A review on nutritional, medicinal and bio-active compound of dragon fruit Hylocereus polyrhizus (F.A.C.Weber) Britton & Rose

ABSTRACT

Dragon fruit (*Hylocereus polyrhizus* F.A.C.Weber) is a popular fruit crop known for its enormous medicinal potential that has drawn the attention of numerous researchers in recent years. It is a rare tropical fruit that has many favorable impacts on human health because it has powerful natural antioxidants and bioactive components, which have a great nutritional value. It contains a lot of nutrients like calcium, phosphorus, and vitamin C. Improved digestion is one of dragon fruit's most well-known health advantages. It has a lot of fiber, which can aid in controlling bowel motions and avoiding constipation. Dragon fruit also has natural digestive enzymes that can aid in food digestion and nutrient absorption. Higher medicinal benefits include lowering diabetes and hypertension. Bioactive compounds found in these parts have a variety of beneficial biological effects, including antioxidant, antibacterial, and anticancer capabilities. These include steroids, saponins, betalains, flavonoids, alkaloids, tannins, polyphenols, terpenoids, and carotenoids, all of which have been shown to be more effective than synthetic drugs in the treatment and prevention of a variety of diseases, such as diabetes, cancer, obesity, and hyperlipidemia, as well as pathogenic organisms like bacteria, viruses, and fungi. Furthermore, it demonstrates resilience to numerous abiotic stressors and needs relatively little water for growth and development. Therefore, it might be a fruit crop that is both healthy and profitable for sections of the country that are rainfed as well as degraded lands with good resources and abiotic stress. Due to its ecological qualities, advantages to commercial value and human health the dragon fruit has developed into a productive product for the economy and a catalyst for the sustainable development of the country, particularly in the promotion of sustainable use of ecosystem and biodiversity. The current study focuses on the nutritional and medicinal benefits of the dragon fruit (*Hylocereus polyrhizus* F.A.C.Weber).

KEYWORDS: Dragon fruit, medicinal value, nutritional value, abiotic stress etc.

INTRODUCTION

The scientific name of the dragon fruit is Hylocereus polyrhizus, a member of the Cactaceae family. (Patwary *et al*., 2013). Sometimes it is known as pitaya mostly found in tropical regions but can also easily grow in subtropical areas. Dragon fruit is native to North, Central and South America despite being native to Mexico but it is now grown and spread to the rest of the world. Dragon fruit is commercially cultivated in many countries such as Vietnam (50% of the total fruit production), Columbia, Mexico, Costa Rica, USA, Israel, China, Ethiopia, Indonesia, Japan, Thailand and India, Nicaragua and Australia (Wichienchet et al. *2010*)) due to its low cultivation requirements, greater resistance to drought, simplicity in responding to more light and temperature levels, a wide range of tolerance to various soil salinities. (Crane *et al.,* 2017). It is grown in Maharashtra, Gujarat, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, Haryana, Punjab,

and Madhya Pradesh. It is one of the recently introduced exotic fruit crops in India. It can be grown for both ornamental and agricultural uses. Dragon fruit is also used for table purposes and in the processing industry for making different products such as jam, jelly, ice cream, juice, wine and face packs. Dragon fruits have beneficial health benefits. Vitamin B1, B2, B3, and vitamin C are all abundant in it, as are protein, fat, flavonoid, thiamin, niacin, carbohydrate, crude fiber, pyridoxine, kobalamin, glucose, phenolic, carotene, phosphorus, iron, betacyanins, polyphenol, antioxidants, and phyto albumin. (Ruzainah *et al.*, 2009. It has a high concentration of phyto albumins, which are highly prized for their antioxidant effects. Due to its high nutritional content, the fruit has many medicinal uses. It acts as a hypocholesterolemic, antimicrobial and antioxidant agent. Immune system is strengthened by it. It encourages healthy skin and hair. It enhances cognition, eyesight, and appetite. Due to its anti-cancer qualities, it also functions as an anti-cancer agent (Nurul S. R 2014). It aids in the treatment and management of cancer, diabetes, and arthritis as well as the reduction of blood pressure and cholesterol and the prevention of ageing. In addition to linoleic and alpha linolenic acids, which are essential for maintaining cell membranes, cognitive functioning, and the transmission of nerve impulses, the pulp and peel also contain significant levels of water, antioxidants, and vitamins (Harivaindaran *et al.,* 2008**)**. It is utilized in cases of dengue fever because of its antiviral properties. The peel and pulp of dragon fruits can vary in color, but the type with a red peel and white pulp is the most frequently cultivated. The human body is unable to synthesize the critical fatty acids found in dragon fruit, particularly linoleic acid. The pulp and peel also contain considerable amounts of water, antioxidants, and vitamins in addition to linoleic and alpha linolenic acids, which are necessary for maintaining cell membranes, cognitive function, and the transmission of nerve impulses. (Verma D. *et al.*, 2017**)**.

Botanical description of dragon fruit

There are 18 species in the genus *Hylocereus.* The Cactaceae family includes dragon fruit. The majority of the plant species in this genus are climbing vine cacti with aerial roots that produce beautiful glabrous berries with huge scales. (Fournet, 2002). Diploid *Hylocereus* species have chromosome number 2n = 22. (Dios, 2004 and Lichtenzveig *et al.,* 2000). The dragon fruit genus has more than 250 domesticated varieties of industrial and fruit-bearing crops, many of which are grown for their ornamental qualities (Fouqué, 1969). Nonetheless, some species have commercial value. It is by habit epiphytic, climbing cacti with elongated stems that are typically 3-angled or 3-winged and possess branches emitting aerial roots. The plant is known for its extraordinarily huge, funnel-shaped flowers with limbs as broad as long, which usually bloom at night. However, unlike the leafy bract on the hypanthium, the ovary and hypanthium (pericarp) display enormous leafy bracts without spines, felt, wool, or hairs. In contrast to the green bract on the hypanthium, the inner perianth segments are thin, acute, or acuminate, typically white but occasionally red. The fruit is spherical to rectangular, often crimson and juicy, spineless, and covered in several broad, leafy bracts. The stamens are numerous and can range in length from shorter to as long as the style (Sonawane M.S. 2017). Table 1 displays the botanical description of the dragon fruit.

Table 1: Botanical name for dragon fruit

Botanical Description	**Crop description**
Common name	Dragon fruit
Kingdom	Plantae (plants)
Sub kingdom	Tracheobionta (vascular plants)
Chromosome number	22 (2n = 2X)
Super division	Spermatophyta (seed plants)
Division	Magnoliophyta (flowering plants)
Class	Magnoliopsida (Dicotyledonae)
Order	Caryophyllales
Family	Cactaceae
Genus	*Hylocereus*
Species	*Polyrhizus*
Botanical name	*Hylocereus polyrhizus*

Source: Britton and Rose (1963); ISB (2002); NPDC (2000)

Since it blossoms only open at night, the plant is sometimes referred to as the "moon flower" or the "Lady of the Night". The flowers are huge, white, and only bloom for one night and they are at least 20 cm long. They have a pleasant scent when in bloom. Pitaya trees can experience four to six fruiting cycles in a single year. The dragon fruit has eye-catching characteristics such distinct scales and brilliant red, purple, or yellow skin variants. The fruit has an elliptical, oval, or pear form. The flavor of the flesh is generally fairly sweet but can occasionally become slightly sour. The edible black seeds are dispersed throughout the fruit, which is either white or red. (Feng-Ru C. *et al.*, 1997). As shown in Table 2, dragon fruit is divided into three groups based on its physical characteristics: Extra class, class I, and class II.

Table 2: Dragon fruit are divided into groups based on their sizes and shapes

Classification	**Requirements**
Extra	• Superior quality • Must be traits of the variety, commercial type, or both • Free from defects, with the exception of extremely minor flaws on the surface that don't harm the product's look, quality, or packaging, • Tolerance: Five percent of the quantity or weight of dragon fruit must fulfil Class I standards or, in exceptional cases, fall within those standard tolerances.
Class I	• Must be of high quality • Must reflect the traits of the commercial type or variety

	• Slight defects in shape • Skin defects that don't cover more than 1 cm2 of the fruit's entire surface area • Fruit pulp should not be affected by defect • Tolerance: Ten percent by weight or quantity of dragon fruits that meet Class II standards or, in rare cases, fall within those standards, but do not meet the requirements of the class.
Class II	• Fruits are not considered to be of the top class, but they must meet the minimum requirements, such as being whole, sound, and looking fresh as well as being free of any visible pests and other objects. • Slight deformity in shape • Slight deformity of the skin do not cover more than 2 cm2 of the fruit's overall surface area • Ten percent by weight or number of dragon fruit, neither meeting the class's standards • The bare minimum, with the exception of produce that has rotted or undergone any other deterioration that renders it unsafe for eating

(Philippine National Standard for Fresh Fruit,2013)

Health Benefits

Dragon fruit enhances a person's appetite, vision, and memory (Rao and Sasanka 2015). It possesses anti-aging effects (Lim et al., 2012; Zhuang et al., 2012), cancer-preventive characteristics (Yusof et al., 2012), as well as beneficial effects on the immune system, metabolism, digestion, clear vision, oxidative stress, diabetes, and cardiovascular disorders. There are numerous medical advantages of *Hylocereus* species. Along with its fruits, Latin Americans have long utilized these plants' leaves and blossoms as hypoglycemic, diuretic, and cicatrizing agents. Red pitahaya consumption is crucial for the prevention of cardiovascular disorders. Different antioxidants, like vitamin C, vitamin B3, and flavonoids, can lower blood cholesterol and hypertension, which is excellent for preventing cardiovascular illnesses (Nurmahani et al. 2012). This fruit is said to be a very excellent fruit for diabetes patients since it has very little sugar and the sugar glucose, which is prevalent in dragon fruit and helps control blood sugar levels. This fruit, when consumed regularly, helps to alleviate cough, asthma, and sores (Woo, K. K. et al. 2011). It aids in the development of bones and teeth since it is rich in phosphorus and calcium minerals. It also enhances eyesight and has anti-aging properties. (Mercado-Silva E. M. 2018).

Table 3: Functions of some of the main antioxidant compounds and minerals contained in Dragon fruit

Components	**Property**	**Functions**	**Amount**	**Reference**
Betanin	Antioxidant	High free radical	2.0 g sample with	Albano *et al.*

		scavenging activity and oxidative stress inhibition are two characteristics of betanin.	20 mL of 80%methanol in a 250 mL Erlenmeyer flask	(2015)
Betalains	Antioxidant, cardioprotection, antiobesity	Betalains possess the ability to reduce cancer cell growth and combat oxidative stress, making them beneficial in supporting overall health. Additionally, they can aid in weight loss and improve digestion, while also helping to reduce LDL cholesterol levels in the blood and strengthen the immune system. (Verma et al., 2017).	42.71 ± 2.48 mg/100 g fresh pulp	Rodriguez *et al.* (2015).
Linoleic acid and linolenic acid	Antiobesity, cardioprotection	Dragon fruit seeds are rich in omega-3 and omega-6 fatty acids, which have been shown to lower triglyceride levels and decrease the likelihood of developing cardiovascular diseases. (Sonawane, 2017).	Linoleic acid and linolenic acid	Sonawane, (2017)
Flavonoids	neuroprotection	According to Verma	White-fleshed	Abeysinghe and

		et al. (2017), flavonoids work on blood vessels and brain cells to lower the risk of heart disease. It decreases heart disease and keeps blood pressure stable. (Patel and Ishnava, 2019).	26.71 ± 4.46 mg RE/100 g FW and Red fleshed 46.29 ± 2.47 mg RE/100 g FW	Senadheera (2015)
Hydroxycinnamates	Anticancerous	It prevents cancer because of hydroxycinnamates. (Verma *et al.*, 2017).	Minor amounts of hydroxycinnamic acids	Mahattanatawee *et al.* (2006).
Carotenoids (Beta-carotene)	Anticancerous, cardioprotection	decreased risk of heart disease and cancer (Aghajanpour *et al.*, 2017).	1.41 mg/100 g	Charoensiri *et al.* (2009)
Lycopene	Anticancerous	Lycopene reduces the proliferation of several human cancer cell lines. (Levy *et al.*, 1995).	3.39 mg/100 g	Charoensiri *et al.* (2009)
Iron	Better visual functions	Red dragon fruit has a lot of iron, which causes pregnant women's levels of haemoglobin and erythrocytes to rise. (Nurliyana *et al.*, 2010)	1.90 mg/100g	Thokchom *et al.* (2019)
Phosphorus (P) and calcium:: (Ca)	Body strengthening	Dragon fruit contains significant amounts of phosphorus and calcium, which play a	P 22.49 mg/100g and Ca 8.5 mg/100g	Thokchom *et al.* (2019)

		crucial role in promoting the development of robust bones, healthy teeth, and tissues. (Choo and Yong, 2011).		

(Source: Int. J. Hort. Sci. Technol. 2021 8(3): 239-249)

Nutrition value of dragon fruit

Several health-promoting phytochemicals, including polyphenols, flavonoids, and vitamin C, are said to be present in dragon fruit, giving it a potent antioxidant capacity. Flavonoids such as kaempferol, quercetin, isorhamnetin, and related chemicals can be found in the plant's flowers and fruits. The benefits of anthocyanins, natural pigments with antioxidant and preventive effects for capillary fragility, are also present in the pulp of purple dragon fruit. (Herbach *et al.* 2004)**.** The fruit's red coating provides a nutrient-dense source of vitamins B_1, B_2, B_3, and C, as well as minerals. (Bellec *et al*., 2006). When compared to other subtropical fruits, this fruit has a reasonably strong antioxidant activity (Davis, 2007). In addition to being high in vitamins B_1, B_2, B_3, and C, high fiber content, and minerals like Ca, Fe, and P, dragon fruit is also low in carbs and free of fat. Although linoleic acid and linolenic acid, two important fatty acids, are found in 50% of seeds. In the fruit pulp of every species of dragon, Black seeds can be eaten and are loaded with vitamins, minerals, soluble carbohydrates, proteins, calcium, magnesium, and other beneficial compounds. (Rodrigues, E. B. *et al* (2016). Dragon fruit contains significant amounts of vitamin C (ascorbic acid), a water-soluble element essential for normal physiological function and crucial for proper iron absorption. The beta-cyanins in red dragon fruit with pulp protect mice from diet-induced obesity and the associated metabolic problems. showed that eating dragon fruit significantly increased HDL cholesterol levels while lowering total cholesterol, triglycerides, and LDL cholesterol in type 2 diabetics.

Table 4: The nutritional value per 100g of edible part of ripe Dragon fruit

Nutrient	**Amount per 100g**
Water	87 g
Vitamin B_3 (Niacin)	0.16 mg
Protein	1.1 g
Fiber	3 g
Vitamin B_1 (Thiamine)	0.04 mg
Carbohydrates	11 g
Fat	0.4 g
Vitamin C (Ascorbic Acid)	20.5 mg
Iron (Fe)	1.9 mg

Source: https://www.healwithfood.org

The discovery of the phytochemical components found in dragon fruit has garnered more interest in recent years. The dragon fruit contains the following phenolic compounds (fatty acids that are prominently present): apigenin, jasmonic acid, myricetin rhamnohexoside, cinnamic acid, quinic acid isomer, oxo octadecanoic acid, 3,4-dihydroxy vinylbenzene, quinic acid, isorhamnetin 3-O-rutinoside, 3,30-di-O-methyl conjugation pointed out its significance as a natural color source with importance for the food and cosmetic industries. (Ahmed *et al*., 2015). Some of the fatty acids present in dragon fruit are shown in the table below:

Table 5: The fatty acids profile in flesh of dragon fruit

fatty acids composition	**Red pitaya pulp mg per 100 g**
Palmitic acid	62.740
Palmitoleic acid	1.765
Heptadecanoic acid	0.580
Oleic acid	22.066
Linoleic acid	252.650
Alpha linolenic acid	4.569
Arachidic acid	4.587
Eicostareinoic acid	0.304
Behenic acid	3.713
Docosahexaenoic acid	0.608
Tricosanoic acid	0.351
Stearic acid	27.333

Source: Jerônimo *et al.* (2015)

Medicinal value of dragon fruits

Occasionally, dragon fruit is used medicinally. The fruit is widely consumed as food. The use of dragon fruit in the treatment of conditions such as prediabetes, high blood pressure, obesity, diabetes, high cholesterol, and many others. Red dragon fruit, which also contains iron, has the ability to raise erythrocyte and hemoglobin levels, making it a potential cure for anaemia. Dragon fruit contains phyto albumin, which has a preventive effect against cancer. Because it contains a lot of phytochemicals that are good for your health, dragon fruit use may be a tactic to lower disease occurrence. Vitamin B_1, vitamin B_2, B_3, vitamin C, betacyanin, proteins, polyphenols, iron, lipids, carbohydrates, glucose, phyto albumin, carotene, cobalamin, and phenols are among the nutrients that are particularly important. Pitahaya cures asthma and cough, aids in digestion, regulates blood sugar, lowers blood pressure, eliminates toxins from the body, especially heavy metal pollution, and prevents a number of diseases, including colon cancer. The dragon fruit tree's stem even has therapeutic qualities. According to some studies (Ruzainah *et al.*, 2009), Premature dragon fruit stems,

which contain more ascorbic acid than the fruit's meat, may have helped lower the risk factors for some diseases. In addition to polyphenols and flavonoids, pitahaya also includes additional phytochemicals termed betacyanin and betaxanthins, which are a subclass of betalains. According to studies, dragon fruit's betacyanin has an anti-free radical action. We all know that free radicals are bad for the body since they can lead to ageing, heart issues, and neurological illnesses. In tropical formulations, the leaves and water extract of the blossoms from the white dragon fruit (*Hylocereus undatus*) have been demonstrated to promote wound healing (Kumar S.B. et al., 2018). Below are a few of the categories of dragon fruit's medicinal qualities:

•**Antioxidant properties:** There has been an increase in the utilization of natural antioxidant substrates found in medicinal plants that have protective effects against cellular damage brought on by free radicals, which are linked to many disorders like cancer. Thus, the antioxidant (radical-scavenging) qualities of many plants' constituent phenolic chemicals (such as flavonoids, phenolic acids, stilbenes, lignans, and tannins), alkaloids, and vitamin C could be responsible for their popularity in disease prevention. Betacyanin and anthocyanins found in dragon fruit peel extract have a high enough level of activity to fight free radicals, making it a valuable source of antioxidants. (Woo, K. K. *et al.*,2011).

•**Antidiabetic properties:** One of the prominent systemic diseases in the world is Diabetes mellitus, is brought on by either insufficient insulin production by the pancreas or insufficient cell sensitivity to the effects of insulin. Common biochemical mechanisms by which medicinal plants have antidiabetic effects include improved inhibition of glucosidase activities, insulin sensitivity by receptors, inhibition of liver gluconeogenesis, increased glucose absorption, stimulation of insulin secretion, glucose-6-phosphatase, and -amylase. Investigations on the positive effects of red and white dragon fruit in the prevention of diabetes produced data showing a larger reduction in blood glucose levels when pitaya fruit was taken in high dosages. However, because there is little information known concerning the antidiabetic property of dragon fruit, proven clinical experiments are currently being considered (Saryano, J. 2006).

•**Antimicrobial properties:** The secondary metabolites that are produced by a plant's cells in reaction to microbial contamination are linked to the physiological and biochemical basis of a plant's resistance to attacks by particular diseases (such as viruses, fungi, or bacteria). White and red pitaya fruit extracts demonstrated antibacterial activity against a variety of microorganisms (Nurmahani M.M. *et al.*, 2012)

•**Anticancer activity:** Dragon fruit has the ability to stop the formation of cancer cells due to its high concentration of powerful antioxidants such polyphenol, anthocyanin, betalains, steroids, and triterpenoids. In addition to being antimicrobial, betalains have the power to inhibit cyclooxygenase (COX-1 and COX-2) enzymes, lipid peroxidation, and the development of human cancer cells. The extracts from both pitaya species have shown antioxidant and cytotoxic activity against three different cell types: PC3 (a human prostate cancer cell line), Bcap-37 (a human breast cancer cell line), and MGC-803 (a human gastric cancer cell line). Pitaya peels from H. *polyrhizus* and H. *undatus* have been supercritical CO2 extracted

(Aghajanpour *et al.*, 2017).

•**Wound healing activity:** The extracellular matrix, numerous distinct cell populations, and the action of soluble mediators like growth factors and cytokines all play a part in the multistage process of healing a wound. It is designed to restore the integrity of damaged tissues. Extracts from the dragon fruit's stem and bloom encourage fibroblast migration, which is essential for the healing of wounds. Additionally, the extract demonstrated excellent DNA damage prevention activities. Active substances such flavonoids, niacin, cobalamin, Terpenoid, carotene, phyto albumin, betalain, tanine, and saponin are present in the red dragon fruit (*Hylocereus polyrhizus*) peel. The components of soaps and tannins have a part in tissue regeneration during the healing of wounds. Flavonoid inhibits lipid peroxidation, which speeds up wound healing (Perween T. *et al.*, 2018).

•**Anti-hyperlipidemic and anti-obesity properties:** Due to its propensity to accelerate atherosclerosis, dyslipidemia is a complex disease and a significant risk factor for unfavorable cardiovascular events. Pitaya peel extracts helped to reduce hyperlipidemia because of its high crude fiber content (69.30% total dietary fiber, broken down into 56.50% insoluble food fiber and 14.82% soluble food fiber), which lowers caloric consumption. It can improve insulin sensitivity in cells because it traps bile acids and cholesterol in the small intestine (Guimares D.D.A.B. *et al.*, 2017). The bioactive components in dragon fruit extracts, such as phenolic, polyphenol, crude fiber, and flavonoid content, help lower serum lipid profiles by preventing the absorption of cholesterol in the intestine and promoting its excretion through the feces. (Herbach, K. M *et al.*, 2004).

•**Hepatoprotective property:** Pitaya's potent antioxidant content, which includes triterpenes, flavonoids, glycosides, tannins, saponin, and alkaloids, may contribute to its hepatoprotective properties. (Parman. *et al.*, 2019).

•**Anti-inflammatory property:** Dragon fruit contains antioxidant and anti-inflammatory qualities as a result of its chemical makeup, which includes substances like betalains and squalene. The betalains from the peels of H. *polyrhizus* may have strong anti-inflammatory benefits because of their high antioxidant activity. Given that free radicals may be the main pro-inflammatory mediators, the mediators' removal causes a decrease in the inflammatory response (Jeronimo M.C. *et al.*, 2017).

•**Anti-anemia property:** Iron (Fe), vitamins C, E, B_{12}, thiamine, and riboflavin, which are precursors required for erythropoiesis, are just a few of the essential nutrients that pitaya supplies. The high vitamin C concentration of dragon fruit is what gives it its anti-anemia properties since it makes non-heme iron and iron essential for the formation of blood easier to absorb (Nurul S. *et al.*, 2014).

Table 6: Pharmacological effect and activities

S.no.	Pharmacological effect	Pharmacological activity	References
1	Antioxidant properties	There has been an increase in the utilization of natural antioxidant substrates found in medicinal plants that have protective	(Woo, K. K. *et al.*,2011)

		effects against cellular damage brought on by free radicals, which are linked to many disorders like cancer. Thus, the antioxidant (radical-scavenging) qualities of many plants' constituent phenolic chemicals (such as phenolic acids, lignans, flavonoids, stilbenes, and tannins), vitamin C and alkaloids could be responsible for their popularity in disease prevention. An abundant source of antioxidants, dragon fruit peel extract contains betacyanin and anthocyanin and has a strong enough activity against free radicals.	
2	Antidiabetic properties	Diabetes mellitus, a widespread systemic condition, occurs due to either the pancreas' incapacity to produce adequate insulin or the cells' reduced responsiveness to insulin's effects.	(Saryano, J. 2006)
3	Antimicrobial properties	Secondary metabolites that plant life synthesized following microbial contamination are linked to the physiological and biochemical basis of a plant's resistance to attacks by specific diseases (such as viruses, fungi, or bacteria)..	(Widyaningsih, A. et al. 2017)
4	Anticancer activity	As a result of its high concentration of potent antioxidants such polyphenol, anthocyanin, betalains, steroids, and triterpenoids, dragon fruit has the potential to inhibit the growth of cancer cells. In addition to having antibacterial qualities, betalains have the ability to prevent the growth of human tumour cells, lipid peroxidation, and the cyclooxygenase (COX-1 and COX-2) enzymes.	(Aghajanpour M. *et al.*, 2017)

5	Wound healing activity	The process of healing a wound is a multistage process that involves many different cell populations, the extracellular matrix, and the action of soluble mediators like growth factors and cytokines. It is designed to restore the integrity of damaged tissues. Extracts from the dragon fruit's stem and bloom encourage fibroblast migration, which is essential for the healing of wounds.	(Perween T. *et al.*, 2018)
6	Anti-hyperlipidemic and anti-obesity properties	Due to its propensity to accelerate atherosclerosis, dyslipidemia is a complicated condition and a significant risk factor for unfavorable cardiovascular events. Pitaya peel extracts helped to reduce hyperlipidemia because of its high crude fiber content (69.30% total dietary fiber, broken down into 56.50% insoluble food fiber and 14.82% soluble food fiber), which lowers caloric consumption.	(Guimarães D.D.A.B. *et al.*, 2017)
7	Hepatoprotective property	Pitaya's potent antioxidant content, which includes triterpenes, flavonoids, glycosides, tannins, saponin, and alkaloids, may contribute to its hepatoprotective properties.	(Parman. *et al.*, 2019)
8	Anti-inflammatory property	Due to the presence of substances like squalene and betalains in it	(Jeronimo M.C. *et al.*, 2017)

Dragon fruit has received more attention recently as a result of the bioactive, non-nutritive chemical components called phytochemicals that are present in it. These phytochemicals show that not just the edible pulp but even the waste components of dragon fruit, such as the peels, may have health advantages. Some of the phytochemicals that are present in the various plant parts are listed in table 7 below:

Table 7: The phytochemicals present in different parts of the plant

Aerial Parts	Phytochemical compounds	Method	Reference
Pulp and peel	Betacyanin, phenolics, flavonoids	Color test followed by UV-	Ramli *et al.* (2014)

		Vis	
Pulp	Carbohydrates, proteins, amino acids, alkaloids, terpenoids, steroids, glycosides, saponins	NA	Kanchana *et al.* (2018)
Fruit	Glycosides, alkaloids, phenols, tannins, steroids	Color tests	Mahdi *et al.* (2018)
Peel	Quinic acid, cinnamic acid, 3-O-rutinoside, jasmonic acid, octadecanoic acid	UHPLC-ESI-QTRAP-MSMS	Zain *et al.* (2019)
Pulp and stem	Phenolics	Color test followed by UV-Vis	Wu *et al.* (2006)

(Source: 77 Czech Journal of Food Sciences, 39, 2021 (2): 71–94)

Conclusion

Dragon fruit's nutritional content varies based on the species, region of cultivation, and time of harvest. The potential for using dragon fruit peel as a natural colour is very high. Due to the rising trend in fruit consumption, the fruit's future looks promising on the global market. As a fruit that is both healthy and therapeutic, dragon fruit is rapidly gaining favor in India. It is commonly taken because of its great nutritional value and ability to treat a variety of health issues. The stems, blooms, peels, and pulps of the pitaya are among its different sections. Bioactive compounds found in these parts have a variety of beneficial biological effects, including antioxidant, antibacterial, and anticancer capabilities. These include steroids, saponins, betalains, flavonoids, alkaloids, tannins, polyphenols, terpenoids, and carotenoids, all of which have been shown to be more effective than synthetic drugs in the treatment and prevention of a variety of diseases, such as diabetes, cancer, obesity, and hyperlipidemia, as well as pathogenic organisms like bacteria, viruses, and fungi. They are also healthier, safer, and more sustainable. Furthermore, it demonstrates resilience to numerous abiotic stressors and needs relatively little water for growth and development. Therefore, it might be a fruit crop that is both healthy and profitable for sections of the country that are rainfed as well as degraded lands with good resources and abiotic stress. Due to its ecological qualities, advantages to commercial value and human health the dragon fruit have developed into a productive product for the economy and a catalyst for the sustainable development of the country, particularly in the promotion of sustainable use of ecosystem and biodiversity.

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