



Dragon: A new profitable fruit crops in Jammu subtropics areas

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Dragon (*Hylocereus undatus* Haw.) is a one of most important and highly profitable fruit crops. It is commonly known as pitaya and pitahaya. In India, cultivation of dragon is very small scale and its price is very high due to lack of its scientific cultivation in the fruit grower's community, lack of cultivars, quality planting materials as well as non availability of fruit in the market. Poor community cannot effort it due high price in the fruit market. Dragon is a very health benefits fruit crop it is rich in source of vitamins, minerals and proteins. It helps in controlling diabetes, lowering cholesterol and fighting against ageing. It is good source of antioxidant, helps in preventing arthritis and asthma. It also helps in reducing the weight and improving heart health. Therefore cultivation of dragon is very necessary to enhance the production and provide good quality fruit in the poor community to fulfill nutrition requirement as well as uplift of social economic condition of low marginal growers.

Introduction: Dragon (*Hylocereus undatus* Haw.), a new introduction in India is highly valued for its nutraceutical properties. It is common known as pitaya and pitahaya are a generic

term which includes several species. *Hylocereus* word is derived from the Greek word *keros* or Latin *cereus* meaning wax taper, referring to the columnar habit of species in the genus. The name *Hylocereus* was subsequently given to the genus of similar cacti growing in woodlands, the prefix deriving from the Greek word *hyle* meaning

a wood or forest. It is a very important and highly profitable fruit crops in cactus species of the family Cactaceae. It is one of 15 accepted *Hylocereus* species native to Central and South America. While many of these species have ornamental value for their beautiful flowers that open at night, only five are important as fruit producers. *H. undatus* has several common synonyms, including *Cereus guatemalensis*, *C. tricostatus*, *C. trigonus* var. *guatemalensis*, *C. undatus*, *C. undulatus*, *H. guatemalensis* and *H. tricostatus*. The names of numerous genera in the Cactaceae end with the suffix 'cereus' as the genus *Cereus* was one of the first cactus

genera to be described. Its name is derived from the Greek word *Keros* or Latin *Cereus* meaning wax taper, referring to the columnar habit of species in the genus. The name



Hylocereus was subsequently given to the genus of similar cacti growing in woodlands, the prefix deriving from the Greek word *Hyle* meaning a wood or forest. Dragon fruit plantations must be sighted in frost-free areas or incorporate some form of frost protection such as greenhouse production for cooler winter climates. Dragon fruit plants will show damage

at temperatures of below 0°C and also above 40-45°C as they were originally adapted to shade canopy environments. In high radiation areas, overhead shading are often installed which also helps reduce extremely high temperatures which can limit flowering and fruit set. High radiation levels cause the plants to become bleached in appearance caused by the destruction of chlorophyll in the stems, growth will also be retarded and plants may eventually die. However, under heavy shade the plants may become etiolated with reduced flowering and production levels. Recommendations for shading are to apply the minimal amount of shade required to prevent

bleaching of the stems and ensure the plants are not water stressed as this reduces the crop's resistance to high light damage.

Sweet pitahayas come in three types, all with leathery, slightly leafy skin:

– *Hylocereus undatus* (*Pitaya blanca* or white-fleshed pitahaya) has pink-skinned fruit with white flesh.

– *Hylocereus costaricensis* (*Pitaya roja* or red-fleshed pitahaya, also known as *Hylocereus polyrhizus*) has red-skinned fruit with red flesh.

– *Hylocereus megalanthus* (*Pitaya amarilla* or yellow pitahaya, also known as *Selenicereus megalanthus*) has yellow-skinned fruit with white flesh.

Origin and distribution: Most *Hylocereus* species principally originated in Mexico and Central and South America. *Hylocereus* species are now distributed all over the world (Tropical and Subtropical regions).

Plant description: *Hylocereus undatus* (*Pitaya blanca* or white-fleshed pitahaya) is a fast growing, epiphytic or xerophytic, vine-like cactus. Stems are triangular, 3-sided, although sometimes 4- or 5-sided, green, fleshy, jointed, many branched. Each stem segment has 3 flat wavy ribs and corneous margins may be spineless or have 1-3 small spines. Stems scandent, creeping, sprawling or clambering, up to 10 m long. Aerial roots, which are able to absorb water, are produced on the underside of stems and provide anchorage for stems on vertical surfaces. Flowers are 25-30 cm long, 15-17 cm wide, nocturnal, scented and hermaphroditic; however, some cultivars are self-compatible. Flowers are typically white in colour and bell shaped, stamens and lobed stigmas are cream coloured. Fruit is a fleshy berry, oblong to ovoid, upto 6-12 cm long, 4-9 cm thick, red with large bracteoles, pulp white, edible, embedded with many small black seeds.

Health benefits : Dragon fruit is rich in vitamins, minerals and proteins. It helps in controlling diabetes, lowering cholesterol and fighting against ageing. It is good source of antioxidant, helps in preventing arthritis and asthma. It also helps in reducing the weight and improving heart health.

Biology and ecology: Dragon fruit is a fast growing, vine-like, tropical cactus grown for its fleshy, succulent fruit. Dragon fruit is frost and chilling sensitive and is largely produced in areas where temperatures do not exceed 38°C. Optimum temperatures for growth are 18-25°C, with good relative humidity levels. Growing as a climbing cactus in shaded or semi-shaded positions under large canopies, dragon fruit may be injured by extreme sunlight and can tolerate some shade; however, it is considered to

be a full sunlight crop in Central and South American countries.

Soil and climate: Dragon is a drought and high temperature tolerates fruit crops. Its plants can survive in low water holding capacity and poor soil conditions. However, it can grow in subtropical and tropical climatic conditions. This plant requires minimum annual rainfall of 50-70cm and temperature about 20°C to 30°C for its best cultivation. Too much of sunlight is not good for its cultivation, in high sunlight areas, shading can be provided for better yield. Dargon fruit prefer cultivate on loamy, sandy or stony moderately saline soils with good drainage. They do best in a loose soil, rich in organic matter, with a pH of 5.5-6.5 and not more than 50 per cent slope.

Land preparation: Land should be ploughed till soils achieve the fine tilth and weed free. Organic compost should be added in proportionate ratio at the time of field preparation.

Propagation: Dragon is commercially propagated by asexual method such as cuttings. However, it can also be propagated by seeds, but the seeds take longer time and will not continue with mother plant characteristics. Planting materials should be taken from high pedigree mother plants to enhance the production and productivity per unit areas.

Planting method and distance: Dragon is a herbaceous and high profitable fruit crop. Dragon can be planted in rainy season under rainfed conditions. But planting may be done in the January –February months. Therefore, this planted at distance 2 x 2m plant to plant with pits size of 60x 60x60 cm. These pits should be filled with top soil and compost. About 20 cm long cutting should be used for planting in the field. Pile up these cutting two days before potting. Then these cuttings should be potted with planting mixture of dry cow dung: top soil: sand as 1:1:2. Make sure these pots are placed in shade before planting.

Training and pruning: To get the desirable shape, size, growth, development and enhance the production and fruit quality, training is very necessary in dragon fruit plant. As dragon is a non-woody plant. Therefore, its plant required support to upright growth and development. It plants should be supported by concrete or wooden columns. Immature plant stems are required to tie with these columns. Lateral shoots should be limited and two to three main stems should be allowed to grow. It is recommended to have round or circular metal frame. When growing naturally, dragon fruit attaches branched stems to trees or rocks via adventitious roots. Under cultivation, the vine-like stems are supported by a post and trellis system. The plant is fairly tolerant of wind when attached to a trellis.

Problems can occur with single-post trellises, where the plant forms a fairly bulky canopy, depending on the sturdiness of the trellis.

Manures and fertilizers: Organic matter plays key role in dragon fruit development and growth. Each plant should be applied with 10-15 kg of organic manure. Thereafter, fertilizers should be applied 2 kg per year. This crop also requires organic and inorganic fertilizers for vegetative growth, in the ratio of 70:90:40 as Urea: Super phosphate: Murate of potash. Apply the fertilizer mixture just before flowering (in April), fruit developing stage (July-August) and after harvesting the fruits in December.

Irrigation: Like many cacti, dragon fruit has a low water demand, which is related to their crassulacean acid metabolism (CAM) mode of photosynthesis – uptake of CO₂ occurs during the night when the stomata are open, which restricts water loss via transpiration during the heat of the day. Therefore, slight irrigation required during summer months. However, at the time of planting, flowering, fruit development stage and hot dry climatic conditions, frequent irrigations are required. Drip irrigations can be used for effective water usage.

Pollination: Flowers are pollinated by bats or moths; however, hand pollination is also used with self-incompatible varieties to ensure good fruit set and fruit size. This requires considerable labour input and many new commercial operations are utilising new cultivars which are self-fertile to avoid the cost of hand pollination. Pollen collected from dragon fruit flowers can be stored after drying to a moisture content of 5-10 per cent and stored at below freezing temperatures. Pollen can be stored in this way for 9 months and used to pollinate the first blooms of the season, resulting in an earlier and larger crop. The flowering was initiated in the red fleshed and white fleshed dragon fruits in the month of March (nine month after planting) dragon.

Harvesting: These plants start bearing fruits in the first year itself. Generally, these plants starts flowering in May to June month and bears fruits from August to December. Fruits are ready for harvesting after one month of flowering. Fruiting time continues till December. Harvest the fruit when its colour turns to red. Exact time for harvesting is after 3 to 4 days of colour change. But in case of export, harvest the fruit one day after colour change.

Yield : Dragon fruits are harvested generally November-December in the months. The average fruit weight is 350-400 g, although may weigh upto 900 g. Mature fruit plant average yield of 5 to 6 tonnes per acre can be expected under good filed conditions and proper management of orchard.

Insect and pests: Fruit flies are a harmful pest affecting fruit quality. Oriental fruit fly (*Bactrocera dorsalis*) and guava fruit fly (*B. correcta*) are species that both lay eggs in fruits and the larvae can develop successfully even when the fruits are too green to eat. *H. undatus* is also a host for *Anastrepha* and *Ceratitis* spp. fruit flies. Aphids may infest flowers or fruits in some regions and young plants can be prone to slugs and snails under damp conditions. Rabbits, squirrels, possums and similar pests have been known to feed on the lower stems and mice, rats and birds will eat ripe fruits.

Diseases: Few diseases are reported on *H. undatus*, although stem rot caused by *Xanthomonas campestris* and brown spots on fruits caused by *Dothiorella* occur in some production areas. Viruses such as Cactus virus X (CVX) have been reported on dragon fruit plants, causing symptoms such as stunted, malformed and mottled growth. A strain of *Fusicoccum* has been isolated from stems, and *H. undatus* is also a host to a quarantine-significant rust, *Aecidium* sp., known from Mexico

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