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Dragon Fruit as a Nutrient-Rich Functional Food for Human Health

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Introduction:

Dragon fruit or Pitaya (*Hylocereus spp*.), is a kind of vine cactus that is a member of the Cactaceae family. Dragon fruit is native to Mexico and Central and South America's tropical and subtropical forest regions (Mizrahi *et al.*, 1997). The dragon fruit plant is a fast-growing, evergreen cactus with thin, vine-like branches that can grow up to 1.5 to 2.5 meters in height. It is an epiphytic or terrestrial cactus with green, succulent stems that have three wings. The fruit is stunning, with white or red meat, many small black seeds, and brilliant red skin speckled with green scales (Patwary *et al*., 2013). The bioactive components of dragon fruit may be impacted by the cultivar, time of year, climate, cultural customs, water availability, handling, storage, and transportation. Due to its low water requirements and ability to withstand high temperatures, dragon fruit holds tremendous promise as a new crop for growers in the Mediterranean (Trivellini *et al.,* 2020). Due to their nutritional and therapeutic qualities, dragon fruits are becoming more and more well-liked. Because of its nutritional qualities, this fruit is regarded as a significant economic fruit species globally. The ripening process caused the red-fleshed dragon fruits to become pigmented (Rahim *et al.,* 2009). The fruit tastes delicious, is crunchy, and is high in

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sugars and antioxidants. An edible fruit with water-soluble fiber, dragon fruit is rich in vitamin C and antioxidants such as flavonoids, hydroxycinnamates, and betalains. Among its many health advantages include its capacity to boost immunity, lower blood LDL cholesterol, enhance digestion, and help people lose weight. Flavonoids work on brain cells and blood vessels to lower the risk of heart disease, whereas hydroxycinnamates assist prevent cancer. Additionally, it protects against germs and fungus and aids in the body's general operation. The use of dragon fruit as a source of functional materials to produce phytochemicals with potent antioxidant capabilities has increased in recent years due to the fruit's health and economic significance. Vitamins, calcium, phosphorus, magnesium, fiber, phytochemicals, and antioxidants are all abundant in the fruits of Hylocereus undatus. Dragon fruit, which can be eaten raw or added to drinks, candies, and jelly, is gaining popularity in many nations. Additionally, the food and pharmaceutical industries might use the pigments as coloring agents.

Nutritional Values of Dragon fruit

The nutritional value of dragon fruit varies depending on the species, harvest season, and area of origin. The environment has a considerable impact on the nutritional composition and phytochemical qualities of red dragon fruit. More minerals, including potassium, phosphorus, salt, and magnesium, are found in dragon fruit than in mango steen, mango, pineapple, and other vitamin sources combined. Fruit quality is greatly impacted by flowering and fruit setting time, particularly on the amount of total soluble solids. TSS is higher in dragon fruits, primarily in autumnal fruits as opposed to summer ones. Fresh fruit has 82.5-83.0% moisture, 0.16-0.23% protein, 0.21-0.61% fat, and 0.7-0.9% fiber. There are 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 in 100 g of fresh fruit pulp. Additionally, the red flesh is high in betalains, satisfying the growing market need for natural food coloring and antioxidant products. Furthermore, when compared to other subtropical fruits, this fruit exhibits a comparatively high level of antioxidant activity. Dragon fruit is low in carbs and fat and abundant in fiber, minerals like calcium, iron, and phosphorus, and vitamins B_1, B_2, B_3, and C. On the other hand, 50% of the necessary fatty acids linoleic and linolenic acid are found in seeds. Compared to the flesh of the fruit, the premature stem of dragon fruit has more ascorbic acid, which may help reduce the risk factors for diseases including scurvy, anemia, and weakness. In fruit cultivation, dragon fruit may be a significant source of pectin. Due to its high levels of polyphenolic components and antioxidant

qualities, dragon fruits are recognized all over the world. High-quality essential fatty acids were found in several of these fruits' small black seeds. Phytochemical substances found in dragon fruit pulp and peel extract have antibacterial properties and can be utilized as a natural antioxidant.

and beverages, although it is best consumed raw, fresh, or dried. Fresh flower buds and the fruit and young stems of *H. undatus* have been used as vegetables, while dried flower buds are utilized in indigenous medicine. Dried flowers are eaten as vegetables in Taiwan. Depending on the desired flavor, it is also consumed as

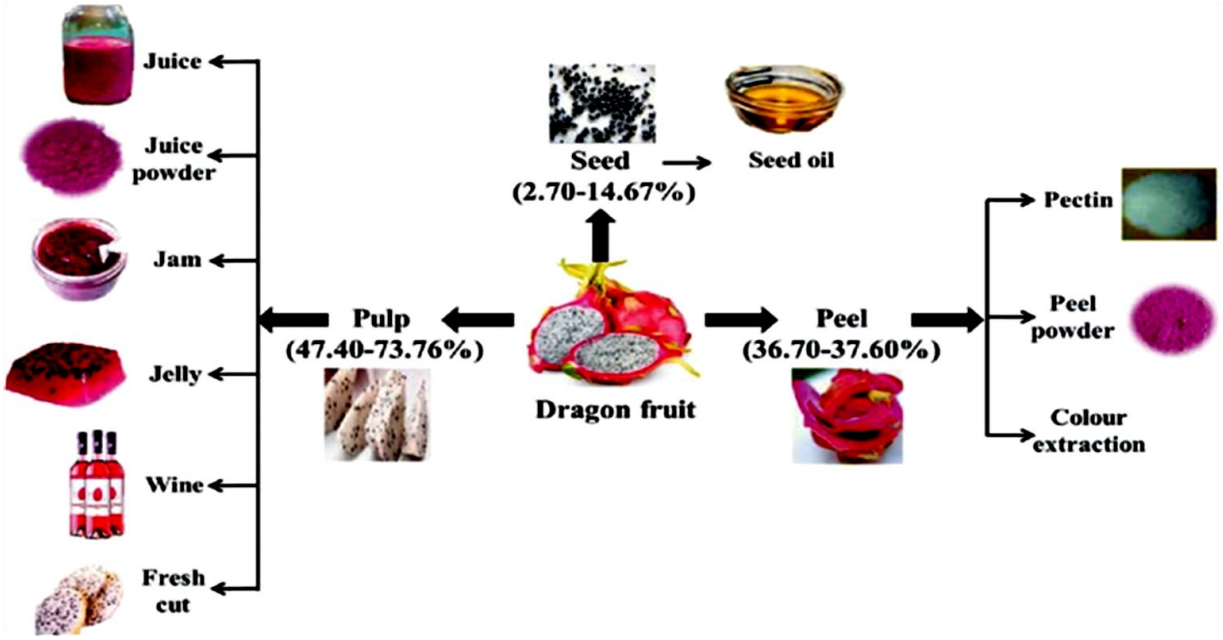
Nutrient content of 100 g edible portion of Dragon fruits (Thokchom *et al.*, 2019)

Component	Amount	Component	Amount
Water	87g	Vitamin B_1	0.04 mg
Protein	1.1 g	Vitamin B_2	0.05 mg
Fat	0.4 g	Vitamin B_3	0.16 mg
Fiber	3.0 g	Vitamin C	20.5 mg
Carbohydrate	11.0g	Calcium	8.5 mg
Iron	1.9 mg	Phosphorus	22.5 mg

Consumption of Dragon Fruits

Dragon fruits are becoming more popular all around the world because of their lovely hues and juicy, sweet flavor. Dragon fruit can occasionally be used as a natural coloring ingredient in a variety of cocktails

fresh table fruit in the form of jam, preserves, ice cream, cookies, candies, wines, shakes, or unique beverages. Dragon fruit skins, both fresh and dried, are a natural food thickening and coloring agent due to their high pectin and betalain content (Sonawane, 2017).



Health benefits of Dragon fruit

1. **Role in Bone Health and Tissue Formation**

Dragon fruit has significant levels of calcium and phosphorus, two minerals necessary for the growth and upkeep of healthy teeth and strong bones. Additionally, these minerals are essential for the processes of tissue development and cellular repair. Therefore, regular dragon fruit eating may support healthy growth and development and increase bone strength, especially in children and the elderly who are more susceptible to bone-related illnesses.

2. **Role in Metabolic Health and Chronic Disease Prevention**

Dragon fruit is good for people with diabetes and cardiovascular risk factors because its ingredients help control blood glucose levels and reduce cholesterol. Consuming dragon fruit has been shown in studies to lessen aortic stiffness, a crucial indicator of cardiovascular health. Furthermore, the fruit helps lower blood pressure and has preventive benefits against arthritis and asthma, which helps prevent and manage chronic lifestyle related disorders.

3. **Antioxidant and Immune-Boosting Properties**

Dragon fruit contains a lot of vitamin C, which is important for strengthening the immune system and shielding the body against illnesses like asthma and cough. Additionally, by promoting collagen synthesis and tissue regeneration, vitamin C accelerates the healing of wounds. Dragon fruit's natural antioxidants also increase the activity of endogenous antioxidant enzymes, which lowers oxidative cell damage and fortifies the body's defenses against harm.

4. **Polyphenols and Bioactive Compounds**

Polyphenolic chemicals found in the fruit have potent antioxidant and free radical-scavenging properties. Cellular components are shielded from oxidative damage by these bioactive chemicals, which aid in neutralizing reactive oxygen species produced during metabolic activities and environmental stress. By these means, the polyphenols found in dragon fruit help to prevent chronic illnesses and support longevity and general health.

5. **Probiotic and Gut Health Benefits**

The flesh of dragon fruit contains a lot of polysaccharides and mixed oligosaccharides, which are prebiotics that help the growth of good gut bacteria like Bifidobacteria and Lactobacilli. Through enhancing digestion and nutrient absorption and inhibiting the growth of dangerous pathogens, these probiotic microbes support gut health. Dragon fruit thus functions as a natural functional food that promotes metabolic balance and gastrointestinal health.

6. **Nutritional and Functional Properties**

Dragon fruit is a great source of important micronutrients, such as antioxidants, dietary fiber, calcium, phosphorus, and vitamin C. The polyunsaturated fatty acids omega-3 and omega-6, which are abundant in the fruit's edible seeds, are known to lower triglyceride levels and the risk of cardiovascular diseases. Dragon fruit's whole nutritional composition makes it a functional food that promotes general health and heart health.

7. Medicinal and Therapeutic Applications

Dragon fruit has long been thought to have a number of therapeutic benefits. According to reports, it supports kidney function, increases appetite, improves vision and cognition, and speeds up wound healing. To increase blood circulation, extracts made from the flower and stem are utilized. The fruit's antioxidant and bioactive components also give it anti-aging and cancer-preventive qualities. The potential of dragon fruit in complementary medicine and preventative nutrition is highlighted by these medicinal advantages.

8. Functional Food and Nutraceutical Potential

Dragon fruit has antioxidant, antimicrobial, and immunomodulatory properties because it contains bioactive substances. It is a promising raw material for the creation of cosmeceuticals, nutraceuticals, and functional meals because of these qualities. The fruit and its byproducts can be used to provide natural substitutes for artificial ingredients in food formulations and cosmetic preparations that promote physical and mental well-being.

9. Dragon Fruit Peel as Natural Food Additive and Colorant

Dragon fruit peels, which are typically thrown away as waste, are high in betalains and pectins. These substances provide inherent coloring and thickening qualities, respectively. Dragon fruit coloring powder (albedo), which is traditionally used to color foods like rice, milk, yoghurt, juice, and pastries, can be made from both fresh and dried skins. In addition to giving agro-waste more value, using peel encourages the use of natural, healthful food additives.

10. Hypolipidemic Effects of Red Dragon Fruit Peel

It has been claimed that red dragon fruit peel powder has hypolipidemic properties, lowering triglycerides, total cholesterol, and low-density lipoprotein (LDL) levels while raising HDL levels. Frequent use of peel powder as a dietary supplement in food items may help avoid hyperlipidemia and maintain good lipid profiles, which lowers the risk of cardiovascular diseases.

11. Economic and Cultivation Importance

Dragon fruit's excellent nutritional content, therapeutic qualities, and rising consumer desire for functional foods are all contributing to the fruit's rapid global expansion. The fruit's widespread cultivation and commercialization have also been aided by its economic potential as a high-value horticulture product and its adaptability to a variety of weather situations.

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