

Integrated Nutrient Management Technology for Kamalam Fruit Cultivation

Dragon fruit or Kamalam (*Hylocereus* spp.) has been considered as a potential fruit crop in India. Application of fertilizer in several split doses at specific plant growth stages is important considering its shallow root system, continuous luxurious growth habit of flashy stems, heavy bearing nature, and loss of applied fertilizers due to high rainfall. The paper discusses the planting methods and integrated nutrient management for the cultivation of Kamalam fruit.

KAMALAM fruit (*Hylocereus* spp.), belongs to the Cactaceae family, also known as pitaya fruit, pitahaya fruit, strawberry pear and in India it is known as *Kamalam*. Semi-epiphytic cacti, climbing in nature and ariel roots are also common. Stems are triangular, flashy, succulent with wavy ribbed margins, Dark –light green in colour. Small spines arise along the edges of stems at each node. Numerous lateral branches arise from the stems which require strong support. Flower bud initiation from suppressed buds at the base of spines (areola). Centre of origin of *Kamalam* fruit is Central America. It was brought by settlers to southeast Asian regions like Vietnam, Cambodia, Thailand, Taiwan, Philippines and subsequently to all parts of the Asian Countries including China. In India, this fruit was introduced during the 90s and is cultivated in some southern and northeastern states of India. This super fruit is rich in minerals, vitamins and antioxidants. Hermaphrodite flowers bloom at night at around 7-9 PM and during this time hand pollination is done for higher fruit sets as flowers are pin type heterostyly (long-styled) in nature. Fruits are oblong – oval

and non-climacteric, deep green when unripe and turn to reddish pink when ripe. *Kamalam* fruit plants will show damage symptoms at temperatures below 0°C, and also above 40-45°C as they were originally adapted to shade canopy environments.

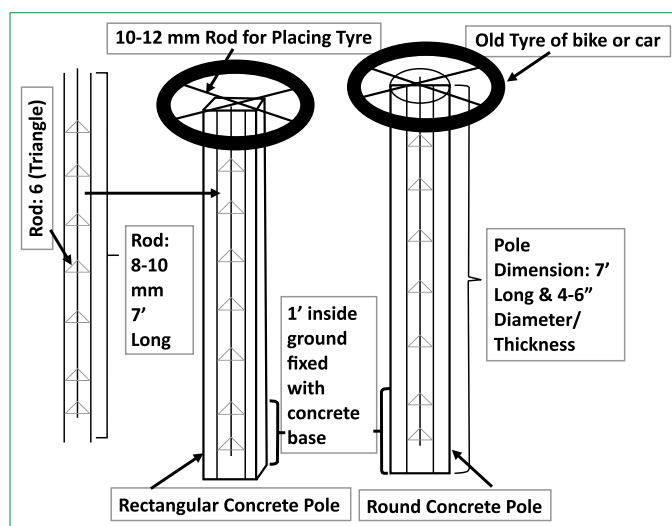
Planting Materials: Rooted cuttings raised from one-year-old stems (15-25 cm long). Stem cuttings are collected from July to October and planted in polybags in the net house. Rooting takes place in one month and these cuttings are ready for planting after 4-6 months. Cost of plants is 50-80. Planting Time is June to August.

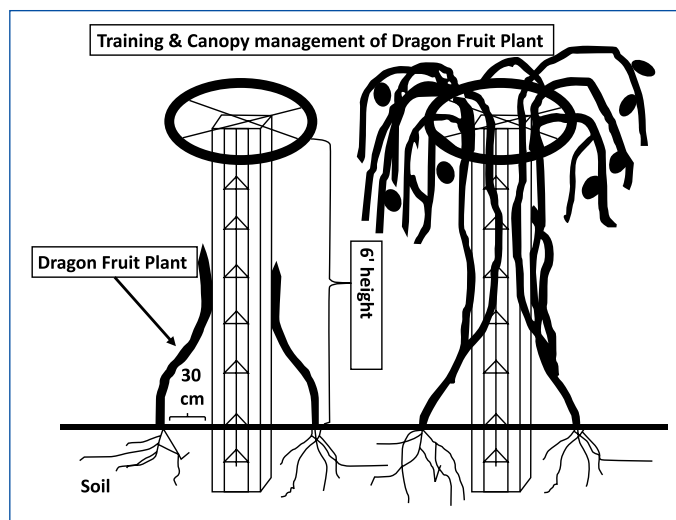
Varieties: Red skin red flesh (*Hylocereus costaricensis*), Red skin white flesh (*Hylocereus undatus*), and Yellow skin white flesh (*Hylocereus megalanthus*).

Planting System

Spacing: 2 × 2 or 3 × 3 m (Plant to plant and Row to Row). However, may vary depending upon the intercropping plan. Spacing 3 × 3 m or more is suitable for intercropping.

Support Poles: Concrete poles or even angle iron poles may be used. Pole dimension: 7' height and 4-6" thickness. Poles are fixed at 2 × 2 m spacing and 1 ft is





inserted into the soil. Concrete mixture is put at the base of each pole to fix the poles firmly. Cost around 500-600/pole. Number of poles/ha: 2,500 (at spacing 2×2 m).

Planting: Rooted stem cuttings are plants @ 2-4 plants/pole at 30 cm distance from the pole base. Raised beds of 1 m width are prepared which may be covered with weed mat mulch.

Integrated Nutrient Management

Kamalam fruit roots are adventitious and shallow-rooted. Numerous fleshy branches show a luxurious growth trend throughout the year. Fruiting takes place in 4-5 flushes from May to September-October. Moreover, *Kamalam* fruit plants are heavy feeders. Under such conditions, if manures and fertilizers are applied in one or two shifts as a top-dressing basal dose, then the plant

cannot uptake a sufficient quantity of nutrients at a time. Major part of fertilizers is lost by leaching or washed out by surface runoff during heavy rainfall. Therefore, an INM schedule has been standardized where manures and fertilizers are applied at specific growth stages of plants to maximize uptake and minimize nutrient loss. VAM and Azotobacter @ 50 g/plant each are applied at each hole at the time of planting.

Intercropping:

Winter: French bean and green peas

Summer: Cowpeas, Amaranthus and marigold

Any other suitable crops may be selected which are seasonal, shallow-rooted, not vigorous in growth and should not compete for space and nutrition with *Kamalam* fruit plants.

Irrigation: *Kamalam* fruit being a xerophytic plant has low water demand. Crassulacean acid metabolism (CAM) mode of photosynthesis restricts water loss via transpiration during the heat of the day. However, irrigation during dry spells @ 1.5-2.0 L water/day through drip system is essential for better plant growth and fruit production.

Mulching: Straw mulching from November to March for moisture conservation and enriching soil organic matter. Weed mat mulch is also very effective for weed control and moisture conservation.

Foliar application;

N:P:K (19:19:19) (@2g/litre water) in the First week of January and August.

Three sprays of micronutrients especially Zn (0.1%) and Boron (0.5%) at each three fruiting developing stages (i.e. in June, July and August).

Standardized INM Schedule for Kamalam Fruit (under Tripura condition)

Fertilizer application	Dose/Plant	
	N+P ₂ O ₅ +K ₂ O (g/plant)	Vermicompost + FYM (Kg/plant) + VAM (g/plant) + Azotobacter (g/plant)
1 month after planting	6+2+3	1 + 1 + 50 + 50
6 months after planting	12+4+6	2 + 2
12 months after planting	18+6+9	3 + 3
15 months after planting	24+8+12	4 + 4
18 months after planting	30+10+15	5 + 5
21 months after planting	36+12+18	6 + 6
24 months after planting	42+14+21	7 + 7
27 months after planting	48+16+24	8 + 8
30 months after planting	54+18+27	9 + 9
33 months after planting	60+20+30	10 + 10
36 months after planting	66+22+33	11 + 11
After 36 months (after 3 rd year of planting) same stabilized dose of 36 th month after planting is continued at specified growth stages.		
1 st dose after first fruiting i.e. last week of May	66+22+33	11 + 11
2 nd dose after second fruiting i.e. last week of July	66+22+33	11 + 11
3 rd dose after third fruiting i.e. last week of September	66+22+33	11 + 11
4 th dose in November	66+22+33	11 + 11
5 th dose in February	66+22+33	11 + 11

Cost of Cultivation (Pole spacing of 2 × 2 m)

Head	Numbers or Unit	Rate (₹)/Unit	Amount (₹)
Field preparation and pit digging	1 ha	50,000	50,000
Concrete pole	2,500	500	12,50,000
Plants	10,000 @ 4 plants/pole	50	5,00,000
Tyre	2500	100	2,50,000
Fertilizer and manures, irrigation, mulching etc./year	10,000 plants	30	3,00,000
Cultural operations weeding, intercropping, foliar sprays etc./year	10,000 plants	20	2,00,000
Total			25,50,000



Fruit-bearing: In the first year, one or two fruits may be set on each plant, but it is advisable to allow the plant to grow instead of fruiting in the 1st and 2nd year. Full bearing starts from 3rd year. Under better management,

flowering and fruiting come in 4-5 flushes from May to September.

Pollination: *Kamalam* fruit flowers are night blooming and during daytime flowers remain closed. Flowers open for one time at night when pollination must be done. Shelf pollination is difficult as the flowers show pin type heterostyly where thick-erect long style protrudes out of the floral parts and anther bearing filaments are short. Best pollination time is from dawn to dusk which is performed manually by touching the separated filaments on the receptive stigma base or by collecting the pollen grains on butter paper and applying those pollen grains on the stigma base with a fine brush.

Harvesting: Fruits mature in 1-1½ months after fruit set. Fruits are harvested when skin starts to turn green to red/rosy pink. Yield varies from 25-35 kg/pole and around 62.0-85 t/ha. Market price of fresh fruit is 200-300/kg.

For further information, please contact:

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Success Story

Cultivation of Dragon Fruit in Dryland Area

Dragon fruit is a tropical fruit that has become increasingly popular in recent years. Though people primarily enjoy it for its unique look and taste, evidence suggests its health benefits as well. Dragon fruit is the fruit of a variety of cactus species. It has a unique appearance, sweet taste and crunchy texture. The dragon fruit contains multiple antioxidants, that are beneficial for good health. Dragon fruit also contains many vitamins and minerals, that are important for a healthy body.

Shri Pavankumar Basappa Rangatti, 21 years of age, is a young graduate hailing from Ratnapur village, Tikota Taluk, Vijayapur district of Karnataka. Being the only son, he did not want to leave his parents alone. After his graduation, he was in dilemma regarding profession to be taken up. Browsing through the newspapers, he read about the trainings being conducted by Krishi Vigyan Kendra, Vijayapura-I on organic farming, especially meant for individuals aged below 35 years; and he attended one such training. Subsequently, he adopted dragon fruit cultivation in his dry land area, under the technical guidance of KVK, Vijayapura-I. Earlier his father was growing grape, which was a costly affair. Looking into the expenses on cultivation of grapes, his father too supported him in his new venture. He brought 4,000 saplings of both white and red varieties of dragon fruit from Maharashtra, and took the risk of planting them in his 2 acres of land. He harvested the fruits after one and half years. He sells the fruits at the rate of ₹ 150-180 per kg and sapling at the rate of ₹ 20 per sapling. In 18 months only, he earned ₹ 1.25 lakh by spending ₹ 3.00 lakh. Gradually,



A view of dragon fruit orchard and sapling unit of Shri Pavankumar Basappa Rangatti



his profit increased to ₹ 3.80 lakh in second year, ₹ 6.00 lakh in third and ₹ 8.00 lakh in fourth year by selling the fruits. From the sale of saplings, he has earned ₹ 3.00 lakh. Thus, as on today, he has earned a net profit of ₹ 11.00 lakh, and is very much confident of earning higher profits in future too. Looking into the profits/benefits and realizing the importance of dragon fruit, farmers of different taluks and districts from surrounding areas like Muddebihal, Torvi, Atalatti, Nidgundi, Dhavalgi, Hoskote, Kadur have purchased seedlings from him and started dragon fruit farming in their respective fields.

Source: ICAR-Annual Report 2022-23