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REVEALING THE HEALTH BENEFITS: A COMPREHENSIVE LOOK AT THE NUTRITIVE AND MEDICINAL VALUE OF DRAGON FRUIT: A REVIEW

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ABSTRACT

The nutritional content and health advantages of dragon fruit will be covered in this review. Dragon Fruit (Kamlam) is also known as Pitahiya in India. It is a fruit of American origin, which is grown in large quantities in Thailand, Vietnam, Israel and Sri Lanka. It is a species of Cactus. This foreign fruit not only doubles the income of farmers, but it also has many nutritional properties. Due to its attractive appearance, this fruit is in great demand in the market. Its cultivation in India has recently become an example. The pulp which looks pink or yellow on the outside has a white or pink pulp on the inside. It is sweet and full of nutrients. It is rich in vitamins and minerals. Consuming dragon fruit proves to be very beneficial for those people who have immunity against many diseases. Little information is currently known regarding the production of dragon fruit. The market for dragon fruit may be expanded and the benefits to global growers and consumers can be maximized with research on many elements of agriculture and health benefits of dragon fruit.

Key words : Dragon fruit, Nutrient value, Medicinal value, Immunity.

Introduction

A fruit of the *Hylocereus* genus, dragon fruit is also known as pitaya or pitahaya. The herbaceous perennial climbing cacti known as *Hylocereus* species are primarily found in tropical and subtropical climates, and they are extremely drought-tolerant. It is indigenous to Costa Rica, Guatemala and Southern Mexico (Mizrahi *et al.*, 1997). Dragon fruits are becoming more and more well-known for their therapeutic and nutritional qualities (Sonawane, 2017). Given that it requires little water and can withstand the high temperatures, dragon fruit has a lot of potential as a new crop for Mediterranean farmers (Trivellini *et al.*, 2020). Due to its high nutritional content, this fruit is regarded as a significant commercial species globally (Rifat *et al.*, 2019). The fruit tastes nice and has crunchy qualities. It is high in sugars and antioxidants (Rao and Sasanka, 2015). In Asian nations where traditional healers employ herbal remedies to both prevent and treat illnesses, dragon fruit is also regarded as a medicinal plant (Sofowora *et al.*, 2013). Weight loss, better digestion, lower blood levels of LDL cholesterol and immune system

strengthening are just a few of the health advantages it provides. Because flavonoids affect blood arteries and brain cells, they lower the risk of heart disease and hydroxycinnamates help prevent cancer. Additionally, it protects the body from fungus and bacteria and aids in normal bodily functions (Verma *et al.*, 2017). The peels and pulp are high in water content, high in fiber, and packed with nutrients, including a significant number of antioxidants, vitamins, and minerals (Nurliyana *et al.*, 2010; Perween *et al.*, 2018). The fruits of *Hylocereus undatus* are high in antioxidants, phytochemicals, fiber, vitamins, calcium, phosphorus, and magnesium (Mahdi *et al.*, 2018; Luo *et al.*, 2014). Fruits are a great source of nutrients and vitamins. Fruit's flavor, nutritional value, and therapeutic qualities make it extremely popular. Foods with dragon fruit have a higher rate of digestion. Moreover, it can regulate blood pressure, high cholesterol, diabetes and cancer (Tripathi *et al.*, 2014). This review study discusses the nutritional value, health benefits, and cultivation of dragon fruit based on various research findings and new updates of philanthropist works.

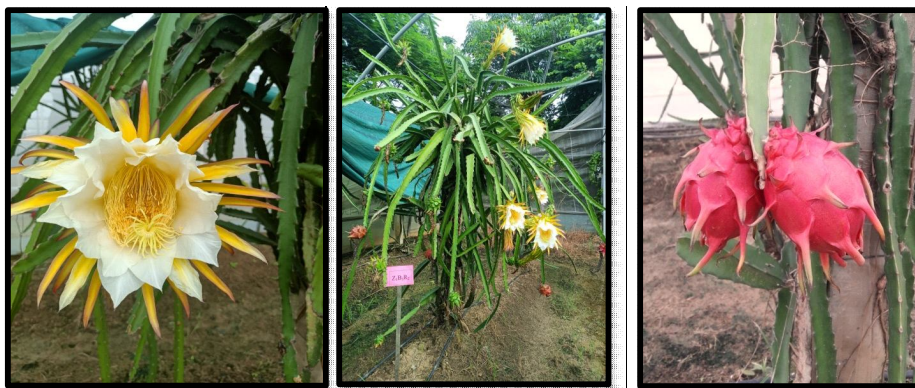


Fig. 1 : Dragon fruits with flower and fruit.

Morphology of Dragon fruit plant

Dragon fruit is mainly found in 3 main spp. are (*Hylocerous undatus*) Red colored fruit with white pulp, (*Hylocerous megalanthus*) Yellow colored fruit with white pulp, (*Hylocerous polyrhizus*) Red colored fruit with red pulp (Hunt, 2006; Hamidah *et al.*, 2017).

***Hylocerous undatus*:** Britton and Rose have long, green stems that are rather horny as they age. Its long (up to 29 cm) flowers include green, or yellow-green, outer perianth segments and pure white inner perianth segments. The fruits are rectangular in shape and have large, long scales that are red and green at the tips. They are rosy-red in color and range in length from 15 to 22 cm. They weigh between 300 and 800 g.

***Hylocerous megalanthus*:** The production of this variety is also very less in India. In this, the outer color of the fruits growing on plants is yellow and the inner color is white. This fruit is very good in taste, which also has the highest market price.

***Hylocerous polyrhizus*:** Britton & Rose offers robust vines. Perhaps the stoutest vines in this genus. The blooms resemble those of *H. polyrhizus*, but the stems are waxy white. The fruits weigh between 250 and 600 g and have a diameter of 10-15 cm. They are crimson in colour. Fruits are ovoid and coated in a range of size scales. Its flesh is a nice reddish-purple colour with lots of tiny black seeds, and it tastes wonderful.

Technique for cultivation

Dragon fruit plants require appropriate environmental conditions, particularly tropical and sub-tropical photoperiodic climates, sufficient rainfall, humid sandy soil, etc. All of these conditions are also necessary for flowering and fruit setting. The fruit crop is grown year-round in subtropical and tropical countries (Nerd and Mizrahi, 1995; Yen and Chang, 1997). Bangladesh has a subtropical monsoon climate, which is distinguished by high temperatures, high humidity and significant seasonal

changes in rainfall. This nutrient-dense dragon fruit plant can be grown in this climate. Sweltering sunlight and complete darkness prevent flowering and fruit setting, which affects fruit growth and development. Moderate temperatures are ideal for optimal fruit growth (Mallik *et al.*, 2018). An excessive amount of irrigation can cause fruit splitting, flower falling, and plant yellowing. The plant thrives in tropical or dry regions with 30 to 40 inches of rainfall and any type of soil that contains organic content. Seeds and stem cuttings are used to propagate dragon fruit. In contrast to vegetatively propagated plants, which bear flowers in three years, seedlings require four to five years to bear fruit and flowers (Rao and Sasanka, 2015). The semi-epiphytic dragon fruit plant thrives in dry tropical or subtropical climates with average temperatures between 21 and 29°C, while it can withstand brief temperatures. For this crop to thrive, it needs 600–1300 mm of rainfall spread out across alternating wet and dry seasons (Mc Mahon, 2003). It is often recommended to feed 10 to 15 kg of farm yard manure, 200 g of nitrogen, 50 g of phosphorus and 50 g of potash to 1 to 2 old plants. Use this three times a year, dividing it into three equal doses. A plant that is three years old or older should receive 20 kg of farm yard manure, 500 g of nitrogen, 750 g of phosphorus, and 300 g of potassium regularly. Each year, after harvesting and during growth, before flowering, and after fruit set, these should be administered in four equal split dosages (Tripathi *et al.*, 2014). When a stem's tip is removed, lateral branching results. A healthy vine can yield 30 to 50 branches in a year and over 100 branches in four years. To improve aeration, facilitate cultural operation, and guard against disease and pests, these branches should be cut (El Obeidy, 2006). During the summer or dry days, one to two liters of water per day per plant is adequate. The amount of water needed might change according on the soil, temperature, and health of the plants (Tripathi *et al.*, 2014). Regular irrigation is necessary for the plant to build up enough reserves to ensure the development of the fruits. Fruit is

typically planted with vertical support of pillars to which its stem must be attached with a clip. Pillars with a frame attached on top to allow the plant to hang down (Perween *et al.*, 2018). The flowers are big, nocturnal, hermaphrodite, and very stunning. The flowers open in the evening from 6.30 to 7.30 pm and close by approximately 10.00 pm, with the exception of the first two hours of the new moon. Then the blooms start to wilt. The dragon fruit is known to flower in waves, and in many regions, the flowering season lasts from May to November, with some reports extending into December and Ripe fruits can be picked 30–50 days after pollination; flower buds appear 15–17 months after planting and 28 days are needed for blossoming (Mizrahi and Nerd, 1999; Pushpakumara *et al.*, 2005). Its early maturity and high yielding capacity make it a crop for easy income creation (Thokchom *et al.*, 2019). Growers of dragon fruit can get greater rewards by implementing the most recent crop management techniques.

The nutritional content of dragon fruit

The nutritional qualities of dragon fruit juice derived from various species and crops exhibit significant variability, as demonstrated by the analysis conducted (Ruzainah *et al.*, 2009; Ramli and Rahmat, 2014; Jerônimo *et al.*, 2015). Therefore, depending on the source, 100 g of fresh dragon fruit pulp has above 80% moisture content, 0.4 to 2.2 g of protein, 8.5 to 13.0 g of carbs and 6.0 g of total sugar regarding the kind and the source. The observation that the vitamin C amounts found in the research (Ramli and Rahmat, 2014; Jerônimo *et al.*, 2015). Significant levels of minerals, including potassium, phosphorus, sodium, and magnesium, are found in dragon fruit; these concentrations are greater than those found in mangosteen, mango and pineapple (Gunasena *et al.*, 2007; Stintzing *et al.*, 2003; To *et al.*, 1999) were lower than one might anticipate from a fruit with such highly regarded antioxidant qualities, and the writers ascribed this to a variety of factors: The concentration of ascorbic acid in fruit varies depending on the type of culture, the maturity stage, and the cultivation conditions; ascorbic acid is sensitive to air and light and is easily oxidatively degraded throughout the juice-making process; Fruit storage and transportation have an impact on their vitamin and mineral content; to maintain the fruit's qualitative characteristics, it is ideal to preserve it at a temperature of about 8 °C (Ramli and Rahmat, 2014 ; Jerônimo *et al.*, 2015). TSS is higher in mature dragon fruits, primarily found in autumn fruits compared to summer fruits (Nomura and Yonemoto, 2005). Three species *H. costaricensis* or super red pulp; *H. polyrhizus*, or red pulp and *H. undatus*, or white

pulp that were gathered from four distinct places had their vitamin C levels examined. Sukoharjo, Pasuruan (East Java) and the districts of Bantul (Yogyakarta); and Klaten (Central Java). Depending on the species and the area, the concentration of vitamin C varied from 3.3 to 6.0 mg 100 g⁻¹. As a result (Choo and Jong, 2011). Pasuruan super red pitaya had the highest concentration of vitamin C content (6.0 mg 100 g⁻¹), while Bantul white pitaya had the lowest concentration (3.4 mg 100 g⁻¹). The ascorbic acid contents of two species, *H. polyrhizus* and *H. undatus*, were determined by Choo and Jong (2011) to be 36.65 and 31.05 mg 100 g⁻¹ fresh pulp, respectively (Mahattanatawee *et al.*, 2006). Dragon fruit is an excellent source of vitamins, minerals, dietary fiber, glucose, and fructose (Rao and Sasanka, 2015). It is highly renowned for having high levels of antioxidants, phosphorus, calcium, and vitamin C (Morton, 1987). 82.5–83.0% moisture, 0.16–0.23% protein, 0.21–0.61% fat, and 0.7–0.9% fiber are present in fresh fruit. 6.3–8.8 mg of calcium, 30.2–36.1 mg of phosphorous, 0.5–0.61 mg of iron, and 8–9 mg of vitamin C are found in 100 g of fresh fruit pulp (TFIDRA, 2005). Additionally, the red meat has a high betalanin content, which satisfies consumer demand for natural food coloring and antioxidant-containing products (Perween *et al.*, 2018). Numerous vitamins, including B₁, B₂, B₃, C, and minerals, are abundant in the fruit's red layer (Le Bellec *et al.*, 2006). Dragon fruit has a high fiber content, low carbohydrate and fat content, and is high in nutrients like vitamin B1, B2, B3, C and minerals like Ca, Fe and P. Conversely, 50% of the necessary fatty acid found in seeds is linoleic acid (Sonawane, 2017). Phytochemicals found in dragon fruit pulp and peel extract have antibacterial properties and can be utilized as a natural antioxidant (Patel and Ishnava, 2019). The young stem of the pitaya is another portion that has great nutritional value. It contains raw protein (10.0–12.1 g 100 g⁻¹), raw fiber (7.8–8.1 g 100 g⁻¹), and other minerals (Fe = 7.5–28.8 mg kg⁻¹ of dry mass) (Ortiz-Hernández and Carrillo-Salazar, 2012). Table 1 shows the components and minerals contain in 100 g edible dragon fruits.

All the preceding research findings have been indicated that Dragon fruit contains various vitamins and minerals that are needed for a healthy body.

Benefits of dragon fruit for health

Studies show that Dragon fruit promoted the growth of healthy gut bacteria and Betacyanin which serves as a red or purple pigment with anti-oxidative properties (Liaotrakoon, 2013). The dragon fruit is known for its antioxidant qualities and numerous thorough research

Table 1 : Nutrient content of 100 g edible portion of Dragon fruits (Thokchom *et al.*, 2019; Jerônimo *et al.*, 2015; Ramli and Rahmat, 2014).

Component	Amount	Component	Amount
Water	87 g	Sodium	35.63 mg
Protein	1.45 g	Zinc	0.40 mg
Fat	0.4 g	Phosphorus	22.5 mg
Total dietary Fiber	2.65 g	Calcium	8.5 mg
Crude fiber	1.15 g	Vitamin A	0.89 mg
Carbohydrate	11.0 g	Vitamin B ₁	0.04 mg
Energy	62.95 kcal	Vitamin B ₂	0.05 mg
Iron	1.9 mg	Vitamin B ₃	0.16 mg
Magnesium	26.40 mg	Vitamin C	20.5 mg
Potassium	158.29 mg	Ash	0.54 g

have been conducted on the antioxidant activity of various species as well as the antioxidant content of various plant components, such as pulp, peel, stem, and leaves (Mahdi *et al.*, 2018; Zain *et al.*, 2019). There are many little black seeds in the delicious pulp. Additionally, it is thought to be a possible source of antioxidants and minerals (Lim *et al.*, 2010). Many research have examined dragon fruit's potential as an antidiabetic (Omidizadeh *et al.*, 2014). It has medicinal values like reducing hypertension and diabetes (Kumar *et al.*, 2018). cancer-preventing effects (Yusof *et al.*, 2012). In addition to their potential to inhibit cancer cells, betalains offer anti-oxidative stress properties. It can strengthen the immune system, lower blood levels of LDL cholesterol, enhance digestion, and help with weight loss and Hydroxycinnamates helps to prevent cancer (Verma *et al.*, 2017). decreased chance of heart disease and cancer (Aghajanzpour *et al.*, 2017). favorable effects on oxidative stress, diabetes, cardiovascular disorders, immunological system, metabolism, and clarity of vision (Nurmahani *et al.*, 2012). Flavonoids lower the risk of heart disease via acting on blood arteries and brain cells. It reduces heart disease and keeps blood pressure stable (Patel and Ishnava, 2019). Omega-3 and omega-6 fatty acids, which lower triglycerides and lower the risk of cardiovascular problems, are abundant in the seeds of dragon fruits (Sonawane, 2017). The physiologic and biochemical underpinnings of plants' defense against various pathogen assaults (such as viruses, fungi, or bacteria) are linked to the secondary metabolites that plants produce during a microbial infection (Mickymaray, 2019). The bioactive chemicals found in dragon fruit help people's immunity. enhances both mental and physical wellness as a result and People suffering from arthritis should consume dragon fruit (Jeronimo *et al.*, 2017). Frequent consumption of dragon fruit, which has a high vitamin C content, can

help prevent cough and asthma; it also has wound-healing properties that promote quick healing of cut areas; it also strengthens the immune system and encourages the body's other antioxidants to function (Cheah *et al.*, 2016). Red dragon fruit with high iron content raises levels of erythrocytes and hemoglobin in expectant mothers (Nurliyana *et al.*, 2010). The findings of (Parmar *et al.*, 2019) provided evidence for the antioxidant and hepatoprotective properties of pitaya, both at the histological and enzyme levels. The extract of dragon fruit, which was found to be comparable to silymarin, was found to restore levels of oxidative stress parameters such as reduced glutathione, malondialdehyde and catalase and superoxide dismutase activity, as well as total protein, total and direct bilirubin, lactate dehydrogenase, gamma-glutamyl transferase and total protein. Due to the high iron content of red dragon fruit, pregnant women's levels of erythrocytes and hemoglobin are elevated (Nurliyana *et al.*, 2010). Pitaya is a source of vital nutrients, including riboflavin, iron (Fe), iron precursors, vitamins C, E, B12 and thiamine (Tenore *et al.*, 2012). An evaluation of the impact of dragon fruit on postpartum mothers—who are thought to be vulnerable to anemia was carried out by (Rahmawati *et al.*, 2019). High amounts of calcium and phosphorus found in dragon fruit are essential for the development of healthy teeth, tissue, and bones (Choo and Yong, 2011). Prebiotics are non-digestible oligosaccharides that have protective properties against intestinal illnesses including colon cancer and promote the formation of healthy flora in the colon (Khuituan *et al.*, 2019). It demonstrated higher levels of antioxidants that are safe for the environment and function as antibacterial agents, which are important in the food processing, healthcare, nutraceutical, and cosmetic industries. Medical research is being drawn to the fruit's potential for managing a variety of illnesses and important aspects that promote health because of these effects.

Conclusion

The goal of this review paper is to present the cultivation of dragon fruit in a new region while taking its nutritional and commercial worth into account. The nutritional richness and health benefits of dragon fruit have made it famous globally and given it great adaptability. In tropical and subtropical regions, this fruit crop is grown year-round on well-drained soils with a little heavy texture. This fruit is rich in vitamins, dietary fiber, fructose, glucose, and minerals. Together, all of the ingredients in dragon fruits strengthened the body's defenses against disease. Dragon fruit flowering and fruit set have been directly impacted by environmental

conditions. Depending on the species, growing region, and harvesting period, dragon fruit has varying nutritional content. Peel from dragon fruit has a lot of promise for usage as a natural colouring. The fruit has a promising future in the global market because of the growing trend of its consumption. In order to have a long-term view, further study on dragon fruit should be done, with a focus on the production and value chain components.

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