



## *Hylocereus undatus* (Dragon Fruit): A Brief Review

**Pandya Prutha Hitendraprasad\*, Karunakar Hegde, A R Shabaraya**

Department of Pharmacology, Srinivas College of Pharmacy, Valachil, Farangipete Post, Mangalore, Karnataka, India.

\*Corresponding author's E-mail: [pruthapandya62@gmail.com](mailto:pruthapandya62@gmail.com)

Received: 05-11-2019; Revised: 18-12-2019; Accepted: 25-12-2019.

### ABSTRACT

Our nature is surrounded with wide variety of plants and many of them are having medicinal properties. These medicinal plants have been playing an essential role in the development of human culture. They contain the substances that provide nourishment essential for maintenance of life and for growth. The use of medicinal plants has attained a commanding role in health system all over the world. *Hylocereus undatus* is typically the most cultivated vine cactus belonging to the family of Cactaceae, originating natively from Mexico and America. Commonly, it is well known under the name of “dragon fruit” or “pitaya”. Besides its attractive coloration, the fruits of *Hylocereus undatus* are being prevailed globally because of its rich source of polyphenolic components and their antioxidant activity. *Hylocereus undatus* contain carbohydrates, crude fiber, vitamin C, flavonoids, thiamine and polyphenol.

**Keywords:** Dragon fruit, *Hylocereus undatus*, Morphology, Phytochemical constituents.

### INTRODUCTION

Herbal medicine has now become an integral part of standard healthcare, as they are used both traditionally as well as in ongoing scientific research. Herbal medicines are rich in natural substances that can promote health and reduce illness. The fruit *Hylocereus undatus* is also known as Dragon Fruit and Pitaya belonging to family Cactaceae. *Hylocereus undatus* fruit is commonly used as a food. It is a native fruit originating from Mexico and Central and South America.<sup>1</sup> It has been cultivated in Vietnam for at least 100 years, following by the French.<sup>2</sup> There are three types of dragon fruit: *Hylocereus undatus*, pink skin with white flesh; *Hylocereus polyrhizus*, red flesh with pink skin; *Hylocereus costaricensis*, violet red flesh with pink skin and *Hylocereus (Selenicereus) megalanthus*, white flesh with yellow skin.<sup>3</sup>

#### Common / Vernacular Name: <sup>4</sup>

Chinese	huǒlóngguǒ (fire dragon fruit)
French	Cierge-lézard, Pithaya rouge, Pitaya
Mexico	Junco, Flor de caliz, Pitajava, Pitahaya roja
English	Strawberry Pear, Dragon fruit, Red pitaya, Night Blooming Cereus, Belle of the Night, Cinderella Plant, Queen of the Night, Jesus in the Cradle
German	Distelbirne, Echtestachelbrin
Spanish	Flor de caliz, Junco tapatio, Pitahaya orejona, Pitajaya, Reina de la noche
Hindi	Dragon Fruit

#### Synonyms:

*Cereus undatus* Haw.<sup>5</sup>

### Propagation

The *H. undatus* is most often propagated through cuttings, obtained by severing foot-long, lateral branches at a stem segment. Making a slant cut on the stem end to be inserted into the soil to improve rooting. Cutting should be cured in a cool, dry area for 5-7 days before planting. Mature stems are preferred for cutting, as they are more resistant to insect and snail damage. Cutting may be planted directly in the field or in pots using a well drained potting medium.<sup>6</sup>

### Cultivation

Commercial plantings can be done at high density with between 1100 and 1350 plants per hectare. Plants can take up to five years to come into full commercial production, at which stage yields of 20 to 30 tons per hectare can be expected.<sup>7</sup> *Hylocereus* has custom-made to measure in dry tropical climates with a moderate quantity of rain. The dragon fruit sets on the cactus-like trees 30–50 days once flowering and might typically have 5-6 cycles of harvests each year. In various regions, it's free cultivation to become a weed and is assessed as cuckoo nvasive weed in some countries.<sup>8</sup>

### TAXONOMICAL POSITION: <sup>9</sup>

Kingdom	Plantae
Order	Caryophyllales
Family	Cactaceae
Subfamily	Cactoideae
Tribe	Hylocereae
Genus	<i>Hylocereus</i>
Species	<i>H. undatus</i>

**BOTANICAL DESCRIPTION****Fruit**

The fruit is fleshy berry, which is oblong and about 4.5 inches (11 cm) thick with red or yellow skin/ peel with scales and with or without spines. The colour of pulp may be pink, white, red, or magenta depending on the species. Seeds are very small, numerous, and black embedded among the pulp.<sup>10</sup>



Figure 1: *Hylocereus undatus*, white-fleshed



Figure 2: *Hylocereus polyrhizus*, red-fleshed



Figure 3: *Hylocereus megalanthus*, Yellow pitahaya fruit with spines removed

**Flowers**

Flowers are unit hermaphroditic, however, some pitaya species and cultivars are self incompatible. The extremely showy, edible, white flowers are very large, very fragrant, nocturnal, bell formed and may be inches long (36 cm) and 9 inches wide (23 cm). The stamens and lobed stigmas are cream colored. 3 to 5 spherical buttons ordinarily emerge on the stem margin; two to three of those could change into flower buds in about 13 days. The light green,

cylindrical flower buds reach approximately 11 inches after 16-17 days, when anthesis occurs.<sup>11</sup>



Figure 4: *Hylocereus undatus* with both carpels and stamens



Figure 5: *Hylocereus undatus* flowers on plant

**PHYTOCHEMISTRY**

*Hylocereus undatus* is a rich source of nutrients and minerals such as vitamin B1, vitamin B2, vitamin B3 and vitamin C, protein, fat, carbohydrate, crude fiber, flavonoid, thiamin, niacin, pyridoxine, kobalamin, glucose, phenolic, betacyanins, polyphenol, carotene, phosphorus, iron and phytoalbumin<sup>12</sup>. It is rich in phytoalbumins which are extremely valued for its antioxidant properties<sup>13</sup>.

**Medicinal Uses<sup>14</sup>**

The fruits are used as hypocholesterolemic, anti-microbial, antioxidant, in constipation. Anti-cancer, to boost immune system, in diabetes, to maintain cholesterol level, to promote healthy hair and skin, to prevent anemia, to improve appetite, vision and brain function.

**PHARMACOLOGICAL ACTIVITIES****Antioxidant activity**

Ethanol extract of the *H. undatus* peel and flesh were proposed to have different antioxidant capacities because peel contain more flavonoids than flesh.<sup>15</sup>

**Anti-cancer activity**

The anticancer properties of *Hylocereus undatus* was recently studied. Several evidences showed that polyphenols, flavonoids and betanins that present in the

*Hylocereus undatus* are responsible for the anticancer effects. *H. undatus* peel extracted by ethanol-water (50:50, v/v) solvent system showed anti-proliferative activity.<sup>16</sup>

#### Antimicrobial activity

The antibacterial activity of ethanol, chloroform and hexane extracts from *H. undatus* peel was studied. From the disc diffusion assay results, exhibited inhibition zone of about 7 to 9 mm against Gram-positive and Gram-negative bacteria.<sup>17</sup>

#### Hypocholesterolemic Effect

Polyphenol contents in *H. polyrhizus* flesh were proven to be able to reduce cholesterol level in the body.<sup>18</sup>

#### Cardio-protective Effect

Polyphenol contents in *H. polyrhizus* flesh also possessed anti-thrombotic effects which further enhanced its cardio-protective properties.<sup>19</sup>

#### Prebiotic Effect

The ethanolic extract of *H. undatus* flesh was detected as approximately 85% of mixed oligosaccharides. These oligosaccharides had higher resistance towards the human salivary  $\alpha$ -amylase compared to inulin. This is not digested in the stomach, but act as prebiotics, which assists in the growth of lactobacilli and bifidobacteria, which are the healthy bacteria. These microorganisms will assist in the digestion and keep the immune system strong.<sup>20</sup>

#### CONCLUSION

The fruit *H. undatus* is a promising source of alternative medicine that might serve as antioxidant, anticancer, hypocholesterolemic, cardio-protective, antimicrobial as well as prebiotic agent. The fruit contains various chemical constituents like carbohydrate, crude fiber, flavonoid, thiamin, niacin, pyridoxine, kobalamin, glucose, phenolic, betacyanins, polyphenol, carotene, phosphorus, iron and phytoalbumin. It is also rich in phytoalbumins which are highly valued for their antioxidant properties. Apart from these many researches has been done on this fruit and proven that the plant is having many pharmacological activities.

#### REFERENCES

- Britton NL, Rose JN., The Cactaceae: Descriptions and illustrations of plants of the cactus family, The Carnegie Institution of Washington USA2, 1937, 1-334.
- Mizrahi Y, Nerd A, Nobel PS, Cacti as crops, Hort Rev, 18, 1997, 291-319.
- Le Bellec F, Vaillant F, Imbert E, Pitahaya (*Hylocereus* spp.), a new fruit crop, a market with a future, Fruits, 61(04), 2006, 237-250.
- Zee F, Yen C R, Nishina M, Pitaya (dragon fruit, strawberry pear), College of Tropical Agriculture and Human Resources (CTAHR), University of Hawai'i, 9, 2004, 1-3.
- Cereus undatus* Haworth, Philos, Mag, Ann, Chem, 7, 110, 1830.
- Boning, Charles R. Florida's Best Fruiting Plants- Native and Exotic Trees, Shrub, and Vines, Pineapple Press, Inc, Sarasota, Florida, 2006, 184-185.
- "Dragon Fruit - Amorentia Sweet Dragon Fruit" (<https://amorentia.co.za/dragon-fruit/>.) Retrieved 2018-06-05.
- "Hylocereus undatus (dragon fruit)" (<https://www.cabi.org/isc/datasheet/27317>), CABI, 3 January 2018, Retrieved 19 April 2018.
- Britton NL, Rose JN, The Cactaceae, Descriptions and illustrations of plants of the cactus family, Dover Publications Inc USA3, 1963, 4.
- Crane, Jonathan H, Carlos F, Balerdi, and Ian Maguire, "Pitaya Growing in the Home Landscape," *edis.ifas.ufl.edu*, This document is HS1068, one of a series of Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Publication date Nov, 2005, Revised Nov, 2016, Web, 17 June 2017.
- Pushpakumara DKN, Gunasena HPM, Kariyawasam M, Flowering and fruiting phenology, pollination agents and Breeding system in *Hylocereus* spp, (dragon fruit), Proc Peradeniya University Research Sessions, Sri Lanka, 11, 2006, 15.
- Le Bellec F, Vaillant F, Imbert, Pitahaya (*Hylocereus* spp.), a new fruit crop, a market with a future, Fruits 61(4), 2006, 237-50.
- Mahattanatawee K, Manthey JA, Luzio G, Talcott ST, Goodner K, Baldwin EA, Total antioxidant activity and fiber content of select Florida-grown tropical fruits, J Agri Food Chem, 54(19), 2006, 7355-63.
- Gunasena HP, Pushpakumara DK, Kariyawasam M, Dragon fruit *Hylocereus undatus* (Haw.) Britton and Rose, Underutilized fruit trees in Sri Lanka, New Delhi, World Agroforestry Centre, 2007, 110-42.
- Nurliyana R, Syed Zahir I, Mustapha Suleiman K, Aisyah MR, Kamarul Rahim k, Antioxidant study of pulps and peels of dragon fruits, a comparative study, Int Food Res J, 17, 2010, 367-75.
- Li F, Li S, Li H, Deng G, Ling W, Wu S, Xu X, Chen F, Antiproliferative activity of peel, pulps and seeds of 61 fruits, J Funct Food, 5(3), 2013, 1298-1309.
- Nurmahani MM, Osman A, Abdul Hamid A, Mohamad Ghazali F, Pak Dek MS, Antibacterial property of *Hylocereus polyrhizus* and *Hylocereus undatus* peel extract, Int Food Res J, 19(1), 2012, 77-84.
- Khalili MA, Norhayati AH, Rokiah MY, Asmah R, Siti Muskinah M, Abdul Manaf A, Hypocholesterolemia effects of red pitaya (*Hylocereus* sp.) on hypercholesterolemic-induced rat, Int Food Res J, 16, 2009, 431-40.
- Santhakumar AB, Bulmer AC, Singh I, A review of the mechanism and effectiveness of dietary polyphenols in reducing oxidative stress and thrombotic risk, J Hum Nutr Diet, 27, 2014, 1-21.
- Wichienchot S, Jatupornpipat M, Rastall RA, Oligosaccharides of pitaya (dragon fruit) flesh and their prebiotic properties, Food Chem, 120(3), 2010, 850-7.

Source of Support: Nil, Conflict of Interest: None.

