

Dragon Fruit – A potentially healthy niche fruit crop in waiting

Dragon Fruit (*Hylocereus* sp.) is a perennial, wide known as red Pitaya, has recently drawn much attention of South Indian growers, not only because of its attractive red or pink colour, loaded with functional food supplements and economic value as fruit, but also for rich antioxidant activity, vitamin C, fibres content. Therefore, Dragon Fruit can be called as a “healthy fruit”. Studies conducted elsewhere indicates that its consumption strengthens the human immune system and could be used in the management of diabetes. Fruits can also be processed into juice, ice cream or wine.

DRAGON fruits are currently being grown commercially in South East Asia and the USA. In India, it was introduced somewhat in the late 90s and still the area under Dragon fruit cultivation is very limited. Few farmers in Karnataka, Kerala, Tamil Nadu, Maharashtra, Gujarat, Odisha, West Bengal and Andhra Pradesh have taken up its cultivation. Total area under Dragon fruit cultivation in these regions may be less than 500 acres. Majority of the dragon fruits presently available in India are imported from Thailand, Malaysia, Vietnam and Sri Lanka. There is a good potential for its cultivation in regions of Southern and Western India that are frost-free, for domestic and international markets. It is native to the Central and South America and belongs to the family of Cactaceae representing climbing or epiphytic cacti with angular stems and bearing mostly white, fragrant, night-blooming flowers. One of the widely grown cultivars and most commonly available is the *H. undatus* (red colour epicarp with white sub-sweet juicy and consistent pulp). The other one that has been commercialised is the *H. polyrhizus* (red epicarp with red sub-sweet juicy and consistent pulp) and *H. megalanthus* (yellow colour epicarp with white sub-sweet juicy and consistent pulp).

Dragon fruit plant prefers a tropical climate with an average temperature of 20-30°C and with well distributed annual rainfall of 100-150 cm, but can withstand temperatures of 38-40°C, and as low as 0°C for short periods. The plants are sensitive to extremes of temperature however, the plants will be damaged at temperatures above 40°C,

causing yellowing of the stem. Heavy rainfall areas are not suitable for the crop, as excessive rain causes flower and fruit drop. Dragon fruit plants prefer sandy loam soils with high organic matter content and having good drainage.

The flowers start with emergence of small, spiral button type structures at the stem margins. These develop into flower buds in 10-15 days. The attractive hermaphrodite flowers (25-30 cm), white inside and greenish yellow with purple colouration on the outside are scented and only bloom at night and lasting only a night. Flower production generally takes place during May-September and fruits are harvested, 30-40 days after fruitset. Quality of the fruits vary between varieties, but harvest time has a much greater effect on quality than varietal differences. There are self-compatible and self-incompatible varieties. The majority of the varieties from Asia are found self-compatible. There is considerable variation in fruit size and shape between the varieties. Presently, very little knowledge is available on the varietal and production aspects of this crop.

Dragon fruit is propagated through seeds or cuttings; with the latter being the most commonly adopted method. Cuttings permit the production of plants with identical characteristics to the parent plant. Additionally, they reach production earlier when compared to seedling plants. Well-hardened cuttings, 20 cm or longer are taken by making cutting on the stem or branches of elite mother plants. The cutting should be prepared one-two days prior to the planting and the latex oozing out of cut is allowed to dry. The cut at the base



Dragon fruit cultivars (white and red pulp)



Dragon fruit flowering and fruiting

of cutting should be slant. These cuttings are planted in 12×30 cm size, polyethylene bags filled with 1:1:2 ratio of soil: FYM and sand. The cuttings root profusely and become ready for planting around 4-5 months.

Planting

Dragon fruit plant prefers full sunlit open areas for successful growth and production. Generally, in single post system planting is done at 3×3 m spacing. Single posts with vertical height of 1.5 to 2 m at which point, plants allowed to branch and hang down, are first established on well prepared land. The Dragon fruit plants are then planted near the posts so as to enable them to climb the posts easily. Number of plants per pole may vary between 2 to 4 plants depending upon the agro-climatic conditions.

Dragon fruit plant needs support for upright growth, stone or concrete posts can be used for this purpose. Immature stem must be tied to the posts. Thereafter aerial roots that develop are tied loosely to the posts. Lateral shoots must be limited and 2-3 main stems are allowed to grow. As lateral shoots need to be removed from time to time, it is important to arrange round metal/concrete frame to maintain balanced shrub growth.

Manure and fertilizer schedule

The crop responds well to majority of the fertilizers, although care must be taken not to burn the shallow root system. It is since, a newly introduced plant for cultivation there is no recommended fertilizers available yet. However, good results can be obtained by applying organic manures copiously for proper growth and development of Dragon fruit plant. Apply 10-15 kg of organic manures per plant before planting and increase the amount by 2 kg per year up to 20 kg. In the initial stages, more nitrogen should be applied for promoting good vegetative growth. In later stages, higher amounts of phosphorus and potash are applied. Application of Calcium and other micronutrients are beneficial for growth of fruits depending upon, soil tests and crop responses. The dragon fruit can be grown organically without applying chemical fertilizers and pesticides. The farmyard manure and poultry manure may be used for supplementing nutrients. There is no published information about fertilization of these plants, and a proper schedule will need to be worked out to

increase flowering and fruit production.

Water requirement

Although these plants are cacti group, they take more water than expected for a typical desert cactus. Irrigation through drip system, small quantity of water (2-4 litres twice weekly) is more beneficial to these plants than a larger amount of water less often. They have a very shallow fibrous root system and it responds well when the upper portion of the soil is kept continuously moist. Excessive irrigation may cause development of fungal diseases, hence due care is necessary. Therefore, proper drainage should be provided in rainy season. Frequent dry periods without irrigation reduces the yield and quality of fruits. Dry period before flowering is required for production of more fruits.

Training to trellis and pruning

Dragon fruit plants are fast growing and produce more thick dense branches in the initial stages. The lateral buds and branches should be pruned to grow towards stands. Once vines reach up to the top of the stands the branches are allowed to grow. The removal of tip of the main stem to allow growth of new shoots to grow laterally and climb at the rubber tyre to form an umbrella like structure of vines where, flowers will emerge and develop into fruits inducing lateral branching. This pruning is referred to as structural pruning or making a structure on the trellis. The well grown plant may produce 30 to 50 branches in 1 year and may be more than 100 branches in 4 year. Excessive number of growing lateral stems will increase the advent of pest and diseases, hence, desirable number of lateral stems only should be maintained to ensure vigorous growth, better aeration, ease of cultural operations and prevention of diseases pests attack.

Many trellis designs are used in India. The ICAR-IIHR-CHES, Hirehalli evaluated four different trellis systems of Single posts with cement and ring, continuous pyramid stands and 'T' stands with two different cultivars. Each trellis consisted of one 6 feet height by 5 or 6 inches thickness of posts erected with 2 feet depth. Single posts system showed better performance in growth and yield when compared to other trellis systems. Single posts with ring type of trellis that can support the weight of



Field view of Dragon fruit crop established under trellis system

the canopy and allow easy access to flowers and fruits will work for commercial production. The wooden poles though are of hard nature, but durability and sustainability is the least as compared to that of cement post. It is not possible to change the posts in between because of the heavy growth and entangled branches. Therefore, it is better to go with concrete posts though its cost may be high, they are durable.

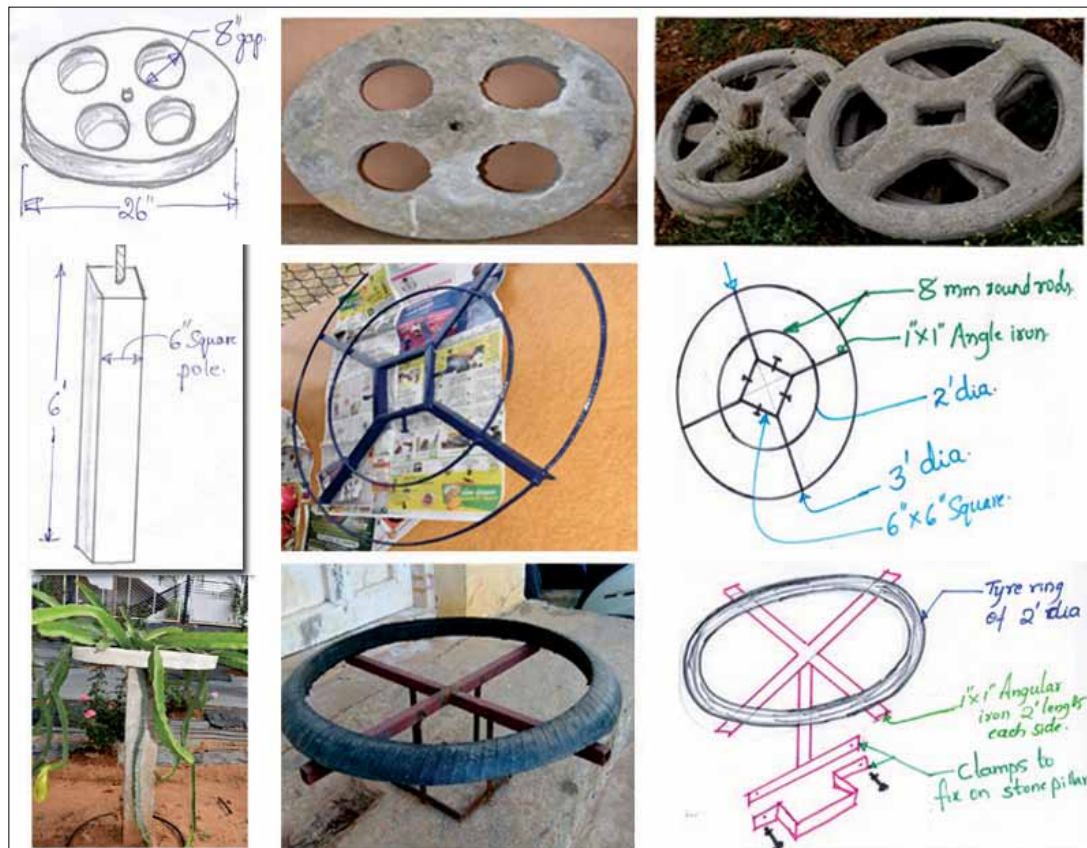
Fruit quality parameters

Fruits possess excellent taste and texture. The average fruit weight recorded in white pulped (457.0 g) was higher than the red pulped cultivar (331.40 g). Among the two cultivars evaluated, the maximum number of fruits per post was recorded in red pulped (14.40) as compared to

white pulped over two years period. It has 74.44% and 70.28% pulp recovery ratio, respectively wherein abundant dark brown or black seeds are found distributed. The cultivar having deep red or purple colour pulp (11.54°B) recorded the higher values of TSS as compared to the one having white colour pulp (9.75°B), an important parameter related with fruit quality.

Proximate and phytochemical constituents in Dragon fruit

Dragon fruit is rich in different biochemical compounds. The biochemical analysis of 100 g fresh fruits revealed that the fruit have moisture content of about 83-88%. The fruit is slightly acidic and the titratable acidity varied between 0.20 to 0.40 mg lactic acid equivalents. The TSS varied between 8-14°Brix. Dragon fruit is one of the rich sources of vitamin-C, and the vitamin-C content ranged between 10 to 14 mg/100 g. Due to richness of vitamin C, consumption of 100 g of Dragon fruit could provide about 16-22% of the recommended daily allowance (RDA) of Vitamin-C. The total sugar content is about 3.5 to 7.0 g. Fruits with pink pulp had higher phenolics and flavonoids content (40-60 mg GAE and 20-40 mg QE, respectively) as compared to white pulped fruits (15-20 mg GAE and 10-20 mg QE, respectively). Similarly, the antioxidant activity estimated by DPPH method also revealed that the antioxidant activity of the pink pulped fruits (250 to 400 mM TE/100 g) was higher than the white pulped (100 to 125 mM TE/100 g). (Note: GAE- Gallic acid equivalent; QE- Quercetin equivalent and TE- Trolox equivalent)



Diagrammatic representation of single post trellis system with different models of ring for Dragon fruit field establishment.

Harvest

Dragon fruit normally fruits after 15-18 months after planting. Flowering initiates during warmer months of May under the Hirehalli condition. As many as 4-8 flowering cycles may occur in tropical areas. Flowering and fruit set is highly dependent upon temperature and photoperiods. Maturity can be judged with the change of fruit colour from green to red. Proper time of harvesting is after 4 days of colour changing. Harvesting may be done three-four times in a month between July-September. Peak harvest attains at around 40-45 days

after flowering. The fruit weight ranges from 300-800 g and initially, each plant produces 10 to 15 fruits per post after 15 months of planting. Approximately one post normally yields 10 to 15 kg of fruits from a three years old planting. About 4-6 tonnes of Dragon fruits can be harvested from one acre if properly managed. The present farm gate price rate ranges between ₹ 80 to 120 per kg.

Pest and Disease

Dragon fruit crop is lesser affected by pests and diseases. The pests like mealy bugs and aphids have been found damaging the Dragon fruit. As far as the disease is concerned, the watery stem rot caused by *Xanthomonas* causes damages in heavy rainfall areas. Ensuring proper drainage, wider spacing for adequate air circulation and proper sunlight interception helps in minimizing the disease incidence.

The crop has the potential to be a profitable new

crop for farmers in India especially for niche markets. In addition, the fruit is viewed as “*Healthy Fruit*” because of its high levels of antioxidants, nutrients and nutraceutical such as lycopene, and hence is becoming increasingly popular with health-conscious consumers. With a market already established in the South East-Asian countries and a much larger potential in niche markets, commercial plantings can thus be increased. Overall, Dragon fruit is therefore a promising crop in waiting, but as of now growers should be cautious before dedicating significant amounts of resources to large-scale plantings. Further studies on crop husbandry are under progress.

For further information please contact:

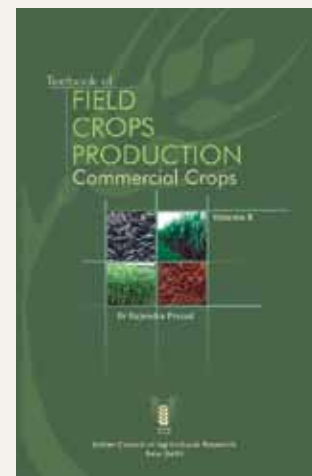
Dr G Karunakaran (Principal Scientist, Fruit Science), IIHR-Experimental Farm, Hirehalli, Tumkur 572 168. **S Sriram** and **M Arivalagan (Scientist)** ICAR-Indian Institute of Horticultural Research, Hesaraghatta Lake Post, Bengaluru 560089. Corresponding author e-mail: ganeshan.karunakaran@icar.gov.in

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For obtaining copies, please contact:

Business Manager

Directorate of Knowledge Management in Agriculture
Krishi Anusandhan Bhavan I, Pusa, New Delhi 110 012
Tel: 011-25843657, Fax 91-11-25841282; e-mail: bmicar@gmail.com