking in their diversity, and breeders continue to work to improve their chemical composition, taste and make it possible to grow in various climatic conditions. Typically, grape varieties are divided into table (fresh eaten) and wine (used to make wine). Among the former, pitted berries (for example, sultanas) are often found. Grapes are also distinguished by color: white, pink, red and black. The most common varieties in our country are: Veles, Adler, Jupiter, Muscat, Ladyfingers and Chardonnay.

Among the unusual varieties of grapes, "Witch's fingers" can be noted. These dark berries really resemble short fingers with their elongated oblong shape. And the fruits of the Cotton Candy variety do not outwardly differ from others, but the breeders endowed them with a pronounced taste of cotton candy. They contain 12% more sugar and have almost no astringency, making them very popular with children.

One cannot ignore the Roman Ruby variety, which is grown and sold at auction exclusively in the Japanese prefecture of Ishikawa. These red berries contain 18% sugar, so they are especially sweet. Their size is also striking - each grape must weigh at least 30 g, and the entire bunch - at least 700 g. In 2017, a branch of such grapes was sold at auction for \$ 9,800.

Of great interest are the so-called sea grapes and the Brazilian grape tree Jaboticaba. True, none of these plants has anything to do with the Grape family. They probably got their names purely by visual resemblance. Moreover, under the name "sea grapes" both the type of algae, which are eaten, and fruit-bearing evergreen trees are hidden at once. But jaboticaba is the edible fruit of a plant from the Myrtle family.

With regard to the characteristics of growing grapes, the key factor is the choice of location. Berries tolerate heat well, but are afraid of shade, so for planting it is better to choose a sunny side, protected from the wind. The soil can be sandy, clay or black earth. With frequent precipitation, the plant can not be watered, but if there is a lack of moisture or drought occurs, then additional measures are necessary. In the absence of rain, you need to water the grapes up to 10 times per season, but not too abundantly.

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So, moderate consumption of grapes definitely benefits the body. Dark berries enhance antioxidant protection, support the normal functioning of the cardiovascular, digestive and nervous systems, protect against the development of chronic diseases, and also provide activation of skin regeneration processes.

### **Literature**

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### **Grapes - useful properties, composition and contraindications**

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**Abstract.** The article discusses the main properties of grapes 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 in various types of

medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of grapes on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application.



### **Zucchini (lat. Cucúrbita pépo)**

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**Abstract.** The article discusses the main properties of zucchini 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 vegetable are indicated, the use in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of zucchini on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

**Key words:** zucchini, benefits, harm, beneficial properties, contraindications

### **Beneficial features**

Table 1. Chemical composition of zucchini (according to [Food+ data](#) ).

<b>Main substances (g / 100 g):</b>	<b>Raw zucchini</b>
Water	94.60
Sugar	1.7
Alimentary fiber	1.1
Squirrels	1.2
Fats	0.2
Calories (kcal)	16-27
<b>Macro- and microelements (mg/100 g):</b>	
Potassium	262
Sodium	ten
Phosphorus	38
Calcium	fifteen

Magnesium	17
Iron	0.4
Zinc	0.3
Copper	0.1
Manganese	0.2
<b>Vitamins (mg/100 g):</b>	
Vitamin C	17
Vitamin PP (niacin)	0.5
Vitamin B6	0.2
Vitamin B2 (riboflavin)	0.1
Vitamin B1 (thiamine)	200 IU
Vitamin A	200 IU
Vitamin E	0.1
Vitamin K	4.3 mcg
Vitamin B5 (pantothenic acid)	0.2
Vitamin B9 (folic acid)	29 mcg

The table shows that zucchini is rich in vitamins B1, B2, PP (niacin, or nicotinic acid), but there is especially a lot of vitamin C in it. In zucchini (a variety of zucchini bred by Italian breeders), the content of vitamin C is even higher. In addition, zucchini contains folic, pantothenic acids. Potassium is distinguished from mineral salts by its relatively high concentration.

The nutritional value of this product is also associated with the presence of easily digestible carbohydrates in the pulp of greens (unripe fruits). In young zucchini, approximately 2-2.5% sugars, 5-6% dry matter. As the fruits ripen, the amount of sugars increases, but the amount of carotene also increases markedly. According to the content of this substance, mature yellow-fruited zucchini is ahead of carrots. In addition, the skin of these yellow squash is rich in the antioxidants lutein and zeaxanthin. But since the skin of the "old" fruits coarsens and becomes unusable, young yellow zucchini are chosen for healthy food.

Changes the concentration of certain substances in vegetables and the heat treatment of the product. So, for example, in boiled zucchini, the amount of vitamin A increases, which even in a raw vegetable reaches (depending on the variety) 40% of the daily requirement.

Zucchini seeds contain about 45-50 mg of Omega-3, which is about 3.5 times more than eggplant. At the same time, omega-6 in squash seeds is much less than in eggplant - 2.25 times.

### Medicinal properties

In zucchini, unlike, for example, eggplant, there is very little coarse dietary fiber (4% versus eggplant 14%), which makes them an excellent dietary product that can and should be included in the diet of people with gastrointestinal diseases and patients who have undergone surgery on organs digestion. For the same reason, both old people and babies can eat this vegetable (complementary foods in the form of a monocomponent puree are usually introduced from 6 months, and after a year they try to give boiled zucchini).

The diuretic properties of this product make it possible to include it in therapeutic programs during the treatment of kidneys, gout. Potassium in the composition ensures normal salt metabolism and removal of excess fluid from the body. In this case, there are zucchini, preferably with a peel, without using salt and oil during cooking.



Pectins cleanse the body of toxins and "bad" cholesterol, which at the same time becomes the prevention of atherosclerosis. Also, zucchini is recommended to be actively consumed after antibiotic treatment. Pectins protect the gastrointestinal tract from damage and help strengthen blood vessels and the heart.

Zucchini fruits contain specific enzymes that ensure the transition of protein compounds into a soluble state, which is important for people suffering from liver diseases. In addition, they contribute to the separation of bile, which can be used to prevent gallbladder diseases.

Squash "derivatives" also have medicinal properties:

- *juice* is drunk to improve the quality of sleep and improve the state of the nervous system;
- *decoction of flowers* is used to treat purulent wounds and some skin diseases;
- *unroasted seeds* drive out worms (in order for the seeds to retain their effectiveness, they should not be fried, but they can be dried a little in the oven).

The skin of yellow eggplant (about 3-10 times more than the flesh) contains a high concentration of lutein and zeaxanthin, which prevent eye diseases and are generally good for vision <sup>[1]</sup>. At the same time, like other antioxidants, they neutralize the negative effects of free radicals, protecting cells from damage.

In 2015, at the American Association for Cancer Research Annual Meeting, the findings of a research group were presented, according to which patients with cancer of the neck and head should eat certain foods containing sulforaphane, which include zucchini. Scientists claim that zucchini (along with broccoli and watercress) qualitatively reduces the risk of developing cancer of the larynx and pharynx in people undergoing treatment for malignant tumors of the neck and head. A similar effect was recorded not only in laboratory mice, but also in healthy human volunteers, who, with the help of regular consumption of vegetable juice, acquired protective mechanisms that prevent the formation of cancer.

### **Use in medicine**

In clinical pharmacology, zucchini (along with pumpkins, eggplants and cucumbers) is recommended to maintain anabolic processes in diabetes mellitus. When immunotherapy for type 1 diabetes mellitus, it should be borne in mind that the glycemic index of a product is not a constant value, depending on the combination of neighboring products, the method of preparation, the temperature of the dish during meals, and other factors. Therefore, the low glycemic index characteristic of raw zucchini will increase if they are stewed.

Despite the pharmacological potential of zucchini, this product, however, has so far attracted the attention of manufacturers, not of drugs, but of dietary supplements and vitamins. So, in an extensive reference book of biologically active additives, a preparation is described that includes cryopowders of zucchini and carrots. The agent is declared as an antioxidant, anti-inflammatory and diuretic, capable of preventing the development of urolithiasis and, in particular, preventing the formation of the most common type of calcium oxalate stones. The instruction recommends the use of dietary supplements for inflammatory diseases of the urinary system and kidneys, for nephrolithiasis and renal colic.

### **In folk medicine**

Useful properties of zucchini traditional medicine revealed gradually. Healers have appreciated the delicate texture of this product and the ability to stimulate bowel function without causing stomach irritation. The soft dietary fiber of zucchini in folk recipes is still designed to absorb "excess" water,

toxins, cholesterol and remove them from the body. Due to this, zucchini is recommended for the elderly, in whose diet they provide prevention of atherosclerosis, improve the secretion and motor function of the gastrointestinal tract, and have a beneficial effect on hematopoiesis.

Another effect of the diuretic function is the removal of puffiness associated with disorders in the functioning of the kidneys, bladder and cardiovascular system. Also in folk medicine, zucchini-based products are used to activate the function of the gallbladder. The alkalizing effect allows healers to use zucchini for the treatment of gastritis with high acidity, as well as for stomach and duodenal ulcers.

In some eastern countries, there is a tradition to use zucchini-based products to increase potency. Perhaps this is due to the ability of the vegetable to effectively remove cholesterol, which, in turn, qualitatively affects the state of blood vessels and normalizes blood circulation, including in the organs of the genitourinary system. Zinc content in zucchini can also increase testosterone levels. However, in 100 g of this product, there is only 0.3 mg of zinc, which is approximately 2% of the daily intake. Freshly squeezed juice in small doses (along with some herbs) is used for sleep disorders and increased anxiety, and improving the quality of sleep in itself has a positive effect on male potency.

For the treatment of diabetes in folk medicine, there is a recipe for the preparation of the so-called "zucchini milk". Two tablespoons of dried zucchini seeds are ground into a fine powder, to which 0.5 teaspoon of flower honey is added. The mixture is dissolved in 100 ml of boiled water until a greenish "milk" of a homogeneous consistency is obtained. The remedy is prepared daily for two meals a day on an empty stomach: before breakfast and before lunch. The course usually lasts several months.

#### Decoctions and infusions

- With edema, hypertension at an early stage, gynecological inflammation. 100 g of cut peel of raw zucchini (or about 70 g of dried) are poured with water (1 l), which is brought to a boil. The broth settles overnight in a thermos, after which it is taken in a glass 3-5 times a day.
- With disorders of the nervous system. Zucchini seeds (150 g) are crushed and poured into 0.5 liters of vodka. A tablespoon of mint leaves, a teaspoon of cinnamon are added to the mixture. In this form, the infusion is aged for 3 weeks, while it is desirable to shake it daily. After 21 days, 4 teaspoons of honey are added to the product, after which the mixture is infused for another week. Take a sedative you need one teaspoon in the morning and evening.
- With ascites (dropsy). The peel of zucchini, cucumber and watermelon peel are cut into centimeter slices, dried, crushed and mixed. For infusion, you need 1 tablespoon of the mixture per 300-350 ml of boiling water. The remedy is infused for an hour, after which it is filtered. It is taken 50 ml twice a day.
- With inflammation of the bladder. Dried zucchini seeds (1 cup) are mixed with the same amount of hemp seeds and ground in a mortar until a milk emulsion is obtained, which, in turn, is mixed with 600-700 ml of boiling water. After cooling, the infusion is filtered and taken in approximately equal portions throughout the day.
- With infertility (for men). Sprouted zucchini seeds are eaten without additional preparation daily at 70-100 g before breakfast. To germinate seeds, they are laid out in moistened gauze or cloth on a plate in a warm place for about 1-1.5 days.
- With hypertension. Zucchini juice is mixed with honey (in the proportion of 100 ml of juice per 1 teaspoon of honey) and taken in the indicated volume twice a day in the mornings and evenings for 1-2 weeks.

#### in oriental medicine

In Tibetan and Chinese medicine, similar properties are attributed to zucchini: there it is sweet and cold (in Tibetan healing practice - a little cool) product. Sweet "status" is formed by a combination of

two elements: Earth and Water. ( In some sources, zucchini is defined as a "bitter" product - the result of the interaction of Water and Wind).

As a "cold" food, zucchini reduces vital warmth, therefore, adjusted for the constitution (that is, for a certain type of distribution of the energies of Wind, Bile and Mucus), age, place of residence and some other parameters, it is more correct to eat zucchini in the heat and for people with excess vitality.

In Tibetan medicine, it is recommended to enhance lactation, heal damage to the mammary gland, and restore various body tissues. Healers also use the antibacterial properties of zucchini seeds.

In traditional Chinese medicine, zucchini is believed to be able to reduce the "heat" of the pericardial sac, stomach, gallbladder, liver, bladder and colon. Raw zucchini is contraindicated for people with gastrointestinal diseases.

The classic Chinese work on pharmacology, Li Shichen, mentions winter narrow-mouthed squash, which is offered with special ceremonies to already married but still childless women during the harvest period (autumn), since it is believed that zucchini increases the ability to bear children.

### **In scientific research**

In the study of zucchini, scientists are primarily interested in the zucchini, which is more common in the West. Therefore, the results of scientific research are given in relation to this type of product.

- A group of Spanish experts have been measuring the cytotoxicity (toxicity to cells) of the components of light green and yellow zucchini, and their ability to fight cancer cells that cause leukemia (HL60). Moreover, the peel and pulp of the fruit were studied separately. As a result, it was found that the peel of yellow fruits is the best to cope with the task. This is attributed to the fact that it contains more carotenoids (lutein, zeaxanthin, b-carotene) than in the peel of green fruits and in the pulp of samples. Scientists came to the conclusion that zucchini should be introduced into the diet so that pathogenic cells do not have a favorable environment for development. Yellow zucchini is also effective at an early stage of cancer - during this period it contributes to the destruction of infected cells <sup>[2]</sup>.
- Iranian experts tested the effectiveness of a water-alcohol extract of zucchini on normal cells of the ovaries of female hamsters and rat fibroblasts, as well as on cancer cells (liver and rectum). Moreover, it was checked in comparison with the effectiveness of black nightshade extract, and in zucchini it turned out to be higher in four studied parameters at once <sup>[3]</sup>.
- Another research group in vitro has documented a significant decrease in cell growth in prostatic hyperplasia when zucchini seed extract was tested at 200 and 400 mg/kg. Scientists suggested that antioxidants played a decisive role here, but clarified that the mechanism of this influence has not yet been fully understood <sup>[4]</sup>.
- On the island of Menorca (Spain), scientists followed pregnant women and then their children (from birth to 6.5 years), studying the effect of diet in women during pregnancy and in their children on the development of asthma and childhood allergies. The study involved 232 boys and 228 girls. The mothers filled out a very detailed questionnaire every year with questions about the health, weight, diet and breathing problems of their children. 90% of children were sampled for the 6 most common allergens.

The researchers concluded that those children who ate more than 40 grams of salad daily, which included zucchini, tomatoes, eggplant, green beans or cucumber, were less likely to develop asthma and allergies. The consumption of fish (at least 60 g per day) was also important. Moreover, other fruits and vegetables (outside the list) did not have a similar effect.

The study was conducted by analyzing eating habits and statistical indicators. 17% of children had a positive test for at least 1 allergen. And when we studied the diet of children who did not have allergies, they came to the conclusion that the relationship between the absence of symptoms and the consumption of the above-mentioned vegetables is significant and statistically significant. Explaining the mechanism of action, the scientists suggested that vegetables from the list and fish reduce inflammation that leads to asthma and allergies <sup>[5]</sup>.

## Weight regulation

Eating zucchini makes it possible to lose extra pounds and stay slim thanks to two features of this vegetable:

- a small amount of calories;
- the ability to remove fluid from the body and, therefore, relieve swelling.

The main advantage - low calorie content (for zucchini - 27 kcal / 100 g, for zucchini - 16 kcal / 100 g) - makes this vegetable one of the most popular bases in various diets. In the middle of the 20th century, thanks to the special interest of media stars (Sophie Loren, Catherine Deneuve, Alain Delon), the following diet became widespread, involving five meals a day:

1. Stewed zucchini (250 g) in a stew with other vegetables (150 g), green tea (200-250 ml).
2. Orange juice (200-250 ml) and an apple.
3. Baked zucchini (300 g), boiled meat (200 g), plums (1-2 pieces), kiwi, green tea.
4. Baked zucchini (200 g), carrot and cabbage salad (100-200 g), apple juice (200-250 ml).
5. Prunes (100 g), plums (2-3 pieces), green tea.

There are other variations of this diet, where, for example, meat is replaced with stewed fish, apple juice with green tea, and the first and second breakfasts are reversed. But the number of calories consumed during the day remains about the same. "Sit" on such a diet is recommended no more than once a year. Having stayed on the described diet for a week, you can lose up to 2.5 kg, and in a month - lose 5-6 kg.

Sometimes seeds are included in "squash diets". But it must be borne in mind that the nutritional value of zucchini seeds increases with an increase in the storage period. Thus, researchers at the Massachusetts Experimental Station recorded an increased protein content in seeds stored for more than 5 months.

## In cooking

The culinary history of zucchini began in Mexico even before the European conquistadors arrived there. True, the locals preferred not the pulp of the vegetable, but its seeds. But even after moving to Europe, the zucchini did not immediately end up on the dining table. For almost two centuries, the plant, with its bright large flowers, adorned botanical gardens, not garden beds. Only in the 18th century did Italian chefs guess to include unripe zucchini in dishes.

Having a neutral, slightly sweetish taste and smell, these vegetables took on the taste of their "neighbors" in the dish, giving the food a special delicate texture. They could be eaten raw or baked, stewed, fried, pickled and canned. They go well with cereals, fruits, fried fish and chicken.

Celebrity British chef Angela Harnett has zucchini as her favorite vegetable. She also recommends basting zucchini dishes with lemon juice or making a more complex gremolata sauce consisting of olive oil, lemon zest, garlic and parsley.

However, zucchini flowers have also become ingredients in a number of Mediterranean cuisines (for example, in the Greek or French culinary tradition). Flowers are prepared in different ways: stuffed, baked in dough, fried, added to soups and salads. In Greece, for example, squash flowers are stuffed with rice mixed with cheese and aromatic spices, then deep fried or baked in tomato sauce. Similar dishes are found in Mexican cuisine.

By the way, baking in the oven is considered the most “gentle” way of cooking not only flowers, but also the pulp of vegetables. With this processing, zucchini retains the maximum amount of nutrients.

Some dishes with zucchini in the composition are known throughout the world: for example, the Mediterranean ratatouille. Some are very popular, but only in one country or region. Thus, zucchini caviar, famous throughout the Soviet Union (the recipe of which, in addition to chopped pulp, included tomato paste, onions and carrots) is one of the dishes loved by several generations.

### **In cosmetology**

In home cosmetics, zucchini is presented in masks (less often - creams) for the face with a wide spectrum of action. The ingredients in this vegetable moisturize and tighten the skin, which eliminates micro-wrinkles, peeling, and a feeling of dryness. Often, auxiliary components are added to the recipe to enhance the effect. Here, for example, is a recipe for a moisturizing zucchini mask with honey.

1. Zucchini is peeled and rubbed on a fine grater.
2. Honey is added to the gruel (in the proportion of 2 tablespoons of zucchini to 1 teaspoon of honey).
3. The mixture is applied to the face for a quarter of an hour, after which it is washed off with lukewarm boiled water.

In this case, as with any other moisturizer, one must take into account the degree of dryness of the air in the environment (room). If the air is not humidified (and this often happens in closed, overheated apartments in winter, on airplanes, on a frosty street, etc.), retaining barrier fatty components should be used along with moisturizing elements. Therefore, there is also a recipe for zucchini cream with milk and lard in the composition. In it, for 50 g of squash gruel, the same amount of lard and 1.5 tablespoons of milk are taken, and then all the ingredients are ground and mixed until smooth.

Zucchini is also widely used in hair care. Moreover, not only in home, but also in professional cosmetics. There are shampoos, mousses, strengthening masks, conditioners, hair sprays with zucchini extract, designed for chemically damaged and thinning hair. (For example, the "zucchini" series of the Italian brand Parisienne Italia). Another, unexpected effect of zucchini on hair is also known: regular consumption of this vegetable in food slows down the appearance of gray hair.

### **Dangerous properties of zucchini and contraindications**

Zucchini is a product with a minimum number of contraindications. It is not recommended:

- people with a violation of the excretion of potassium by the kidneys, since potassium salts, contained in large quantities in zucchini, can form stones <sup>[6]</sup>;
- patients suffering from ulcers, gastritis, pancreatitis (in the acute phase of the disease).

You should also moderately consume this vegetable (especially raw) for people with increased secretion of gastric juice and with kidney failure.

### **What is the difference between zucchini and zucchini?**

The difference between zucchini and zucchini is negligible, but there are:

- **Zucchini is larger** : its greens at the time of harvest are about 20-25 cm, and the size of zucchini rarely exceeds 15 cm.
- **Zucchini seeds are also larger** and, unlike zucchini, they are usually removed during cooking.
- **Zucchini peel is rougher** than that of the Italian "relative", so zucchini is rarely peeled, and zucchini is almost always peeled.

All this affects the keeping quality of tender and whimsical zucchini, most of the varieties of which are stored worse than zucchini and require more attention during cultivation (watering, top dressing, temperature control, etc.). Zucchini is considered a green-fruited variety of zucchini, although its hues can range from almost black to yellow.

### Selection and storage

Both when harvesting and when buying zucchini in a store or market, you should follow the general principles that help you choose vegetables with excellent taste that can be stored for a long time.

- The best keeping quality is characterized by mature and large fruits with a smooth and dense peel. However, zucchini that have been lying in the garden begin to lose their taste. Therefore, the best choice would be a zucchini of medium size for its variety.
- If the task is to increase the shelf life, then it is better to buy vegetables with a dark skin. Light zucchini "keep" less time.
- The ability to be stored for a long time is indicated by small seeds and dense pulp of the fruit. If it is possible to cut one vegetable from a bush, then it can be used to judge its "neighbors".
- There should be no (even minor) dents or scratches on the skin.
- A sign of the health of the zucchini is the dried stalk ("tail"), which remains after cutting the vegetable from the bush. Without it, it is better not to take a zucchini, because an infection can penetrate into the vegetable at the place of separation.

It is recommended to collect zucchini in sunny weather, stopping watering a few days before harvesting. If, due to rain, the fruits are wet, then before being sent for storage, they should be laid out to dry in a ventilated room for several days. Moisture on the surface of the vegetable can cause rotting, so the fruits are not washed, and the earth remaining on the skin is cleaned with a dry cloth. In good weather, the crop can be decomposed under the sun. So the skin will dry well and harden, providing reliable protection for the pulp. In any case, it is desirable to have time to harvest the crop before frost, since frozen fruits cannot be stored for a long time.

There are several rules by which you can keep zucchini longer:

- Dip the stalk of each vegetable in melted candle paraffin, which will slow down the decay process.
- Move the box of zucchini away from the heaters. Fruits keep well at normal room temperature and humidity.
- Avoid exposure to bright light. Sunlight and heat encourage seed germination, so crops are usually stored under beds or in closets.
- Separate one vegetable from another. If the crop is small, each individual zucchini can be wrapped in paper. In the absence of such an opportunity, cardboard can be laid between the rows of zucchini.
- Eliminate excess moisture. For this, zucchini folded in a box are sprinkled with sawdust or straw.



- To carry out the prevention of fungal diseases. Each layer of zucchini is sprinkled with chalk powder.

In addition, fruits that emit ethylene (for example, apples) should not be placed next to zucchini. From time to time, zucchini should be sorted out, discarding fruits with darkened "tails" and spots on the skin. If you want to keep vegetables that have begun to deteriorate for a few more months, you can cut them into centimeter-thick rings and send them directly on the board to the freezer, and after freezing, transfer them to a more convenient plastic bag.

## Varieties and cultivation

Although squash is a perennial in the gourd family, in temperate climates it is more commonly grown as an annual. Seeds can be grown by direct sowing in the ground or seedlings. The second is considered more preferable because it reduces the time to harvest. However, a number of varieties grown using this technology give a crop that does not tolerate storage well and requires processing as it matures.

When sowing in the ground, it is necessary to exclude the risk of frost. Zucchini loves heat and light, so they plant it on the sunny side. The soil should warm up well throughout the entire growth period. Sandy and loamy soils are considered the best for this culture.

Different varieties of zucchini can differ markedly from each other in the appearance of the fruit:

- "Gold". A bright yellow variety with fruits of about 15 cm is one of the first among yellow zucchini. The yield is high (up to 15 fruits can be harvested from a bush). Ripening period - 47-50 days. Juicy and dense pulp of zucchini vaguely resembles a cucumber. Small fruits are well preserved, while the pulp does not lose its density.
- "Ball". The fruits of this variety are similar to green kilogram balls covered with polynomial light dots. The variety ripens in 50-55 days and is appreciated by culinary specialists for its taste and the possibility of convenient use as a basis for stuffing. It can be confused with round zucchini varieties "Kolobok", "Tintoretto". But among the round zucchini, there are those that cannot be confused with anything - for example, the almost black hybrid "Bourgeois F1" or the yellow-orange hybrid "Festival F1".
- "White". Oval fruits of rich white color ripen already 35-40 days after planting. Zucchini keeps well and is valued for its ultra-early ripeness and firm, creamy flesh. At first, in the Russian Empire there was only a white-fruited form of zucchini, brought from Turkey ("kabak" is translated from Turkish as "pumpkin"). Multi-colored variety appeared much later.
- "Legenaria" ("Calabaza", or "Vietnamese zucchini"). There is no standard form of squash of this variety, but most often the fruits grow very elongated, "snake-like". Since the pulp of mature old squash dries out and a natural cavity forms inside, some peoples use them to make vessels. This zucchini takes a long time to ripen, so it is rarely planted in our gardens.
- "Spaghetti". Another unusual variety for our gardens, which looks like a small melon, tastes little different from the usual zucchini, and it got its name for the similarity of the pulp of a fully ripe vegetable with spaghetti - the fibers delaminate and resemble pasta<sup>[8]</sup>. Due to the late ripening period, it is planted relatively rarely, but, nevertheless, its popularity is growing every year.

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Today, zucchini is an affordable and healthy product that not only helps diversify the menu, but also becomes an excellent alternative to eggplant for weight loss in cases where the use of coarse dietary fiber is unacceptable.

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## Zucchini - useful properties, composition and contraindications

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**Abstract.** The article discusses the main properties of zucchini 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 vegetable are indicated, the use in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of zucchini on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application.



**Persimmon (lat. Diöspyros)**

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**Abstract.** The article discusses the main properties of persimmon 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 fruit are indicated, the use of persimmon in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of persimmon 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:** persimmon, benefit, harm, beneficial properties, contraindications

**Beneficial features**

Table 1. Chemical composition of oriental persimmon (according to [Food+ data](#)).

Main substances (g/100 g):	Persimmon oriental [1]	Dried oriental persimmon [2]
Water	80.32	23.01
Carbohydrates	18.59	73.43
Sugar	12.53	
Squirrels	0.58	1.38
Alimentary fiber	3.6	14.5
Fats	0.19	0.59
Calories (kcal)	70	274
<b>Minerals (mg/100 g):</b>		
Potassium	161	25
Phosphorus	17	81
Magnesium	9	31
Calcium	eight	802
Sodium	one	2
Manganese	0.355	0.42
Iron	0.15	0.74
Copper	0.113	0.442
Zinc	0.11	1.39
<b>Vitamins (mg/100 g):</b>		
Vitamin C	7.5	0
Vitamin A	0.976	0.460
Vitamin E	0.73	
Vitamin B6	0.1	
Vitamin PP	0.1	0.18
Vitamin B1	0.03	

Vitamin B2	0.02	0.029
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The table shows data on persimmon *orientalis* - the most common type on the shelves of our stores. However, belonging to a different type of product can significantly affect some of the indicators. Thus, the amount of sugar (glucose and fructose) in some varieties reaches 44%, but the range for this parameter is very wide (from 9.27%). In dried fruits, the upper limit of the range will rise even higher (up to 60-65%).

Vitamin C may be present in an amount of 0.41-0.92% by weight of the fruit. According to this parameter, for example, *virgin persimmon* with 66 mg / 100 g is noticeably ahead of *eastern persimmon* with its 7.5 mg / 100 g. In addition, virgin persimmon contains almost twice as much potassium (31 mg / 100 g) and iron ( 2.5 mg/100 g), 3.5 times more calcium (27 mg/100 g), 50% more phosphorus (26 mg/100 g) <sup>[3]</sup>.

In addition, the fruits of any persimmon contain citric and malic organic acids, leucoanthocyanides (and in particular delphinidin both in soluble and insoluble forms), minerals, flavonoids, glycosides, protein, fats, 7-methylglon, tannin, the amount of which decreases with maturation and exposure to low temperatures (soluble tannins become insoluble). Oriental persimmon has a high iodine content (up to 50 mg%). But useful substances are found not only in berries. In the roots of the tree, naphthoquinones have been isolated, which also have numerous medicinal properties <sup>[4]</sup>.

### Medicinal properties

Scientists have isolated the substance 7-methylglon from persimmon, which exhibits anti-inflammatory properties, has an antipyretic effect, and can relieve pain <sup>[5,6]</sup>. Studies show that dimeric naphthoquinones and their derivatives have antitumor properties <sup>[7]</sup>. The same effect is exerted by the saponin lupeol and plant sterol sitosterol present in persimmons <sup>[8]</sup>. Like some other phytosterols, it also helps to lower blood cholesterol, which inhibits the development of atherosclerosis.

Persimmon (thanks to naphthoquinones) also has a pronounced sedative effect, causing a decrease in irritability and anxiety <sup>[9]</sup>. The hypnogenic effect of persimmon is manifested in the fact that lovers of this berry fall asleep faster and easier, sleep longer and more soundly, they rarely have spontaneous awakenings. Therefore, the inclusion of persimmons in the diet can potentially help people suffering from insomnia.

A number of scientific works have confirmed the antioxidant properties of persimmon (manifested due to the large number of flavonoids), as well as the antiproliferative effect <sup>[10,11]</sup>. The latter lies in the fact that due to the suppression of the synthesis of proteins and RNA, cell growth is inhibited, which can potentially become the basis of methods for combating cancer.

Persimmon polyphenols are able to fight a number of mutagens (carcinogenic, radioactive, poisonous substances, etc.) that cause pathological changes in genes and DNA. Also, with the help of persimmons, you can easily and with pleasure restore iodine deficiency.

Recently, of particular interest to physicians is the ability of persimmon to reduce the risk of developing heart disease. In particular, Dr. Shela Gorinshtein called for persimmons to be included in diets designed to prevent the development of atherosclerosis <sup>[12]</sup>.

But not only persimmon fruits have a healing effect:

- **The leaf extract** can be included in the effective therapy of atopic dermatitis, a chronic inflammation of the skin caused by a hereditary predisposition to allergies <sup>[13]</sup>, as well as protect the skin from ultraviolet radiation <sup>[14]</sup>.
- **seed extract** has shown itself well in therapy aimed at preserving kidney function. In addition, it helps to slow down the processes leading to the destruction of red blood cells <sup>[15]</sup>.

## Use in medicine

Despite the great medicinal potential of persimmon, today relatively few substances released from the fruit have found their use in medicine. So, the seeds of the Caucasian persimmon became the basis for the production of activated carbon. And tannins are mainly used:

- as an astringent antidote for poisoning with salts of mercury, lead, etc., and for diarrhea,
- as a local anti-inflammatory agent,
- as part of antihemorrhoidal drugs.

Surgeons use tannins to treat the skin before operations. However, in industrial production, persimmon has not become the main raw material base for obtaining this substance, which today is isolated mainly from the bark of acacia, chestnut and coniferous trees. But already today on the market you can find dietary supplements, including persimmon.

In 2011, a patent was obtained for a dietary supplement called "Rukhmin", which includes oriental persimmon juice (along with white mulberry juice, grape juice and 10% succinic acid solution). In an experimental study, when studying the pharmaco-biological properties of Rukhmin, its anti-inflammatory activity, a protective function that facilitates the adaptation of the body to adverse factors in extreme conditions, as well as the ability to positively influence liver function, preventing the destruction of cell membranes, were confirmed.

## In folk medicine

Persimmon as a medicine and preparations based on various parts of the plant are known in folk medicine in various countries. So, for example :

- In Guatemala, a decoction of the leaves of the local persimmon sapota (known to us as "black apple" or "chocolate persimmon") is used as an antipyretic and astringent. Ground leaves and crushed bark are part of poultices for various skin diseases: ringworm, leprosy (leprosy, which, in addition to the skin, affects the peripheral nervous system), etc.
- In Tajikistan, condensed juice (persimmon-dushob) is taken for anemia and general weakness of the body, and a powder is made from the powder of dried berries, which is used to cleanse the skin of stains.
- In Georgia, where the Caucasian persimmon is still found in natural conditions, fortified tea rich in ascorbic acid (vitamin C) is brewed from small fruits and leaves. And the fruits are actively eaten with early manifestations of toxic goiter (Basedow's disease).
- In Japan, scurvy is treated with persimmon juice, and atherosclerosis is treated with fruit-based folk remedies.
- In Thailand, with the help of persimmons, helminths are expelled.
- In Korea, raw berries are considered an effective anti-inflammatory agent.

In addition, in the modern folk tradition of different countries, the use of persimmon fruits is considered an effective way to treat thyroid diseases, a way to improve the functioning of the digestive tract. Traditional healers recommend unripe fruits as an antidiarrheal remedy. Outwardly, the pulp of ripe berries is prescribed for the rapid healing of wounds.

Often, with the help of persimmons, they struggle with nervous disorders, depression, absent-mindedness. Not without reason, it is believed that the persimmon eaten for breakfast, due to the high content of glucose, increases the efficiency of the brain.

### **Decoctions and infusions**

Traditional medicine recommends using decoctions and infusions of persimmon to enhance the therapeutic effect:

- from chronic diarrhea. 1 ripe berry is cut into slices, which are poured into an enamel bowl and poured with 100 ml of boiling water (the number of fruits and the volume of boiling water can be proportionally increased if necessary). The infusion is kept closed for half an hour. Drink cold, one glass every 4 hours.
- From urinary incontinence. Petioles (legs) of persimmon fruits are crushed, and the resulting raw material (1 tablespoon) is poured with boiling water (200 ml) and boiled for 10 minutes, after which it is infused under the lid for another hour. The drug is taken in 60-70 ml twice a day.
- From hemorrhoids. Daily dried berries (20 g) are poured with warm water (300 ml) and infused for half an hour. The remedy is taken until symptoms are relieved.
- From hiccups. Dry stalks from 1-2 fruits are brewed in 200 ml of water, like tea, which is drunk warm until hiccups stop.
- From hypertension. Ripe persimmon fruit (1 pc.) Is turned into a jelly-like mass with a blender and mixed with finely chopped ginger root (1/4 persimmon volume), lemon juice (4 drops), honey (1 tbsp. L.). The mixture is taken three times a day, 10 ml.

### **in oriental medicine**

In China, Japan, Nepal, northern India and Korea, it has been cultivated and traditionally used for the treatment of various diseases for more than 2 thousand years. Persimmon *orientalis* is one of the oldest and most popular types of this plant. Its fruits are distinguished by a particularly high content of beta-carotene and vitamin C.

Chinese healers with the help of fresh persimmons treat atherosclerosis, enterocolitis (inflammation of the large and small intestines), diarrhea, fight anemia, and restore the strength of patients after illness. Unripe persimmon fruits are used by healers as an antipyretic, and the juice of such berries is recommended to lower blood pressure. With the help of a decoction of dried cups, hiccups, "heat" of the stomach, nausea and vomiting were stopped.

Other parts of the plant are also used as the basis for the preparation of medicinal preparations:

- The stems of the fruit were used to relieve coughing fits and treat bronchitis.
- An infusion of the bark of a tree was drunk for dysentery, diarrhea, intermittent fever, in which sharp jumps in temperature are observed (such a fever is typical, for example, for malaria).
- The leaves of the plant were dried, ground into powder, and with its help they stopped bleeding, reduced pressure, and activated the diuretic function. However, it should be borne in mind that persimmon leaves contain substances that have a nerve-paralytic (curare-like) effect, which makes the use of self-prepared healing powders an unsafe procedure.

Also, for medical purposes, Chinese healers used persimmon, the ripening process of which was artificially accelerated (thin bamboo sticks were inserted from the side of the stalk into the berry, which reduced the ripening time, although it led to a loss of taste and / or aroma). Such fruits were

prescribed as a sedative ( han-shi ), with their help they fought fever and the consequences of drinking alcohol.

Another way to enhance the medicinal properties of persimmons was the procedure of contrast drying of the fruits, as a result of which a fermented shi-bin was obtained. The process of preparing the medicine consisted in the fact that the skin was first removed from the persimmon fruits, and then the unprotected pulp was exposed to the sun during the day, and kept in the cold at night. It was believed that due to this, anthelmintic and antihemorrhagic effects were added to the above medicinal properties. In addition, such a persimmon was used as a tonic, expectorant, a drug for healing infected wounds and an antidote in case of wood varnish poisoning.

Strengthening the healing properties of persimmon was carried out with the help of hot air from the fire. Smoky fruits soothed pain, drove out worms, and stopped nausea.

The tradition of using persimmons in healing has also spread to the Middle East. So Ibn Sina (Avicenna) prescribed fresh fruits for emaciated patients for a tonic effect, and he suggested grinding the dried seeds of berries into powder and using them as a cosmetic powder to cleanse the skin.

In Tibetan medicine, where among many characteristics, the "cold" and "warm" properties of products and their division into Yin and Yang groups were taken into account, persimmons were classified as "Yang" (warming, active) products that can balance the Yin beginning and prevent accumulation of mucus and fat, and, accordingly, the development of cardiovascular, oncological diseases, diabetes, etc.

### **In scientific research**

Research groups around the world are studying the effects on the body of both persimmon fruit and some other parts of the plant.

- In this work, scientists determined the ability of tannin-rich coarse dietary fibers of young persimmon (oriental) to bind bile acids. In a pilot study, people were divided into 3 groups. One was given just "empty" cookies (placebo), while the other two groups were given 3 and 5 grams of persimmon dietary fiber, respectively, in the cookies. Participants in the experiment had to eat this supplement three times a day before the main meal for 12 weeks. As a result, after the experiment, the level of the so-called. "bad" low-density cholesterol. At the same time, the level of triglycerides and high-density cholesterol in the blood plasma did not change. This gave reason to use persimmon in the clinical treatment of hypercholesterolemia <sup>[16]</sup>.
- In an experiment on laboratory rats, 6-week-old females were divided into 3 groups: with a standard diet, with the addition of young persimmons to the standard diet, and with the addition of mature persimmons. The experiment lasted 4 weeks, during which the animals received persimmon powder from frozen dried fruit. As a result, it was found that in rats eating young persimmon, the level of phospholipid hydroperoxides in plasma fell more than in others, which inhibited the development of atherosclerosis. Mature persimmon also showed a decrease in hydroperoxides, but to a slightly lesser extent. <sup>[17]</sup>.
- Persimmon leaf extract helps with hyperglycemia, hyperlipidemia and fatty liver in type 2 diabetes. This was established in an experiment on mice, which were supplemented with a powdered leaf extract for 5 weeks to a standard diet. The rodents had lower levels of glucose, triglycerides, and total cholesterol (although there was more "good" high-density cholesterol). The weight of the liver also decreased due to a decrease in the weight of fat <sup>[18]</sup>.
- In 2002, a study in mice showed that oral administration of persimmon leaf extract had both preventive and curative effects in atopic dermatitis, helping with allergic rashes <sup>[19]</sup>.

- Persimmon (Oriental) phenolic compound extract helps soothe the pain of colitis. To prove this, mice with colitis were given an extract, after which they had a decrease in intestinal inflammation, which was manifested in the reduction of diarrhea, getting rid of external injuries (for example, ulcers). In addition, it was found that the extract prevented the development of cancer cells in rectal cancer <sup>[20]</sup>.
- In an in vitro study, Chinese scientists found that 50mg/mL of persimmon extract provided high protection against DNA damage. Carotenoids and flavonoids contained in persimmons (as natural antioxidants) along with anthocyanins and polyphenols reduced the risk of DNA damage. In humans, this can prevent accelerated aging, as well as the development of neurodegenerative diseases and cancer <sup>[21]</sup>.

## Weight regulation

Those who want to lose extra pounds make persimmons the basis of unloading diets, in which from one and a half to two kilograms of fruit are eaten per day. On such programs, persimmons are sometimes “diluted” with black bread and tea without sugar.

However, nutritionists advise excluding persimmons from active weight loss programs for obesity. Persimmon per 100 grams of the product contains approximately 70 kcal (in some varieties, this figure is at the level of 120-130 kcal). Although this berry is not the champion in calories among fruits exotic for our country (for example, a banana has about 90 kcal, and a date has about 280 kcal in general), it contains a lot of sugar, because of which it is also removed from the diet with sugar diabetes.

The problem also lies in the fact that with an extreme mono-diet "on persimmon" the risks of harming health far outweigh the potential benefits. Persimmon in volumes of 1.5-2 kg per day can create serious problems with the gastrointestinal tract: from the formation of clots of plant fibers in the stomach (bezoar stones) to acute intestinal obstruction and constipation. We should not forget about allergic reactions. Therefore, nutritionists recommend eating no more than 2-3 medium-sized fruits (or one large fruit) per day. Moreover, it is more useful to do this at the moment of changing biological rhythms (for most people, the time is about 16 hours). And diets for weight loss are best based on other products.

## In cooking

Ripe persimmon goes well with cottage cheese, yogurt, kefir and other fermented milk products and badly with milk. Often, persimmons are generally recommended to be separated from the main meal, with pauses of 0.5 hours before and / or 1.5-2 hours after eating.

In the product compatibility tables of the famous American naturopath Herbert Shelton (whose separate nutrition theory, however, is actively criticized by many nutritionists), persimmon is included in group No. 1 (“Sweet fruits”). According to the theory, products from this group are perfectly combined with each other, with representatives of group No. 2 (“Semi-acidic fruits”), with sour-milk products. Shelton allows a combination of sweet fruits with nuts, vegetables, herbs.

Gastronomic and culinary preferences for persimmons are shown in contrast: some chefs like to fry it, while others believe that this can “kill” the product. Similar conflicting opinions are expressed about the marinade.

In Georgia, persimmon belongs to the category of desserts, and in the kitchen they use it both raw and dried. Local vodka is made from persimmon, which is then often “snacked” with persimmon. Very often this fruit is served with cheeses (guda sheep cheese, smoked sulguni, chanakh and tenil cheeses). Similarly, persimmons are combined with cheeses in Armenian cuisine.



Traditionally, persimmon is not added to hot Georgian dishes, but modern chefs successfully combine this berry with baked lamb, stewed pork. In Armenian cuisine, the combination of sweet persimmon with meat, with spicy and sour foods is considered traditional. Persimmon sauce with garlic, ginger, cilantro perfectly complements the taste of beef and lamb. Chefs representing the cuisines of different peoples of the world call persimmon with dried and baked duck an ideal pair.

### In cosmetology

Persimmon is widely used in folk cosmetology, where it becomes the basis of natural nourishing creams, lotions for oily skin, anti-cellulite body masks. Here are some examples of solving cosmetic problems with persimmons at home.

- **Lotion for dry skin.** The juice of one freshly squeezed ripe fruit is filtered and mixed with olive oil (0.5 tsp) and still mineral water (100 ml). The ingredients are mixed and applied to the skin of the face and neck for about a quarter of an hour. The lotion is washed off with warm water.
- **Mask for dry skin.** Butter (1 tbsp), yolk of one egg and honey (1 tsp) are added to the pulp of a ripe fruit, ground in mashed potatoes. All this is mixed, and the mass, brought to a state of uniformity, is applied to the face for half an hour. After the procedure, the mask is removed with a paper towel.
- **The mask is complex nourishing and moisturizing.** Half of the persimmon fruit is mixed with the protein of one egg, milk (1 tablespoon), liquid honey, aloe juice and glycerin (1 teaspoon each). The duration of the procedure is 20-30 minutes.
- **Cleansing lotion.** The pulp of one fruit is poured with vodka (200 ml) and lemon juice (1 tsp), corked and infused for a week in a dark place. A paper napkin is impregnated with this lotion, which is applied to the face for 10-15 minutes.
- **Lotion for oily skin.** Persimmon juice (1 tablespoon), cologne and camphor alcohol (100 ml each) are added to the beaten egg white. This mixture should be wiped on the face before going to bed.
- **Anti-cellulite composition.** The pulp of one fruit is mixed with sea salt (1.5 tablespoons), lemon and orange juice (1 tablespoon each). Mixed to a homogeneous mass, the composition is rubbed into the steamed body in the areas of cellulite formation. After the procedure, you should take a contrast shower.

A number of cosmetology organizations produce products based on persimmons on an industrial scale. For example, the South Korean company Missha produces a sunscreen with persimmon, Belarusian manufacturers under the Tselebnaya Banka trademark offer face creams and masks in which argan oil is added to persimmon, and the Organic Kitchen brand (Russia) presented a moisturizing foot cream with fresh Hawaiian oil. persimmon and mulberry.

### Dangerous properties of persimmon and contraindications

The high concentration of tannin in persimmons (which is especially characteristic of unripe fruits) and a large amount of plant fibers make this berry dangerous for people with adhesive bowel disease and people who have undergone abdominal surgery in the recent past. Since tannic acids (partially preserved even in mature fruits) reduce the secretion of the small intestine and impair peristalsis even in healthy people, children with constipation should not be given persimmon in any form <sup>[22]</sup>. Due to the abundance of sugars, persimmon is also contraindicated for diabetics.

The astringent tannic properties of tannins, combined with the abundance of fiber in persimmons, can potentially threaten the appearance of a bezoar stone in the digestive organs, formed from plant fibers rolled into a lump, and, as a result, to ulcerative formations. Despite the fact that phytobezoar in

humans is a rare phenomenon (until the beginning of the 90s of the 20th century, several hundred cases of the formation of bezoar stones of various origins were described in the literature), and people generally rarely choose unripe fruits for food, the risks of encountering this problem due to consumption of persimmons is relatively small, although they persist.

Thus, there is evidence of the formation of phytobezoars during long-term use of persimmon in both children <sup>[23]</sup> and adults <sup>[24]</sup>. In addition, a large amount of persimmon eaten in a short period of time can lead to the formation of a bezoar stone. In 2017, the media reported on a Muscovite whose stomach formed a lump of fibers the size of a fist after eating one and a half kilograms of fruit. Doctors emphasize that women over 40 are at risk, in whose body, due to a decrease in the amount of estrogen, less digestive enzymes are produced.

Another threat from the use of persimmons is associated with the presence of iodine in the berries, with excessive intake of which into the body (for example, during self-medication and an overdose of iodine-containing drugs), chronic inflammation and hyperfunction of the thyroid gland can occur. An excess of iodine is more dangerous than its lack, however, in our country, iodine deficiency is more common, which especially affects women during pregnancy and children.

### **Selection and storage**

The choice of a ripe and sweet berry is an algorithm in which the persimmon variety plays a decisive role. Signs of a ripe persimmon are usually considered soft sides of the fruit and a dry stalk, and in most cases this is true. The fruits of those varieties that are most often on our market gain sweetness and lose their tannic viscosity when they ripen; maturity is determined, first of all, by the soft sides, indicating a jelly-like consistency of the pulp.

But this rule does not apply to all varieties. Many of them can be both firm (crunchy like an apple), non-astringent and very sweet. And the more assortment of varieties in the store, the more difficult it is for the buyer to figure it out.

In addition, in the varietal division of persimmon berries, there is one feature due to which the fruits (according to the classification adopted in the West) are divided into two groups:

#### **1. Group of constant varieties.**

This includes those plants whose fruits do not change the color of the pulp, regardless of whether pollination and seed formation have occurred or not. In turn, the varieties of this group include two subgroups:

- tart (for example, "Hachiya", "Saijo", "Yemon", "Nikitskaya burgundy", "John Rick", etc.),
- sweet (for example, "Sharon", "Jiro", Fuyu, "Nakhodka", "XX century", "Mishirazu", etc.).

#### **2. A group of varying varieties.**

It contains those varieties that change the color of the pulp and consumer qualities depending on the presence of pollination (the method of fertilization). The berries of the varieties of this group, formed parthenocarpically (without pollination and seed formation), when ripe, do not change the color of the pulp and retain astringency longer, losing it only when the pulp becomes already jelly-like. However, if the same plant has been pollinated, the flesh color of the berries will darken as they ripen, and the astringency will become less pronounced by the time of harvest.

This group includes king (chocolate) varieties, for example : "Zenji-Maru", in fact, "King" (as we usually call the Japanese variety "Hiakume").

From this we can conclude that when choosing a persimmon, first of all, you need to find out which variety the seller offers.

- Widely presented on the market since October, the **Azerbaijani king variety** with characteristic cracked patterns on the top, usually gets on the counter already soft to the touch, juicy (ready to burst from pressing) with almost non-astringent pulp. Although the "female" kinglets, recognizable by the slight darkening at the "nose" (in the center of the fruit at the bottom), can sometimes knit, the "male" kinglet fruits, which are distinguished by round stains around the "nose", almost never knit. Such a persimmon has a bright orange skin and dark "chocolate" flesh.
- **Spanish persimmons** can be found almost all year round in supermarkets . This large, glossy berry typically has firm flanks but non-astringent, sweet flesh. The peel has a rich orange-yellow color. Availability throughout the year is due to the cultivation of this persimmon on an industrial scale in greenhouses.
- **Variety "Sharon"** - a product of Israeli selection, belonging to the group of constant varieties, has also recently begun to appear on the shelves often. This persimmon is characterized by the presence of sweet hard pulp without stones and viscosity.

If there are problems with determining the variety of persimmon, the seller's recommendations come to the rescue, testing the taste of the berry directly at the counter or experiment - buying a trial small amount of persimmon. At the same time, even if a persimmon with a high content of tannins comes across when choosing, this can be corrected by simply holding the fruits for several hours in the freezer - the tannins will stop knitting, and the pulp will become candied.

You can speed up ripening and improve the taste of fruits without a refrigerator by putting them in a paper bag (cardboard box) along with bananas (for about a day). You can also put persimmons next to ethylene-emitting apples. To eliminate the astringent taste, it is sometimes recommended to hold the berries in warm water for half a day, but this is less convenient, since you will have to constantly maintain the temperature of the cooling water at 30-40 C. Another, but not the most popular, method of ripening (bringing to consumer ripeness) - keeping fruits in a 10% solution of lime.

You can not do without a refrigerator for long-term storage of already ripe persimmons. For 3 months, such fruits can be placed in a refrigerator compartment with a temperature of -1C to 0 C and an adjustable humidity of 80-90%. At a lower humidity, the fruits will begin to dry out, and at a higher humidity, they will become moldy. For longer periods (up to six months), persimmons are frozen using extreme temperatures ("quick freeze" mode), however, it must be borne in mind that when defrosted, the pulp will lose its density, turning into gruel.

## Varieties and cultivation

Persimmon is cultivated not only in the Indomalayan zone, but also in a number of European countries (for example, in Britain - from the first half of the 17th century), in America, Africa, Australia, Japan, and some species are found only in one region and do not grow anywhere else. In general, there are more than seven hundred species of plants of this genus in the world, although no more than two hundred are widespread.

Persimmons are also grown here, choosing frost-resistant species for this: Virgin (*Diospyros virginiana*), Eastern (*Diospyros kaki*), Caucasian (*Diospyros lotus*). The first of them (with frost resistance up to -30 C) is most often used as a stock. The tap root system of this species goes deep into

the ground, somewhat reminiscent of carrots. The plant is planted in a place protected from the wind, on the south sunny side. Persimmon is not demanding on soils, but when planting at the bottom of the pit, a layer of fertile soil should be poured. In the northern regions, trees are planted in the spring, and in the south - it is possible in the fall.

Persimmon fruits are removed slightly unripe, as a rule, in early October, and then they are ripened for about another half month. But if you remove the berries later, after the first frost, they will only become tastier.

If the traditional types of persimmon in our country have recently ceased to be something unusual, then rare exotic fruits can still surprise the European consumer:

- **Velvet persimmon (mabolo).** This originally Filipino persimmon is now cultivated throughout Southeast Asia, as well as Cuba, Jamaica and some other Caribbean islands. Malobo is called a "velvet apple" because it resembles the fruits of an apple tree in size and external characteristics, but at the same time the skin is covered with small hairs that can irritate the mucous membrane, therefore, before eating, the skin (which also has an unpleasant pungent odor) is removed. "Velvet persimmon" can reach 10 cm in diameter. The fruits change color as they ripen, going from light green to bright red and purple. The sweet and sour taste of mabolo is reminiscent of a mixture of apple and banana.
- **Sapota ("black apple", "chocolate persimmon").** This species is native to Guatemala and the lowlands of southern Mexico. The Aztecs called their persimmon "totolcuitlatzaputl" and enjoyed eating the sweet fruits of the plant. The fresh ripe flesh tastes like chocolate pudding, which led to the appearance of another alternative name for the species. The berry is spherical, 5-12 cm in diameter. As it matures, the skin changes from a shiny bright green to brown-green and then dirty green. The flesh at the same time darkens, becoming dark brown, almost black.
- **Caucasian persimmon.** Unlike previous species, this persimmon cannot boast of the size of the fruit - its yellow berries do not exceed 2-3 cm in diameter (usually 1-2 cm). But they are very sweet and juicy. The first frosts relieve the pulp from astringency. Also, tannins are removed from the fruit by drying. Despite the geographical indication in the name, this type of persimmon is distributed from Japan to Spain, it is also cultivated in America and North Africa.

If you simply list all the therapeutic effects that appear when using persimmon, you get a long list that allows you to argue that persimmon is an antitumor, hypnogenic, sedative product that can improve skin condition, vision, the functioning of the cardiovascular system and, despite some limitations, with a reasonable approach to normalize the work of the digestive tract.

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### **Persimmon - useful properties, composition and contraindications**

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**Abstract.** The article discusses the main properties of persimmon 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 fruit are indicated, the use of persimmon in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of persimmon on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With her application.



### **Pomegranate (lat. Punica)**

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**Abstract.** The article discusses the main properties of pomegranate 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 fruit are indicated, the use of pomegranate in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of pomegranate on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

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

## Beneficial features

Table 1. Chemical composition of oriental persimmon (according to [Food+ data](#)).

Main substances (g/100 g):	Pomegranate [1]	Pomegranate juice [2]
Water	77.93	85.95
Carbohydrates	18.7	13.13
Sugar	13.67	12.65
Squirrels	1.67	0.15
Alimentary fiber	four	0.1
Fats	1.17	0.29
Calories (kcal)	83	54
Minerals (mg/100 g):		
Potassium	236	214
Calcium	ten	eleven
Phosphorus	36	eleven
Magnesium	12	7
Sodium	3	9
Iron	0.3	0.1
Zinc	0.35	0.09
Copper	0.158	0.021
Manganese	0.119	0.095
Vitamins (mg/100 g):		
Vitamin C	10.2	0.1
Vitamin PP	0.293	0.233
Vitamin E	0.6	0.38
Vitamin B6	0.075	0.04
Vitamin B1	0.067	0.015
Vitamin B2	0.053	0.015
Vitamin A	0	0

Depending on the variety (and there are sour and sweet varieties), the amount of sugars can vary significantly, and the calorie content and juiciness of the fruit also vary markedly. But, in general, the juice of any pomegranate contains tannins and nitrogenous substances, flavonoids, catechins, at least 15 amino acids, up to 20% fatty oil, which includes (in descending order) linoleic, oleic, palmitic, stearic and some other acids. Various macroelements (potassium, calcium, magnesium, iron) and microelements (copper, zinc, manganese, chromium, nickel, etc.) were found in the pomegranate peel, punicin in the flowers, and ursolic acid in the leaves, which in the medicinal form can potentially prevent the process of skeletal muscle atrophy.

## Medicinal properties

The scientific assessment of the pharmacological activity of the substances contained in the pomegranate indicates their potential in preventive and therapeutic measures to reduce blood pressure,



normalize cholesterol and glucose levels in the blood serum, eliminate oxidative stress and inflammatory activity.

The antioxidant capacity of pomegranate juice is rated higher than that of green tea and red wine. Various antioxidants are responsible for this. One of the main ones is punicalagin, which is contained in pomegranate juice and peel, effectively prevents damage to the walls of blood vessels and, as a result, reduces the likelihood of cholesterol deposits. Thanks to the antioxidant activity of punicalagin, inflammatory processes in the brain also slow down, which prevents the development of memory degradation, thinking, and other manifestations of dementia.

80% water-metal extract derived from pomegranate seed oil and including linolenic acids exhibits anti-inflammatory activity, which, according to some studies, can be used to suppress breast, lung, and prostate cancer cells <sup>[3]</sup>. The possibility of treating colon cancer with pomegranate juice is currently being studied <sup>[4]</sup>.

Scientists recommend using pomegranate to anyone who plays sports with great physical exertion or leads a very active lifestyle. In addition to giving more strength and increasing stamina, pomegranate fruit extracts are able to block the enzymes responsible for the development of osteoarthritis (in particular, a pro-molecule that plays a key role in cartilage degradation).

Pomegranate juice is also prescribed for the prevention of iron deficiency (along with other products containing iron). However, if the problem has already arisen, to restore normal blood and grenades, and its juice is ineffective.

### Use in medicine

As a remedy, pomegranates (the so-called spherical fruits), pericarp and bark of the plant were especially actively used during the formation of various schools of scientific medicine.

- In the ancient Greek therapeutic tradition, slurries from grated pomegranate fruits and flowers were used for “liver weakness”, to get rid of hemoptysis and bruises (in the recommendations of the military doctor Pedanius Dioscorides). Pomegranate juice and pericarp were used to get rid of worms, which, for example, Aulus Cornelius Celsus wrote about in his writings on medicine. His 8 books, combined in the treatise "De medicina", contained for their time the most reliable and proven knowledge about the theory and practice of treating various ailments. And the fact that he mentioned pomegranate in various recipes more than 20 times speaks of the demand for the pomegranate component.
- In the Arab East, whose medical traditions were laid down in the writings of Avicenna, raw materials from various parts of the pomegranate tree were used in the treatment of gastrointestinal diseases, inflammation of the lungs, bleeding, diseases of the liver and eyes.
- The founder of European medicine of the Renaissance, Paracelsus critically revised the ancient norms of healing, but pomegranate, pericarp and tree bark were preserved in his descriptions of methods for removing worms and treating diarrhea.

Despite a long history, pomegranate is practically not used widely in modern scientific medicine and pharmacology. However, various manufacturers willingly include it in the composition of food additives and dietary supplements. There, it often becomes the main element, the action of which is enhanced with the help of auxiliary components that have a complex activating effect on the body.

- French **VISION Granatin Q10** (Garnet with coenzyme Q10), in addition to pomegranate powder, contains grape pomace. This dietary supplement is claimed as a means of preventing



cardiovascular disease (helping reduce the risk of heart attack and coronary heart disease) and a drug for controlling and lowering blood pressure.

- Japanese "**Pomegranate in tablets**" from "FINE" is positioned as a remedy for women, helping to restore estrogen deficiency in menopause, thereby prolonging female youth, normalizing emotional mood, improving skin condition, providing prevention of breast cancer. In addition to pomegranate seed extract, the supplement contains extracts of ginkgo, soybeans, royal jelly and a number of vitamins.
- The Indian mono-dietary supplement "**Pomegranate**" from "SANAVI" is a pomegranate extract in its pure form (not counting the emulsifier, stabilizer and anti-caking agent), which is recommended by the manufacturer for the restoration of the circulatory organs (heart, blood vessels), lungs, liver and kidneys. It is indicated that this dietary supplement is especially useful for people in contact with sources of increased radiation or staying in an area with high radioactive levels.

### In folk medicine

Pomegranate in folk medicine is used to combat atherosclerosis, anemia, dysentery, hypertension, colitis, hemoptysis, stomach ulcers, liver and kidney diseases, to heal wounds with burns and cuts, to restore hormonal balance, relieve nervousness, irritability and headache. At the same time, the most proven methods of treating pomegranate exist among those peoples on whose lands this fruit is most common.

So, for example, in Italian folk medicine, pomegranate partitions added to tea during brewing relieve tension and anxiety, improve sleep and, in general, normalize the state of the nervous system. An infusion of fruits and dried flowers has been used since ancient times as a hemostatic agent. Dried and then brewed peel of the fruit is prescribed for diarrhea as a fastener, and also as an anthelmintic agent.

Each part of the pomegranate tree is "responsible" in folk medicine for its own set of diseases:

- **Bark.** It is used to treat arthritis, kidney disease and helminth control. For medicinal purposes, the bark is removed not only from the branches, but also from the roots of the tree.
- **flowers.** Harvested in the spring, pomegranate flowers are ground into powder and then either brewed as a tea to improve the functioning of the heart, gastrointestinal tract, liver, kidneys, remove toxins from the body, or are used as an external remedy for skin inflammations and injuries, with tonsillitis and stomatitis.
- **Leaves.** Pomegranate leaves in folk medicine are also used in the form of a powder, which is prescribed for coughs and sore throats.
- **Peel.** Infusions and decoctions of the peel improve appetite, stabilize the digestive tract, relieving diarrhea and worms. As an external remedy, the peel mixed with oil is applied to wounds, cracks, scratches.
- **Grains and partitions.** With the help of pomegranate seeds and partitions in folk medicine, it is customary to improve the reproductive function of men, relieve menstrual pain in women, and generally normalize the work of hormonal glands. In addition, seeds with stones strengthen the nervous system, improve sleep, and eliminate anxiety.
- **Juice.** In healing practice, it is prescribed for anemia, diseases of the kidneys, liver, spleen and heart. It is included in the courses of getting rid of atherosclerosis, scurvy, uric acid diathesis, asthma. In diabetes mellitus, they drink it 60 drops four times a day, and it is argued that one course of 3-4 days is enough to improve blood counts. The choleretic and diuretic effect produced by the juice is used in diseases of the pancreas and kidneys.

### Decoctions

"Pomegranate" decoctions are usually prepared from the hard parts of the plant, when prolonged exposure to high temperatures is required to obtain useful substances:

- **Fruit peel.** For colitis and diarrhea, a teaspoon of the peel is poured into 200 ml of water and aged over low heat for a quarter of an hour. Then the hot broth "ripens" wrapped in a blanket for about 2 more hours. The strained remedy is taken before meals in a tablespoon.
- **Leaves.** For inflammations and sores in the mouth, approximately 20 g of crushed dry leaves are poured into 400 ml of water, which should lose  $\frac{3}{4}$  of its volume during boiling. The remaining half a glass of decoction is filtered and used to rinse the mouth.
- **Bark.** To combat helminths, 50 g of crushed bark are poured into 400 ml of water and first infused for 6 hours, and then additionally boiled in boiling water so that half (1 cup) remains after evaporation. This decoction (in filtered and cooled form) should be drunk within an hour. After half an hour, you need to take any laxative, and after another 5 hours - do an enema.

## infusions

There are many folk recipes for infusions of pomegranate peel, flowers or bark, but one of the most discussed is the recipe for an aqueous infusion of dried pomegranate peel from the healer G. I. Glubokoy, published by him in 2007. The author in the publication promises a cure for all strains of salmonellosis, dysentery, cholera, typhoid fever in five hours, as well as getting rid of stomach and small intestine ulcers, inflammation of the colon mucosa (colitis), dysbacteriosis - in a week. In addition, the healer believes that, if the technique is followed, with the help of pomegranate infusion, acute appendicitis can be cured and thereby avoid surgery (this statement already causes open protests from doctors).

The process of making the infusion is simple and the same for all diseases. In an approximate ratio of 1:20, 10-12 g of dry pomegranate fruit peels are poured into a slightly preheated glass container (cup, glass, jar), which are poured with 200 ml of boiling water and covered with a saucer (thick paper). This begins the infusion procedure, which lasts 25-30 minutes, and during this time the patient must be present next to the container. Crusts can also be poured with cold raw water, which is then brought to a boil, but not boiled. After this preparatory stage is completed, the peels are not discarded.

The second stage - the method of applying the infusion - for "five-hour" and "seven-day" diseases will be specific:

1. "Five o'clock" diseases. First, the patient drinks 0.5 cups of unstrained infusion and listens to the sensations for 10 minutes (during this time, the remnants of the infusion are again covered with a saucer). Improvement after 10 minutes is considered a sign of recovery and normal indigestion, and the absence of improvement is evidence of a more serious illness from those listed. To recover, you need to wait 3 hours and drink the infusion. Since recovery is expected in 1.5 hours, the entire procedure from the beginning of the first stage fits into 5 hours.
2. "Seven-day" illnesses. To get rid of ulcers, colitis and dysbacteriosis on the first day, the infusion is taken 4 times 25 ml per dose with an equal interval, calculated so that the first portion is drunk in the morning on an empty stomach, and the last one - just before bedtime. The infusion is taken during the week on odd days - that is, 4 days during the weekly treatment. All this time it is forbidden to drink alcohol. The procedure can be repeated in a week, although the author claims that even one course is enough for a therapeutic effect.

Given the danger of these diseases, doctors are anxious about this technique, but among the supporters of folk healing methods, she finds many adherents.

## in oriental medicine

In a classic work on herbal medicine describing Chinese medicinal plants, three types of pomegranates are mentioned:

- with red flowers and sweet fruits (more valued in medicine than others);
- with yellow flowers and sour fruits;
- with white flowers and bitter fruit.

The sweet-looking fruits are said to get rid of intestinal parasites, alleviate thirst, and heal advanced breast inflammation. However, following the list of useful properties, a warning follows: if consumed in excess, sweet pomegranate can harm the lungs. The sour kind was used to stop diarrhea and colic. For women, this pomegranate was prescribed for whites and heavy menstrual bleeding.

Pomegranate peel, which exhibits astringent properties due to tannins, was recommended for men with "loss of seed", as well as dysentery. In general, it was used to reduce the amount and intensity of secretions of various kinds. In addition, it was prepared for infection with helminths, prolapse of the rectum and violations of motor function (with poor coordination, paralysis, etc.).

The root of the pomegranate tree, growing towards the east, was also considered healing. It also had an anthelmintic effect, and, in addition, was used to treat the oral cavity (teeth, gums). Crushed dried pomegranate flowers, mixed with iron, restored the shine and color of hair, stopped bleeding.

In Indian healing practices, the juice of sweet pomegranates has been used to treat kidneys and relieve high fever. The juice of semi-sweet fruits was needed to get rid of kidney stones and gallbladder. And sour fruits were taken to stop vomiting.

In Tibetan medicine, pomegranate is one of the foods with a very warm nature, which allows it to eliminate cold stomach (including cold stomach tumors). Pomegranate helps in the digestion and assimilation of food, relieves nausea, vomiting, belching and hiccups, protects the stomach when taking strong medicines. During treatment, this fruit is taken twice a day (in the morning and between 16 and 18 hours of the day), washed down with boiled water. For problems with the gastrointestinal tract, a decoction of fruits is used, which also enhances the fiery warmth of the stomach.

Among the indications for use, in addition, the wind of the heart, unreasonable depressive states, mental confusion, insomnia, kidney weakness and back pain are mentioned.

### **In scientific research**

The pharmacological activity of the raw material obtained from pomegranate allows it to be used in various therapeutic programs.

1. According to a study presented at the 2009 American Urology Association Annual Meeting, drinking 8 ounces (235 ml) of pomegranate juice daily may slow the progression of prostate cancer.

The experiment involved 48 men who had an increase in the level of PSA (prostate specific agents - markers of prostate cancer) due to radiation therapy or surgery to eliminate localized prostate cancer. At the start of the study in 2003, these men had PSA levels ranging from 0.2 to 5.0 ng/ml, and the mean PSA doubling time (a measure of the severity of prostate cancer) was 15.4 months. In 2006, scientists reported that those men who took 235 ml of pomegranate juice daily had an increased PSA doubling period.

However, the study did not stop there. 15 participants continued to take part in the experiment for 64 months. For those who drank juice all this time, the average PSA doubling time increased by 4 times compared to the beginning of the experiment and compared to those who stopped drinking juice <sup>[5]</sup>.

## 2. Pomegranate has antioxidant, cardioprotective and anti-inflammatory properties.

The researchers decided to test whether pomegranate juice would have a positive effect on the lipid profile, oxidative and inflammatory biomarkers of hemodialysis patients. The experiment involved 41 patients. They were divided into 2 groups: the representatives of the first group were given 100 ml of pomegranate juice immediately after the hemodialysis procedure three times a week. The study lasted 4 weeks, and then the groups were switched.

After the end of the experiment, in patients who consumed the juice, there was a decrease in triglyceride levels (in the control group - an increase), an increase in the level of "good" high-density cholesterol (in the control group - a decrease). But the total cholesterol level and the level of "bad" low-density cholesterol remained practically unchanged in any of the groups. In the first group, the indicators of upper and lower pressure decreased, the level of antioxidant defense of the body increased (in the control group, it decreased). When comparing the analyzes of patients of the two groups, the changes in biomarkers were significant enough to state that pomegranate has a positive effect on the condition of patients <sup>[6]</sup>.

## 3. Ellag polyphenols from pomegranate are effective in gestational diabetes mellitus (a form of diabetes that occurs in pregnancy).

During experiments on pregnant rats with gestational diabetes, it turned out that ellag polyphenols prevented pathological changes and cell apoptosis in the tissues of the pancreas and placenta. They also normalized the weight of the pregnant female and her fetus. In addition, the level of glucose in the blood returned to normal, insulin resistance disappeared (decrease in the sensitivity of insulin-dependent cells to the action of insulin, followed by a violation of glucose metabolism and the development of diabetes).

According to scientists, these results create the prerequisites for the creation of drugs that women with gestational diabetes need <sup>[7]</sup>.

## 4. The use of pomegranate juice by patients with type 2 diabetes does not affect the insulin resistance index and changes in blood glucose levels, but reduces the concentration of inflammatory markers:

C-reactive protein (CRP) in plasma (which is absent in a healthy person), and interleukin-6 (IL-6 - a protein secreted during inflammation). The study that established this study involved 50 people aged 40 to 65 years, divided into two groups. For 12 weeks, one group received 350 ml of pomegranate juice daily and the other a placebo drink. The level of inflammation markers in the representatives of the first group decreased by 32% (for CRP) and by 30% (for IL-6) <sup>[8]</sup>.

## 5. Test-tube and animal studies have shown that both topical use and ingestion of pomegranate reduce UV damage to the skin.

74 women from 30 to 45 years old with skin type II-IV according to the Fitzpatrick scale were invited to take part in the experiment on humans. They were divided into 3 groups and given 1000 mg of pomegranate extract, 235 ml of pomegranate juice and placebo, respectively, for 12 weeks.

It turned out that those who consumed pomegranate and pomegranate juice significantly increased the minimum erythema dose (the minimum amount of UV radiation that leads to erythema - reddening of the skin) compared to participants in the placebo group. Scientists have concluded that daily consumption of pomegranate or its juice can enhance the body's defense against damage caused by UV radiation <sup>[9]</sup>.

6. From 2010 to 2018, 11 studies were conducted on the effect of pomegranate on the condition of athletes from different sports and just active people.

The pooled data analysis was based on a study of the condition of 176 people (155 men and 21 women, 45% of whom were professional athletes, and 55% were highly active people). Subjects consumed pomegranate juice and supplement tablets at doses ranging from 50 ml to 500 ml for varying periods of time ranging from 7 days to 2 months. The conclusions reached by the scientists:

- all the subjects had an increase in the supply of physical strength and a feeling of "freshness" before training,
- muscle pain after exercise became less acute and did not appear as quickly as without a pomegranate,
- the subjects recovered faster after heavy loads,
- in all those who took pomegranate juice, the diameter of the vessels increased and blood circulation improved,
- analysis of blood serum showed an increase in the level of antioxidant defense of the body <sup>[10]</sup>.

7. The research results of a group of Swiss scientists (Ecole Polytechnique Federale de Lausanne) indirectly correlate with the conclusions reached by previous researchers.

During the experiments, it was found that the substances contained in the pomegranate, under the influence of the intestinal flora, are converted into the urolithin A molecule, which is responsible for the restoration of mitochondria, which are called the energy stations of the cell. With aging of mitochondria, muscles weaken (endurance and strength are lost), but urolithin A, introduced into the body, increases their vitality and energy potential.

The experiments were carried out on old mice, whose endurance increased by 42%, and on laboratory worms, which doubled their lifespan with urolithin A. Of course, in no case can these results be transferred to the human body. Yes, and the effect of urolithin A largely depends on the individual characteristics of the composition of the intestinal microflora. However, the results provide a new basis for the development of pomegranate-based restorative nutritional supplements. <sup>[11,12]</sup>.

8. Anthelmintic and anticoccidiosis activity of pomegranate peel methanol extract was tested on laboratory rodents.

Mice were divided into 4 groups for each of which a specific regimen was chosen for infection with parasitic organisms *Eimeria papillata* and *Allolobophora caliginosa* and treatment (oral by gavage) with fruit extract (300 mg/kg) and pomegranate bark extract for 5 days. Pomegranate extracts stopped weight loss in mice, reduced the number of apoptotic cells caused by *E. papillata* by 36%, and had a detrimental effect on adult *A. caliginosa*, paralyzing and killing worms <sup>[13]</sup>.

## **Weight regulation**

Nutritionists warn lovers to use pomegranate fruits and juice in programs aimed at losing weight:

- Pomegranate "snack" quickly relieves hunger, but, like after other "fast" carbohydrates, the effect of suppressing appetite is short-lived and hunger soon returns. Moreover, it often becomes stronger, since the acids contained in the pomegranate increase the activity of gastric juice.
- Pomegranate juice is more nutritious than, for example, orange juice (traditionally used in breakfasts), by about 30%. At 100 ml, this difference is not very noticeable, but since the serving is usually 2-2.5 times larger, the "extra" calories gradually accumulate.
- There is no reliable evidence that the pomegranate diet affects fat metabolism in the body.

Thus, pomegranate or its juice cannot be called an ideal product for weight loss, although they can diversify the diet menu (in the absence of contraindications).

### **In cooking**

Pomegranate in cooking is found in recipes:

- confectionery and pastries;
- meat and fish dishes;
- layered multicomponent salads;
- seasonings (for example, sauces, for which sour varieties of pomegranate are more often used);
- cocktails, punches, composite wines;
- compotes, jelly;
- jam, marshmallow, syrup, marmalade.

In addition, freshly separated pomegranate seeds and beautifully cut pomegranate fruits serve as decorations for various festive dishes. Among the well-known ones are barbecue marinated in pomegranate juice, pilaf with grain, trout stewed in fruit sauce, etc.

Pomegranate Bracelet salad, according to a number of culinary resources, is in the top 5 most popular holiday salads. In its preparation, in addition to the pomegranate itself, chicken meat (leg or breast), eggs, beets, potatoes, carrots, walnuts, mayonnaise are used. The ingredients in this salad are laid out on a plate in layers, with each layer being a ring. (For these purposes, a glass is usually placed in the middle of the plate, around which the layout is then made). The result is a kind of bracelet, which is called pomegranate here, because pomegranate seeds (usually not very sweet) are laid out in the upper bright layer.

The Azerbaijani sauce "Narsharab" is also widely known among culinary specialists ("nar" is translated as "pomegranate", and "sharab" as "wine"). Seasoning is made by thickening pomegranate juice. After exposure to the sun and digestion, approximately 20-30% of the original juice volume remains. It is added most often to meat and fish, a little less often to vegetable stew. Turkey has its own version of this sauce, but it is usually made thinner.

### **In cosmetology**

In cosmetology, the antibacterial, protective and regenerating properties of pomegranate components are in demand. Seed oil improves microcirculation, has an anti-inflammatory effect. Juice - is able to narrow pores, regulate the sebaceous glands and reduce oily skin. Substances derived from pomegranate are used in sunscreens, creams to eliminate age spots and brighten (whiten) the face.

Pomegranate masks, creams, lotions, tonics, balms are found in skin care cosmetics of many brands:

- *Weleda* presents a regenerating body lotion containing organic pomegranate oil, which leaves the skin velvety and fresh.
- *Korres* offers a tonic that reduces the size of pores and reduces oil secretions. The tonic is made from 15% pomegranate water and is claimed to provide radiance to the skin.
- *Apivita* promises a similar effect with its Express Face Mask, which contains the same 15% pomegranate water.
- *Murad* offers quite expensive masks with pomegranate for exfoliation (peeling) of the stratum corneum.
- *EOS* entered the market with an inexpensive moisturizing lip balm created from a combination of pomegranate and raspberry juice.
- *Burt's Bees* offers a lip balm that claims to contain pomegranate oil.
- *Crabtree & Evelyn* sells an organic hand cream that includes shea butter in addition to pomegranate juice.

### Dangerous properties of pomegranate and contraindications

Concentrated pomegranate juice can be dangerous for people with stomach ulcers, gastritis, characterized by high acidity, harmful to patients with inflammation of the duodenal mucosa (duodenitis) in the acute stage. In these cases, pomegranate juice is recommended either to be completely excluded from the diet, or diluted with water (in a ratio of approximately 1: 3-1: 4).

You can not drink pomegranate juice and with hemorrhoidal exacerbations, chronic constipation. Concentrated juice itself can provoke constipation. In addition, it, like most other fruit juices, can damage tooth enamel. At the same time, there are studies in which it is pomegranate juice that is being tested as a temporary storage medium for extracted teeth. 7.5% pomegranate juice was more effective than 1% Hank's saline solution (usually used for this purpose) because it was better at maintaining the viability of periodontal ligament cells. <sup>[14]</sup>.

A decoction of fruit peels containing up to 0.5% toxic alkaloids can also become potentially hazardous to health. With the abuse of such decoctions, dizziness, weakness, and convulsions sometimes occur. In some cases, vision deteriorates.

### Selection and storage

When choosing a pomegranate, if it is not possible to see and taste the grains in advance, the pomegranate is selected by relative weight, sound when tapped and pressed, size, external characteristics of the peel and the state of the "crown" of the fruit.

- **The weight.** With the same fruit diameter, pomegranates with juicy seeds inside will be heavier than the same size fruits with limp or dry grains. Therefore, heavier ones should be chosen.
- **The size.** Each variety of pomegranate has a standard fruit size: some varieties are, in principle, larger than others. But if you choose among pomegranates of the same variety, then it is advisable to take larger ones, since, most likely, such fruits grew longer and, accordingly, ripened.
- **Sound.** The first way is to listen to the sound the pomegranate makes when tapped on the peel. The dry and dull sound of thick cardboard is a sign of a drying and overripe fruit. A sonorous sound is a sign of a perfectly ripe fruit. When pressed on the peel, a ripe pomegranate should emit a specific crunch, characteristic of a broken fruit.
- **Peel.** The surface of the peel of a quality fruit should be even - without cracks, dents, streaks, darkening or black blotches (signs of the onset of decay processes).

- **"Crown"**. The top of the pomegranate fruit is crowned with a calyx ("crown"). In a quality fruit, it should be red (burgundy), juicy colored (not green and not pale pink), triangular sepals ("teeth of the crown") - opened.

Due to the dense peel (in the absence of damage on it), unpeeled pomegranate fruits can be stored for about a month without observing specific conditions. To extend this period, it is enough to put the pomegranate in the refrigerator or a cool place:

- in a compartment with a temperature of +1 C , the storage period will increase to 8-9 months for sour varieties and up to 5-6 months for sweet ones;
- on a glazed loggia or in a basement with temperatures from zero to +10 C , grenades can lie for about 2 months.

It is advisable to remove external moisture and prevent decay processes by packing each pomegranate in a paper bag or simply laying out the fruits in boxes, laying them with newspapers. And in order to protect against loss of internal moisture and drying of the grains, the "crown" of the fruit is filled with a solution of clay or wax.

To keep sweet varieties throughout the year, they can be frozen by folding selected, peeled grains into a closed plastic container (bag).

### Varieties and cultivation

Pomegranate grows best in the subtropics, where the temperature does not fall below -15 C. Although the fruits ripen best in deciduous shade, the tree itself needs light, so it is planted in open places. A variety of soils are suitable for the plant, the composition of which pomegranate is not demanding. In dry regions, it is more important to provide artificial irrigation, because in such conditions without irrigation it is not possible to get a high yield, but the plant tolerates air drought well.

In the past, the pomegranate formed its own Pomegranate family (Punicaceae). Later, the family was abolished, and the pomegranate in the classification was moved to the Derbennikov family, the genus Garnet. This genus is represented by only two species: common pomegranate and rare Socotra pomegranate (growing only on the Socotra archipelago). So the entire varietal diversity of this fruit, numbering about half a thousand cultivars, is the result of a selective transformation of the common pomegranate.

Pomegranate varieties differ markedly in both the appearance of the fruit and the taste of the grains, which can be either very sweet or very sour or combine both flavors. But the division into two groups usually occurs according to the criterion of bone density: hard- and soft-pitted varieties. The second group is more demanding on growing conditions.

Each region boasts its own set of the best varieties of pomegranate, from which the top 5 can only be selected based on subjective preferences:

- **Ahmar**. Iranian pomegranate with a very high sugar content in grains that are light pink in color, and the lighter the grain, the sweeter it is. The fruits of this variety have a green-pink peel and are medium in size for pomegranates.
- **Dholka**. Indian pomegranate, which is considered the sweetest in the world, although it grows to an average of only 190-200 grams. It is characterized by very light, slightly pinkish fruits and white or pale pink grains.



- **Gulyusha is red.** One of the best Azerbaijani varieties with fruits up to 300-400 grams and a thin pink peel. Their large grains produce sweet and sour juice of bright red color. The variety is also popular with gardeners in Turkmenistan and Georgia.
- **Achik-anor.** The variety is distinguished by a very thick unusual dark green skin with a cover of carmine color (part of the shades of the red spectrum). Very large dark cherry grains have a sweet and sour taste.
- **Baby.** Bush decorative pomegranate, which grows up to a maximum of half a meter and is displayed mainly in room conditions for the sake of beautiful and numerous flowers. This plant rarely bears fruit. But this ornamental variety made it to the top because pomegranate bushes are generally quite often used as hedges or front garden decorations.

Despite all the usefulness of the pomegranate and its decorative possibilities, for most it is still a relatively exotic dessert fruit. However, the popularization of proven folk methods of treatment and new scientific research will allow us to look at pomegranates in a new way.

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### **Garnet - useful properties, composition and contraindications**

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**Abstract.** The article discusses the main properties of pomegranate 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 fruit are indicated, the use of pomegranate in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of pomegranate on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application.



### **Avocado (lat. Persêa americana)**

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**Abstract.** The article discusses the main properties of avocado 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 fruit are indicated, the use of avocados in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of avocados on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

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

## Beneficial features

Table 1. Chemical composition of avocados (according to [Food+](#)).

Main substances (g / 100 g):	Fresh avocado [1]
Water	73.23
Carbohydrates	8.53
Sugar	0.66
Squirrels	2
Alimentary fiber	6.7
Fats	14.66
Calories (kcal)	160
Minerals (mg/100 g):	
Potassium	485
Calcium	12
Phosphorus	52
Magnesium	29
Sodium	7
Iron	0.55
Zinc	0.64
Copper	0.19
Vitamins (mg/100 g):	
Vitamin C	ten
Vitamin PP	1.738
Vitamin E	2.07
Vitamin B6	0.257
Vitamin B1	0.067
Vitamin B2	0.13

Based on this data, for example, a dark green, rough-skinned Hass avocado exported from California contains twice the fat and three times the calories of a bright green, smooth-skinned avocado grown in Florida. But, in general, in any variety of avocados there are a lot of fatty oils, campesterol, beta-sitosterol. The composition of fatty acids contains about 60% monounsaturated (in some varieties up to 80%) and 20% each of unsaturated and saturated acids. There is more biotin (also known as vitamin B7) in avocado pulp than most raw fruits, and more vitamin D in avocado oil than eggs and butter.

## Medicinal properties

The Aztecs knew about the medicinal properties of avocados, who began to cultivate this plant about 5 thousand years ago in the territory of modern Mexico. They called the avocado "the oil of the forest" and used the ingredients of the fruit to eliminate scabies and get rid of dandruff. Today, knowledge about the medicinal properties of avocados has significantly expanded, and now various parts of this plant are considered as a medicinal basis for combating diseases such as atherosclerosis, osteoarthritis, type 2 diabetes mellitus, as well as for the prevention of hypertension, anemia, and gastrointestinal diseases caused by increased acidity.

A variety of studies have been conducted to determine the effect of experimental avocado preparations on the health of patients with metabolic syndrome. The syndrome itself is described as a combination of pathological abnormalities in terms of obesity, blood pressure, high-density lipoprotein cholesterol levels, etc. The presence of the syndrome indicates a significant increase in the risk of developing cardiovascular diseases and type 2 diabetes mellitus. An analysis of various data showed a particular modulating effect of avocado preparations on the lipid profile, which gave researchers reason to recommend avocado as a daily supplement for the correction and normalization of various parts of the metabolic syndrome <sup>[2]</sup>. Studies have also confirmed that avocados protect against belly fat <sup>[3]</sup> and the development of complications in diabetes <sup>[4]</sup>.

Avocado oil, containing biologically active unsaponifiable lipids (phytosterols, campesterol,  $\beta$ -sitosterol, stigmasterol), is able to stop inflammatory processes, can exhibit antioxidant and analgesic properties, which gives reason to use avocados in the fight against atherosclerosis. The same unsaponifiable compounds have proven to be excellent in the restoration of joints in osteoarthritis.

The peculiarity of avocados is the presence of a monosaccharide called mannoheptulose in its composition. It stabilizes the state of the nervous system, reduces fatigue, irritability, drowsiness, increases efficiency and concentration.

Relatively recently, from experiments on laboratory animals, it became known about the therapeutic effect of avocados on the liver and mucous tissues of the stomach. But in the healing practice of using avocados to restore the functioning of the gastrointestinal tract and liver, it has a long tradition. In the same tradition, the anticonvulsant, antimicrobial properties of this berry are actively used. With the help of various components, plants stop diarrhea for centuries, expel helminths, treat gastritis with low acidity and anemia. As a wound healing, antibacterial and regenerating agent, avocado is used to treat various diseases of the oral cavity (gum and teeth).

### Use in medicine

In official therapeutic practice, a group of pharmacological preparations is widely used, which include unsaponifiable compounds of avocado and soy. The most famous of them is the French Piascledine ("Piaskledin 300") from Laboratoires Expanscience. Less well-known is Cartilast ("Kartilast"). They are used in osteoarthritis, and "Piaskledin 300" has repeatedly confirmed its effectiveness in clinical settings in comorbid patients with osteoarthritis (that is, in patients with two or more related diseases). In particular, the effectiveness of an avocado-soy preparation in osteoarthritis, the pain syndrome of which is considered a significant risk factor in the development of cardiovascular diseases, has been established.

The drug demonstrates a number of pharmacological properties:

- increases collagen synthesis and reduces the synthesis of interleukins-1 by articular chondrocytes,
- increases the expression of a substance that inhibits plasminogen activator, which is responsible for joint damage,
- increases the expression of TGF- $\beta$  (transforming growth factor  $\beta$ ), which manifests itself in cartilage as an anabolic.

In general, the agent contributes to the restoration of the extracellular matrix component in the hip and knee joints (in the cartilage tissue). Observations demonstrate a higher therapeutic efficacy of the drug in patients with osteoarthritis of the hip joints. But its action is not limited to this. The drug is also indicated in the complex treatment of periodontitis, as it helps to relieve inflammation and bleeding of the gums.

## In folk medicine

Initially, the traditions of medicine of the Aztec, Inca and Mayan peoples classified avocados as aphrodisiacs. This was probably due to the fact that the fruits growing in pairs on a branch resembled testicles. The familiar name “avocado”, according to one of the versions, is a distortion from “ahuacaquahuitl”, which translates as “male testicle”. Therefore, in Central America, the fruits of the plant were used to stimulate sexual desire, increase male reproductive function and enhance potency. However, when avocados spread around the world, this traditional medical practice did not spread widely.

To date, the avocado has left its mark in the folk medicine of the countries of the tropical and subtropical zone, where the tree grows. For example, diabetes with the help of avocado leaves has long been treated in traditional medicine in Morocco. To do this, healers collect fallen leaves containing yeast and mold fungi, and prepare an extract from them that has a weak hypoglycemic effect.

In folk medicine, all parts of the plant are used:

- Crushed seeds are prescribed to get rid of toothache and rheumatic pain, as well as to eliminate the manifestations of seborrhea.
- An expectorant is made from the shoots of the plant.
- The gruel prepared from the leaves is considered an effective remedy for healing purulent wounds and treating fungal skin diseases.
- With avocado oil, folk doctors stimulate the production of breast milk, trying to use it for female and male infertility. Patients drink oil to restore the cartilaginous and skeletal systems, as well as to normalize the functioning of the gastrointestinal tract.
- From the pulp of the fruit, puree is made for anemia, constipation, vitamin deficiency, gastritis and diabetes. In addition, the pulp of ripe fruits lubricate sunburn.
- Infusions and decoctions of seeds and fruit peels treat diarrhea, diseases of the mucous membrane of the large and small intestines, and infection with helminths.
- The bark of the tree is used as an antibiotic for gargling with pustular diseases in the oral cavity.

Despite the prevalence of folk recipes with the inclusion of leaves, peel and stone of the avocado fruit, the use of these parts of the plant in internal use is associated with a certain risk due to the content of persin toxin, which can disrupt the functioning of the digestive system and cause an allergic reaction. Therefore, fans of traditional medicine should be treated with extreme caution to the recipes for decoctions and infusions below.

### Decoctions and infusions

Decoctions and infusions are prepared from the leaves, peel and pits of avocados. Moreover, if the peel and stone of the fruit are easy to obtain by simply preserving them after eating the pulp, then to collect the leaves, most likely, you will first have to germinate the stone and wait until the leaves appear on the sprout. However, it is not difficult to do this even on the windowsill in the apartment.

- "Tea" from the leaves. To prepare it, take 2-3 medium-sized leaves (usually pre-dried) per 200 ml of water, which are dipped in hot water and then boiled for 3-5 minutes. The resulting drink is filtered and honey is added to it. As a means to restore the liver, such a decoction is drunk unsweetened in a sip per hour for a crescent. It is also used as an anesthetic for menstrual cramps and to relieve the symptoms of sore throats.
- Leaf decoction. To prevent the formation of kidney stones, a decoction of 6-8 leaves per 2 liters of water is boiled for 10-15 minutes, after which 1 liter of the decoction is drunk during the

day, and the second liter - closer to the night. To relieve inflammation of the mucous membrane of the large and small intestines and get rid of diarrhea, 1 tablespoon of chopped fresh leaves is boiled for 7-8 minutes in 200-300 ml of water, after which it is infused for another two hours.

- Bone decoction. The avocado seed has a bitter taste, so it is pre-treated: the brown skin is removed, the inner part is finely chopped and laid out on a slow fire for baking until a "blush" of a golden-reddish hue appears. Then the cooled raw materials are crushed into powder, which is then boiled in water.

The most common proportion is 1 tsp. powder in 200 ml of water, boiled for 10 minutes.

However, the ratio of raw materials and water may vary depending on individual tolerance and the severity of symptoms. Usually, weaker solutions are drunk to relieve muscle pain and get rid of fatigue. For the normalization of the thyroid gland or the treatment of asthma - more concentrated.

- Bone infusion. The avocado bone is rubbed without pre-baking and mixed to the state of gruel with castor oil, after which the mixture is kept for a day. The infusion is applied to the scalp to give hair shine and strength. Keep the mask on your hair (using a cap) for an hour. Then the mixture must be washed off with warm water and shampoo.

### **in oriental medicine**

Avocado as an element of corrective nutrition has been included in Eastern therapeutic practice relatively recently. It is usually recommended in the list of products of the cold and cool groups for consumption in the heat.

In Tibetan medicine, avocados are considered part of the diet of people with a bile constitution. Since avocado is an unsweetened fruit that contains a lot of fatty acids, there are recommendations for eating this berry with wind.

### **In scientific research**

The following studies of avocado fruit and its plant parts are aimed at studying a number of important problems of scientific medicine regarding weight control, protecting DNA from damage, new methods of treating atherosclerosis and stomach ulcers, and the quality of assimilation of vitamins with meals.

#### **• Weight control**

Several studies have shown that avocados, despite their calorie content, do not interfere with weight loss. For example, in one of the experiments, 61 participants (both healthy and overweight and obese, among which there were 13 men and 48 women) were randomly divided into 2 groups. The first group included one and a half avocados (200 g) per day in a 6-week weight loss diet. This corresponded to 30.6 g of fat, which was replaced by 30 g of fat, usually obtained from margarine and vegetable oil. And the second - completely excluded from the diet of avocados. In both groups, the subjects evenly lost weight, they also had the same decrease in body mass index and percentage of fat. This confirmed the suggestion that avocados can be included in the diet for weight loss <sup>[5]</sup>.

In another study, 26 people (healthy but overweight) were given half an avocado at lunchtime. All of them noted a significant decrease in hunger and desire to eat and paid attention to the feeling of satiety <sup>[6]</sup>.

The level of satiety after avocados compared with a carbohydrate meal was studied in another study. The 31 overweight/obese participants received three meals per day: low-fat (76% carbs, 14% fat, 5g fiber; ~640 kcal), high-fat (51% carbs, 40% fat, 8.6 g fiber), including half an avocado - 68 g, and

high-fat (50% carbohydrates, 43% fat, 13.1 g fiber), including a whole avocado - 136 g. After 6 hours, scientists measured the feeling of hunger / satiety of the participants, focusing on the level of hormones responsible for these sensations.

After meals with half and a whole avocado, the participants did not feel hungry for longer, although they claimed that immediately after eating they felt more full from eating food without avocados. Carbohydrate food provoked an increase in insulin levels, while fatty food raised the level of hormones PYY (pancreatic peptide YY - a natural appetite suppressant) <sup>[7]</sup>.

- **DNA protection**

Scientists, after conducting clinical studies, came to the conclusion that the xanthophylls contained in avocado carotenoids have antioxidant properties and protect against DNA damage, preventing premature aging. In one of the experiments, 82 men took part, who worked as pilots or made frequent flights. They were all exposed to high levels of ionizing radiation in the air, which damages DNA and speeds up the aging process. As a result, scientists concluded that those who received vitamin C and carotenoids, including xanthophylls from avocados, developed DNA damage more slowly <sup>[8]</sup>.

- **Improved absorption of vitamin A**

Food-derived lipids are known to increase the bioavailability of provitamin A (carotenoids) in foods, but another study has shown that they also improve the conversion of carotenoids to vitamin A and its absorption in the body.

Two experiments were conducted with the division of participants into 2 groups of 12 men and women each. In the first experiment, participants in one group were given a meal with one fresh Hass avocado (23 g fat), and participants in the other were given the same meal but without the avocado. The source of carotenoids in the first study was tomato sauce made from a variety of tomatoes rich in  $\beta$ -carotene (33.7 mg  $\beta$ -carotene), and in the second study, fresh carrots (27.3 mg  $\beta$ -carotene and 18.7 mg  $\alpha$ -carotene). 12 hours after eating, the subjects took a blood test and measured the level of provitamin and vitamin A. The use of avocados improved the absorption of  $\beta$ -carotene by 2.4 times in the first experiment and 6.6 times in the second. Also in the second, the assimilation of  $\alpha$ -carotene improved by 4.8 times. In addition, the transformation of carotenoids into vitamin A improved by 4.6 and 12.6 times, respectively. Thus, for maximum absorption and conversion into Vitamin A, carotenoids should be consumed with avocado <sup>[9]</sup>.

- **Avocado seed extract for stomach ulcers**

Commonly discarded, avocado pits have anti-inflammatory, antioxidant, and antimicrobial properties. In a study on laboratory mice, the effectiveness of the effect of seed extract on gastric ulcers caused by indomethacin was tested. The extract in the experiment reduced the level of oxidative stress, increased the activity of certain enzymes necessary for normal digestion by 4.25 times. Phenolic compounds found in avocado pits inhibited the processes that lead to the development of ulcers. Thus, seed extract can be a natural remedy for preventing or treating stomach ulcers. <sup>[10]</sup>.

- **Protection against atherosclerosis**

In adults who have problems with overweight due to obesity, the systematic consumption of avocados can reduce the risk of developing atherosclerosis. These conclusions were made by scientists from the American University of Pennsylvania, who conducted an experiment with 45 volunteers. At a certain stage of the study, the participants were divided into three groups, each of which followed its own diet: the first was low in fat, the second was moderate in fat, and the third was similar to the second, but

with the addition of one avocado per day. Moreover, in diet No. 2, monounsaturated fatty acids were present in the same volume as in diet No. 3, but had a different origin (that is, they were not obtained from avocados).

After 5 weeks, the researchers compared "bad" cholesterol and the amount of oxidized low-density lipoprotein (LDL) particles, finding that in group #3 their level was significantly lower than in the other two, and lower than before the start of the study. Since the oxidation of LDL particles accelerates the formation of plaque in the arteries, leads to the development of heart disease and oncology, their reduction is considered a positive sign and the basis for the development of avocado therapy.

### **Weight regulation**

100 g of avocado contains an average of 200-220 kcal, which does not make this product dietary. The calorie content of some varieties is lower - about 160 kcal, but some - for example, Hass varieties - are much higher (more than 500 kcal / 100 g). In 1998, according to the criterion of high energy intensity, avocados even got into the Guinness Book of Records. But despite this, avocados can make an effective "fasting pill." The reason is mannoheptulose. This monosaccharide reduces the secretion of those enzymes that are needed for the absorption of glucose, which, with the same amount of food, causes the cells to "starve".

Another property of avocados, thanks to which nutritionists include it in weight loss programs, is the presence of easily digestible monounsaturated fats. They speed up metabolism, which made it possible to create, for example, a fashionable "star" keto diet or Fiona Kirk's "soup" diet on their basis. Comparisons were made of the metabolism and physical activity of people on a diet with saturated fats (palmitic acid) with those of people using, all other things being equal, monounsaturated fats (oleic acid). In the second group, metabolism was higher by 4.5%, and physical activity was higher by 13.5%.

In addition, unsaturated fats can activate a special protein called PPAR-alpha, which burns already accumulated fat in subcutaneous deposits in the thighs, abdomen and buttocks. The results of connoisseurs of monounsaturated fatty acids in the fight against subcutaneous deposits of the abdomen were only 1.6%, but better than those of supporters of weight loss with linseed and safflower oils rich in polyunsaturated fats.

In a series of experiments conducted by nutrition scientists, participants in the experiment who ate lunch with avocados and other foods with unsaturated fatty acids experienced a feeling of satiety longer than subjects from the second, control group, who ate a meal of the same calorie content, but with a low level of unsaturated acids. . Accordingly, representatives of the second group, satisfying their hunger, ate more often and more, which did not contribute to weight loss. In addition, with a dosed regular intake of monounsaturated fatty acids, the body ceases to replenish the reserves of "harmful" fat.

### **In cooking**

The avocado is similar to butter in its culinary properties, which led to its Spanish alternative name "midshipmen's butter" and the Indian version - "poor cow". Therefore, avocados are often used to make a universal pâté, simply served with white bread. To prepare such a "spread", the pulp of the fruit (1 pc.) Is rubbed on a grater, olive oil (1 tbsp.), Lemon juice (1 tsp.), Onion (1 head), ground black pepper and salt are added taste.

Combinations of avocados with cheese, seafood, fish and vegetables (in salads) are of particular culinary interest. To prevent oxidative processes that negatively affect the taste and appearance of the



pulp, lemon or lime juice is usually added to dishes with avocados. For example, one of the most famous Latin American snacks - guacamole - is made from mashed avocados with the addition of lime juice, tomatoes and cilantro.

A thick garlic sauce is also made on the basis of avocado, which can be seasoned with salads with shrimp or dishes with poultry and meat. The recipe for the "green" sauce contains avocado (1 pc.), Garlic (1 head), olive oil (200 ml), balsamic vinegar (50 ml), a bunch of parsley and a teaspoon of salt, which are ground with a blender to a creamy consistency.

In vegetarian cuisine, avocados replace meat and eggs, and are also used as a filling for sushi. Brazilian, Filipino, Indonesian, and Vietnamese culinary traditions include avocados in sweet creams and milkshake recipes.

### **In cosmetology**

In professional and amateur (home) cosmetology, avocado oil is widely used, the fatty acid composition of which includes up to 80% oleic, up to 32% palmitic, up to 18% linoleic, up to 13% palmitoleic acid, as well as a relatively small amount of linolenic and stearic acid. Avocado oil is similar in composition to the composition of the protective mantle of the skin of a healthy person, which is used by manufacturers of cosmetics in the manufacture of products for restoring the skin and drugs for the treatment of acne and oily seborrhea.

Restoration of epidermal cells is facilitated mainly by natural steroid alcohols (phytosterols) and vitamin E. Vitamin A helps to prolong the youthfulness of the skin. Avokutin relieves seborrheic dermatitis and acne.

As a basic ingredient, avocado oil can be used both as an independent agent and as part of cosmetic compositions. Undiluted oil is often used instead of a night face cream. To relieve inflammation and irritation, it is enough to apply a little warmed oil for 30-40 minutes, and remove the unabsorbed residues with a paper towel.

As an example, the following recipes for popular masks can be given:

- To normalize the work of the sebaceous glands, avocado, orange and neroli oils are mixed in equal proportions (2 drops each), and then the yolk of one egg is added to the composition. The mask is applied for 10 minutes.
- From puffiness and signs of fatigue under the eyes, avocado oil is mixed with cucumber juice in a ratio of 1 to 2.
- To strengthen the hair roots, 1 teaspoon of avocado oil is mixed with 1 tablespoon of wheat germ oil and heated over low heat. This mixture is rubbed into the scalp after washing the hair, and then washed off with plenty of water.

### **Dangerous properties of avocados and contraindications**

Back in 1576, the Spanish missionary monk Bernardino de Sahagun, who studied the history and life of the Aztecs in the territory of modern Mexico, in his fundamental work on this topic, when mentioning avocados, indicated that, according to the Aztecs, this product could not be consumed by lactating women, because the fetus can provoke diarrhea in them.

Today it became known that not only nursing mothers are at risk among avocado lovers, but also pregnant women, representatives of the age category from 65 years old, as well as people with a weakened immune system. The reason lies in the activity of the bacterium *Listeria monocytogenes*,

which federal investigators from the US FDA have identified on the skin of one in five berries. In testing 2014-2016, almost 18% of fetuses were infected.

Listeria are intracellular parasites and, if they enter the human or animal body, in addition to diarrhea, they can cause nausea, abdominal pain, severe headache, muscle stiffness, a marked increase in temperature up to 39 ° C and some other signs of listeriosis. Pregnant women have a high risk of miscarriage, while women themselves tolerate the disease relatively easily. In about 15% of cases, listeriosis in humans ends in the death of the patient.

In order to avoid the spread of bacteria from the peel to the flesh of the avocado, it is recommended to first wash the fruit with a brush, and then, after cutting, eat away the edible pulp with a spoon, and discard the remaining parts of the fruit. Boiling the product at 100°C kills the bacterium within 3 minutes.

The listeria bacterial infection situation is not unique to avocados. *Listeria monocytogenes* is regularly detected in various food industries (poultry farms, fish and meat processing plants, dairy farms). So, for example, in 2004, during an inspection of 13 Scandinavian enterprises, *Listeria* was detected on 11. A similar situation in 2011-2013 developed in the Italian dairy industry. Therefore, the bacterial threat from an infected avocado is relatively small, however, it is also recommended to exclude it by thoroughly washing the fruit.

Unfortunately, severe allergic reactions to "unusual" avocados cannot be eliminated by washing. Moreover, according to some nutritionists, more often people find problems in the form of indigestion, intestines, liver intoxication after eating Mexican varieties of avocados. One of the proteins of this berry - a glycoprotein - can be perceived by the body as a foreign one.

Persin, a fungicidal toxin that can cause a deterioration in the functioning of the gastrointestinal tract in humans, and death in animals that actively eat seeds and fruit peel, poses a certain health hazard during the medical use of avocado leaves, peel and seed. The toxin contributes to the accumulation of fluid in the tissues of the body and has a depressing effect on the heart and respiratory system.

Abuse of avocado can lead to exacerbation of gout. 100 g of pulp contains approximately 10% of the daily requirement of purines, as a result of the breakdown of which uric acid is formed. If, in addition, foods rich in purine bases are present in the diet (kidneys, liver, sweet meat and meat extracts, sardines, mackerel, anchovies, fried beans, etc.), then adding avocados to the menu can exacerbate the problem.

### **Selection and storage**

When buying an avocado, you need to check whether the fruit is ripe. If the avocado is hard and the peel is not pressed through at all, then the fruit is not ripe, and if it is pressed too deeply, then it is overripe. You should also pay attention to the presence of dark spots and cracks. This may indicate that the avocado has begun to spoil. When evaluating softness, it is not recommended to press the peel with your fingers - this can leave dents on the avocado. It is better to squeeze the fruit with the whole palm.

Another way to make sure an avocado is ripe is to check the condition of the stalk. In ripe berries, it is easily separated, but does not fall off on its own, as happens with rotten berries. The color of the skin under the stalk is also important, because it can be used to judge the color of the pulp. Green varieties of avocados are recommended to be taken with a light yellow or slightly greenish skin under the "handle".

Most often, you have to buy unripe avocados, so methods of ripening fruits at home are widely practiced:

1. In a paper bag at room temperature. A paper bag is needed here to hold the ethylene released by the fruit, so the bag is taken without holes. In addition, the package will protect from exposure to sunlight, which can cause hardening and blackening of the fetus. And the room temperature regime is respected, because the avocado does not ripen in the refrigerator. Moreover, low temperatures are sometimes used to delay maturation and delay the ripening process closer to the date of preparation and serving. High temperatures (from 30 C) also interfere with ripening. The peel of the fruit becomes stained, an unpleasant odor appears. In a paper bag at room temperature, avocados ripen in 2-5 days.
2. In a paper bag with catalyst products. Most often, as "neighbors" that intensively release ethylene and accelerate the ripening of avocados, they take a banana or an apple (less often a tomato). The banana is said to do the job best, but the apple is more popular because it's a reusable catalyst and even a shriveled and unattractive apple still continues to release ethylene.

If the avocado has already been cut, but not eaten, so that the flesh does not darken, it is sprinkled with lemon (lime) juice. Sometimes the halves of the fruit are again connected to each other, wrapped in cling film and sent to the refrigerator. Already ripe avocados are also usually stored in the refrigerator, but not for long so that the berry does not lose its beneficial properties.

### **As it is**

To peel an avocado, you need to make an incision along and at the same time turn both halves in opposite directions. In this case, the fruit should be easily divided into two parts. From the inside, remove the bone, peel the pulp or scrape it out with a spoon. After cleaning, avocados are recommended to be eaten immediately or used in cooking. This is due to the fact that in the air the flesh quickly loses its external properties and begins to darken.

### **How to grow an avocado from a seed at home**

There are at least three ways to germinate shoots from an avocado seed at home. But for any of them, you will need a bone without signs of decay and damage, so you need to carefully remove it from the fetus.

- Method number 1

Slightly above the middle of the fetus (closer to the sharp end), 3-4 punctures 1-2 mm deep are made in the bone with an awl at equal distances from each other. They are necessary so that you can easily insert matches or toothpicks into them, and those, in turn, are needed to keep the bone in a "suspended" state inside the glass. (The "cross" of the toothpicks forms a kind of wide frame; placed on the edges of the glass, it prevents the bone from falling to the bottom).

With a blunt end, the bone is placed in settled water, but in such a way that the punctures remain above the water and do not get wet. When the water evaporates, it is periodically added to the previous level. (Water in this method is sometimes replaced with hydrogel). In this state, the bone is left in a well-lit place for a period of two weeks to a month. During this time, the root usually has time to appear. When its length reaches 3-4 cm, the bone is transplanted into the ground, immersing about half in the ground.

- Method number 2

The stone is very carefully peeled from the outer skin and lowered with a blunt end to the bottom of a narrow glass so as to be half in the water. A narrow vessel is needed in order to hold the bone in a vertical position. Transplanting into the ground is done when the root sprouts 3 cm in this temporary vessel. It usually takes 2-3 weeks.

- Method number 3

In this variant, the stone is planted directly in loose, non-acidic (with pH = 7) soil, consisting of universal soil, peat and sand in equal proportions. For avocados, for the first time, a pot with drainage holes about 10-15 cm high is selected, of which expanded clay occupies about 2 cm. Lower the bone into the ground by only a third. The soil in the pot should remain moist but not waterlogged. The root with this method may appear in 1-3 months, so the previous options are used more often.

After sprouting and transplanting the seed into a pot, the avocado is set in a bright and warm place. It is believed that in this way it is possible to start sprouting avocados throughout the year.

## Varieties

There are over 400 varieties of avocados in the world, the fruits of which differ markedly from each other both in their chemical properties and in appearance. Here are the top 3 most interesting avocados.

1. Pura Vida (Florida, USA). Berries of this variety are more reminiscent of bottle gourd than avocado. Pura Vida has elongated berries about half a meter long with a weight of 400 g to 1.3 kg. Considering that the average weight of the usual store-bought avocados is 150-250 g, Pura Vida looks like a real giant against their background. There are specimens growing up to 90 cm. The curved "neck" gives unusualness to some fruits. The taste of the flesh of this variety is salty and slightly sweet with a thick creamy texture.
2. "Royal black" avocado (Burma, Vietnam). A rare elite variety of spherical shape with a dense coal-black skin and a small stone. The flesh of a ripe avocado acquires a bright yellow color, which is also called "canary". Royal Black is said to make the best guacamole.
3. Semil 34 (Dominican Republic). In heavy, almost kilogram, fruits of this variety, about 70% of the weight falls on the pulp, which changes taste as it ripens. Ripe Semil is distinguished by juiciness and fresh fruity taste, and the despised flesh, changing color to bright yellow, becomes oily with a pronounced nutty flavor. Despite the "southern" origin, the variety is frost-resistant.

Despite the commercial and consumer attractiveness of these varieties, Hass remains the most common today, named after Rudolf Hass, a postman from the United States who is fond of breeding, who, after a series of failures, created a tree of this variety in his garden and patented it under his own name in 1935.

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From all of the above, we can conclude that when using an exotic berry, you still need to be careful. However, you definitely should not refuse avocados, since this product will be able to qualitatively diversify your diet.

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[An extended HTML version of the article](#) is available on the edaplust.info website.

### **Avocado - useful properties, composition and contraindications**

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**Abstract.** The article discusses the main properties of avocado 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 fruit are indicated, the use of avocados in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of avocados on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application.



## Mandarin (lat. *Citrus reticulata*)

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**Abstract.** The article discusses the main properties of mandarin 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 fruit are indicated, the use of mandarin in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of mandarin on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

**Key words:** mandarin, benefit, harm, beneficial properties, contraindications

## Beneficial features

Table 1. Chemical composition of avocados (according to [Food+](#)).

Main substances (g/100 g):	Fresh tangerines [1]	Canned tangerines in syrup [2]
Water	85.17	83.06
Carbohydrates	13.34	16.19
Sugar	10.58	15.49
Squirrels	0.81	0.45
Alimentary fiber	1.8	0.7
Fats	0.31	0.1
Calories (kcal)	53	61
Minerals (mg/100 g):		
Potassium	166	78
Calcium	37	7
Phosphorus	twenty	ten
Magnesium	12	eight

Sodium	2	6
Iron	0.15	0.37
Zinc	0.07	0.24
Copper	0.042	0.044
<b>Vitamins (mg/100 g):</b>		
Vitamin C	26.7	19.8
Vitamin PP	0.376	0.445
Vitamin E	0.2	0.1
Vitamin B6	0.078	0.042
Vitamin B1	0.058	0.053
Vitamin B2	0.036	0.044

The table shows that vitamin C, which all citrus fruits are famous for, is about 27 mg / 100 g in mandarin. In some varieties it can be 2 times more, but the concentration of vitamin C is an order of magnitude higher, for example, in bell pepper (about 250 mg/100 g) or in dried rose hips (up to 1200 mg/100 g). Nevertheless, in winter, when other products are less available, it is citrus fruits that become the main source of vitamin C, which is practically not lost in mandarin during storage.

In addition, tangerines (also in relatively small amounts) contain choline (10.2 mg / 100 g), which, according to an outdated tradition, is sometimes still called vitamin B4, and lutein (138 mcg / 100 g). But on the other hand, tangerine is considered one of the best sources of the “citrus bioflavonoid” hesperidin, sometimes second only to sweet orange (*Citrus sinensis*) juice in this indicator. Fresh fruits of mandarin (*Citrus reticulata*) contain 19.26 (+/-11.56) mg g/100 g of fresh fruit weight, in a hybrid of orange and mandarin - about 15.42 (+/-7.00) mg/100 g, in a hybrid of mandarin and grapefruit - 4.21 (+/-2.93) mg/100 g

### Medicinal properties

In traditional therapeutic systems, mandarin fruits were used mainly as regulators of the gastrointestinal tract (with moderate use), and mandarin peel was also used as an antispasmodic, stimulant and anti-inflammatory agent. However, due to the presence of a number of useful elements in the pulp and peel of citrus, mandarin is able to exhibit some other medicinal properties.

The yellow pigment lutein in mandarin, along with other lutein-containing foods, can help restore visual function. The human body does not synthesize lutein, getting it exclusively from food. Mandarin, with 138 mcg / 100 g, although it is in the top 15 products containing lutein, is very far behind the leaders - spinach (12198 mcg), Kale (8198 mcg), parsley (5561 mcg) and others. Taking into account the fact that the daily intake of lutein is about 5 mg (5 thousand mcg), you will have to eat about 3.5 kg of tangerines per day in order to provide the body with lutein only due to citrus. Moreover, it is desirable - with fats, which increase its digestibility.

Despite this, in combination with other products, tangerine can help the body replenish the lack of lutein, which has two main functions in the body:

- **Protective.** Lutein protects against free radicals, which, formed under the influence of the most aggressive blue-violet part of the visible spectrum of direct sunlight, lead to retinal degeneration.
- **Filtration.** Thanks to lutein, the “aberration halo” is eliminated, which increases the clarity of objects and, accordingly, increases visual acuity. As a light filter, lutein also saves the lens from clouding.

Another useful organic compound in mandarin is choline. From it, the body synthesizes a transmitter of nerve impulses (acetylcholine), which ensures the functioning of memory and the functions of the nervous system. In addition, as a hepatoprotector, choline helps transport fats in the liver, regulates insulin levels and affects carbohydrate metabolism.

The body produces it in insufficient quantities, and up to the daily norm of 0.5-1 g (500-1000 mg), choline must be “grabbed” from food. Mandarin contains only 10.2 mg of choline per 100 g, therefore, as in the previous case, it is necessary to eat a lot per day - more than 5 kg of tangerines in order to compensate for the lack of choline. However, along with other choline-rich foods (eggs, liver, sprouted rice and wheat, etc.), tangerine helps build a healthy and varied diet. In addition, tangerines are usually eaten without heat treatment, which destroys choline when cooked in other foods.

Hesperidin is obtained from the fruits and spongy part of dried mandarin peels - a natural compound (a source of hesperitin in the body), which is characterized by a complex effect on the cardiovascular system:

- helps strengthen the walls of blood vessels,
- increases blood flow in the coronary vessels,
- improves the condition of capillaries,
- reduces blood pressure.

By itself, this substance reduces the symptoms of asthma, has anti-inflammatory, anti-carcinogenic and antioxidant effects. In combination with the flavonoid diosmin (altered hesperidin), it reduces vein extensibility, increases capillary tone, promotes lymph flow and, in general, has a venotonic effect. In combination with synephrine, it speeds up metabolism, and with nitric oxide inhibitors, it can exhibit neuroprotective properties.

The flavonoid naringin from mandarin peel exhibits antioxidant effects <sup>[3]</sup>, lowers cholesterol levels <sup>[4]</sup> and enhances cognitive function <sup>[5]</sup>. There is also an assumption that it can increase the elasticity of capillaries and exhibit antitumor properties. Existing techniques make it possible to extract up to 74% of naringin from its initial content in the raw material by destroying the cell walls of the tangerine peel using a certain composition of the multi-enzyme composition.

## Use in medicine

In the pharmaceutical industry, pomace from dried mandarin peel is most often used, which is added to extracts, syrups and some medicines to improve the taste of medicines. In addition, it contains hesperidin, a powerful cardioprotector, which, in addition, protects the brain from stress factors. This substance in a 10% concentration is included, for example, in the composition of Daflon, a drug intended for the treatment of varicose veins, edema, restless legs syndrome and other chronic venous diseases, as well as symptomatic treatment of hemorrhoids.

Dried bark of ripe fruits is included in the State Pharmacopoeia of the People's Republic of China, which is widely used by Chinese doctors in the treatment of diseases and pathological conditions of the gastrointestinal tract (in particular, vomiting, diarrhea, heaviness in the epigastric region), anorexia, respiratory diseases, beriberi.

Korean pharmacists are developing and introducing a dosage form of KMP6 extract, which has also found application in the treatment of gastrointestinal pathologies: with bloating, rumbling, diarrhea, provoked by a decrease in intestinal tone and peristalsis, with gastric distention and inflammation of the gastrointestinal tract, as well as in cases of loss of appetite. The composition of the extract, in addition to sour mandarin, includes atractylodes (known as bai shu in China), jujube, ginger, licorice.



For diagnostic purposes, a food allergen is isolated from mandarin for diagnostic purposes, known under the Latin name "Allergenium e Citrus" and belonging to the pharmacological group of immunobiological drugs for diagnosis.

### **In folk medicine**

Traditional medicine traditionally uses various parts of the plant to achieve its intended medicinal effect.

Healers recommend eating mandarin fruits to increase appetite and improve digestion. Fresh fruit juice is drunk for dysentery, diarrhea, the presence of helminths and intestinal pathologies caused by impaired intestinal motility. It is believed that the juice weakens the activity of wave-like contractions of the hollow organs of the gastrointestinal tract. In addition, it has an antimicrobial effect.

The juice is also used for diseases of the respiratory system. Every morning a glass of tangerine juice removes mucus from the bronchi and upper respiratory tract. Fresh juices also quench thirst during various colds accompanied by fever.

External regular use of tangerine juice is practiced for the treatment of fungal diseases - "ringworm" (microsporia and trichophytosis). Also, with the help of fresh applications, vaginal candidiasis (thrush) is treated. This disease is caused by the yeast-like fungus *Candida*.

With the help of prepared tangerine peel, people lower blood sugar levels, restore the digestive tract and respiratory system. Citrus pits are sometimes used to improve the functioning of the cardiovascular system. Mandarin oil is popular in aromatherapy for uplifting mood and fighting lethargy.

### **Decoctions and infusions**

Decoctions and infusions are made from the peel and leaves of mandarin. Some of the most popular recipes among the people are given below:

- **Leaf decoction for gastrointestinal disorders.** 3-4 leaves are filled with water (300 ml) and kept on fire for 15 minutes. After cooling, the decoction is taken three times a day, 100 ml each, until the gastrointestinal tract normalizes.
- **Alcoholic infusion of mandarin peel to remove sputum from the bronchi.** The peel is dried, ground, the resulting powder (3 tablespoons) is poured with vodka (250 ml), and then the mixture is infused in a dark, warm place for a week. Such an infusion is taken three times a day, only 20 drops added to a small amount of water, 15-20 minutes before meals. If alcohol is strictly prohibited, the infusion is replaced with a "cocktail" on water: tangerine peel powder (1 tablespoon) is diluted in warm water (250 ml). In this embodiment, it is enough to drink one glass of the drug per day.
- **Decoction of fresh peel to lower blood sugar levels.** The fresh peel of three medium-sized tangerines is poured with a liter of water and boiled for 10 minutes, after which it cools and is placed in the refrigerator without straining. Take the remedy should be a glass once a day (or half a glass twice a day) after meals.

### **in oriental medicine**

In the ancient reference book of recipes and medicines of plant, mineral and animal origin, known as "Pen Tsao" ("Medic's Matter"), for all citrus crops there is a common name - "chu", while 5 varieties of citrus are distinguished, among which, under the name "kan" (or "chu-sha-chu") orange tangerine

is also mentioned. But regardless of the type of citrus, it is defined as a fruit that refreshes, quenches thirst, normalizes the work of the stomach, manifests itself as a “carminative” remedy, but if abused, it “increases phlegm”. At the same time, more often than citrus fruits in classical Chinese medicine, the peel of kuo-pi (this is the Cantonese name for tangerine peel) is used.

The peel of the fruit is considered a universal medicine, the range of application of which is extremely wide. It is used as an antispasmodic, stimulant, anti-inflammatory and gastric remedy. It is prescribed for shortness of breath in the elderly and exhaustion in children. The peel of immature fruits is prescribed mainly as a carminative.

Boiled in wine, the inner membranes of the fruit are taken to get rid of nausea. Ground in a mortar to a powder state, seeds (with a separated shell) treat pathologies of the genitourinary system, inflammation of the lymph glands in the inguinal region, and varicose veins of the ovary. The juice of fresh leaves and a decoction of dried leaves are washed with ulcers and cancerous tumors. They are also used for menstrual disorders.

Tangerine essential oil is considered by traditional Chinese medicine to be the mildest and most soothing of the essential oils extracted from any other citrus. It has a significant effect on the condition of oily skin, helping to fight acne and giving it a healthy color. In addition, it is effective for insomnia, has antiseptic properties. Oil is also prescribed for the syndrome of increased intestinal permeability. It reduces gas formation and stimulates the lymphatic system.

In Japan, where the frost-resistant mandarin unshiu, brought from China, has long been cultivated, the tradition of using dried citrus peel as a pleasant-tasting spicy medicine to normalize the work of the stomach has also taken root. A decoction of the peel, as well as its water and alcohol infusions, were used to improve digestion and eliminate nausea, they treated bronchitis and relieved coughs. Satsuma mandarin flower tea has been recommended as a mild sedative to relieve insomnia.

In Ayurveda, the system of traditional medicine of the peoples of India, mandarin is considered a “heavy and hot” fruit that reduces Vata, one of the three primary vital forces (doshas) that determine the human constitution. Vata (corresponds to the elements of air, ether) is a biological “juice”, “which moves” and is responsible for the will, thinking, movement, sensory perception. Excessive Vata provokes hypertension, insomnia, nervous system disorders, flatulence. Mandarin is able to get rid of these problems, and, in addition, it can remove helminths, improve appetite, relieve spasms, pain, fatigue and give strength. In Ayurvedic recipes, mandarin is also included in the composition of funds intended to stop bleeding of various nature.

### **In scientific research**

Despite the prevalence of mandarin as a crop (and among citrus fruits, it lags behind only orange in terms of cultivation), there are quite a few scientific projects devoted to studying the beneficial properties of various parts of the plant. Of the recent ones, attention is drawn to those that explore the antibacterial and analgesic properties of mandarin, the possibility of its inclusion in therapeutic programs for the treatment of atopic dermatitis, liver and lung cancer.

1. Cultivated in Japan, Unshiu tangerines may be useful in the fight against atopic dermatitis.

Scientists have found that the extract of the peel of this fruit has anti-inflammatory and antiviral properties. For the experiment, unripe fruits were taken, since at this stage they contain a greater amount of the necessary flavonoids. The effectiveness of the agent was tested on artificially infected and shaved mice. After 36 days of exposure to the extract in experimental animals, hyperkeratosis

(thickening of the stratum corneum), reddening of the upper layer of the skin, and the number of mastocytes, cells that play a key role in inflammation, decreased <sup>[6]</sup>.

2. Essential oil from mandarin skins and terpene limonene separately extracted from them were tested for their ability to have an anti-cancer effect.

In a test-tube experiment, the scientists used the oil and limonene to combat A549 (lung cancer) HepG2 (liver cancer) cell lines. Depending on the dose, both substances had a detrimental effect on pathogenic cells. At the same time, the essential oil showed the best results. The researchers believe that it could be taken to create a drug that will be used as an additional treatment, although scientists admit that more experiments are needed to confirm the information <sup>[7]</sup>.

3. Mandarin leaves can become a raw material for the creation of painkillers.

Mandarin leaves tend to be slightly pungent, so scientists have speculated that they may contain compounds with analgesic properties. As a result of experiments, they managed to establish that in the purified essential oil of mandarin there are molecules that can become part of drugs for relieving pain of various nature <sup>[8]</sup>.

4. Inhalation aromatherapy with mandarin essential oils reduces pain and anxiety.

In 2016, a large-scale experiment was conducted, in which 10262 people took part (81.71% of women and 18.29% of men, 87.32% of Caucasians and 12.68% of other races). Participants were patients with a variety of diagnoses in hospitals in Minnesota and western Wisconsin. The essence of the experiment was that aromatherapy in the form of inhalations was included in the set of routine patient care procedures. The nurses used different essential oils (lavender, ginger, tangerine, or a mixture of them). As a result, patients noted a decrease in nausea, pain and anxiety <sup>[9]</sup>.

4. Mandarin essential oils inhibit the activity of *Listeria innocua* bacteria.

The antimicrobial properties of tangerine oil have been tested in a procedure to extend the shelf life of food products. The object used in this experiment was green string beans. 0.05% mandarin essential oil was added to the composition of the substance that provides protective functions and is designed to fight the *Listeria innocua* bacterium on the surface of vegetables. Together with other protective procedures, the effect of the substance with tangerine oil justified the hopes of researchers <sup>[10]</sup>.

## **Weight regulation**

In sports supplements for weight loss, naringin is used, a flavonoid that is obtained from the peel of tangerines and grapefruits. Although it does not burn fat directly, its inclusion in preparations can suppress appetite, improve glucose metabolism and absorption of several components from the intestine.

Also in sports nutrition designed to burn fat, a substance called synephrine is widely used. It is believed that synephrine accelerates metabolism, mobilizes fat depot, enhances heat production and destroys fats by activating thermogenesis. This substance is often mentioned on the Internet in connection with the benefits of eating tangerines in programs aimed at weight correction.

However, such a reference requires significant clarifications:

- Firstly, the pharmacological effect has been proven for m-synephrine, and for its p-synephrine isomer (which is extracted from citrus), this effect has not yet been reliably confirmed.

Studies in 2004 suggest that some lipolytic effect of p-synephrine occurs only at high doses <sup>[11]</sup>. In 2011, researchers studied the combination of p-synephrine with green tea extract and caffeine, resulting in the contribution of synephrine to fat loss remained unknown, although the scientists calculated that thanks to synephrine, the metabolic rate probably increased by 6.7% <sup>[12]</sup>.

- Secondly, p-synephrine is derived from bitter orange, not mandarin, although there is a mandarin-bitter orange hybrid that partially inherits the characteristics of both parents.

At the same time, mandarin itself, with its 30-55 kcal / 100 g, really belongs to low-calorie foods and, on this basis, becomes part of unloading short-term complex diets. For example, it is included in the 7-day diet, which involves eating 200 g of cottage cheese with tangerines four times a day. It is alleged that on such a diet for a week you can get rid of 3-5 "extra" kilograms. However, it should be borne in mind that tangerine fruits in the diet increase appetite, and it will be quite difficult to stay on a tangerine diet.

### In cooking

In cooking, mandarin is popular both fresh and in jams, syrups, compotes. When preparing jam, in addition to the pulp, zest is usually laid, which gives the dessert astringency and enhances the tangerine flavor.

As a spice, the fruits of this fruit are added to meat and fish dishes; numerous recipes for making tangerines with rice are known. At the same time, the mention of tangerines is usually included in the name of the dish as an "advertisement" of the taste: "Duck with tangerines", "Turkey escalopes in a tangerine marinade", "Red cabbage with tangerines stuffed with cloves", etc.

Aromatic citrus fruits often become components of alcoholic and non-alcoholic drinks. Combinations of tangerines in champagne with star anise and cardamom, warmed wine with tangerines and lemongrass, tangerine-banana smoothies, etc. are popular. In China, pu-erh tea is made from Xinhui fruit. To do this, the top of the fruit is first cut off, then the pulp is partially removed, and tea leaves are poured into its place, which are filled with water. Tea brewed in this way is also covered on top with a "cap" from a previously cut top, resulting in a very fragrant citrus drink.

### In cosmetology

In care cosmetics, mandarin extract is used, which is found in the compositions under synonymous names: Ext. Mandarin Orange, Mandarin Orange Fruit Extract, Citrus Nobilis Extract and others \_ It exhibits mainly antiseptic properties - as an antibacterial agent, the extract fights acne pathogens. But the functions of tangerine extract in cosmetics are not limited to this.

- **Tonic effect.** Upon contact with the skin, the extract has a cooling and astringent effect. It stimulates local blood circulation, due to which the supply of oxygen to the skin improves, the firmness and elasticity of the skin increases.
- **Anti-age.** Intensive microcirculation also provides prevention of aging - prevents the formation of fine wrinkles.
- **Whitening effect.** In this role, the extract does not act as the main component, but is often added to brightening compositions, where, together with a more effective ingredient, it controls melanin biosynthesis, inhibiting the development of hyperpigmentation.
- **Seborrhea regulation** (for oily skin). The extract from tangerine peels eliminates peeling, tightens pores, reduces the secretion of sebaceous glands, which also favorably affects the appearance of the hair.

- **perfume ingredient.** The strong and pleasant smell of mandarin is often used in relaxing aromatherapy. In shampoos and soaps, it deodorizes hair and skin.

In home cosmetologists, masks, lotions, scrubs based not only on tangerine oils, but also on the zest and pulp of fresh citrus fruits are popular.

- Refreshing fruit pulp mask. Mandarin (1 pc.) Is peeled, the pulp of the fruit is stirred into a gruel, to which honey (1/2 tsp) or sour cream is added. 2-3 times a week, such a mask is applied to the face for a quarter of an hour, after which it is washed off with water.
- Scrub mask with tangerines and flakes. Mandarin pulp gruel (1 pc.) is mixed with heavy cream (1 tsp) and crushed barley flakes (1 tbsp). The scrub is applied to the face with massage movements, and then, after 15 minutes, is removed with a napkin.
- Toning peel mask. Dried tangerine peel is ground in a coffee grinder, after which 1 tbsp. l. of this powder is thoroughly mixed with egg yolk (1 pc.) And sour cream (1 tsp). The mask is applied to the entire face, except for the eye area, for 20 minutes.
- Lip balm with essential oil. Essential oil of mandarin (10 drops), palm oil (1/2 tsp) and cocoa butter (1/3 tsp) are added to beeswax (10 g) melted in a water bath. After mixing until smooth, the balm is applied to the lips before going out in windy or frosty weather.
- Hair Mask. Juice squeezed out of 2 tangerines is mixed with mustard (1 tablespoon) and applied for 20 minutes along the entire length of the hair. Then the mixture is washed off with water and shampoo. This mask eliminates dandruff and reduces sebaceous secretions.

### **Dangerous properties of mandarin and contraindications**

In addition to the fact that mandarin, like most other citrus fruits, can cause allergic reactions, there are the following contraindications for including these fruits in your daily diet:

- Tangerines increase the level of acidity of gastric juice. For this reason, they can harm people with peptic ulcers and gastritis due to high acidity.
- As a food rich in glucose, mandarin (fruit) increases the concentration of sugar in the blood, which limits its use in diabetes.
- In the manufacture of extracts and infusions on tangerine peel, they contain a high content of naringin, which blocks some liver enzymes responsible for drug metabolism. Therefore, due to the unpredictable enhancement or prolongation of the pharmaceutical action of drugs, it is not recommended to take them simultaneously with tangerine peel extracts <sup>[13]</sup>.
- When applied topically, tangerine extract can potentially pose a risk to people with hypersensitive skin, rosacea, and rosacea. In addition, it can provoke phototoxic reactions: when ultraviolet rays hit the skin with tangerine extract applied to it, under the influence of free radicals, inflammatory processes can begin, accompanied by the death of individual cells. Therefore, in order not to reduce the resistance of cells to sunlight, it is better not to apply the extract before going out into the sun.
- Concentrated tangerine juice aggressively affects tooth enamel, so fresh juice lovers are advised to drink diluted juice through a straw.

### **Selection and storage**

When choosing the best tangerines, you should focus on the country of origin, variety, and the compliance of the characteristics of the tangerine with the varietal criteria of the selected fruits.

- **Spanish.** The appearance and taste of tangerines largely depend on the variety, but usually hybrid varieties of clementine and murcott are brought from Spain. Clementine has a flattened shape at the "poles", a bright orange color and a delicate smell. The variety is sweet, although

not as sweet as murcott. Also, unlike murtotta, clementine is more juicy. Murcott is distinguished by its smaller size, dense partitions and a large number of small bones. Both varieties are very popular with consumers. Often, buyers, if they do not receive information about the variety and exporting country from the seller, look for small stickers on the peel. It is widely believed that on Spanish tangerines such stickers can be found on most fruits.

- **Abkhaz.** These tangerines, with their 70% mass fraction of juice, are considered the most juicy, and therefore are best suited for making fresh juices. They appear on sale only by the beginning of December, and until that time, under the guise of Abkhazian, they sell either Moroccan clementines or Turkish tangerines with green streaks visible on the peel. Abkhazian citrus are characterized by a bumpy matte peel, a persistent aroma that can be felt even in unpeeled fruits, and a minimum number of seeds.
- **Moroccan.** Another popular hybrid variety nadorcott is brought from Morocco more often than others. When fully ripe, the fruits of this variety are quite sweet (the sugar level reaches 11-14%), but they are not always ripe, and compared to clementine and murcott with a moderate acid content (up to 1.4%), they may seem more sour. The usually smooth (with sufficient moisture) reddish-orange peel of ripe fruits separates easily from the pulp. The fruits themselves are spherical, 5.5-6 cm in diameter. If the manufacturer managed to save tangerine trees from cross-pollination, then the fruits are obtained without seeds. The same variety is most often exported from South Africa.
- **Turkish.** As in previous cases, it all depends on the variety, but usually on the shelves are tangerines with a pale orange (or greenish-yellowish) thin and smooth peel. They have a slight acidity, moderate sweetness and juiciness, and are usually the lowest priced.

When buying tangerines, one should also not forget about the general rules for choosing any vegetables and fruits: there should be no dark spots and mold on the fruits, soft “failures” of rotting that have begun, the integrity of the peel should not be broken, and healed superficial cuts are also not allowed. Tangerines should look healthy overall, but slight abrasions or superficial scratches do not affect the taste and quality of the fruit. In addition, the shiny surface indicates, rather, not about the health of the fetus, but about the processing of the peel with protective wax by the supplier.

The freshness of tangerines is determined, first of all, by the density of the peel. In despised or stale fruits, it lags behind, and in fresh and timely harvested fruits, it adheres tightly to the fruit. At the same time, the presence of green leaves on the stalk is not considered an indicator of freshness. Leaves of tangerine trees may not fade for a long time, only drying out over time. However, a popular opinion among consumers is that citrus fruits with stalks are better stored, since this ensures the integrity of the peel at the attachment point.

Tangerines brought home from the store are rarely stored for a long time, and within a week they can be stored without creating special conditions at room temperature. If, nevertheless, it is necessary to make stocks for a longer period (up to a month), the fruits are put in a container that provides air circulation and removal of excess moisture (for example, a box made of perforated cardboard), and placed in a refrigerator or cellar with a temperature in the range of +4 -8°C and humidity of about 80%. Low humidity levels cause the fruit to dry out, and excess moisture in a tightly sealed plastic bag can cause rotting.

Some lovers of tangerines do not stock up for food, but then, during the year, use the fruit in traditional medicine recipes. But it must be borne in mind that the longer the citrus lies, the more useful properties it loses. So, for example, the concentration of oil in the peel of a tangerine after 4 months of storage is reduced by an average of 35%.

### How to grow a tangerine from a seed at home

To grow a tangerine tree from a stone at home, you need to be patient and be prepared for unexpected results. Without human help, a mandarin may never bloom or bear fruit at all, remaining an ornamental plant. But if the fruits do set and grow, their taste and size will most likely differ from the fruit from which the stone was taken, and not always for the worse.

To speed up the growing process, for planting they try to choose seeds of hybrid varieties that germinate faster and bear fruit more often. Seeds are selected "chubby" (not dried), without blackening on the "nose". It is advisable to plant several (5-10) seeds at once, in order to then select the strongest sprouts. It is important, after removing the stone from the pulp, immediately put it in the soil at an approximate depth of 3-4 cm.

The soil will need not acidic with pH = 6.5-7 - without peat content. With self-preparation of the soil, the soil from under deciduous plants is mixed, rotted humus and sown sand in a ratio of 2: 2: 1.

You can even plant a bone in an ordinary plastic cup, in which a drainage hole has been made. Sometimes germination is practiced in a damp cloth (gauze), which is placed on a saucer in a warm place, out of direct sunlight.

Above the soil surface, tangerine sprouts may appear after 2 weeks, and after a month. However, they will germinate provided that they are regularly moistened and maintained in a temperature range of 20-25 ° C of the environment. It is not recommended to create greenhouse conditions with a higher temperature, because the plant will have to get used to room conditions again, which complicates care.

If two sprouts appear from one tangerine seed, then either they are planted (with a separate root system), or the weaker one is pinned. The first transplantation of sprouts is carried out at the stage of the appearance of four leaves. The second - when the roots fill the entire volume of the cup (they do not immediately transfer it to a spacious pot to avoid the risk of waterlogging). Subsequent transplants of barren plants are carried out annually, and fruit-bearing plants - once every 2 or 3 years. During the fruiting period, the mandarin grown from the stone enters the 5-6th year.

In our country, mandarin has been and remains the main New Year and Christmas fruit, which, with its smell alone, can create a festive mood. But, besides this, as we now know, the aroma of this citrus helps relieve anxiety and muffle pain, and the fruits ensure the normal functioning of the digestive tract, which makes mandarin useful not only during the New Year celebrations.

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[An extended HTML version of the article](#) is available on the edaplus.info website.

### **Mandarin - useful properties, composition and contraindications**

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**Abstract.** The article discusses the main properties of mandarin 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 fruit are indicated, the use of mandarin in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of mandarin on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application.





## Vitamin B9 - description, benefits, effects on the body and best sources

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Folic acid is a water-soluble B vitamin. It is also known as **folate** and vitamin **B-9**. Plays an important role in the process of cell division and creation in some organs and bone marrow. A key function of folic acid is also to help form the spinal cord and nervous system of the fetus in the womb. Like other B vitamins, folic acid promotes energy production in the body.

In our body, coenzymes of vitamin B9 (folate) interact with one-carbon units in a variety of reactions that are vital for the metabolism of nucleic and amino acids. Folate is needed to maintain the vital activity of all cells.

The terms folate, folic acid, and vitamin B9 are often used interchangeably. While folate is present in both food and the human body in a metabolically active form, folic acid is often consumed in vitamin supplements and fortified foods.

**Keywords:** vitamin B9, vitamin B 9, benefits, harms, beneficial properties, contraindications

**Other names:** *folic acid, folacin, folate, pteroylglutamic acid, vitamin B9, vitamin Bc, vitamin M.*

**Chemical formula:**  $C_{19}H_{19}N_7O_6$

Foods with the highest folic acid content <sup>[6]</sup>

Product	Content, Dietary Folate Equivalent per 100g
Turkey liver	677
Chickpeas, raw	557
Edamame beans, frozen	303
beef liver	290
Wheat germ	281
Peanut	240
Sunflower seeds	237
Spinach, fresh	194

turnip tops	194
Lentils, cooked	181
Asparagus, cooked	149
Romaine lettuce	136
Pinto beans	118
Beets, raw	109
Walnut	98
Rucola	97
Flaxseeds	87
Avocado	81
Broccoli	63
curly cabbage	62
Brussels sprouts	61
Cauliflower	57
Red beans, cooked	47
Chicken egg	47
Almond	44
White cabbage	43
Mango	43
Corn	42
Papaya	37
Celery	36
Orange	thirty
Kiwi	25
Strawberry	24
Raspberry	21
Banana	twenty
Carrot	19
honey melon	19
Kohlrabi	16
Tomato	fifteen
Potato	fifteen
Grapefruit	13
Lemon	eleven
Bell pepper	ten

See also [Top 100 Natural Sources of Vitamin B9](#).

### Daily requirement for vitamin B9

In order to establish the daily intake of vitamin B9, the so-called " *dietary folate equivalent* " (in English - DFE) was introduced. The reason for this was the better absorption of synthetic folic acid, compared with natural folate obtained from food. PFE is calculated as follows:

- 1 microgram of food folate equals 1 microgram of PFE
- 1 microgram of folic acid taken with food or from foods fortified with it equals 1.7 micrograms of PFE

- 1 microgram of folic acid (a synthetic dietary supplement) taken on an empty stomach equals 2 micrograms of PFE.

For example : from a meal containing 60 micrograms of natural folate, the body receives 60 micrograms of a Dietary Equivalent. From a serving of pasta fortified with 60 micrograms of synthetic folic acid, we get  $60 \times 1.7 = 102$  micrograms of a Food Equivalent. And one 400 mcg folic acid tablet will give us 800 mcg of a Dietary Equivalent.

In 2015, the European Scientific Committee on Nutrition established the following daily intake of vitamin B9:

Age	Recommended Amount Men (mcg Dietary Folate Equivalent/day)	Recommended Amount Women (mcg Dietary Folate Equivalent/day/day)
7-11 months	80 mcg	80 mcg
1-3 years	120 mcg	120 mcg
4-6 years old	140 mcg	140 mcg
7-10 years old	200 mcg	200 mcg
11-14 years old	270 mcg	270 mcg
15 years and older	330 mcg	330 mcg
Pregnancy		600 mcg
lactating		500 mcg

Due to the fact that vitamin B9 plays a very important role in pregnancy, the daily requirement for pregnant women is many times higher than the usual daily requirement. However, the formation of the neural tube of the embryo often occurs before a woman knows she is pregnant, and it is at this point that folic acid can play a critical role. For this reason, some experts recommend regularly taking courses of vitamins, which include 400 micrograms of folic acid. It is believed that even when taking such a dose and eating foods containing folate, it is almost impossible to exceed the maximum safe amount of vitamin B9 per day - 1000 mcg <sup>[1]</sup>.

### Increasing the body's need for vitamin B9

Generally, serious B9 deficiency in the body is rare, however, some populations may be at risk of deficiency. These groups are:

- **people with alcohol dependence** : alcohol disrupts the metabolism of folate in the body and accelerates its breakdown. In addition, people suffering from alcoholism are often malnourished and do not get enough vitamin B9 from food.
- **Women of childbearing age** : Women of childbearing potential should take enough folic acid to avoid developing a neural tube defect in the early stages of pregnancy.
- **pregnant women** : during pregnancy, vitamin B9 plays an important role in nucleic acid synthesis.
- **people with poor digestibility of food** : diseases such as dengue fever, celiac disease and irritable bowel syndrome, gastritis can interfere with the absorption of folate <sup>[6]</sup>.

### Chemical and physical properties

Folic acid is a yellow crystalline substance, slightly soluble in water, but insoluble in fatty solvents. Resistant to heat only in alkaline or neutral solutions. Destroys under the influence of sunlight. Almost or completely odorless <sup>[7]</sup>.

### Structure and forms

Dietary folate exists predominantly in the polyglutamyl form (containing a few glutamate residues), while folic acid, the synthetic vitamin form, is a monoglutamate containing only one glutamate moiety. In addition, natural folates are molecules with a reduced molecular weight, while folic acid is completely oxidized. These chemical differences have significant implications for vitamin bioavailability, with folate being significantly more bioavailable than naturally occurring dietary folate at equivalent intake levels <sup>[8]</sup>.

The folic acid molecule consists of 3 units: glutamic acid, p-aminobenzoic acid and pterin. The molecular formula is  $C_{19}H_{19}N_7O_6$ . The various B9 vitamins differ from each other in the number of glutamic acid groups present. For example, folic acid contains one Lactobacillus casei fermentation factor three and Bc conjugate-7 glutamic acid groups. Conjugates (i.e., compounds having more than one glutamic acid group in the molecule) are not effective in some species because these species do not have the enzyme needed to release the free vitamin <sup>[7]</sup>.

### Useful properties and effects on the body

#### The benefits of vitamin B9 for the body:

- affects the course of a healthy pregnancy and the proper development of the fetus: folic acid prevents the development of defects in the nervous system of the fetus, underweight, premature birth, and this occurs in the very early stages of pregnancy.
- antidepressant: folic acid is believed to help manage depression and improve emotional well-being.
- helps in protein metabolism.
- Acne Treatment: Vitamin B9 is considered a powerful antioxidant that helps detoxify the body and improve skin condition.
- maintaining heart health: folic acid intake reduces blood levels of homocysteine, an increased amount of which can lead to the risk of cardiovascular disease. In addition, the vitamin B complex, which includes folic acid, reduces the risk of stroke.
- Reducing the risk of cancer: there is evidence that insufficient folic acid intake is associated with the development of breast cancer in women.

### Folic acid metabolism in the body

Folate functions as a coenzyme in nucleic acid synthesis and amino acid metabolism. Once ingested, dietary folates are hydrolyzed to the monoglutamate form in the intestine before they are absorbed through the mucosa by active transport substances. Before entering the bloodstream, the monoglutamate form is reduced to tetrahydrofolate (THF) and converted to the methyl or formyl form <sup>[1]</sup>. The main form of folate in plasma is 5-methyl-THF. Folic acid can also be detected in the blood unchanged (unmetabolized folic acid), but it is not known whether this form has any biological activity <sup>[8]</sup>.

In order for folate and its coenzymes to cross cell membranes, special transporters are required. They include the reduced folate transporter (RFC), the proton-coupled folate transporter (PCFT), and the folate receptor proteins, FR $\alpha$  and FR $\beta$ . Folate homeostasis is maintained by the ubiquity of folate transporters, although their number and importance varies in different body tissues. PCFT plays an

important role in folate translocation because mutations affecting the gene encoding PCFT cause hereditary folate malabsorption. Defective PCFT also leads to impaired folate transport to the brain. FR $\alpha$  and RFC are also critical for folate transport across the barrier between the circulatory system and the central nervous system. Folate is essential for the proper development of the embryo and fetus. It is known that the placenta is responsible for the entry of folate into the fetus, resulting in higher folate concentrations in the baby than in the mother. All three receptor types are associated with transport of folate across the placenta during pregnancy <sup>[6]</sup>.

### Interaction with other trace elements

Folate and vitamin B12 together form one of the most powerful micronutrient pairings. Their interaction supports some of the most fundamental processes of cell division and replication. In addition, they together participate in the metabolism of homocysteine. Although these two vitamins can be obtained naturally from two completely different types of foods (vitamin B12 from animal products: meat, liver, eggs, milk, and vitamin B9 from leafy vegetables, beans), their relationship is very important to the body. They act as cofactors in the synthesis of methionine from homocysteine. If synthesis does not occur, then the level of homocysteine may be elevated, which is often associated with the risk of developing cardiovascular diseases and stroke <sup>[9]</sup>.

An important metabolic interaction in vitamin B9 occurs with riboflavin (vitamin B2). The latter is the precursor of a coenzyme involved in folate metabolism. It converts folate to its active form, 5-methyltetrahydrofolate.

Vitamin C may limit the degradation of natural folate coenzymes and supplemental folic acid in the stomach and thus improve folate bioavailability <sup>[8]</sup>.

### The most useful food combinations with vitamin B9

Vitamin B9 is useful to combine with other B vitamins.

For example, in a salad with kale, sunflower seeds, feta, barley, red onion, chickpeas, avocado and lemon dressing. Such a salad will provide the body with vitamins B3, B6, B7, B2, B12, B5, B9.

A great recipe for breakfast or a light lunch is a sandwich made from whole grain bread, smoked salmon, asparagus and poached eggs. This dish contains vitamins such as B3 and B12, B2, B1 and B9.

Food is the best source of vitamins. Therefore, the possibility of taking vitamins in the form of medicines should be considered if there are appropriate indications. There is evidence that vitamin preparations, if used incorrectly, not only do not benefit, but can also harm the body.

### Application in official medicine

- Pregnancy

Folic acid is used in medicine for many reasons. First of all, it is prescribed to pregnant women and those who are preparing for conception. The growth and development of the fetus is characterized by active cell division. Adequate folate levels are critical for DNA and RNA synthesis. Due to a lack of folic acid, between the 21st and 27th days after conception, a disease called *neural tube defect can develop*. As a rule, during this period, the woman does not yet know that she is pregnant, and cannot take appropriate measures by increasing the amount of folate in the diet. This disease leads to a number of undesirable consequences for the fetus - brain damage, encephalocele, spinal lesions.

Congenital heart anomalies are the leading cause of childhood death and can also lead to death in adulthood. According to the European Registry of Congenital Anomalies and Twins, consumption of at least 400 micrograms of folic acid per day one month before conception and for 8 weeks after conception reduced the risk of congenital heart defects by 18 percent.

Maternal folate levels may affect the risk of congenital cleft palate anomalies. A study in Norway showed that taking vitamin supplements with at least 400 micrograms of folic acid reduced the risk of cleft palate by 64%.

Low birth weight is associated with an increased risk of mortality during the first year of life and may also affect health status in adulthood. A recent systematic review and meta-analysis of eight controlled studies found a positive association between folic acid intake and birth weight.

Elevated blood levels of homocysteine have also been associated with increased rates of miscarriage and other pregnancy complications, including preeclampsia and placental abruption. A large retrospective study showed that plasma homocysteine levels in women directly affected the presence of adverse pregnancy outcomes and complications, including preeclampsia, preterm birth, and very low birth weight. The regulation of homocysteine, in turn, occurs with the participation of folic acid.

Thus, it is wise to take folic acid, under medical supervision, throughout pregnancy, even after neural tube closure, to reduce the risk of other problems during pregnancy. Moreover, recent studies have found no evidence of an association between folate intake during pregnancy and adverse health outcomes in children, such as asthma and allergies.

- Cardiovascular diseases

More than 80 studies show that even moderately elevated blood levels of homocysteine increase the risk of cardiovascular disease. The mechanism by which homocysteine may increase the risk of developing vascular disease is still the subject of much research, but may include adverse effects of homocysteine on blood clotting, arterial vasodilation, and arterial wall thickening. Folate-rich diets have been associated with a reduced risk of cardiovascular disease, including coronary heart disease, myocardial infarction (heart attack), and stroke. A 10-year study of 1,980 men in Finland found that those who consumed the highest amount of dietary folate had a 55% lower risk of sudden heart disease compared to those who consumed the least amount of folate. Of the three B vitamins that regulate homocysteine levels, folic acid has been shown to have the greatest effect on lowering basal levels, provided there is no concomitant vitamin B12 or vitamin B6 deficiency. Increasing folate intake through folate-rich foods or supplements has been found to decrease homocysteine levels.

Despite controversy regarding the role of lowering homocysteine in the prevention of cardiovascular disease, some studies have examined the effect of folic acid supplementation on the development of atherosclerosis, a known risk factor for vascular disease. Although recent trials have not shown that folic acid directly protects the heart, low folate intake is a known risk factor for cardiovascular disease.

- Cancer diseases

Cancer is thought to be caused by damage to the DNA, either from excessive DNA repair processes or from mis-expression of key genes. Due to the important role of folate in DNA and RNA synthesis, it is possible that insufficient vitamin B9 intake contributes to genomic instability and chromosomal defects that are often associated with cancer development. In particular, DNA replication and repair are critical for maintaining the genome, and nucleotide shortages caused by folate deficiency can lead to genomic instability and DNA mutations. Folate also controls the cycle of homocysteine/methionine and S-adenosylmethionine, a methyl donor for methylation reactions. Thus, folate deficiency can

impair DNA and protein methylation and alter the expression of genes involved in DNA repair, cell division, and cell death. Global DNA hypomethylation, a typical hallmark of cancer, causes genomic instability and chromosomal fractures.

Eating at least five servings of fruits and vegetables a day is currently associated with a reduced incidence of cancer. Fruits and vegetables are excellent sources of folic acid, which may play a role in their anti-carcinogenic effect.

- Alzheimer's disease and dementia

Alzheimer's disease is the most common form of dementia. One study found an association between increased intake of folate-rich fruits and vegetables and a reduced risk of dementia in women.

Through its role in nucleic acid synthesis and providing enough methyl for methylation reactions, folate affects normal brain development and function not only during pregnancy and after birth, but also later in life. In one cross-sectional study of older women, patients with Alzheimer's disease had significantly higher homocysteine levels and lower blood folic acid concentrations than healthy individuals. In addition, the scientists concluded that the prevention of dementia is influenced by long-term blood levels of folate, and not recent folate use. A two-year, randomized, placebo-controlled trial in 168 elderly patients with mild cognitive impairment found benefits from daily intake of 800 mcg folic acid, 500 mcg vitamin B12, and 20 mg vitamin B6. Atrophy of certain areas of the brain affected by Alzheimer's disease was observed in individuals of both groups, and this atrophy correlated with cognitive decline; however, the group treated with B vitamins experienced less gray matter loss compared to the placebo group (0.5% vs. 3.7%). The most beneficial effect was found in patients with higher baseline homocysteine concentrations, suggesting the importance of lowering circulating homocysteine in the prevention of cognitive decline and dementia. Although encouraging, B-vitamin supplementation needs to be further explored in larger studies that evaluate long-term outcomes such as the incidence of Alzheimer's disease <sup>[8]</sup>.

- Depression

Low folate levels are associated with depression and poor response to antidepressants. In a recent study of 2,988 people aged 1 to 39 years in the United States, serum and red blood cell folic acid concentrations were significantly lower in those with severe depression than in those who had never been depressed. A study of 52 men and women diagnosed with a depressive disorder showed that only 1 of 14 patients with low folate levels responded to antidepressant treatment, compared with 17 of 38 patients with normal folate levels.

Although folic acid supplementation has not been suggested as a replacement for conventional antidepressant therapy, it may be useful as an adjunct. In a UK study, 127 depressed patients were chosen to take either 500 micrograms of folic acid or a placebo in addition to 20 mg of fluoxetine (an antidepressant) daily for 10 weeks. Although the effects in men were not statistically significant, women who received fluoxetine plus folic acid fared much better than those who received fluoxetine plus placebo. The authors of the study concluded that folate "may have a potential role as an adjunct to mainstream depression treatment" <sup>[6]</sup>.

### **Dosage forms of vitamin B9**

The most common dosage form of folic acid is tablets. The dosage of the vitamin may be different, depending on the purpose of the drug. In prenatal vitamins, the most common dosage is 400 mcg, since this amount is considered sufficient for the healthy development of the fetus. Often, folic acid is

included in vitamin complexes, along with other B vitamins. Such complexes can be in the form of tablets, as well as in the form of chewable plates, soluble tablets, and injections.

To lower the level of homocysteine in the blood, 200 mcg to 15 mg of folic acid per day is usually prescribed. In the treatment of depression, take 200 to 500 mcg of the vitamin per day, in addition to the main treatment. Any dosage must be prescribed by the attending physician <sup>[10]</sup>.

### **Folic acid in folk medicine**

Traditional healers, as well as doctors in traditional medicine, recognize the importance of folic acid for women, especially pregnant women, as well as its role in preventing heart disease and anemia.

Folic acid is found, for example, in strawberries. Its fruits are recommended for diseases of the kidneys, liver, blood vessels and heart. In addition to folate, strawberries are also rich in tannins, potassium, iron, phosphorus, and cobalt. For medicinal purposes, fruits, leaves and roots are used <sup>[11]</sup>.

Folate, along with essential oils, vitamin C, carotene, flavonoids, and tocopherol, is found in parsley seeds. The plant itself has a bile and diuretic effect, relieves spasms and cleanses the body. Infusion and decoction of seeds helps with swelling, inflammation of the mucous membrane of the urinary tract. In addition, parsley infusion is prescribed for uterine bleeding <sup>[12]</sup>.

Grapes are considered a rich source of folic acid in folk medicine. They contain from 65 to 85 percent of water, from 10 to 33 percent of sugar, and a large number of useful substances - various acids, tannins, potassium, magnesium, calcium, manganese, cobalt, iron, vitamins B1, B2, B6, B9, A, C, K, P, PP, enzymes <sup>[13]</sup>.

### **Latest Scientific Research on Vitamin B9**

- The use of high doses of folic acid does not affect the risk of developing preeclampsia. It is a serious illness characterized by the development of abnormally high blood pressure during pregnancy and other complications. This condition is dangerous for both mother and child. It has previously been suggested that high doses of folate may reduce the risk of developing it in women who are predisposed to the disease. These include those who have high blood pressure chronically; women with diabetes or obesity; pregnant with twins; as well as those who have had preeclampsia in previous pregnancies. The study involved more than 2 thousand women pregnant for a period of 8 to 16 weeks. It was found that taking 4 mg of folic acid daily did not affect the risk of developing the disease compared with those who took placebo in addition to the standard 1 mg of folate (14.8% of cases and 13.5% of cases, respectively). However, physicians still recommend taking a low dose of folic acid before and during pregnancy to prevent the development of congenital diseases <sup>[15]</sup>.
- Irish scientists have determined that a significant number of people over the age of 50 are deficient in vitamin B12 (1 in 8 people) and folic acid (1 in 7 people). The degree of deficiency varies depending on lifestyle, health status and nutrition. Both vitamins are essential for the health of the nervous system, brain, red blood cell production, and DNA division. It has also been found that the percentage of folic acid deficiency increases with age - from 14% among 50-60 year olds to 23% in those over 80 years of age. It was most common in smokers, obese people, and those who lived alone. Vitamin B12 deficiency was more common in those who smoke (14%), live alone (14.3%) and people from low socioeconomic backgrounds <sup>[16]</sup>.
- British scientists insist on the general enrichment of flour and other products with folic acid. According to the authors of the study, every day in Britain, on average, two women are forced to terminate a pregnancy due to a neural tube defect, and every week two children are born affected by this disease. Britain is one of the countries where food fortification with folic acid



is not the norm, unlike the US and other countries. “If the UK had legalized folate fortification in 1998, as it did in America, about 3,000 birth defects could have been avoided by 2007,” states Professor Joan Morris <sup>[14]</sup>.

### **Use in cosmetology**

Folic acid plays a very important role in maintaining the natural beauty of the skin. It contains a concentration of antioxidants that reduce the activity of oxidative processes and neutralize free radicals present in the environment. The skin-care properties of folic acid also help maintain skin hydration by strengthening the skin barrier. This retains moisture and reduces dryness.

In cosmetics, folic acid products are most commonly included in moisturizing lotions and creams, which when applied topically can help improve overall skin quality and appearance.

### **Use in animal husbandry**

Folic acid deficiency has been experimentally detected in many animal species, manifesting itself as anemia with a decrease in the number of leukocytes. Tissues with a high rate of cell growth or tissue regeneration are mainly affected, such as the epithelial lining of the gastrointestinal tract, the epidermis, and the bone marrow. In dogs and cats, anemia is most commonly associated with folic acid deficiency caused by intestinal malabsorption syndromes, malnutrition, folic acid antagonists, or increased folic acid requirements due to blood loss or hemolysis. For some animals, such as chickens, guinea pigs, monkeys and pigs, having enough folic acid in the diet is essential. In other animals, including dogs, cats, and rats, folic acid produced by the gut microflora is usually sufficient to meet requirements. Therefore, signs of deficiency may develop if an intestinal antiseptic is also included in the diet to inhibit bacterial growth. Folic acid deficiency occurs in dogs and cats usually only when antibiotics are taken. It is likely that most of the daily requirement for folic acid is met by bacterial synthesis in the gut.

### **Contraindications and warnings**

About 50-95% of folic acid is destroyed during cooking and preservation. Exposure to sunlight and air is also detrimental to folate. Foods high in folic acid should be stored in a dark vacuum container at room temperature <sup>[18]</sup>.

### **Signs of a folic acid deficiency**

Deficiency of folic acid alone is rare, usually associated with other nutrient deficiencies due to malnutrition, alcoholism, or absorption disorders. Symptoms typically include weakness, trouble concentrating, irritability, heart palpitations, and shortness of breath. In addition, there may be pain and ulcers on the tongue; problems with skin, hair, nails; problems in the gastrointestinal tract; elevated levels of homocysteine in the blood <sup>[6]</sup>.

### **Signs of excess vitamin B9**

As a rule, excessive consumption of folic acid does not carry side effects. In rare cases, very high doses of folate can harm the kidneys and cause loss of appetite. Taking large amounts of vitamin B9 can mask a vitamin B12 deficiency. The established maximum daily intake of folate for an adult is 1 mg <sup>[1]</sup>.

Some medicines affect the absorption of vitamin B9 in the body, among them:

- oral contraceptives;
- methotrexate (used in the treatment of cancer and autoimmune diseases);
- antiepileptic drugs (phenytoin, carbamazepine, valproate);
- sulfasalazine (used to treat ulcerative colitis) <sup>[6]</sup>.

## Discovery history

Folate and its biochemical role were first discovered by British researcher Lucy Wills in 1931. In the second half of the 1920s, active research was carried out on the nature of pernicious anemia and methods of its treatment - thus vitamin B12 was discovered. Dr. Wills, however, decided to focus on the narrower subject of anemia in pregnant women. She was criticized for such a narrow approach, but the doctor did not stop trying to find the cause of the severe anemia that pregnant women in the British colonies suffered from. Studies on rats did not bring the desired results, so Dr. Wills decided to conduct an experiment on primates.

After trying many substances, and rejecting all possible hypotheses by elimination, in the end, the researcher decided to try using cheap brewer's yeast. And finally got the desired effect! She determined that the nutrient found in yeast is essential to prevent anemia during pregnancy. Some time later, Dr. Wills included in her study attempts to use various substances by pregnant women, and brewer's yeast again gave the desired result. In 1941, folic acid derived from spinach was named and isolated for the first time. That is why the name folate comes from the Latin folium - leaf. And in 1943, the vitamin was obtained in pure crystalline form.

Since 1978, folic acid has been used in combination with the anticancer drug 5-fluorouracil. First synthesized in 1957 by Dr. Charles Heidelberger, 5-FU has become an effective drug against certain types of cancer, but has had severe side effects. Two students of the doctor discovered that folic acid can significantly reduce them, while at the same time increasing the effectiveness of the drug itself.

In the 1960s, scientists began to investigate the role of folic acid in preventing neural tube defects in the embryo. It was found that vitamin B9 deficiency can have very serious consequences for the child, and also that usually a woman does not get enough of the substance from food. Therefore, in many countries it was decided to enrich foods with folic acid. In America, for example, folate is added to many grain products - bread, flour, cornstarch, pasta and noodles - as they are staple foods for most of the population. Thanks to this, the number of cases of neural tube defects has been reduced by 15-50% in the United States. <sup>[2-4]</sup>.

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### **Vitamin B9 - useful properties, composition and contraindications**

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**Abstract.** The article discusses the main properties of vitamin B9 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 vitamin B9 are indicated . The use of vitamin a in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of vitamin B9 on the human body under certain medical conditions and diseases are analyzed separately.