



## Pineapple (lat. *Ananas comosus* )

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

**Keywords:** pineapple, beneficial properties, potentially dangerous effects, side effects, contraindications, diets

## Beneficial features

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

100 g of fresh pineapple contains [5]:					
Main substances:	G	Minerals:	mg	Vitamins:	mg
Water	86	Potassium	109	Vitamin C	47.8
Carbohydrates	13.12	Calcium	13	Vitamin PP	0.5
Sugar	9.85	Magnesium	12	Vitamin B6	0.112
Alimentary fiber	1.4	Phosphorus	eight	Vitamin B1	0.079
Squirrels	0.54	Sodium	one	Vitamin B2	0.032
Fats	0.12	Iron	0.29	Vitamin A	0.03
calories	50kcal	Zinc	0.12	Vitamin E	0.02

When preserved, pineapples lose a significant amount of vitamins and fiber. At the same time, they become more high-calorie and contain much more sugar. Especially in this regard, fruits canned in thick syrup stand out.

## Medicinal properties

Pineapple is rich in various vitamins and minerals and mainly has a positive effect on the body. However, it is often valued not for the standard set of nutrients that can be found in any other fruit, but for a certain enzyme bromelain concentrated mainly in the core of the fruit. There are even legends that this enzyme breaks down fats, which is why pineapple is often called the #1 fruit for weight loss.

However, eating a late, heavy dinner with a few slices of pineapple will absolutely not help you burn extra calories. To date, science knows that the proteolytic enzyme bromelain promotes the breakdown of proteins, but there is no evidence of its involvement in the process of fat breakdown. Thus, pineapple, and in particular the enzyme contained in it, can help to better digest protein foods (meat, fish, dairy products), but will not get rid of excess weight.

In addition to participating in the process of protein breakdown, bromelain also has an anti-inflammatory effect and fights swelling. Together with the fiber contained in pineapple, this enzyme helps to normalize intestinal motility, has a beneficial effect on digestion and helps get rid of constipation. Scientists claim that bromelain prevents the formation of blood clots, as it exhibits anticoagulant activity.

As for the vitamin cocktail found in pineapple, vitamin C is the highest concentration. Being a strong antioxidant, it helps protect healthy cells under attack by free radicals, contributes to the body's defense against bacterial and viral infections, and also helps to absorb iron.

There are also B vitamins in the composition of pineapple. For example, vitamin B1 promotes the absorption of fats and carbohydrates. In addition, it has a beneficial effect on the body with overwork and nervous exhaustion. Vitamin B2 regulates the metabolism in the body, supports the work of the visual organs.

Nicotinic acid (vitamin PP), which is present in pineapple in a significant amount, takes part in carbohydrate and protein metabolism, stimulates the pancreas and regulates the secretion of its juice. In addition, it has a dilating effect on blood vessels.

Although not in too large doses, pineapple also contains vitamin E and beta-carotene, which in the human body takes the form of vitamin A. The first is necessary for the normal functioning of the reproductive system. In addition, it provides strengthening of the heart and eye muscles, thus supporting the work of the cardiovascular and visual systems. Vitamin A also has a positive effect on eye health. In addition, it contributes to the normal development of a growing organism and is responsible for the condition of the skin and mucous membranes.

In addition to vitamins, pineapple contains many useful minerals. For example, this exotic fruit is a rich source of potassium, calcium, magnesium and phosphorus. Potassium is actively involved in the process of water-salt metabolism. Calcium plays an important role in bone renewal. The level of phosphorus compounds in the body affects the mental and physical activity of a person. And magnesium regulates the heart rate and takes part in a large number of enzymatic reactions.

Trace elements such as manganese and copper contained in pineapple are also of great importance for the body. Thus, manganese is necessary for the formation of bone and connective tissues, the activation of certain digestive enzymes, and the improvement of the quality of sperm in men <sup>[12]</sup>. And copper favors the absorption of iron, regulates blood pressure and heart rate <sup>[10]</sup>.

## In medicine

Since the 60s. scientists have been actively studying the characteristics and possibilities of application in various fields, including medicine, of the bromelain substance contained in pineapple. During research and experiments, it was revealed that this enzyme has a mass of multidirectional beneficial properties. In particular, it is able to destroy blood clots, normalize blood pressure, regulate metabolism, fight urinary tract infections, have an anti-inflammatory effect and restore connective tissues.

Nowadays, bromelain can be obtained not only from fresh overseas fruit, but also with the intake of a dietary supplement of the same name. As a rule, the enzyme is obtained not from the pulp of pineapple, but from the leaves and stem of the plant, which contains many times more of it. Usually the drug is produced in the form of tablets or capsules of 500 mg. Before using it, you should definitely consult a doctor.

Bromelain is recommended to be taken both as a preventive measure for various diseases, and for problems that have already arisen. For example, with digestive disorders, exocrine pancreatic insufficiency, malfunctions of the cardiovascular system, inflammatory processes of any nature. By the way, this drug is especially popular among athletes, as it helps to recover faster after various injuries and injuries <sup>[11]</sup>. In addition, it is often taken in the postoperative period.

Unfortunately, very often the sale of bromelain is accompanied by speculative advertising that promises to burn extra calories. In fact, the effect of the drug is not aimed at weight loss. Of course, it can indirectly contribute to the achievement of harmony by resolving problems in the digestive tract, but it does not affect other causes of weight gain in any way. Similarly, bromelain's often-touted anti-aging effect has not been scientifically proven.

### **In folk medicine**

Treatment with folk methods usually involves the use of simple and easily accessible ingredients in recipes. In our latitudes, it is difficult to call pineapple affordable, therefore the range of its application is not too wide. But the indigenous people of South America have long used all parts of this fruit to treat various diseases. With the spread of pineapple plantations to other tropical countries, folk recipes began to appear there too.

So, for example, in Africa, the root of the plant, dried and ground into powder, is used to get rid of edema. The crushed peel is used in wound healing, and its decoction with the addition of rosemary is considered effective for hemorrhoids. The Indians in Panama drink the juice from the leaves of the plant as a laxative and anthelmintic <sup>[13]</sup>. In Bangladesh, pineapple juice is used to treat fever, and the juice from the leaves of the plant is used to treat jaundice <sup>[14]</sup>.

In addition, pineapple leaf juice is believed to lower blood sugar levels, so in countries with low living standards and lack of access to medicines, it is advised as an alternative to drugs for diabetics <sup>[15]</sup>. In some places, it is believed that the pulp of an unripe fruit with honey, taken three days in a row on an empty stomach, can provoke a miscarriage and get rid of an unwanted pregnancy.

Given that we do not grow pineapples, there is simply nowhere to get the roots and leaves of the plant, so traditional healers usually suggest using only the pulp of the fruit. Crumpled into gruel, it is recommended to add it to various vitamin mixtures based on berries, lemon, ginger, etc. to activate the protective functions of the body and in the fight against colds. For the same purpose, finely chopped fruit pulp is poured into 2 liters of vodka, a little lemon juice is added and kept in the refrigerator for 3 weeks, and then taken 50 mg per day.

Alcohol tincture is also used for blockage of blood vessels. To prepare the medicine, it is necessary to grind the pulp of pineapple, pour 1 liter of vodka into it, close it tightly and leave it in a dark, cool place for 2 weeks. You need to take this drug 1 tablespoon 15 minutes before eating. Naturally, one cannot fight vascular obstruction with pineapple tincture alone. With the approval of a doctor, it can be used as an additional remedy.

### **in oriental medicine**

In Chinese medical treatises, foods were usually classified according to their levels of Yin and Yang. And the human diet had to be composed in such a way that the balance of the two energies was maintained in the body. Moreover, food must be chosen according to the season, as this helps to stay in harmony with nature.<sup>[16]</sup> It is believed that pineapple has a female Yin energy and has a cooling effect on the body, so it is recommended to use it in the hot summer.

Pineapple juice is considered an effective protector against heat stroke, and the pulp of the fruit is used to eliminate digestive problems. By the way, in Asia there is a tradition to finish the meal with papaya or pineapple with salt and pepper. Due to their enzyme systems, these fruits help food to be digested and absorbed faster.

### **In scientific research**

Recently, pineapple is increasingly becoming the object of scientific research. Scientists are closely studying the properties of the enzyme bromelain, which shows great promise in the field of medicine. Its anti-thrombotic, anti-inflammatory and even anti-carcinogenic effects have already been identified. Do not fall out of the field of view of researchers and other parts of the plant that can be useful, both in medicine and in other areas.

If we talk about bromelain, it should be noted that its mechanism of action is not yet fully understood, but it is known for sure that this enzyme and the dietary supplement that is made from it are well tolerated by the body and do not have any side effects even with prolonged use.

One of the most important properties of bromelain is the relief of symptoms of angina pectoris and transient ischemic attack. Experiments on rats demonstrated the ability of the enzyme to have a protective effect on the myocardium<sup>[18]</sup>. In addition, scientists have proven its effectiveness in the prevention and treatment of thrombophlebitis<sup>[19]</sup>.

Researchers believe that bromelain has good potential to fight cancer cells. Experiments conducted on mouse and human cells have shown that this enzyme is capable of destroying protein and thereby depriving the tumor of building material<sup>[21]</sup>.

Not so long ago, the possibility of treating allergic respiratory diseases (for example, asthma) with bromelain was considered. There was also a study that tested the effectiveness of this enzyme in the fight against cough in tuberculosis. Scientists have concluded that a mixture of pineapple juice, salt, pepper and honey can help dissolve mucus in the lungs<sup>[17]</sup>.

In combination with trypsin and rutin, bromelain has an anti-inflammatory effect on par with the well-known non-steroidal drug *diclofenac*. This is evidenced by the observation of the treatment of 103 patients with osteoarthritis of the knee<sup>[20]</sup>. In addition, taking this enzyme prior to any surgical procedure may reduce the time it takes for post-operative pain to disappear.

### **Weight regulation**

As has been repeatedly noted above, pineapple is often associated with a product that provides quick and painless weight loss. However, this is not entirely true, since this fruit can only help improve digestion, but is not directly related to direct weight loss. In addition, nutritionists insist that there are no products, the use of which in itself would lead to weight loss.

However, pineapple should not be discounted when forming your diet, because it is low in calories, rich in vitamins and has a balanced set of minerals <sup>[11]</sup>. This fruit at least does not add extra calories and at the same time supplies the body with a lot of useful substances.

The famous actress Sophia Loren once admitted that she is helped to keep herself in shape by pineapple fasting days, which she arranges 3-4 times a week. On one such day, the actress eats one fresh pineapple and does not limit herself in drinking water. However, nutritionists agree that the benefits of such a diet are extremely doubtful. In their opinion, the energy value of such a monotonous diet is too low, and such unloadings are carried out too often. All this can, as a result, provoke a pathological feeling of hunger.

In order to minimize the harm caused by the diet to the body, you should take at least 2 kg of fresh pineapple, 1 liter of pineapple juice, 100 g of boiled chicken breast, 100 g of low-fat cottage cheese and 30 g of rye flour bread. All these products are divided into 4 meals during one day. Juice is usually drunk no earlier than an hour after a meal.

### **In cooking**

Pineapple is an ingredient used in almost every cuisine in the world. It is consumed fresh and canned, juice, jam and candies are made from it. Also, this fruit is added to salads, yogurts, ice cream, and pies. Moreover, pineapple is often cooked with meat, and in Malaysia it is customary to put it in curry sauce. A lot of discussions and jokes are caused by cooking pizza with pineapples. Not so long ago, at a meeting with schoolchildren, the President of Iceland even said that, if it were in his power, he would forever ban the preparation of "Hawaiian" pizza.

By the way, one of the most amazing ways of cooking pineapples was popular in the 19th century in the Moscow region. In the Muranovo estate, owned by the family of the famous poet Fyodor Tyutchev, greenhouses were equipped and mushrooms, peaches and pineapples were grown in them. In those days, the latter were treated like overseas cabbage, which is why they prepared it accordingly - they fermented it. And after that, cabbage soup was cooked from pickled fruits.

As for the compatibility of pineapples with other foods, they do not like to coexist with dairy products. In addition, like all acidic fruits, they slow down the digestion process and are not recommended for breakfast.

### **Beverages**

Smoothies and various cocktails are prepared from pineapple, but the simplest and most healthy drink is freshly squeezed juice, which fills the body with vitamins and minerals. It is sometimes mixed with other fruits and vegetables. One of these diet drinks can be prepared by taking 1 stalk of celery, 1 cucumber, a bunch of parsley and 3 slices of fresh pineapple. All ingredients must be ground in a blender without adding sugar and salt. You need to drink the juice within 15 minutes after preparation so that the pineapple-vegetable mixture does not lose its beneficial properties.

In tropical countries, pineapples are used to make alcoholic drinks. For example, pineapple wine is popular in Costa Rica. The Caribbean Piña is world-famous. Colada, in which, in addition to

pineapple juice, light rum and coconut milk are added. But in Cuba and in some countries of South America they love cooling mate with pineapples soaked in rum.

### **In cosmetology**

The myth that pineapple burns calories and fights cellulite is so firmly rooted in the public mind that girls in Latin American countries still believe in the magical power of this fruit. They use the skins of a fresh fruit, applying their pulp to the legs in the thigh area and wrapping them with cling film. Girls believe that during such a 30-minute procedure, the acid contained in pineapples destroys subcutaneous fat deposits.

Cosmetologists confirm that pineapple extract is a frequently used ingredient in cosmetology. It is added to various creams and lotions. However, it provides antibacterial, regenerating and illuminating, but not fat burning, effect. Moreover, experts warn against using fresh fruit by itself. It is best to use it in combination with other components.

For example, you can make a cleansing face mask by mixing 1 tablespoon pineapple puree, 1 tablespoon cornmeal, and 1 egg white. This mask should be applied in a thin layer on the skin of the face and left for 20 minutes, then rinse with warm water. Given that pineapple is an allergenic product, before applying the mixture to the face, you should first make a test on the wrist.

### **Unconventional use**

Scientists are looking for a use for the biomass that remains after growing pineapples, since the fibers of the stems and leaves of the plant are very strong. So, one Spanish researcher developed a method for producing leather from pineapple leaves. It turned out a very high-quality material from which you can sew bags, shoes and use it in the furniture industry. Such leather is lighter and 30% cheaper than genuine leather.

Hollywood designer Oliver Tolentino sews clothes from "pineapple" fabric. For the manufacture of the material, fibers are taken from the leaves of the plant. They are processed and divided into threads, from which an ivory-colored fabric is woven, which is then easily dyed.

But American scientists have invented an environmentally friendly alternative to plastic from pineapple leaves and stems - a strong and lightweight nanofiber that can be used in auto construction [22].

### **Dangerous properties of pineapple and contraindications**

bromelain contained in it has the potential to treat many serious diseases. However, you should not get carried away with the use of this fruit, because its consumption in large quantities is accompanied by the ingestion of acid into the body and is fraught with irritation of the mucous membranes of the stomach and oral cavity. For this reason, fresh pineapple should not be eaten with peptic ulcer and gastritis.

Dentists do not recommend abusing this fruit, as its juice acts destructively on tooth enamel. True, in this case, you can solve the problem with the help of an ordinary straw. People suffering from excess weight should not lean on dried pineapples, because they are almost 7 times more nutritious than fresh ones.

Pregnant women should also be careful with pineapple. You can eat this fruit, but in small quantities, because it helps to reduce and maintain the tone of muscle tissue. In addition, given that pineapple is

considered a strong allergen, it is better to limit its use during lactation. Fruit is not advised to introduce into the diet of children under two years of age.

## Botanical description

It is a tropical plant belonging to the *Bromeliad family* and is a perennial evergreen herb. Pineapple is also called the fruit of this plant, which received the scientific name "*crested pineapple*" (Latin *ananas comosus*) because of its lush top.

## origin of name

The word pineapple, used in many languages of the world to refer to this exotic fruit, comes from the Tupi language, where it meant "*wonderful smell*" <sup>[1]</sup>. Interestingly, in English, the overseas fruit "pineapple" has never been. As soon as they got to know him, the British called him **pineapple** - the word then used to designate a cone (probably because of the external resemblance). Then the cones began to be called the word pinecone, and pineapple stuck to the pineapple. By analogy, in Spanish, pineapple is called the word **piña**.

## Cultivation history

The homeland of the heat-loving pineapple is the territory of Paraguay and southern Brazil, where this fruit grew wild. The place where the pineapple was first cultivated by scientists is still unknown, but it was the Indians who spread it across South and Central America, Mexico, and also brought it to the islands of the Caribbean <sup>[2]</sup>. Pineapple, like many other exotic fruits and vegetables, came to Europe thanks to Christopher Columbus, who first saw it on the island of Guadeloupe at the end of the 15th century and called it **piña de Indes** (Spanish for *Indian bump*).

From Spain and Portugal, the pineapple began its journey to other tropical countries. The Spaniards brought it to the Philippines, Hawaii and Guam <sup>[3]</sup>, and the Portuguese to India and the east coast of Africa. As for the Old World, here the exotic fruit fell in love, and they began to cultivate it in greenhouses and botanical gardens, which became fashionable in Europe at the end of the 18th century. The cultivation of overseas fruits was especially popular in rich British estates.

They also grew their pineapples at the court of Catherine the Great. Since the import of these fruits, as well as the cost of growing them in adverse conditions, was not cheap, the pineapple quickly became a symbol of wealth. By the way, in many aristocratic houses they resorted to tricks: pineapples were simply put on display during receptions and dinner parties, but they were never served at the table. Thus, expensive fruits could be used repeatedly until the fruits began to rot.

## Varieties

In nature, there are many different varieties of pineapple, which are insignificant, but still differ from each other in the shape and size of the fruit, the physical properties of the pulp (crispy, soft, juicy, etc.), as well as flavors. In addition, breeders are tirelessly working on the development of new cultivars. Their research is aimed at making the fruit even more useful. Although it does not do without an economic component, because unusual varieties instantly attract buyers.

Not so long ago, after many years of experiments, scientists bred a pink pineapple, which has already gone on sale, having received the approval of the Sanitation Department. US Food Safety Authority. The secret of this fruit is that its composition is dominated by the carotenoid pigment lycopene, which determines the color of tomatoes and watermelons <sup>[4]</sup>. The fruit differs only in the pink color of the

pulp, from the outside it is absolutely unremarkable. Manufacturers of this variety also claim that their pineapple has a sweeter taste.

It is customary to consider sweeter and grown in many tropical countries, especially in Thailand, mini-pineapples, which weigh 200-500 grams and easily fit in the palm of your hand. And on the French island of Reunion, a special variety of pineapple called Victoria is cultivated. Its specificity lies in the fact that, unlike other fruits, it has a completely edible and very sweet core.

It is impossible to ignore two other interesting products, one way or another connected with pineapple. Firstly, we are talking about a hybrid of Chilean and Virginian strawberries, which was called *pineberry* (from English pineapple and strawberry). Visually, this fruit resembles a white strawberry with red seeds, but at the same time it has the taste and aroma of pineapple.

Secondly, we mean sea pineapples - a species of *ascidia* grown in aquaculture. They owe their name to the outward resemblance to an exotic fruit. They are eaten mainly in Asian countries. Sea pineapples have a very specific taste that is often described as rubber soaked in ammonia.

### **Growing features**

Pineapple is a low plant (0.75-1.5 m) with a short strong stem and long pointed leaves, covered with thorns along the edges. Depending on the variety, the leaves can be either pure green or with red, yellow or light stripes. During flowering, the stem produces a peduncle with lilac or red inflorescences sitting in bracts <sup>[2]</sup>. Gradually, they turn into large yellow-brown seedlings, similar to cones, since they consist of a large number of ovaries fused with bracts. Pineapple fruits do not have seeds.

Since it is a tropical plant, it is very thermophilic and feels comfortable at temperatures from 19 to 45°C. Colder conditions slow down the growth and ripening of fruits and make them more acidic. Pineapples tolerate the lack of moisture well, surviving due to thick, strong leaves that accumulate it for future use. Excess water can seriously damage the crop. As for the soil, it should rather be acidic, which is why pineapples take root so well on lands located near volcanoes (Costa Rica, Hawaii, Reunion, etc.) and flavored with their minerals.

When planting pineapples, the distance between the bushes must be at least 30 cm, otherwise the fruits will be too small. After about 7 months, the bushes begin to bloom, and then fruits form on them. Harvesting can take place at different times depending on the goals pursued. So, not fully ripened fruits are harvested for export, ripe pineapples are suitable for domestic sales, and slightly overripe fruits are needed for canning. After harvesting, the bushes are divided into several parts and planted again.

### **growing at home**

With the right approach to the process, even at home, it is quite possible to grow a pineapple, and with proper care, fruiting can also be achieved. To do this, cut off the top crest from a ripe fruit. Some gardeners leave a little pulp on the rosette, others cut it off at the very base.

If you chose the first option, then you should leave the top to dry in a dark place for a week, and then plant it in a pot, after dusting the cut with charcoal powder. In the second option, it is necessary to wash the tuft in a pink solution of potassium permanganate, sprinkle the base with wood ash and leave to dry for 5-6 hours. Then the stalk must be planted in the ground.

A pot for pineapple should be chosen low and wide (about 0.6 l in volume), since the root system of this plant is distributed mainly in breadth. Good drainage is also important for pineapple, so the bottom



of the pot should be covered with charcoal. For a pineapple cutting, a mixture of leaf and sod land, birch sawdust, high-moor peat and coarse sand is well suited.

After planting, the pineapple is usually watered with a warm solution of potassium permanganate and placed in a well-lit place with a temperature regime of about 25 ° C. After 1-2 months, the cutting should take root and young leaves begin to appear on the plant. It is recommended to transplant it into a larger pot every year. Pineapple usually begins to bear fruit 3-4 years after planting.

### **Pests and diseases**

Pineapple is subject to a large number of diseases and attacks by various pests. For example, roundworms, mealybugs, red mites, glitter beetles, and even crows can damage both the underground and aboveground parts of the plant. And some even pose a danger to the fetus. Also, various types of fungi can provoke rotting and wilting of the plant, so pineapple plantations can never do without fungicides and pesticides. At home, chemicals should be used only when necessary.

### **Selection and storage**

The most delicious and ripe pineapples can only be found in their growing areas - in the tropics. Finding good quality fruits on the shelves of our stores is very difficult, since almost all pineapples come to us from distant South America on ships. Since ripe fruits do not tolerate long-term transportation, unripe pineapples are usually sent for export. Moreover, before shipping, they undergo mandatory processing: washing in chlorinated water, coating the crust with wax, and the tuft and bottom with safe fungicides.

Despite all these measures, pineapples reach us, losing a little the sweetness of taste, but retaining all the useful elements (the ripeness of the fruit when cut only affects the amount of sugar in it, but does not reduce its benefits). However, given that these tropical fruits are still not the most popular commodity in our country, after a long journey on ships, they can lie for quite a long time in warehouses or on the shelves of our supermarkets.

In order to find not stale, but relatively fresh fruit, you need to pay attention to the color of the peel - it should be uniformly yellow or green (green color does not indicate the unripeness of the fruit), without brown spots that indicate impacts or damage from the inside. There should be no signs of mold or rot on the fruit. It should have a not very sharp sweet aroma.

A good pineapple has a solid and strong tuft with slightly wilted leaf tips, but it easily separates from the fruit. When tapped, the fruit makes a dull sound, and no dents remain on the peel. The size does not really matter, because it does not affect the quality of the fruit. But when buying, take into account the fact that the skin is quite thick and after cutting off the pulp, there is not much left <sup>[9]</sup>.

As for storage, a whole unpeeled pineapple should be kept at room temperature. After peeling and cutting, the fruit can lie in the refrigerator for 1-2 days, but it is better to eat it right away. The fruit is not recommended to be frozen, because at sub-zero temperatures it loses a significant amount of its beneficial properties and loses its usual taste, becoming insipid.

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

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