Blueberry (lat . Vaccínium uliginosum)

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

Keywords: blueberries, benefits, harm, beneficial properties, contraindications

Beneficial features

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

Main substances (g / 100 g):	**Fresh blueberries [1]**
Water	84.21
Carbohydrates	14.49
Sugar	9.96
Alimentary fiber	2.4
Squirrels	0.74
Fats	0.33
Calories (kcal)	57
Minerals (mg/100 g):	
Potassium	77
Phosphorus	12
Magnesium	6
Calcium	6
Sodium	one
Iron	0.28
Zinc	0.16
Copper	0.057

Vitamins (mg/100 g):	
Vitamin C	9.7
Vitamin E	0.57
Vitamin PP	0.418
Vitamin B6	0.052
Vitamin B2	0.041
Vitamin B1	0.037

The composition of blueberries is characterized by a high content of vitamins C, K, E (about 30%, 16% and 14% of the daily intake, respectively). According to the content of minerals, blueberries are not among the champions, but fruits contain iron, zinc, magnesium, potassium, phosphorus, etc. in moderation.

The composition of the berries also includes pectin (up to 0.6%), organic acids (up to 2.7%), fiber (1.5-2%), sugars (8-10% by the time of collection). Moreover, in the cultivated northern tall blueberries, there are about two times more sugars than in the wild. And this figure can still be significantly increased if the fruits are “held” on the bush for 4-6 days after staining.

In 100 grams of fresh blueberries, up to 3500 mg of anthocyanins and leukoanthocyanins, up to 200 mg of flavonols, about 270 mg of catechins, 300-340 mg of triterpene and 150-300 mg of chlorogenic acids were found.

The amount of a number of substances that cause the healing effects of blueberries varies greatly depending on the species (varietal) and cultivation methods. For example, the cultivated tall blueberry had, on average, almost two times less organic acids than the swamp berry. When comparing the content of chlorogenic acid, flavonol, anthocyanin in the varieties O'Neal, Bluecrop, Bluejay, Brigitta, significantly higher levels of anthocyanidins were recorded than in other varieties. But in organically grown blueberries, there was very little anthocyanidin, but there was a lot of flavonol and chlorogenic acid. [2]

Also, in determining the phenolic, flavonoid, anthocyanin and antioxidant enzymatic activity of the pulp and skin of berries, the stage of fruit development is essential. When comparing data on 5 stages of the development of tall blueberries (from the "green" stage to the "blue"), it was found that most of the polyphenol oxidase (an enzyme of the oxidative system) was contained in green berries, catalase (an enzyme-catalyst for the decomposition of hydrogen peroxide) - in red, superoxide dismutase (another antioxidant enzyme) in blue. Although, in general, the more ripe the blueberry was, the higher the activity of antioxidant enzymes it showed. [3]

Medicinal properties

If we consider blueberries as a set of valuable biologically active substances, then we can predict various pharmacological effects associated with eating it:

- Phytoestrogens (plant hormones) of blueberries protect against heart and vascular diseases (reduce "bad" cholesterol, delay the development of atherosclerosis).
- Caffeic and chlorogenic acids have a capillary-strengthening, urinary and choleretic effect.
- Folic and ellagic acids prevent the appearance of neoplasms.
- Bioflavonoids contribute to the normalization of the activity of the thyroid gland and some other endocrine glands.
- Betaine from blueberries exhibits anti-ulcer properties. In addition, betaine is known as an appetite stimulant and as an atherosclerotic and lipotropic substance that can remove fats and toxic decay products from the liver.

- Pectins prevent damage to body tissues by heavy metals and radioactive elements.
- Vegetable fibers improve the functioning of the digestive tract.

Despite the great potential of the berry, not much is known today about the medicinal properties of blueberries, reliably confirmed by peer-reviewed scientific studies, although work on its study is being carried out by specialists from all over the world.

There is evidence that due to the use of the fruit extract of some species of this plant, insulin resistance is "corrected". A recently published study of blueberry supplementation in mice reported an improvement in glucose tolerance. Potentially, these properties of blueberries could be used, for example, in the treatment of diabetes in humans, but most of the effects are still recorded in laboratory experiments. True, the media reported that the Center for Human Nutrition Research in Beltsville (Maryland) at the US Department of Agriculture, as part of a clinical study, tested the effect of blueberry powder on insulin sensitivity in patients. However, the results have not yet been reported.

However, some of the medicinal properties of blueberries are already being confirmed in human studies. For example, many have known from childhood "from the elders" that blueberries have a beneficial effect on visual function. And although folk ideas often mythologize the product, attributing unconfirmed properties to it, this time the scientific data, in general, confirm the current image.

So, Chinese scientists have found that the tablet intake of blueberry extracts can reduce visual discomfort and relieve eye fatigue that occurs while working on a computer. Also, the study of the effect of blueberries on human visual function was carried out in the USA, New Zealand, Italy, Spain, France and other countries.

In Japan, for example, scientists divided 26 people into 2 groups, one of which was given 125 mg of blueberry extract daily for 28 days. During the entire experiment, with the help of frequent flashes of light, the rate of onset of eye fatigue and the degree of visual impairment were verified in the subjects. It turned out that the representatives of the group that received the berry supplement got tired more slowly, and the deterioration in their vision was less pronounced. The same results were obtained by Japanese scientists when they swapped the representatives of the groups and duplicated the experiment again. Not surprisingly, it has now become a popular practice among the Japanese to protect their eyes from monitor radiation by prophylactic use of blueberry juice or vitamin products containing blueberry concentrate.

Other scientists (albeit again only in laboratory experiments) have found that blueberry polyphenol-enriched fractions reduce retinal damage caused by blue light in cell culture and mice experiments. According to scientists, such polyphenolic fractions in the future can serve as a therapeutic agent in the fight against age-related macular degeneration. [four]

Also in the future, blueberries may be able to help in the treatment of cancer. Chinese scientists have found that blueberry extract reduces viability, and also affects the cyclic progression and membrane permeability of grown Hep-G2 (human hepatocellular carcinoma cell line), Caco-2 (human colorectal adenocarcinoma cell line) and 3T3-L1 (non-malignant mouse cells).).

Another group of researchers independently concluded that anthocyanins extracted from blueberries could be a promising therapeutic tool for suppressing human colorectal cancer (anti-inflammatory activity has been documented in experiments on human colon and rectal cancer cells) [5] . Also, already in animal experiments, blueberries inhibited the development of esophageal cancer, estrogen-induced breast cancer and prevented DNA damage.

While evidence for blueberry's cancer-fighting benefits remains limited, the American Institute for Cancer Research has included the blueberry on its list of cancer-fighting foods.

Highbush blueberry extracts can potentially have a preventive and therapeutic effect against ulcerative colitis by regulating oxidative processes and suppressing the expression of inflammatory mediators (these effects were found in experiments on mice). [6]

There is evidence that **blueberries are good for the cardiovascular system.** So, in one study, taking a dried blueberry mixture for six months, equivalent to 150 grams of a berry per day, provided a 12-15 percent reduction in the risk of cardiovascular pathologies in people with metabolic syndrome, improved endothelial function (a layer of cells on the inner surface of blood vessels) and reduced arterial stiffness [7] . In another 8-week clinical study, 48 postmenopausal women in the early stages of hypertension were given a powdered blueberry extract equivalent to a cup of berries a day. As a result, in patients, the upper pressure decreased by an average of 5.1%, and the lower one by 6.3% (compared to the placebo group).

Blueberries also improve brain function. Because blueberry anthocyanins are able to cross the blood-brain barrier, they can reduce vulnerability to oxidative stress that occurs with aging, reduce inflammation, and increase signaling between neurons. According to Barbara Shukitt-Hale of the Tufts HNRCA Neurology and Aging Laboratory, “A growing body of preclinical and clinical research has identified neurological benefits associated with berry consumption; In addition to their now well-known antioxidant effects, berry supplements also have a direct effect on the brain.”

In one large study, conducted on 16,000 women over 70, they were asked to eat half a cup of blueberries or strawberries 1-2 times a week. According to scientists, this slowed down the rate of brain aging by about 1.5-2 years.

In an animal experiment, scientists found that adding blueberries to the diet improved short-term memory, navigational skills, balance, and coordination. It is assumed that the active substances contained in blueberries are likely to “force” aging neurons to communicate effectively again. [eight]

Medicinal properties are possessed not only by berries, but also by other parts of the plant. For example, flavonoids of tall blueberry leaves exhibit a pronounced immunomodulatory effect. Ethanol extracts significantly reduce the levels of tumor necrosis factor in the cellular material, normalize (by reducing expression) the regulation of the factor that controls the cell cycle, apoptosis, and the expression of immune response genes. That is, flavonoids derived from the leaves of the plant are likely to prevent inflammation, cancer and autoimmune diseases. [9]

Use in medicine

In pharmacy chains, blueberry preparations registered as medicines are not sold, but there you can find dietary supplements from various manufacturers, which contain blueberry extract. As a rule, these extracts are included in a group of drugs that improve the state of the cardiovascular system. But this industry is not without scandals and revelations.

In 2016, a warning [10] was published in the media about the functioning of a fraudulent scheme for the sale of blueberry extract for the treatment of diabetes. For credibility, the authors of the scheme created a fake website of the Ministry of Health, on the pages of which a dietary supplement called Golubitoks was advertised. (The practice of creating such shim sites is generally widespread in online commerce).

The very fact of the unfair sale of dietary supplements does not mean that the drug is fake or ineffective. But such a dubious distribution scheme, with wide publicity, could well undermine

consumer confidence in the product. However, this did not happen. The drug "Golubitoks" and today is issued in the top for the request "blueberry extract" by all popular search engines.

"Golubitoks" is sold in the form of drops of a concentrate of fruits, shoots and leaves of blueberries and, according to the instructions, is intended for a comprehensive restoration of the body. Among the medicinal properties of the drug, first of all, those that were found in real medical and scientific studies are listed: normalization of visual function, improvement of the brain, gastrointestinal tract, heart, regulation of blood pressure, restoration of blood vessels and prevention of atherosclerotic damage.

In addition, among the therapeutic effects, normalization of sleep, improvement in the condition of the skin, nails and hair, elimination of bacterial and fungal infections, prevention of sexual dysfunction, infertility, osteoporosis, etc. are indicated. But, since the full composition of the drug includes many other herbal components, perhaps some of the effects should be attributed to them.

In folk medicine

In folk medicine, blueberries are also used as a remedy for treating diabetes and cardiovascular diseases, lowering high blood pressure, and restoring visual function. With beriberi, blueberry juice is drunk as a tonic and antiscorbutic agent. A tea drink based on fruits and leaves is brewed to reduce high temperature, inhibit inflammation, and remove radioactive nuclides.

The berries of the bush are also used as a mild laxative, diuretic and choleretic agent for inflammation of the renal pelvis, mucous membrane of the large intestine, stomach and small intestine, for dysentery and gastritis.

Decoctions and infusions

The general rules for the preparation of blueberry infusions involve the use of 20 grams of fresh or dried fruits per cup of boiling water (250 ml), which are aged in hot water for an hour. With bronchitis and temperature, this infusion is taken with a teaspoon of honey twice a day, 80 ml each, with hypertension - three times a day, 50 ml each, with colitis - 2 tbsp. l. every 3 hours.

To prepare decoctions from leaves and shoots of a shrub, you will need 50 grams of crushed raw materials per glass of water (250 ml), which should be boiled for 30 minutes. Drink a decoction after straining for heart disease, high blood pressure, diabetes, inflammation of the excretory organs, kidney disease, anemia, constipation. Different folk healers can find dosage options, but the most common scheme for taking decoctions of the plant part of the shrub is 1 tbsp. l. 3 times a day. For heart problems, 3-6 doses per day are often recommended.

In scientific research

Evidence-based medicine cannot blindly rely on the experience of traditional medicine, so scientists in their experiments test the long-known and new medicinal properties of blueberries. Examples of such studies are given below:

Blueberry extract has a beneficial effect on eye fatigue and visual discomfort caused by a computer screen. [eleven]

60 volunteers were divided into two groups: for 4 weeks, participants from the first were given 1000 mg/day of blueberry extract tablets, participants from the second received a placebo. The results of the experiment were evaluated by a questionnaire followed by scoring from 0 to 60. During the month, the subjects assessed the degree of eye irritation, tension, dryness, tearing, fogging, etc. whenever they sat

down at the computer. At the end of the experiment, scoring showed that visual discomfort in the first group was significantly lower than before the start of the experiment. There were no differences in the assessment of the state of the participants in the second group.

Blueberry extract reduces the viability of cell lines of human hepatocellular carcinoma (Hep-G2), human colorectal adenocarcinoma (Caco-2) and non-malignant mouse cells (3T3-L1), and also affects the cyclic progression and membrane permeability of grown cells. [12]

According to scientists, blueberry extract contains 3 types of anthocyanins (cyanidin-3-glycoside, malvidin-3-glycoside, malvidin-3-galoctaside). It is with their influence that the release of LDH, a marker of cell membrane permeability, is associated. LDH levels were measured 24, 48 and 72 hours after blueberry extract application. It turned out that the membrane permeability of Caco-2 cells increased by 21% after 48 hours and by 58% after 72 hours compared with measurements after the first day. The results were even better with Hep-G2 cell culture: 66% and 139%, respectively. As for 3T3-L1 cells, the activity of the LDH marker in them, unexpectedly for scientists, decreased by 21% 72 hours after using the blueberry extract.

The use of the extract also affects the cell cycle. Violations in one of the phases of this cycle leads to an increase in the level of cell death in all three cultures.

Systematic consumption of blueberry extract exhibits hypoglycemic, hypolipidemic, antidepressant-like, and antiperoxidant effects in an animal model of the metabolic syndrome. [13]

In this study, the researchers examined the effects of blueberry fruit extract on metabolic, behavioral, and oxidative stress parameters in the hippocampus and cerebral cortex of mice fed a high-calorie diet. The animals were divided into 4 groups: mice in the first two groups were fed standard food with and without blueberry extract for 150 days, while in the third and fourth groups they were fed high-calorie food with neutral saline and extract additives.

Animals of group No. 3 (“high-calorie food + saline”) by the end of the experiment were characterized by increased body weight, an increase in visceral fat, elevated levels of triglycerides, glucose, cholesterol, and had insulin resistance. The addition of blueberry extract in group #4 prevented an increase in these metabolic parameters. In addition, the extract showed the ability to reduce the levels of substances that react with thiobarbituric acid in the cerebral cortex and hippocampus of animals. Differences were manifested in the mobility of animals - mice in group No. 4 were more active than animals in group No. 3.

Weight regulation

The above study showed that blueberry extracts (at least blueberry rod) can neutralize the accumulation of visceral fat and prevent weight gain in animals on a high-calorie diet.

There is no direct evidence that extracts (or, even more so, berries in the diet) will affect humans in a similar way. But in 2019, British researchers conducted an experiment in which they introduced blueberry supplements into the diet of people with metabolic syndrome for 6 months, in which there is an increase in adipose tissue in the waist, as well as a violation of fat and carbohydrate metabolism in the body. And indirectly , the results of these studies confirm the effect of blueberries on the metabolism of overweight people.

115 people with metabolic syndrome aged 55-70 years and a body mass index greater than 30 kg / m2 received in three groups either 75 grams of blueberries per day, or 150 grams, or a placebo (more precisely, they were given a dried powder equivalent to the indicated dosage). According to the results

of the experiment, scientists came to the conclusion that, unlike placebo and even a 75-gram dose of blueberries, a 150-gram supplement per day was able to reduce some metabolic indicators by up to 15%.

It may be a little embarrassing that the study was supported by an organization that monitors the spread of blueberries in the United States (US Highbush Blueberry Council). Nevertheless, firstly, the authors of the study deny any third-party interference in their work, and secondly, such experiments still encourage those who want to lose weight, especially when it is difficult for a person to overcome his eating habits and tendency to overeat.

In cooking

Blueberries are eaten fresh and dried without additional processing, and damaged berries are processed into jams, jams, juices, sauces, fruit drinks, berry wines, and kvass. In culinary recipes, blueberries are included in baking. In some regions of the United States and Canada, muffins and cakes with this berry have become a local specialty.

Chinese blueberries can be used as an effective natural preservative that can inhibit the activity of Salmonella, Staphylococcus aureus, Listeria monocytogenic and some other pathogenic bacteria. It is assumed that the components of the raw blueberry extract have a destructive effect on the membrane cell wall of bacteria. At least in this way, E. coli strain O157:H7 destroys the extract of undersized wild blueberries.

In cosmetology

In cosmetics, blueberries are used in the form of berry extracts to protect the skin from UV damage, reduce redness and signs of aging, as well as nourish the skin and provide antioxidant support. The optimal concentration of blueberry extract in anti-aging products is approximately 2-3%. The ground powder of the plant's seeds is sometimes used as an exfoliating agent in scrubs.

In home cosmetics, blueberries are rarely used, since the cost of such procedures is considered unreasonably high. But the leaves of a wild shrub in decoctions and infusions are still in demand to create a tonic effect when taking a bath.

Dangerous properties of blueberries and contraindications

Blueberries are considered a low-allergenic product. However, lactating women are advised to carefully introduce it into the diet so as not to provoke allergies in children. This berry is also not recommended for violations of the normal outflow of bile (for example, with biliary dyskinesia), when taking blood-thinning medications (so as not to interfere with their action), and when diagnosing thrombosis. The high content of vitamin K in blueberries, which contributes to increased blood clotting, can exacerbate the situation.

If, when using wild blueberries “from the bush”, an individual change of consciousness occurs, which is accompanied by symptoms similar to those of intoxication, you should reduce the amount of berries eaten or change the place of collection. It is believed that a similar effect may occur due to the proximity of wild blueberries with wild rosemary, as a result of which the essential oils of poisonous wild rosemary may accidentally appear on harmless blueberries.

Selection and storage

When buying blueberries, you should choose uniformly colored berries (without red "poles"), not neglecting fruits with a whitish coating, since this is a natural coating that protects the skin of the fruit. To preserve the protective layer, blueberries should only be washed immediately before eating. Organic berries generally can not be washed if the manufacturer (seller) is trustworthy.

After harvest, blueberries, unlike many other products, no longer ripen, so it is important that the harvest is carried out at the optimal interval (this is another reason to trust the producer). If, after full staining, the berries are left on the bush for up to a week, then under favorable weather conditions, both the mass and the amount of sugars in the fruits will increase. But if blueberries are harvested late, their density decreases, and they can be damaged during transportation, which is also desirable to pay attention to when choosing.

Before buying, to make sure there are no mold or ice crystals (when it comes to frozen berries), the blueberries in the container should be shaken slightly: the fruits should not stick together.

Store fresh berries in a sealed container in the refrigerator. At a temperature of +2/+4°C and a humidity of 80-95%, blueberries can lie without loss for up to 3 weeks, and at a temperature of 0°C - up to one and a half months, although it is believed that the fresher the fruit, the more aromatic and tastier they are.

Long-term storage involves freezing the berries. The optimal conditions for this are temperatures from 0 to -1°C and humidity in the range of 90-95%. Studies have shown that frozen blueberries retain most of their anthocyanin content.

At home, blueberries are harvested by drying the berries laid out in one layer in the sun. A day later, after the fruits have dried, they are transferred to the shade, to a room with good ventilation or under sheds and dried, turning over from time to time to prevent rotting and mold. Sometimes the berries are dried in ovens or ovens.

In production, to extend the shelf life of blueberries, a modified gas environment is used, which is created in sealed bags, and shock freezing with a stream of cold (up to -40 ° C) air. Then, when the internal temperature of the berry reaches -20°C, the berries are transferred to a freezer with a temperature of about -18°C.

In part, it is the ability to save blueberries for the future that leads to the fact that blueberry prices break all records even in season. Substandard blueberries also do not disappear - they are processed into jams and juice. In addition, investments in infrastructure for cooling, sorting, packaging, processing fruits, for their part, increase the cost of the product. However, this is not the main and not the only reason for the high price of blueberries.

Why are blueberries so expensive?

The market price of blueberries is influenced by many parameters, the combination of which leads to the fact that the demand for this berry systematically exceeds supply. Here are just a few factors that affect pricing:

Possibility to send blueberries to foreign markets with greater profit.

The "geography" of blueberry consumption is constantly expanding, including through countries that do not have their own plantations. For example, Ukraine, which has been regularly and rapidly increasing the area of blueberry plantations for several years in a row (recently taking second place after Peru in this parameter), exports berries on an industrial scale to Europe, Asia, and the Middle

East. But even in countries with their traditionally large plantations, from time to time, due to weather conditions or diseases, crop failures occur, increasing the opportunities for competitive exports. Particularly strongly export-oriented are the products of organic berries, blueberries from which are rarely and expensively sold domestically.

- Growing features.

Blueberries are a very beneficial berry, but in the long run. This shrub takes a relatively long time to reach full fruiting, but it also gives crops longer than, for example, strawberries, raspberries or blackberries, which begin to make a profit very quickly. However, the need for long-term non-profit investments is also reflected in the price, increasing the cost of goods.

- Harvest characteristics.

The blueberries that hit the shelves are, of course, not a wild berry that needs to be found. Modern plantations are specially organized for convenient and, in part, mechanized harvesting. For example, in the USA and the Netherlands, special trailed and self-propelled harvesters are produced for these purposes. But picking blueberries is still a laborious process. The fruits of this plant do not ripen at the same time, and on the same bush there are both ripe and still green berries. Therefore, usually the first two or three collections are carried out manually and only the final one is mechanized. At the same time, the fruits harvested by machines are often damaged and they still have to be sorted and cleaned additionally. As a result of this, there is often a banal problem of "lack of hands" that countries that grow berries regularly face.

Varieties and cultivation

Almost all modern cultivars, of which there are about two hundred today, are hybrids of crossing different types of American blueberries. We have the most popular group of varieties of **northern tall blueberries** . Such plants withstand low temperatures down to about -30-35 ° C, in contrast, for example, from the **southern tall plant** , which tolerates temperatures down to -5 ° C, and even more so, from **Ashe blueberries** with frost resistance down to 0 ° C).

But as examples of blueberry varieties, we will give here those that are distinguished by the highest content of anthocyanin in berries:

- **O'Neal.** Represents a group of varieties of tall southern blueberries, among which it is considered the most fragrant (fragrant) variety. O'Neal produces large, dark blue fruits that ripen early. In mild winters, it retains beautiful gray -green foliage, but in cold climates, the leaves change color to bright red before shedding.
- **bluecrop.** The reference industrial variety with abundant fruiting has been known since 1952. Slightly flattened berries reach 17-20 mm in diameter. They ripen to blue with a pronounced light blue bloom. They do not crack and tolerate transportation and storage well. Bluecrop is characterized by a bright tart taste, but if harvested early or there are too many berries on the bush, it can turn out to be sour.
- **Bluejay.** The variety was bred in the USA back in 1952, and transferred to production in 1977. It is a unique mixture of old varieties (Pioneer, Grower, Stanley, Brooks) with forest plant populations. In good conditions, the berries can reach 20 mm in diameter and weigh up to 4 grams. Very dense light blue fruits with a slight wax coating have a wine-sweet taste with a slight sourness. It is convenient in organizing the harvest in that up to 70% of the berries ripen almost simultaneously, after which they do not crumble for a long time.

- **Brigitte Blue.** The berries of this variety grow up to 15 mm in diameter and have a sweet and sour taste. Brigitta Blue enters fruiting in the fourth year, after which it shows a regular yield of about 4-6 kg per bush (in the conditions of the middle lane, the bush grows to 1.8-2 meters).

Early-ripening varieties give a harvest in the first half of July, late-ripening - in the first half of August. At the same time, the cultivation of any blueberry requires strict adherence to certain conditions:

- **Soil for blueberries.** The plant needs acidic soils with a pH level of 3.8-5 (no higher than 5.5). When planting shrubs, it is necessary to introduce a soil mixture consisting mainly of acid peat with the addition of leaf humus and coniferous litter (in a ratio of 5:2:1). After that, the soil is usually mulched with sawdust or bark (about 10-15 cm). There is a widespread (though not indisputable) opinion that the love for acidic soil arose in this plant due to symbiosis with fungi. Blueberry roots are devoid of thin suction hairs, but are densely braided with fungal threads that help the plant consume nutrients.
- **Planting blueberries.** This will require a hole meter in diameter with a depth of about 60 cm. Under the next bush of tall blueberries, a hole is dug no closer than 2 meters from the previous one. The plant is demanding on moisture (neither drying out nor flooding is allowed), therefore, a shrub is planted in well-drained and moistened soil. A windless, well-lit area is selected. Blueberries grow well in partial shade, but a shrub planted in the sun produces larger and sweeter berries.
- **Blueberry seedlings.** Varieties for planting are selected based on the given climatic conditions. For cultivation in private gardens, attention is paid not only to the taste of the berry and yield, but also to the decorative attractiveness of the bush. The industrial approach takes into account the size and taste of the berry, its ability to endure transportation, the sequence of fruit ripening on the bush, etc.
- **Care.** During dry periods, blueberries are watered at least once a week in the amount of 10-20 liters per bush. If the water is hard, with a lot of alkali, it is acidified with vinegar before watering in a ratio of about 1 tsp. for 2 liters of water. To improve fruiting in early spring, pruning of bushes is carried out. Potassium-phosphorus fertilizers are applied in autumn, nitrogen fertilizers are applied in spring and early summer.

In recent years, growing blueberries in container pots has become increasingly popular, which makes it possible to create optimal soil conditions and provide the plant with constant light.

Despite the increase in popularity, in our country, blueberries remain an expensive and delicacy product, which, nevertheless, is still in demand. Its fruits are justifiably valued for both taste and medicinal properties. And although it is too early to call blueberries a real medicine, the benefits of eating these berries are definitely more than harm.

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Blueberry - useful properties, composition and contraindications

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