



Dragon Fruit a Review of Health Benefit and Nutrients.

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ABSTRACT:

The most widely grown vine cactus in the Cactaceae family is *Hylocereus undatus*, sometimes known as the "Dragon," which is native to Mexico and America. It is widely recognized by the names "dragon fruit" and "pitaya." In Malaysia, it is also referred to as "buah naga," which means dragon fruit. Dragon, a super fruit that was just introduced to Indian markets, is becoming very popular among farmers because of its tremendous export potential, tasty pulp that has edible black seeds imbedded in it, appealing color, and nutritional value. It begins bearing fruit 14–16 months after stem cuttings are planted, and it can continue to bear fruit for up to 20 years. Typically, fruiting occurs in many flushes from May to December. Harvesting of dragon fruit occurs 28–30 days after flowering. The fruits are mostly offered in five colors: pink, red, white, sour, and yellow dragon fruits. The public greatly favors dragon fruit, also known as pitaya, a non-local fruit due to its effectiveness, advantages, and high nutritional content. The anti-oxidant, antimicrobial, antifungal, anti-inflammatory, anti-tumor, anti-ulcer, anti-diabetic, infertility-prevention measure, anti-platelet action, cardioprotective, pain-relieving, and other properties of dragon fruit are its most well-known medicinal benefits. Because it is an excellent source of minerals, glucose, fructose, dietary fiber, and vitamins, this fruit is well-liked for its nutritional content. Alkaloids, terpenoids, flavonoids, thiamine, niacin, pyridoxine, cobalamin, phenolic, carotene, and phytoalbum are among the other nutrients found in dragon fruit peel. Dragon fruit varies in production and nutritional value based on species, growth conditions, growing region, and harvesting methods. These days, one of Indonesia's most popular and developed commodities is red dragon fruit (*Hylocereus polyrhizus*). This article aims to explain about Dragon Fruit, History, Botanical Classification of Dragon Fruit, Storage Condition, How to eat Dragon Fruit, Several Varieties of dragon Fruit, Planting of Dragon Fruit, Nutraceutical Value, Benefits And Pharmacological Action of Dragon Fruit.

Keywords: Dragon Fruit, Nutraceutical Value, Antioxidant, Planting of Dragon Fruit, Benefit of Dragon Fruit, Pharmacological effect.

1. Introduction :

The cactus species known as dragon fruit was first domesticated in southern Mexico and parts of South and Central America (Britton and Rose, 1963; Morton, 1987; Mizrahi et al., 1997) [1,2,3]. It was introduced to Southeast Asia by the French in the early 1800s. It has just been brought to India and is regarded as a fruit crop with great promise and financial reward. Its fruits are incredibly visually appealing, with a flesh that melts in your tongue and black, edible seeds imbedded in it that are packed full of nutrients. It is now the focal point of interest for Indian cultivators. This plant, known as Queen of the Night, which translates to "Noble Woman," has lovely blooms that bloom at night. It is a long-day plant. Other names for dragon fruit include strawberry pear, Pithaya, belle of the night, night flowering cereus, Cinderella plant, and Jesus in the cradle. The dragon fruit, also known as the "scaly fruit," gets its name Pitaya from the bracts or scales on its surface. Its enormous, magnificent, creamy white blooms, which have a diameter of 22 to 25 cm and bloom at night, provide it decorative value. It is seen as a product of the twenty-first century. (Gunasena and Pushpakumara, 2006; Gunasena et al., 2006).

Hylocereus undatus, which has white flesh with pink skin, *Hylocereus polyrhizus*, which has red flesh with pink skin, *Hylocereus costaricensis*, which has violet red flesh and pink skin, and *Hylocereus (Selenicereus) megalanthus*, which has white flesh with yellow skin, are the three varieties of dragon fruit.

The main benefit of this crop is that, once planted, it will continue to grow for over 20 years, and 800 dragon fruit plants may be grown on 1 hectare. Israel, Vietnam, Taiwan, Nicaragua, Australia, and the United States are the countries where it is mostly grown for commerce. (Merten, 2003)[4]

It bears fruit in the second year following planting and reaches its peak yield in five years. The primary focus of this page is dragon fruit cultivation, with reference to the literature and research on the genus *Hylocereus* and species *costaricensis*. The 16 species of *Hylocereus* are unique to Latin America and are not well-liked by cultivators and scientists.

In India, very little study has been done on this fruit crop. particular subjects pertaining to the challenges faced by nations that have welcomed the new species.

As a result, floral biology and ecophysiology must be the focus of future study. The primary subject of this page is the literature that has been written on *Hylocereus*. It groups references that discuss the plant's significance, botany, vegetative and reproductive biology, culture, pests and diseases, harvesting, pollination, and manuring. In order for everyone to become acquainted with dragon fruit.

One of the fruits that is now consumed and grown extensively in Indonesia is the red dragon.

A tropical fruit belonging to the Cactaceae family of cacti, dragon fruit is also known as pitaya. It is indigenous to South America, Central America, and Mexico. But it's also grown in Asian countries including Indonesia, Malaysia, Vietnam, Philippines, and Taiwan. The population greatly prefers dragon fruit, a non-local fruit with many health advantages and a high nutritious content. Dragon fruit can be eaten raw or processed to make syrup, jam, juice, and other goods. Even though the peel makes up 22% of the overall fruit, it is rarely used to its full potential in the creation of processed dragon fruit. Peel from dragon fruit has the highest concentration of polyphenols, which are antioxidants.[5]

Dragon fruit peel contains 150.46 mg of the pigment betacyanin per 100 g. Dragon fruit peel is nutrient-rich and may be added to partially fermented herbal drinks [6]. Vitamins C, E, and A, alkaloids, terpenoids, flavonoids, thiamine, niacin, pyridoxine, cobalamin, phenolic, carotene, and phytoalbumin are all present in dragon fruit peel. Peel from dragon fruit has the benefit of being an excellent source of antioxidants and high in polyphenols. The peel of dragon fruit has the potential to be developed as a natural antioxidant source since its antioxidant activity is higher than that of the fruit's meat. Thus, the purpose of this essay is to elucidate the qualities of dragon fruit, how to handle it after harvest, and how to prepare it to increase its shelf life. The vine cactus species known as dragon fruit is a member of the Cactaceae family. (Patwary et al., 2013). Because of its unique look, the plant is appealing. (Liaotrakoon, 2013). Dragon fruits are becoming more and more well-known for their dietary and therapeutic qualities. (Sonawane, 2017) Because of its nutritional qualities, this fruit is regarded as a significant economic fruit species globally. (Rifat et al., 2019). The bioactive components of dragon fruit may be impacted by the cultivar, season, environment, cultural methods, water availability, transportation, handling, and storage. (Franke et al., 2004; Wall, 2006). Because dragon fruit requires minimal water and can adapt well to the high temperatures, it offers significant promise as a new crop for Mediterranean gardeners.[7]. Red-fleshed Dragon fruits developed a pigmented color as they ripened. [8]. The fruit tastes nice and has crunchy qualities. It is high in sugars and antioxidants.[9].

Dragon fruit is a consumable fruit that has water-soluble fiber, a high vitamin C content, and antioxidants such as flavonoids, hydroxycinnamates, and betalains.[10]. It can help lower blood levels of LDL cholesterol, boost immunity, aid in weight reduction, and improve digestion, among other health advantages. Hydroxycinnamates have anti-cancer properties, while flavonoids lower the risk of heart disease via acting on blood arteries and brain cells. Additionally, it protects the body from germs and fungus and supports normal bodily functions. [11]. The tropical and subtropical forest regions of Mexico, Central America, and South America are the origin of dragon fruit.[12]. From its original core, this fruit migrated throughout tropical and subtropical America, Asia, Australia, and the Middle East. Australia, Cambodia, China, Israel, Japan, Mexico, Peru, Philippines, Spain, Sri Lanka, Taiwan, Thailand, South-Western USA, and Vietnam are among the countries where it is widely grown. [13]. In South East Asia, dragon fruit is also well-liked (Patwary et al., 2013). Due to the health benefits and increased economic significance of dragon fruit, its cultivation has increased recently. This has led to its use as a source of functional materials for the production of phytochemicals with potent antioxidant capabilities.[14]. The fruits of *Hylocereus undatus* are high in antioxidants, polyphenols, calcium, phosphorus, magnesium, and fiber.[15]. Due to its appealing appearance, vibrant color, and nutritious qualities, dragon fruits have gained popularity in Asian nations.[16]. In some parts of Bangladesh, dragon fruit cultivation has begun because of the favorable tropical temperature, seasonal rainfall, light intensity, and type of soil. Public awareness of dragon fruit production, its numerous health advantages, and its nutritional impact has been raised by the media. The Bangladesh Agricultural Research Institute (BARI), located in Gazipur, and the Bangladesh Agricultural University (BAU), located in Mymensingh, have already initiated research on dragon fruit.[17] Due to its environmental appropriateness, cultivating dragon fruit has enormous potential in many nations. There is currently very little information known on Dragon fruit production. [18].

History:

The tropical and subtropical woods of Mexico, Central America, and South America are said to be the birthplace of dragon fruit. The fruit eventually made its way to other tropical and subtropical areas of the globe. As of right now, at least 22 nations—Australia, China, Israel, Malaysia, Nicaragua, Taiwan, Sri Lanka, and Vietnam—are growing dragon fruit. Some reports claim that the fruit was taken by the French from Colombia and Nicaragua, while other reports claim that it was brought by them as an ornamental plant from Guyana, South America, around 1870. Actually, the fruit was brought to Vietnam by the French more than a century ago. As of right now, Vietnam leads the globe in dragon fruit exports, accounting for 55% of the fruit export industry in the nation. Southeast Asia is a prominent region for the fruit. More and more nations are starting to plant it, including Thailand, Indonesia, Israel, the Philippines, southern China, northern Australia, and Hawaii.

According to legend, a fire-breathing dragon developed the dragon fruit long ago. 'DRAGON FRUIT' got its name because every time the dragon breathed fire, the fruit would always end up tailing the flames. The beast was promptly killed by a huge group of soldiers after a fierce struggle as the dragon spewed fire and the fruit appeared. Picking up the fruit, the victorious warriors gladly offered their King the prized fruit. The warriors then killed the dragon and ate its flesh to commemorate their triumph. It was thought that individuals who consumed the dragon's meat would gain the dragon's power and fury and that the monarch would also want them. Perhaps in an attempt to give the idea that this exotic fruit was their own, the tale may have been part of popular legend when the pitaya was originally brought to Asia from South America. Regardless of the truth, the captivating folklore surrounding the dragon fruit undoubtedly contributes to the marketing narrative of this genuinely unique and enigmatic fruit.[22].

2. Botanical classification :

The genus *Hylocereus* and family Cactaceae are home to dragon fruit. According to Fourné, the primary characteristic of this genus is its climbing vine cactus, which has aerial roots and bears an eye-catching, glabrous fruit with enormous scales.[19]. According to Lichtenzweig et al. (2000) and De Dios (2004), *Hylocereus* species are diploid ($2n = 22$). 10 and 16]. The family Cactaceae (Caryophyllales) is grown in Latin America and has between 120 and 200 taxa, with 1500–2000 species (Spichiger et al., (2000) [31]. Although approximately 250 cultivated species of fruit-bearing and industrial crops are included in the Cactaceae family, they are mostly valued for their decorative properties (Fouqué, 1969) [21]. Few species, nevertheless, are valuable economically. For its fruits, the genus *Opuntia* Mill. is arguably the most extensively grown (cactus pear, prickly pear, Barbary fig or tuna).

Currently, four varieties of dragon fruit are contributed to the global market: (i) red skin and white flesh (*Hylocereus undatus*), primarily from Vietnam and Thailand; (ii) red skin and red flesh (*Hylocereus polyrhizus*), primarily from Malaysia and Israel; (iii) red skin and purple flesh (*Hylocereus costaricensis*), primarily from Guatemala, Nicaragua, Ecuador, and Israel; and (iv) yellow skin and white flesh (*Hylocereus (Selenicereus) megalanthus*) from Colombia Ecuador, as well (Fig. 1). In the global market, the shares of red skin with white flesh, red skin with purple flesh, red skin with red flesh, and yellow skin with white flesh are around 94%, 4.0%, 1.5%, and 0.5%, respectively. Based on estimates, the global output of dragon fruit is estimated to reach above 2.1 million tons in 2017–18, covering an area of 1.12 lakh acres. Philippines, Taiwan, Malaysia, Vietnam, China, Indonesia, Thailand, India, USA, and Comodia are the top producers.



Fig 1 : There are four varieties of dragon fruit available worldwide.

Eukaryota is the domain

Plantae is the kingdom (Haeckel, 1866)

Tracheobionta is the subkingdom.

Spermatophyta, or seed plants, is the superdivision (Willkomm 1854)

Magnoliophyta, or flowering plants, is the division (Cronquist et al. 1966).

Class: Dicotyledons, Magnoliopsida (Cronquist et al. 1966)

Caryophyllidae is the subclass (Takhtajan 1966).

Caryophyllales (Jussieu 1789 ex Berchtold and Presl 1820) is the ordered taxon.

Family: Cactaceae, often known as the Cactus family (Jussieu 1789)

Cereoideae is a subfamily (Schumman 1898, published in Schumann 1899).

Hylocereae is the tribe (Buxbaum 1958).

Hylocereus (A. Berger) is the genus (Britton and Rose 1909).

3. How Do You Eat Dragon Fruit?

Cut the dragon fruit in half lengthwise, just like you would a lemon.

Simply remove the meat and consume. Eat only the white part that has the seeds on it; throw away the pink parts, since they might not be edible.

Alternatively, chop the halves into tiny cubes without slicing through the peel or skin. (In the same way that you wouldn't touch the wooden or cardboard foundation when slicing a cake into little squares). Take out the cubes and consume.

Raw fruit is typically consumed. It's a great snack that tastes best when cold. It may also be chopped into little cubes and used with yogurt, salads, smoothies, ice cream, pastries, and other desserts.

4. Storage:

Preserving the Entire fruit:

The dragon fruit should be put in a paper bag. Don't cut or peel it before storing.

The crisper drawer of your refrigerator is the best place to keep dragon fruit (best stored at temps between 5 and 8° C).

Fruit kept in the refrigerator can last up to three months.[23].

Keeping the chopped fruit stored:

After cutting the dragon fruit, remove the pulp by scooping it out of the skin. Put the pulp into a container that is well sealed.

Because cut dragon fruits lose quality fast, they should be stored frozen. For up to three months, store the dragon fruit pulp in the freezer.[23].

5. Several Varieties of Dragon Fruit:

A. Sour Dragon Fruit :

In America's arid areas, dragon fruits of the *Stenocereus* kind are common. Dragon fruit that is sour and more spicy in flavor is a refreshing fruit. This fruit is still harvested by people in the northwest of Mexico. Their moniker, "ziix is ccaxl," which translates to "things whose fruits are sour," is also well-known. The seeds have a strong nutty flavor and are edible.[24].



Fig: Sour Dragon Fruit

B. White Dragon Fruit :

Other names for them are *Hylocereus Undatus* and *Selenicereus Undatus*.. This dragon fruit is the most commonly produced kind, with pink skin and white meat. Among these varieties is Thompson, which may weigh up to 1.5 pounds and is the biggest and most well-known dragon fruit. The pulp of harpua is semi-sweet and has a grape-like flavor. Native to California, neitzel is much sweeter and tastier cold. Vietnamese Jaina, David Bowie, and L.A. Woman's Seoul Kitchen are among the well-known brands of white dragon fruit.[24]



Fig : White Dragon Fruit.

C. Red Dragon Fruit :

Known also as *Hylocereus costaricensis*, Pitaya Roja. It's a dragon fruit, having skin and meat both red. It's a sweet-type dragon fruit that resembles a kiwi in feel. In addition, it may be included in smoothies or consumed raw. Eating red dragon fruits has the drawback of leaving stains on your hands. But it will taste better if you combine them with tastes of solid fruit, like pineapple. Zamorano, Red Jaina, and Costa Rican Sunset (Natura Mystic) are varieties of red dragon fruit.[24]



Fig : Red Dragon Fruit

D. Yellow Dragon Fruit :

Selenicereus Megalanthus is another colloquial name for *Pitaya megalanthus*, which is officially *Hylocereus Megalanthus* in science. This South American native dragon fruit species boasts firm white flesh and a yellow-skinned scaling pattern. There is only one kind of this dragon fruit, but it is the tastiest.[24].



Fig: Yellow Dragon Fruit

E. Pink Dragon Fruit :

Although they are likewise red dragon fruits, the flesh on these fruits is different. The flesh of pink dragon fruit is soft to hot pink and delicious. This kind of dragonfruit is able to adapt to many soil types and weather conditions. Numerous types of pink dragon fruit exist, such as Delight, Voodoo Child (Voodoo Child), Cosmic Charlie (Delight), and American Beauty (*Hylocereus guatemalensis*).[24].



Fig : .Pink Dragon Fruit.

6. Planting Dragon Fruit Seeds :

Tropical plants like dragon fruit may be left outside all year round. Planting it in a container is the best option if you don't reside in those places. This will enable you to move the plant and pot inside when the colder months roll around. Remember that you'll need a big container for a dragon fruit tree. It could be a good idea to have a cart or place your plant on wheels.

Fruit from dragons may be self-fertile. This implies that fruit may be produced with just one plant. But you may raise the yield by growing more plants. This plant may also be multiplied using the fruit's seeds. Slice the apple in half to do this. Once the seeds are removed, wash them. You may plant the seeds in potting soil once they have dried. After sowing the seeds, cover the area with plastic wrap. Allow the soil to stay wet for a further 10 to 15 days prior to germination. You can move them to a somewhat bigger container once they have blossomed. If you happen to have a friend who has mother plants, you may ask nicely for a cutting. After finishing, give the ends a few more days to dry out. You may bury your portion in the ground two inches deep once it has dried. The soil need to stay damp but not drenched. In three to four weeks, your plant should start to grow. It might not bear fruit for two years.[25].

7. Nutritional Values of Dragon Fruit:

The species, place of origin, and time of harvest all affect how nutritious dragon fruit is. [26].The growth environmental circumstances have a considerable impact on the phytochemical features and composition of red dragon fruit.[27].Significant levels of minerals, including potassium, phosphorus, sodium, and magnesium, are found in dragon fruit; these concentrations are more in dragon fruit than in mangosteen, mango, and pineapple[28].and every vitamin source [29].Fruit quality is greatly impacted by flowering and fruit setting time, particularly with regard to total soluble solids contents. [30].TSS is greater in mature dragon fruits, primarily found in fall fruits compared to summer fruits. [31].

8. Facts about Nutrition :

- Calories: 60
- Protein: 1.2 grams
- Fat: 0 grams
- Carbs: 13 grams
- Fiber: 3 grams
- VitaminC: 3% of the RDI

- Iron: 4% of the RDI
- Magnesium: 10% of the RDI.

9. Benefits of Dragon Fruit (Pitaya) for Health:

A) Lowers Diabetes Risk -

High fiber content in this fruit helps diabetics prevent blood sugar rises and maintain blood sugar levels. Consuming this fruit on a regular basis might assist diabetics maintain blood sugar balance and avoid future medical complications.[32]

B). Lowers Cancer Risks -

Colon cancer risk may be lowered by the fruit's anti-cancer qualities. Its abundant supply of vitamin C contributes significantly to strengthening the immune system. Strong antioxidants like vitamin C can keep you from developing long-term conditions including diabetes, Parkinson's disease, Alzheimer's, cancer, etc.[33]

C). Boosts immunity -

High quantities of vitamin C in this fruit strengthen immunity and promote overall well-being. Increased Vitamin C levels indicate that your body can fight off potentially fatal illnesses. To maintain your health, all you have to do is eat one cup (200 grams) of this fruit each day.[34]

D). Beneficial for Digestion

Rich in oligosaccharides, a kind of carbohydrate, this fruit promotes the growth of beneficial bacteria called flora, which facilitates easy digestion. It has a high fiber content, which benefits digestive health and lowers the risk of cardiovascular and cancer illnesses.[35]

E). Heart-Healthy -

The crimson pulp of dragon fruit is made of betalains, which give the fruit its red color and lower bad cholesterol (LDL cholesterol). Rich in heart-healthy omega-3 and omega-9 fatty acids that lower the risk of cardiovascular illnesses are the fruit's small, dark-black seeds.[36]

F). Combats Skin Aging -

Stress, pollution, and other variables like poor food, among others, can all contribute to faster aging. On the other hand, its abundance of antioxidants can help with acne, dry skin, and sunburn. Because of its vitamin C concentration, skin might seem more radiant. For glowing skin, you can make dragon fruit juice and consume it once day.[37]

G). Beneficial to Hair -

Want hair that is lustrous, thick, and black? You'll benefit from trying dragon fruit powder once a day, along with a 250 ml glass of milk. This fruit extract powder's rich vitamin content minimizes chemical hair coloring harm to hair and enhances hair structure, making it silky and glossy. All you have to do is take one dose of this each day to start seeing results.[37]

H). Strong Bones -

Many aspects of good bone health include preventing injuries, reducing joint discomfort, and more. This superfruit helps maintain healthy bones and stronger bones since it contains 18% magnesium. All you have to do is consume one glass of smoothie made with dragon fruit each day.[39]

I). Beneficial to Eyes -

The ingredient that gives this fruit its color, beta-carotene, helps to prevent eye conditions including cataracts and macular degeneration. You would benefit from consuming one cup (220 grams) of dragon fruit every day.[40]

J). Beneficial for Pregnancy -

Pitaya fruit, sometimes referred to as dragon fruit, is a nutrient-dense option for expecting moms. It's perfect for pregnancy since it contains important vitamins including iron, folate, and B. These nutrients, which are frequently highlighted in talks about eating dragon fruit while pregnant, assist the development of fetal bones, increase energy levels, and help avoid birth abnormalities. Additionally, the magnesium component in it may help ladies with postmenopausal issues.[41]

10. Health benefits of Dragon fruit :

As indicated before, Dragon fruit is healthy and nutritious for human health due to its essential nutrients such as vitamins, minerals, complex carbohydrates, dietary fibers and antioxidants (Table 2). 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). It decreases cardio-vascular heart issues and regulates blood

pressure since it is low in calories, cholesterol-free, and rich in antioxidants (Patel and Ishnava, 2019).. Dragon fruit flesh is rich in polysaccharides (Xu et al., 2016) and mixed oligosaccharides (Wichienchot et al., 2010); these are acting as stimulating factors for the growth of Lactobacilli and Bifidobacteria. Probiotics are these gastrointestinal microorganisms that inhibit the growth of gastrointestinal pathogens. Dragon fruit is also used as a natural probiotic (Sonawane, 2017). Juicy pulp with a lot of little black seeds in it. It is also considered as a potential source of micronutrients and antioxidants (To et al., 1999; Mahattanatawee et al., 2006; Lim et al., 2007; Ariffin et al., 2009; Jaafar et al., 2009; Lim et al., 2010).

11. Pharmacological Activity:

therapeutic herbal plants have shown pharmacological effectiveness in the treatment of many ailments. Dragon fruit has numerous pharmacological activities, which are given below:

A. Antimicrobial Efficacy-

An ethanolic extract from the flesh of white dragon fruit was found to contain around 85% of mixed oligosaccharides. These oligosaccharides were more resistant to human salivary α -amylase than inulin. Rather of being broken down in the stomach, this acts as prebiotics to support the stomach. The good bacteria lactobacilli and bifidobacteria are proliferating. Hylocereus peel acetone extracts (at 70% concentration) show strong antibacterial properties, especially against Salmonella.[42]

B. Antifungal Properties -

Two yeasts, *Candida albicans* and *Rhizoctonia solani*, and four molds, *Aspergillus flavus*, *Fusarium oxysporum*, *Botrytis cinerea*, and *Cladosporium herbarum*—the research panel that includes laboratory control strains obtained from the American Type Culture Collection (ATCC)—have been found to exhibit polyphenol antifungal activity in extracts and fractions of flesh and peels of red pitaya fruits.

C. Anti-inflammatory properties-

On dragon fruit, anti-inflammatory effect has been observed. The skin and meat of the dragon fruit were combined, and the mixture was separated using vacuum-distilled water, water, and drying. The outcomes of this will then be applied to the bioassay testing against 5-lipoxygenase (5-LipoX), Acetylcholinesterase Enzymes (AChE), and Cyclooxygenase-2 (COX-2). According to the findings of these investigations, extracts made from the flesh of dragon fruits performed very well in the bioassay test against the three enzymes and had a greater inhibitory effect on the enzyme acetylcholinesterase than on the other two. This has demonstrated the potential of dragon fruit to reduce the symptoms of inflammation. The mechanism that directly relates to cholinergic anti-inflammatory can be used to observe it. Furthermore, the effects of dragon fruit meat on the COX and LipoX enzymes suggest that it has a strong potency that may obstruct the prostaglandin and leukotriene pathways 46. This indicates that the characteristics of dragon fruit include anti-inflammatory qualities. The ethanol extract from red dragon fruit peel includes betalain, which inhibits the transcription factor NF- κ B, preventing the separation of inflammatory genes like TNF- α and IL-1 β . [43].

D. Anti-Tumor Action -

Numerous research have demonstrated the anticancer properties of dragon fruit's flavonoids, polyphenols, and betanin. In just one dosage, the dragon fruit skin that was extracted using a 50:50 blend of water and ethanol solvent demonstrated antiproliferative action against human hepatocellular carcinoma cells. The specific nature of the anticancer action of dragon fruit is still being investigated and cannot be determined with certainty. Nevertheless, prior studies have shown that the anticancer impact of polyphenols in dragon fruit may be mediated by a mediated route and factor inhibition on nucleic-kappa B. growth factor receptors, anti-inflammatory, antioxidant processes, prevention of angiogenesis, induction of cell cycle arrest and apoptosis, and activation of protein kinase. The natural antioxidant lycopene, which is found in red meat, is known to prevent cancer. Antioxidants shield cells from potentially harmful reactive oxygen species and stop the production of free radicals that can lead to cancer. Rich in polyphenols and a strong source of antioxidants, the flesh and peel of red pitayas. Studies also reveal that white dragon fruit has a high flavonoid content.[44]

E. Anti-Ulcer Properties-

Topical quercetin from the skin of *Hylocereus polyrhizus*, or red dragon fruit, has antiulcer properties. Results showing complete discomfort in 35% of instances after 2–4 days and in 90% of cases within 4–7 days attest to this. Quercetin helps relieve minor symptoms and lower the frequency of relapses.[45]

F. Activity of Antioxidants -

Pitaya is regarded as a fruit that is abundant in nutrients, water content, sugars, minerals, and antioxidants yet low in calories. 34. *H. polyrhizus*, also called the red-fleshed pitaya, has a high betalains content that satisfies consumer demand for both natural food coloring and antioxidant goods. The oil extracted from pitaya seeds has great promise as a natural antioxidant source. In addition to its abundance of phytoalbumins, which are well-known for their antioxidant qualities, pitayas also have high levels of polyphenols in their pulp and peel. It is demonstrated by the analysis of the ethanolic extracts of *H. undatus*'s peel and meat that the peel has a higher flavonoid content than the flesh. Yogurt may be enhanced with pitaya pulp to increase its antioxidant content.[46]

G. Anti-Diabetic Actions-

Numerous plants and fruits, including dragon fruit, may have anti-diabetic properties. Numerous investigations have demonstrated the antidiabetic efficacy of dragon fruit. Red dragon fruit can help individuals with Type II Diabetes lower their blood glucose levels. Glucose is the component in red dragon fruit that decreases blood sugar. Apart from glucose, the dietary fiber in dragon fruit also serves to lessen the rate at which food is broken down in the intestines, which lowers the production of blood glucose [53]. Dried dragon fruit has unique effects when used as a herb with antidiabetic properties. This is also due to the fact that dried dragon fruit lowers blood sugar, which might result in diabetes. [47]

H. Infertility-Prevention Measures-

According to one investigation, extract from dragon fruit can enhance testicular histology and preserve sperm motility. Gallic acid, an antioxidant found in white dragon, has the tendency to improve spermatozoa quality by increasing their motility, quantity, and shape in the epididymis.

I. Antiplatelet Action -

Because ethanol and ethyl acetate extracts from dragon fruit have inhibitory effects on platelet aggregations caused by different agonists in a concentration-dependent manner, the fruit exhibits antiplatelet action. [48]

J. Hepatoprotective Properties -

Rats that have been poisoned do benefit from dragon fruit extracts. Owing to the high concentration of antioxidants derived from the aforementioned consumption of CCl₄. Particularly, flavonoids and triterpenes are phytochemical components that protect the liver from fat peroxidation; however, the silymarin capsule has little protective effect against liver injury due to an improvement in serum glutamic-oxaloacetic transaminase (SGOT) and serum glutamic-pyruvic transaminase (SGPT). When stimulated with CCl₄, it has been demonstrated that dragon fruit extracts effectively shield the liver from chronic damage in test animals. [49]

K. Cardioprotective Intent-

The anti-thrombotic activity of the polyphenols in *H. polyrhizus* meat enhances its already strong cardioprotective qualities. Two heat processing techniques for this dragon fruit were applied to rats in one research. The analysis's conclusions indicated that red pitaya's cardioprotective ingredients would include polyphenols and antioxidant material. [50]

L. Neuroprotective Actions -

Among the many health advantages of dragon fruit is its connection to nerve work's neuroprotective properties, as was previously noted. Dragon fruit's phytochemical composition actively contributes to neuroprotective effects, particularly in averting neurodegenerative illnesses. Dragon fruit contains essential fatty acids, a phytochemical that actively participates in neuroprotector action and may prevent neurodegenerative illnesses.

M. Activity that is Cytoprotective -

Pitaya is a fantastic source of ascorbic acid, polyphenols, and betalains, among other natural antioxidants. Being a fiber-rich dragon fruit, it facilitates the breakdown of meals. Pitaya peel contains soluble fibers that may aid in the digestion process by neutralizing harmful chemicals like heavy metals and may also help manage blood sugar levels in individuals with type II diabetes. Additionally, the mucilage found in pitaya peels may be useful for cholesterol metabolism. [51]

N. Activity Involving Hypolipidemia -

Rats' hypolipidemic activity was assessed using an extract from the flesh of dragon fruits. The extract from dragon fruit meat has the potential to significantly increase blood HDL cholesterol, total fecal cholesterol, and fat while significantly lowering TG, LDL, total cholesterol, and total cholesterol ratio over HDL cholesterol, body weight, and Lee index obesity. This study demonstrated the biological effects of extract from dragon fruit flesh, including anti-obesity and hypolipidemic properties that may prevent atherosclerosis. Consuming extract from dragon fruit flesh may increase the quantity of fat and cholesterol in excrement in addition to binding them from the feed. [52]

O. Pain-Relieving Action-

Gallic acid (3,4,5-trihydroxybenzoic acid), an organic compound found in plant materials with antioxidant, antibacterial, antiviral, and analgesic properties, is present in pitaya and many other plants. [53].

Conclusion:

From the above article, it can be inferred that dragon fruit appears to have several commercial advantages. Their attractive color and shape, as well as their excellent nutritional qualities, draw manufacturers from all across India. The species with red meat, *Hylocereus costaricensis*, is also abundant in betalains, which satisfies the growing market demand for natural food coloring and antioxidant-containing goods. The dragon fruit has several beneficial effects on human health because of its nutritional and medicinal qualities, most notably in the area of oxidative stress management and control. Pitaya comprises various parts such as stems, flowers, peels, and pulps. These parts contain bioactive compounds that have various beneficial biological activities, such as antioxidant, antimicrobial, antifungal, anti-inflammatory, anti-tumor, anti-ulcer, anti-diabetic, infertility-prevention measure, anti-

platelet action, cardioprotective, and pain-relieving action. Dragon fruit is a fruit that offers several health advantages both within the fruit and on the peel. Dragon fruit is distinguished by its distinct red color, soft, scaly skin, and sizable quantity of black seeds. Phyto album, alkaloids, terpenoids, flavonoids, thiamine, niacin, pyridoxine, cobalamin, phenolic, and carotene are all present in the fruit.

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