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## Dragon fruits: Myth and symbolism associated with chinese culture and its cultivation in India as climate resilient attractive fruit crop under subtropical and tropical conditions: A review

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### Abstract

The dragon fruit (*Hylocereus* spp.) serves as a striking symbol that connects ancient myths with modern values. Its vivid appearance embodies themes of vitality, prosperity, fertility, strength, and resilience—qualities that resonate across cultures and traditions worldwide. As both a culinary delicacy and a cultural icon, this alluring fruit continues to inspire admiration for its beauty while symbolizing human aspirations for abundance and lasting resilience. In recent times, Indian farmers are showing increased interest in cultivating dragon fruit due to its high potential yields and strong commercial prospects, which could significantly improve their economic status. Currently, the cultivated area is not sufficient to satisfy consumer demand, highlighting the need to boost dragon fruit production in India. The crop offers a high yield potential of 10-15 tons per hectare and is valued for its attractive look and nutritional benefits, providing approximately 3.0 grams of dietary fiber and 60-70 calories per 100 grams. Additionally, it is rich in antioxidants such as betalains, flavonoids, and phenolic acids, which are essential for neutralizing free radicals—unstable molecules that can cause oxidative stress, cellular damage, and accelerate aging. Increasing cultivation of this fruit is crucial to lowering import expenses and improving the livelihoods of farmers and entrepreneurs involved in its production.

**Keywords:** Dragon fruits, nutritional value, agronomic practices, climate resilient, yield and benefits

### Introduction

Dragon fruit (*Hylocereus* spp.) is recently introduced amazing fruit in India, its cultivation gaining popularity because of its high nutritional value and antioxidant property. Introduced in the late 1990s, it is now grown in states such as Karnataka, Maharashtra, Gujarat, Andhra Pradesh, Tamil Nadu, Odisha, Kerala, West Bengal. The crop's popularity is increasing due to its nutritional value, high antioxidant levels, and strong market demand. To meet domestic consumption, India imports dragon fruit from countries like Vietnam, Thailand, Malaysia, and Sri Lanka. The crop's popularity is increasing due to its nutritional value, high antioxidant levels, and strong market demand. To meet domestic consumption, India imports dragon fruit from countries like Vietnam, Thailand, Malaysia, and Sri Lanka. Dragon fruit, a member of the Cactaceae family, is a tropical fruit that has gained popularity worldwide due to its distinctive appearance, nutritional benefits, and economic value. Rich in essential nutrients such as vitamins, minerals, complex carbohydrates, dietary fiber, and antioxidants, it makes a healthful addition to any diet (Abirami et al., 2021) [29]. This fruit is primarily cultivated in tropical and subtropical regions, with major production centers in countries like Vietnam, China, and Brazil (Wonglom et al., 2023; Zhao and Huang et al., 2023) [30, 31]. The morphological features of dragon fruit include vibrant peel and pulp colors, spines on the skin, and uniquely shaped cladodes. These characteristics not only enhance its visual appeal but also aid in its identification and classification (Abirami et al., 2021; Xu et al., 2024) [29, 32]. Its photosynthetic mechanisms are adapted to dry environments, employing specialized processes that enable it to thrive under arid conditions.

Studies have revealed substantial genetic diversity among different *Hylocereus* species, especially regarding traits like fruit size, pulp weight, carotenoid content, and antioxidant capacity (Abirami et al., 2021) [29]. Economically, dragon fruit holds significant importance due to its high demand both locally and internationally. It is enjoyed fresh or processed into products such as juices, jams, and health supplements.

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Its high antioxidant levels particularly in the peel make it a promising ingredient for developing nutraceuticals aimed at addressing vitamin deficiencies (Abirami *et al.*, 2021) <sup>[29]</sup>. Additionally, cultivating dragon fruit provides economic opportunities for farmers in tropical regions and contributes positively to the agricultural sector (Zhao and Huang *et al.*, 2023) <sup>[31]</sup>.

### Myth and Symbolism Associated With Chinese Culture

Discover the allure and profound significance of the mesmerizing dragon fruit in this In mythologies where dragons themselves are revered such as Chinese folklore the dragon fruit's name evokes imagery of mystical creatures embodying power, wisdom, and protection. The fiery aspect attributed to dragons aligns with interpretations of the fruit symbolizing energy and dynamic strength. Moreover, some cultures see the shape and color variations of dragon fruits as reminiscent of flames or celestial bodies, adding layers to their symbolic repertoire related to illumination and enlightenment. Detailed exploration of its symbolic meaning. Revered for its striking, vibrant appearance and distinctive flavor profile, the dragon fruit—also known as Pitaya captures the imagination not only through its aesthetic appeal but also through the rich cultural symbolism it embodies across various societies. Its captivating visual presentation, with a bright pink or yellow skin often adorned with scale-like protrusions reminiscent of mythical dragons, makes it a standout fruit in both culinary and ornamental contexts. Beyond its exotic look, the flavor of dragon fruit is a harmonious blend of mildly sweet and subtly tart notes. The cultural symbolism attached to the dragon fruit extends far beyond its physical beauty and taste. It holds a deep-rooted significance that spans ancient mythology to contemporary practices, reflecting universal themes of vitality, strength, prosperity, and good fortune. Historically, in regions where the fruit is native or cultivated particularly Southeast Asia, Central America, and parts of China it has been regarded as more than just nourishment; it is seen as an emblem of positive energy and auspiciousness. For instance, in traditional Chinese culture, the vibrant pink hue of the fruit's skin is associated with happiness and prosperity because pink is colors traditionally linked with good luck. Yellow symbolizes joy, optimism, and Carmine pink symbolizes passion, confidence, and creativity. During festivals such as Chinese New Year, gifting dragon fruits symbolizes wishes for abundance and success in the coming year.

Unraveling the enigma surrounding this enigmatic fruit reveals fascinating insights into how different cultures interpret its symbolic meanings. In some traditions, the numerous tiny black seeds scattered throughout the flesh are viewed as representations of fertility and continuous growth—an emblem of life's ongoing renewal. The plant's resilience in harsh environments further reinforces notions of vitality and endurance; it thrives in arid conditions yet produces lush, nourishing fruit. This duality represents its association with strength and adaptability traits highly valued across many civilizations. In mythologies where dragons themselves are revered such as Chinese folklore the dragon fruit's name evokes imagery of mystical creatures embodying power, wisdom, and protection. The fiery aspect attributed to dragons aligns with interpretations of the fruit symbolizing energy and dynamic strength. Moreover, some cultures see the shape and color variations of dragon fruits as reminiscent of flames or celestial bodies, adding layers to their symbolic repertoire related to

illumination and enlightenment. In Eastern -Asian societies increasingly embracing super-foods for their health benefits rich in antioxidants like betalains the symbolism has expanded to include notions of wellness and longevity.

Research supports these cultural beliefs; studies indicate that compounds found within dragon fruit possess antioxidant properties that may contribute to improved immune function and overall health a modern reflection of its traditional associations with vitality. Its high fiber content promotes digestion and metabolic health, reinforcing societal ideals about nurturing well-being through natural foods rooted in cultural heritage.

### Nutritional Value

Recently, it drawn the much attention of the Indian consumers owing to its pleasant flavour, colour, with their attractive appearance, tremendous health and nutritional benefits. Nutritional Profile: Rich in vitamin C, fiber, antioxidants, and low in calories, making it a nutritious choice. Dragon fruit extracts from stems, flowers, peels and pulps have beneficial biological properties against pathogenic microbes like bacteria, fungi and viruses as well as diseases like diabetes, obesity, hyperlipidemia and cancer (Maheshwari *et al.*, 2020) <sup>[26]</sup>.

### Macronutrients and Micronutrients

Dragon fruit, also known as pitaya, is celebrated not only for its striking appearance but also for its impressive nutritional profile. This tropical fruit is relatively low in calories typically around 60-70 calories per 100 grams making it an excellent choice for those seeking nutrient-dense, low-calorie foods. Its carbohydrate content mainly comprises natural sugars such as glucose and fructose, which provide quick energy, while dietary fiber contributes to satiety and gastrointestinal health. The fruit offers a balanced amount of dietary fiber—about 3 grams per 100 grams which supports healthy digestion and helps regulate blood sugar levels.

In addition to macronutrients, dragon fruit provides essential micronutrients vital for various bodily functions. It is notably rich in vitamin C, a potent antioxidant that boosts immune function, enhances skin health through collagen synthesis, and aids in wound healing. The B-complex vitamins present include B1 (thiamine), B2 (riboflavin), B3 (niacin), B5 (pantothenic acid), and B6 (pyridoxine), all of which are crucial for energy metabolism and nervous system health. Minerals such as iron support oxygen transport via hemoglobin, calcium promotes strong bones and teeth, and phosphorus plays a role in energy production and cell repair. According to Gunasena *et al.* (2019) <sup>[25]</sup>, these nutrients collectively make dragon fruit a highly nutrient-dense food choice suitable for inclusion in a balanced diet.

### Bioactive Compounds

Beyond its basic nutrients, dragon fruit is renowned for its wealth of bioactive compounds that confer numerous health benefits. It is particularly abundant in antioxidants like betalains, flavonoids, and phenolic acids. These compounds are critical in neutralizing free radicals unstable molecules that can cause oxidative stress leading to cellular damage and aging. Esquivel *et al.* (2021) <sup>[24]</sup> highlight that the high antioxidant capacity of dragon fruit contributes significantly to reducing inflammation and lowering the risk of chronic diseases such as cardiovascular disease and certain types of cancer.

Betalains are especially noteworthy because they not only impart the vibrant red and purple hues characteristic of many dragon fruit varieties but also possess anti-inflammatory properties. Chen *et al.* (2020) [22, 23] have demonstrated that betalains can inhibit inflammatory pathways at the cellular level, making this fruit potentially beneficial for managing inflammatory conditions like arthritis or metabolic syndrome. Furthermore, these bioactive compounds may enhance overall vitality by supporting immune function and reducing oxidative stress at the cellular level.

### Dietary Fibre and Prebiotics

One of the standout features of dragon fruit is its high dietary fiber content comprising both soluble and insoluble fibers that plays a pivotal role in digestive health. Notably, the fruit contains oligosaccharides a type of prebiotic fiber that serve as nourishment for beneficial gut bacteria such as *Lactobacillus* and *Bifidobacterium* species. Phebe *et al.* (2018) [28] emphasize that these prebiotic fibers help foster a healthy gut microbiota balance, which is associated with improved digestion, enhanced immune response, and reduced incidence of gastrointestinal disorders like constipation or irritable bowel syndrome.

The consumption of fibrous fruits like dragon fruit has also been linked to better regulation of blood sugar levels due to slowed carbohydrate absorption during digestion. Additionally, dietary fibre contributes to weight management by promoting feelings of fullness and satiety after meals. As research continues to uncover the extensive benefits of gut microbiota modulation through diet, incorporating dragon fruit into one's daily intake emerges as an effective strategy for supporting holistic health through improved gut function.

Overall, dragon fruit stands out as a multifaceted superfood rich in essential nutrients, powerful antioxidants, and beneficial prebiotics all contributing to its reputation as a valuable addition to a healthy diet grounded in scientific evidence.

### Physiology of Dragon Fruit

Dragon fruit (*Hylocereus* spp.) is extensively grown in tropical and subtropical areas due to its distinctive appearance, high nutritional value, and economic advantages. This research systematically examines the morphological structure and photosynthetic metabolic features of dragon fruit, highlighting its triangular stem segments, vibrant colors of the peel and pulp, and the adaptation strategies of its fleshy stem to dry environments. The findings indicate that dragon fruit employs Crassulacean Acid Metabolism (CAM) photosynthesis, which effectively minimizes water loss by fixing carbon dioxide during the night, showcasing exceptional drought resistance. There is considerable genetic diversity among various species concerning traits such as fruit weight, carotenoid levels, and antioxidant capacity, which establishes a robust theoretical basis for species identification and the selection of superior cultivars. Moreover, the study investigates the growth cycle and physiological traits of dragon fruit, concentrating on flowering physiology, fruit development, and maturation processes. Elevated temperatures and drought conditions significantly impact the growth and yield of dragon fruit, while the regulation of associated genes, including the expression of heat shock proteins, further enhances its resilience to environmental stressors. Additionally, the economic potential of dragon fruit cultivation is strengthened by its applicability in health foods and nutritional supplements. This thorough study offers a scientific foundation for optimizing cultivation management

practices, enhancing yield and quality, and provides insightful research avenues for further exploration of its disease resistance genes and the implications of climate change on dragon fruit production, ensuring its sustainability as a viable crop.

### Climate

Dragon fruit thrives in warm, slightly dry environments with temperatures ranging from 20 °C to 30 °C and requires minimal waterlogging. As a cactus species, it is sensitive to excess moisture which can cause stem rot and fungal diseases. The plant prefers well-drained soils and frost-free zones, making it suitable for arid and semi-arid regions.

### Propagation and Planting

Propagation typically involves using 20–30 cm stem cuttings from healthy parent plants. Supporting structures are necessary; these include concrete or stone pillars approximately 6–7 feet tall with circular rings or tires to support the climbing vines. Spacing between plants generally measures 3 by 3 meters; with four plants per support pole, this results in a density of around 1,200 to 1,500 plants per acre. Organic mulches like dry leaves or coir pith help conserve soil moisture and control weeds.

### Integrated Nutrient Management

For optimal flowering and fruit development, dragon fruit requires balanced nutrition. Fertigation through drip irrigation ensures even distribution of nutrients and enhances yields. Organic compost along with bio-fertilizers such as *Azospirillum* and phosphate-solubilizing bacteria (PSB) are recommended for sustainable cultivation.

The recommended distance between pillars for growing dragon fruit is generally 3 meters. This spacing ensures that the plants have enough room to grow properly, receive sufficient sunlight, and allow their aerial roots to spread freely. Maintaining this 3-meter gap helps prevent overcrowding and supports healthy development of the plants. Recommended annual fertilizer application per pillar: White-pulped dragon fruit requires N : P<sub>2</sub>O<sub>5</sub> : K<sub>2</sub>O at 400:300:650 grams, while purple-red-pulped dragon fruit needs 700:400:350 grams. These recommended doses have been shown to optimize yields, achieving up to 25.5 tons per hectare for the white-pulped variety and 35.6 tons per hectare for the purple-red-pulped variety.

### Integrated Weed Management

Weed control in dragon fruit cultivation is an essential aspect of organic farming that requires careful consideration. The use of weed mats is a highly effective method that not only reduces weed growth but also aids in conserving soil moisture. This technique is particularly beneficial in organic dragon fruit farms, where maintaining soil health and moisture is vital for optimal growth and fruit production. Additionally, incorporating organic inputs such as farmyard manure, coir compost, and vermicompost is recommended to enrich the soil. Using biofertilizers further supports the growth of dragon fruit vines, fostering a thriving, sustainable agricultural ecosystem that benefits the entire farm.

### Pest and Disease Control

Common pests include mealybugs, aphids, and fruit flies. Diseases like stem rot and fungal infections can also impact crops. Integrated pest management strategies using organic insecticides and maintaining proper drainage are effective for safeguarding plant health. For pest management spraying of



nymbicidine 300 ppm @ 1.5 ml/lit and for fungi management spraying of *Trichoderma harzianum* (P) 1.5 g/lit are advocated.

### Best Dragon Variety

The Do Hong dragon fruit is a striking variety characterized by its bright deep pink skin, sweet and juicy flesh, often white or dark magenta in color. Known for its visual appeal and excellent flavor nutritional quality.

**Skin:** Vibrant pink to red with leafy green scales

- **Flesh:** Typically white or light pink or dark magenta, dotted with small black edible seeds
- Dark magenta is a rich, deep hue blending purple and pink, evoking a dramatic and bold mood. It sits between violet and red on the color wheel. Related shades include deep magenta tone and dark purple-pink.
- **Weight:** Usually medium-sized, ranging from 0.5 to 1 pound per fruit
- **Flavor:** Mildly sweet, refreshing, with a slightly berry-like taste
- **Cultivation:** Self-fertile and suitable for warm, tropical climates with well-drained soil
- **Nutritional Profile:** Rich in vitamin C, fiber, antioxidants, and low in calories, making it a nutritious choice
- Other Prominent Dragon Varieties in India are CHESH-D1, CHESH-D2, CHESH-D3, Hirehalli White, Australian Golden Yellow and TLM White.

### Yield and Economic Returns

Dragon fruit starts producing in its second year; full production typically occurs within 3 to 4 years. Average yields range from 8 to 13.5 tons per hectare in established regions; newer plantations may yield between 1.5 to 3.1 tons per hectare. The average-yield is 10-15 ton/ha after 3 years of planting. The crop's high profitability stems from increasing domestic demand and export opportunities; retail prices for a 250-gram portion can reach approximately Rs. 150 in urban markets.

### Future Perspectives and Important Consideration.

With a growing base of health-conscious consumers and government backing, cultivation area is expected to expand significantly potentially reaching 30,000 hectares by 2025. Additionally, the Ministry of Agriculture has established a Centre of Excellence for Kamalam Fruit at IIHR Bengaluru to promote local production and reduce reliance on imports. Cultivating dragon fruit in India presents lucrative prospects due to its high returns, low water requirements, and export potential making it an attractive choice for farmers seeking sustainable profitability.

### Essence

In conclusion, the Dragon fruit stands as a vivid symbol bridging ancient mythologies with contemporary values. Its vibrant appearance encapsulates themes of vitality, prosperity, fertility, power, and resilience traits that resonate universally across human perceptions and traditions. Serving both as a culinary delight and a cultural icon, this captivating fruit continues to inspire admiration for its beauty while representing human hopes for abundance and enduring strength. Nowadays, Indian growers are increasingly interested in its cultivation due to its promising yield and great commercial potential, which can significantly enhance the economic status of farmers. Currently, the area under cultivation is insufficient to meet the demands of

consumers, illustrating the need to increase dragon fruit production in India. This fruit boasts a high yield potential of 10-15 tons per hectare and is known for its attractive appearance and nutritional benefits, containing about 3 grams of dietary fiber and 60-70 calories per 100 grams. Furthermore, it is particularly abundant in antioxidants such as betalains, flavonoids, and phenolic acids, which play a crucial role in neutralizing free radicals unstable molecules that can cause oxidative stress and lead to cellular damage and aging. Expanding this fruit's cultivation is necessary to reduce import costs and enhance the livelihood security of stakeholders and entrepreneurs.

### Different Cultivars of Dragon Fruit



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