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## Passion Fruit (*Passiflora edulis* Sims.)-An Underexploited Plant of Nutraceutical Value.

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### ABSTRACT

*Passiflora edulis* Sims. is a vine species of passion flower that is native to subtropical wild regions of South America, probably originated in Paraguay Brazil and northern Argentina. Pleasantly sweet and tart, passion fruit, also known as granadilla, is brimming with numerous plant derived health benefiting nourishment essentials for the optimum growth<sup>12</sup>. The Passion fruit vine is a shallow-rooted, woody, perennial, climbing by means of tendrils. The alternate, evergreen leaves, deeply 3-lobed when mature, are finely toothed, 3 to 8 in (7.5-20 cm) long, deep-green and glossy above, paler and dull beneath, and, like the young stems and tendrils, tinged with red or purple, especially in the yellow form<sup>2</sup>. It is cultivated commercially in tropical and subtropical areas for its sweet, seedy fruit and is widely grown in several countries of South America, Central America, the Caribbean, Africa, Southern Asia, Vietnam, Israel, Australia, South Korea, and the mainland United States<sup>1</sup>. Passion fruit was introduced in Hawaii in 1880 but was first cultivated commercially in Kenya in 1933 and it also rapidly became popular in home based gardens. They are distinguished by the type of fruit they bear, which have different size, colour and taste. The most important are the purple passion fruit, the yellow passion fruit, the sweet granadilla, the giant granadilla, cholupa and the banana passionfruit<sup>11</sup>. Passion fruit seeds provide a nice crunch when eaten with the fruit pulp, and they deliver an abundance of nutritional and health benefits ranging from antioxidant protection to the maintenance of healthy cardiovascular and intestinal systems. They are rich in polyphenolic compounds such as piceatannol and scirpusin B, and they deliver plenty of insoluble dietary fiber and magnesium.

**Keywords:** MCF-7 – Michigan Cancer Foundation-7, pH- Potential of Hydrogen, UV rays- Ultra Violet rays, gm-gram, µg-microgram, mg-milligram.)

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## INTRODUCTION

*Passiflora edulis* is a vine species of passion flower that is native to subtropical wild regions of South America, probably originated in Paraguay Brazil and northern Argentina .The passion fruit is a pepo , a type of berry , round to oval, either yellow or dark purple at maturity, with a soft to firm, juicy interior filled with numerous seeds<sup>2,3</sup> .The fruit is both eaten and juiced; passion fruit juice is often added to other fruit juices to enhance aroma <sup>4</sup>. Pleasantly sweet and tart, passion fruit, also known as **granadilla**, is brimming with numerous plant derived health benefiting nourishment essentials for the optimum growth. The plant is an avid climber (vine) which grows on anything that it can grapple around through its tendrils<sup>12</sup>.

### Scientific classification

Kingdom	Plantae
(unranked)	Angiosperms
(unranked)	Eudicots
(unranked)	Rosids
Order	Malpighiales
Family	Passifloraceae
Genus	<i>Passiflora</i>
Species	<i>P.edulis</i>

Binominal name- ***Passiflora edulis* Sims.**

The Passionfruit vine is a shallow-rooted, woody, perennial, climbing by means of tendrils. The alternate, evergreen leaves, deeply 3-lobed when mature, are finely toothed, 3 to 8 in (7.5-20 cm) long, deep-green and glossy above, paler and dull beneath, and, like the young stems and tendrils, tinged with red or purple, especially in the yellow form. A single, fragrant flower, 2 to 3 in (5-7.5 cm) wide, is borne at each node on the new growth. The bloom, clasped by 3 large, green, leaf like bracts, consists of 5 greenish-white sepals, 5 white petals, a fringelike corona of straight, white-tipped rays, rich purple at the base, it also has 5 stamens with large anthers, the ovary, and triple-branched style forming a prominent central structure<sup>2</sup>. The flower of the yellow is the more showy, with more intense color. The nearly round or ovoid fruit, 1 1/2 to 3 in (4-7.5 cm) wide, has a tough rind, smooth, waxy, ranging in hue from dark-purple with faint, fine white specks, to light-yellow or pumpkin-color. It is 1/8 in (3 mm) thick, adhering to a 1/4 in (6 mm) layer of white pith. Within is a cavity more or less filled with an aromatic mass of double-walled, membranous sacs filled with orange-colored, pulpy juice and as many as 250 small, hard, dark-brown or black, pitted seeds. The flavor is appealing, musky, guava-like, sub acid to acid <sup>2</sup>.

## Origin and Distribution

Whilst the origin of the Passion Fruit plant is unfamiliar, it truly is usually considered to be indigenous to Brazil exactly where 16th Century Spanish Catholics referred to it as “Flor de lascinollagas” or even “flower of the five wounds” soon after its exclusive purple flower. Nowadays, about 400 years later, passion fruit is cultivated all over the place within the exotic belt yet recognized by the number of various titles. It’s typical title is Maracuya in Ecuador as well as Brazil, Parcha in Venezuela, Lilikoi in Hawaii, and Chinola or Parchita in Puerto Rico. Its common names include passion fruit (US), passion fruit (UK and Commonwealth), and purple granadilla (South Africa). It is cultivated commercially in tropical and subtropical areas for its sweet, seedy fruit and is widely grown in several countries of South America, Central America, the Caribbean , Africa , Southern Asia , Vietnam , Israel , Australia , South Korea, and the mainland United States<sup>(1)</sup> .Passion fruit was introduced in Hawaii in 1880 but was first cultivated commercially in Kenya in 1933 and it also rapidly become popular in home based gardens. It naturalized in Hawaii’s almost ideal environment as well as, by 1930, might be discovered wild on all the islands of the Hawaiian chain. In 1951, the University of Hawaii selects passion fruit as the most encouraging crop for farming improvement as well as undertook a course to produce an industry for production of quick-frozen passion fruit juice concentrate

In Australia the purple passion fruit was flourishing and partially naturalized in coastal areas of Queensland before 1900. In Hawaii, seeds of the purple passion fruit, brought from Australia, were first planted in 1880 and the vine came to be popular in home gardens. The passion fruit is a vigorous, climbing vine that clings by tendrils to almost any support. It can grow 15 to 20 ft. per year once established and must have strong support. It is generally short- lived (5 to 7 years)<sup>2</sup>.

India, for many years, has enjoyed a moderate harvest of purple passion fruit in the Nilgiris in the south and in various parts of northern India. In many areas, the vine has run wild. The yellow form was unknown in India until just a few decades ago when it was introduced from Ceylon and proved well adapted to low elevations around Madras and Kerala. It was quickly approved as having a more pronounced flavor than the purple and producing within a year of planting heavier and more regular crops. The purple passion fruit was introduced into Israel from Australia early in the 20th Century and is commonly grown in home gardens all around the coastal plain, with small quantities being supplied to processing factories. In South America, interest in yellow passion fruit culture intensified in Colombia and Venezuela in the mid-1950's and in Surinam in 1975. In Colombia, there are commercial plantations mainly in the Cauca Valley<sup>2</sup>.



Since the introduction of the yellow passion fruit from Brazil into Venezuela in 1954, it has achieved industrial status and national popularity. Much effort is being devoted to improving the yield to better meet the demand for the extracted juice, passion fruit ice cream, and other appealing products such as bottled passion fruit-and-rum cocktail. The purple passion fruit was naturalized in the Blue Mountains of Jamaica by 1913, and both the purple and the yellow are planted to some extent in Puerto Rico<sup>2</sup>.

### **TYPES OF PASSION FRUITS**

The name 'passion fruit' includes various species of edible fruit of the genus *Passiflora*. They are distinguished by the type of fruit they bear, which have different size, colour and taste. The most important are the purple passion fruit, the yellow passion fruit, the sweet granadilla, the giant granadilla, cholupa and the banana passion fruit<sup>11</sup>.

#### **The Yellow passion fruit**

The yellow flavicarpa variety, also known as the Golden Passion Fruit, can grow up to the size of a grapefruit, has a smooth, glossy, light and airy rind, and has been used as a rootstock for the Purple Passion Fruit in Australia<sup>2</sup>. It is much more energetic as opposed to purple variety. Its fruits are spherical to oblong having a smooth, yellow surface and in addition more appealing as compared to purple passion fruit. The pericarp is tougher as well as the fruit is larger-from Six to twelve cm lengthy as well as 4 to 7 cm in diameter and also weighing 60 to 150 g. They may be significantly less savory as well as a little more acid. Yellow passion fruit demands higher temperature ranges (20 to 34°C) and grows much better in a low height. Yields are usually higher at from 10 to 25 tons for every hectare each year and as much as 55 tons in some cases, having a juice yield of 30 to 46 %.

#### **The Purple or Red Passion fruit or granadilla:**

It belongs to the species *Passiflora edulis*. It is the most well-known species in Europe. The fruit has the shape and size of a round egg, between 4-8cm of diameter and 40g of weight. The skin is hard and thick, and it wrinkles when ripe. The colour ranges from dark purple to violet. The pulp is of orange or greenish colour, having various edible seeds. It has a jelly texture and bittersweet taste; it is fleshy and refreshing<sup>11</sup>. The purple *edulis* variety is smaller than a lemon, though it is less acidic than the yellow passion fruit, and has a richer aroma and flavor and has a higher proportion of juice (35-38%). It originated from southern Brazil as well as northern Argentina and Paraguay and is also suitable for exotic as well as subtropical locations and may even tolerate mild frost. That is why, this type is that most often grown at higher latitudes or even elevations, as with Australia as well as Kenya.

#### **Sweet Passion fruits**

Granadilla or grenadilla (*Passiflora ligularis*) is an oval-shaped fruit, 11cm long, pointed in one

of its tips. The skin is of yellowish or orange colour. The pulp is of pale or grayish colour, with a less acid flavour<sup>11</sup>.

### **Giant Passion fruit**

Its scientific name is *Passiflora quadrangularis*. It produces the largest fruit any species within the genus<sup>10</sup>. It is a thick and elongate fruit that may reach 26cm of length. The skin is thick, with multiple protuberances<sup>11</sup>. It is developed in the West Indies and also the part of South America. The fruit is yellowish green, occasionally pinkish as well as ovoid to oblong. It really is Twenty to thirty cm prolonged and also to 18 cm in diameter. They weigh around 2.8 kg and may attain 4 kg. The pulp is pale, white to orangey as well as sweet and acidulous. The taste differs yet is usually significantly less marked compared to another passion fruit types.

### **Cholupa, chulupaor gulupa Passion fruit**

Its scientific name is *Passiflora pinnatistipula*. It is very similar to the yellow passion fruit. The skin is of yellowish green or reddish-brown color, and the pulp is yellowish, carrying many seeds<sup>11</sup>. The fragrant , yellow pulp has an agreeable sweet –acid flavor.

### **Banana passionfruit**

Its scientific name is *Passiflora mollisima*. It is an oval and lengthy fruit, 10cm long. The skin is yellow or red according to the variety. The pulp is of yellow or orange color, sweet and slightly acid taste<sup>11</sup>. They weigh 50 to 150 g The pulp forms 60 % of fruit weight and is also salmon pink to dark orange. It's got lower level of acidity and is extremely agreeably fragrant but usually astringent.

### **Health benefits of Passion Fruits**

#### **Promotes intestinal health:**

Passion fruit seeds are generally abundant with insoluble dietary fiber the passion fruit seeds' insoluble fiber may provide an efficient functional component to enhance intestinal function as well as health<sup>7,8</sup>. They discovered that including passion fruit seeds' insoluble fiber to the fiber-free diet might boost the intestinal amylase action and lower the caecal pH as well as caecal ammonia content. Amylase is a crucial enzyme required to transform complex sugars directly into simple sugars throughout digestion of food. A decline in caecal pH as well as caecal ammonia in return assists equilibrium bacteria within the intestines as well as possibly decreases the chance of tumors within the colon. In addition, insoluble fiber assists encourage regular bowel movement and stop bowel problems as well as hemorrhoids. It may also help carry harmful toxins out from the entire body<sup>8</sup>.

#### **Cardiovascular benefits:**

The vasorelaxing results of the main polyphenols present in passion fruit seeds. Vasorelaxation refers back to the extending of blood vessels as a result of relaxation of smooth muscle cells inside the blood vessel walls. This particular extending of blood vessels results in a reduction in vascular stress that is essential for a proper coronary heart. The research workers discovered that both equally piceatannol as well as scirpusin B provided potent vaso relaxant effects in rat aortas<sup>3</sup> (aorta may be the massive artery which carries oxygen-rich blood from the heart). Whilst both these substances provided cardiovascular health advantages, scirpusin B applied a larger vasorelaxant impact<sup>9</sup>.

#### **Asthma attack:**

A current scientific study stated that passion fruit is an extremely powerful remedy for asthma victims. The peel includes a group of substances which includes chemicals, acids and several various other ingredients which can supply a little bit of alleviation to the asthma sufferers all over the place. It really is being setup like a non-toxic option to medicines. A nutritious health supplement can easily battle the problem in inhaling and exhaling as well as coughing gone through by millions due to bronchial asthma. Research workers from the University of Arizona as well as Mashhad Medical University in Iran had taken removes of Passion fruit peels and created them into natural powder. They examined it in several asthma victims in the United States of America as well as Iran for 4 weeks. The sufferers who had been provided the Passion fruit powder experienced a lot less than individuals who got placebo. The skin of the passion fruit is made up of a few main acids as well as chemical compounds that might help to relieve high blood pressure and lower blood pressure level. Moreover, it is additionally abundant with anti-oxidants, and it is considered to be very therapeutic for the heart. That's the reason why it may relieve the signs and symptoms of asthma. The fruit's skin also offers higher quantities of flavonoids which behave as natural antihistamines. It really is just like the most widely used cure for hay fever as well as allergic reactions within pills and medicines.

#### **Treats Insomnia:**

Sleeplessness is seen as a long-term lack of ability to sleep. Passion teas are usually utilized like a moderate sedative which causes sleep, Phytochemicals.info states. This particular sedative effect permits insomniacs to acquire a sound night of sleep. As soon as a appropriate sleep pattern has created, your blood pressure level need to go back to regular. However, you should always seek advice from a doctor just before making use of any kind of herbal health supplement, which includes passion fruit tea. Folk medicine has got traditionally utilized passion fruit flower like a natural sleep aid. A survey released in Phytotherapy Research examined the sedative results of passion fruit flower extract. The research workers did notice



a “nonspecific central nervous system depressant effect.” Additionally they observed a possible poisoning to human beings. A survey simply by French scientists demonstrated sedative effects on the actions of mice. The action level of the mice, calculated by quantity of rears as well as steps taken, dropped whenever they obtained an extract of passion fruit flower.

### **Kills Cancer:**

The juice yet mostly the leaves of passion fruit include the alkaloids, which includes Harman, which has blood pressure level reducing, sedative as well as antispasmodic action. The passion fruit foliage is utilized in numerous nations around the world as medications. Research workers in the University of Florida have discovered that yellow passion fruit extracts can easily kill cancer cells within vitro. The phytochemicals which can be liable for this particular anti-cancer effect usually are carotenoids as well as polyphenols. A 2007 screen of Brazilian plants discovered no cytotoxic action towards human MCF-7 breast cancer cells simply by the passion fruit extracts analyzed. The prevalent fatty acid within passion fruit seeds is linoleic acid (composed of roughly 70% of the fatty acid content); the seeds in addition consist of several oleic, palmitic, stearic, as well as alpha-linolenic acids. Additional factors apart, this particular fatty acid profile implies that the seeds could be more prone to encourage breast cancer rather than to avoid or even control it. Whilst passion fruit has revealed anti-oxidant action, it's not remarkable when compared with that of various other fruits considered to be connected with decreased breast cancer chance, just like strawberries as well as grapes. A lot more research is required to figure out the possible impact of eating passion fruit on breast cancer danger as well as survival. Passion fruit is shown to have got anti-oxidant as well as anti-fungal qualities. Passion fruit seed fiber has been proven to be efficient in enhancing intestinal function as well as health and might help decrease cholesterol levels. Purple passion fruit extract has been proven to decrease anxiety-related behaviors within laboratory rats without interfering with memory process. An initial screen of 1,220 Brazilian rain forest plant extracts from 352 plants discovered that passion-flower plant family extracts were one of the few which shown cytotoxicity towards human prostate cancer cells.

### **Reduces Anxiety:**

Anxiety is really a common phrase for a number of problems that create anxiety, fear, stress, as well as worrying. These types of problems affect the way we feel as well as behave, plus they can easily reveal real bodily signs and symptoms. Moderate anxiousness is hazy as well as disturbing, whilst serious anxiousness can be hugely devastating, having a significant effect on everyday life. Individuals usually notice a general state of worry or even fear just

before facing something difficult say for example a test, evaluation, recital, or even interview. This sort of feeling are often warranted and regarded regular. Anxiousness is recognized as a challenge whenever symptoms hinder an individual's capability to sleep or otherwise not function. Generally speaking, anxiety takes place when a reaction is out of proportion with what may be usually anticipated in a scenario. Anxiety doesn't straight result in long-term high blood pressure levels, or even hypertension. However, anxiousness usually results in unexpected yet temporary surges in blood pressure level. If these types of surges occur regularly, then damage occurs in your blood vessels, kidney as well as heart. Once this damage takes place, you may produce high blood pressure levels. Passion fruit tea has demonstrated the capability to decrease the signs and symptoms of anxiousness, in accordance with Medline Plus, a service of the National Institutes of Health. In some instances, extract from passion flower are simply as good as several prescription drugs.

### **Antioxidants**

Research workers within a University of Florida study discovered that this particular climbing vine plant from the *Passiflora* tree has even much more going for it. They found out that passion fruit extract had the ability to destroy cancer cells in vitro. The phytochemicals present in passion fruit that are accountable for this particular anti-cancer effect are usually carotenoids as well as polyphenols. Wait there is a lot more study which shows that the Gods have delivered passion fruit to us. In an Arizona College of Public Health study, the peel from passion fruit might help asthma sufferers relieve their coughing. They feel the anti-oxidants from the peel might assist in reducing the wheezing, as well as the flavonoids can in fact help in reducing allergy symptoms as well as swelling. Passion fruit is abundant with vitamin C, an anti-oxidant which safeguards you from the harm free-radicals cause, avoiding premature aging as well as keeping the immune system powerful. Along with 71 milligrams for each cup, one serving provides you with all the vitamin C you'll need every day. Additionally, it provides you with 10 % of the foliate you will need. Vitamin C as well as foliate are water- soluble nutrition which gradually turn out to be exhausted right after harvest. A freshly-picked passion fruit is a lot more nourishing than one which has been saved as well as moved, so get passion fruit from the farmers' marketplace whenever possible. The damage brought on by free-radicals can easily in the end result in numerous degenerative as well as long-term illnesses just like immune system difficulties, coronary artery disease, Alzheimer's disease, cardiovascular disease, arthritis, dementia, as well as diabetic issues. In addition to offering safety from particular illnesses, the free radical ruining qualities of passion fruit seeds might also offer beauty benefits simply by stopping premature wrinkles of the skin brought on by UV radiation. In reaction to experience of UV rays the



body produces considerable amounts of enzymes known as metalloproteinase that really help restore sun-damaged collagen. However, not every metalloproteinase are great for us. A number of them in fact break down elastin and collagen – which could ultimately result in wrinkles of the skin – as well as free-radicals, stimulates these types of dangerous metalloproteinase.

#### **Contains Iron which relieves anemia:**

As soon as the quantity of red blood cells or even concentrations of hemoglobin are reduced an individual is thought to have got anemia. Hemoglobin is really a protein (metalloprotein) within the red blood cells which contains iron as well as carries oxygen. Anemia is easily the most typical problem of the blood. Roughly 3.5 million Americans are influenced by it. It really is a lot more typical in developing nations, particularly in extremely poor locations where individuals are afflicted by poor nutrition. In several areas of Africa serious anemia can also be brought on by Malaria. Passion fruit is really a wealthy method of obtaining nonheme, or even plant based, iron. Whilst the Institute of Medicine suggests that men get 6 micrograms of iron each day and ladies obtain 8.1 micrograms, a cupful of raw passion fruit offers nearly 4 milligrams. Combined with overflowing cereals as well as iron-rich vegetables just like broccoli or even beets, a vegetarian could possibly get an ample amount of iron with the addition of passion fruit to her diet. The vitamin C content of the passion fruit likewise helps the body soak up its iron content.

#### **Great Dietary Aid for Weight Loss:**

For all those watching their body weight or even attempting to lose weight, fruits are definitely the suggested culinary food. However the passion fruit appears to be created for a fat loss diet. It really is lower in calories, just 97 calories for each 100 g! It can be lower in sodium as well as fat. It provides a fair amount of carbohydrates as well as natural sugars, therefore the body of a human recovers rapidly from the exercise as well as energy levels are rejuvenated. The fruit's nutrition focus on cholesterol-reducing levels within the body. In addition, the high fiber content indicates a serving of the fruit satiates your hunger as well as keeps you full, so that you do not overeat on various other food items.

#### **Has Relaxation Effect**

A tall cool glass of passion fruit juice might help unwind your nerves as well as your mind, causing you to really feel relaxed. This particular juice can also be recommended for digestive problems and enables along with indigestion as well as Gastric problems Types of Passion Fruit The genus *Passiflora* (Passifloraceae) is definitely the wealthiest in fruit varieties with more than 60 examples. A number of varieties may also be of decorative interest due to the single, magnificent type of their flowers, plus some can be used for their

sedative, antispasmodic, anti-bacterial as well as anti-insect qualities. A number of grown varieties are explained.

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