



SUSTAINABLE FARMING TECHNIQUES FOR DRAGON FRUIT PRODUCTION AND PROTECTION

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Abstract

The nutritional benefits and economic potential of dragon fruit (*Hylocereus* spp.) also known as Red Pitaya, a tropical fruit crop, have made it popular around the world. Proper fertilizer, effective irrigation, propagation techniques, and ideal site selection are necessary for efficient production. In order to maximize productivity, timely pollination and harvesting are crucial, and training and pruning strategies aid in improving plant health and fruit quality. Controlling diseases like anthracnose and stem rot, as well as pests like mealybugs, aphids, and fruit flies, are all part of protection technology. The sustainability and financial success of dragon fruit cultivation are ensured by additional tactics like weed control, frost protection, and post-harvest care. To overcome obstacles and increase output under a variety of environmental situations, integrated management strategies are essential.

Introduction

Farmers are rapidly adopting dragon fruit (*Hylocereus undatus*), which was introduced as a novel crop on rocky barren soil and low rainfall zones. Pulp, which makes up 70-80% of the ripe fruit, is a versatile and healthy fruit. Dragon fruit is primarily found in Three varieties exist: red-skinned and white-

pulp *Hylocereus undatus*; red-skinned and red-pulp *Hylocereus monacanthus*; and white-skinned and yellow-skinned pulp *Hylocereus megalanthus*. The crimson Dragon fruit with flesh is comparatively high in antioxidants.



It is recognized for preventing diabetes, and colon cancer, and removes harmful materials like heavy metals; lessens increased blood pressure and cholesterol. It has a lot of Phosphorus, vitamin C, and Calcium. In the last two decades, dragon fruit has gained wide popularity in tropical Asian countries, which initiated its commercial cultivation around the world (Sanoamuang, 2019). The fruit has a flavor similar to kiwi fruit. Fruits have an ideal Brix value of 15-18°Bx and are low in fat and high in minerals. In upscale hotels and restaurants, it is frequently served as fruit salad. It can be processed to create a variety of commercial goods, including syrup, ice cream, jam, juice, pastries, yogurt, preserves, and candies. The dragon fruit's scarlet and pink pulp is utilized for the process of extracting natural colors. Dragon fruit is one

such potential crop that can be easily cultivated in large parts of degraded land and drought-prone areas of the country and has received worldwide recognition, first as an ornamental plant and then as a fruit crop, and has become the choicest fruit for salads owing to its colorful bracts, dark red flesh and edible tiny black seeds embedded in white flesh.

Nutrition Composition of Dragon Fruit:

Nutrient	Amount (per 100 g)	Daily value (%)
Water	87 g	-
Protein	1.1 g	2.1
Fat	0.4 g	-
Carbohydrates	11.0 g	3.4
Fiber	3 g	12
Vitamin B1 (Thiamine)	0.04 mg	2.7
Vitamin B2 (Riboflavin)	0.05 mg	2.9
Vitamin B3 (Niacin)	0.16 mg	0.8
Vitamin C (Ascorbic Acid)	20.5 mg	34.2
Calcium (Ca)	8.5 mg	0.9
Iron (Fe)	1.9 mg	10.6
Phosphorus (P)	22.5 mg	2.3

(FAO, 2012)

Production Technology:

Cultural Practices:

Propagation: Cuttings are mostly used in the vegetative propagation of dragon fruit. To obtain better plants, utilize the complete stem segment or a portion of the 15–30 cm mature cutting. The cuttings need to be treated with fungicides to prevent infections, especially rots. placed in a cool, dry area for five to seven days prior to planting. The cuttings with roots are prepared to transplant in the nursery in 30–40 days for the main field.



Spacing: The recommended 3.0-4.0 m x 3.0 m spacing allows for sufficient air circulation and reduces the likelihood of diseases occurring,

although denser plant populations are advised in low-fertile dryland environments (3.0 m x 2.5 m spacing) in order to offset the decrease in yield per unit area.

Training and Pruning:

As an epiphytic climbing cactus, the dragon fruit vine needs support from wall columns, wooden poles, or concrete. Aerial roots cannot form and bind to the column unless the immature stem is attached to it. There are few lateral shoots and only two to three main stems that are permitted to expand. The chosen column needs to be strong and long-lasting enough to support the weight of the vine canopy exceeding 100 kg; therefore, concrete or solid wood stakes are advised.



During the rainy season, planting is often done and then appropriate 50 cm-high ridges are made to support the plants. Each pole has four cuttings that are planted. The likelihood that the vines will lodge and fall to the ground grows with their rapid growth. To prevent this issue, it is therefore crucial to tie the vines and regularly prune the lateral branches. When pruning structurally, free branching is permitted only once the outer leader vine has reached the top of the trellies.

Nutrient Management: For healthy vegetative development in the early phases, more nitrogen should be applied; in the latter stages, more phosphorus and potash should be applied. For this crop, applying calcium and other micronutrients are advantages.

Time of application	Type of fertilizer	Application rate (g per pole)
1. Immediately after final harvest	N	200
	P ₂ O ₅	250
	Manure (kg)	25
2. Two months later	N	200
	P ₂ O ₅	200
	K ₂ O	150
3. Just before flowering	N	150
	P ₂ O ₅	200
	K ₂ O	100
4. One month after 3 rd application	N	100
	P ₂ O ₅	100
	K ₂ O	75
5. One month after 4 th application	N	100
	P ₂ O ₅	100
	K ₂ O	75

(ICAR-NIASM Technical bulletin No 33)

Water Management:

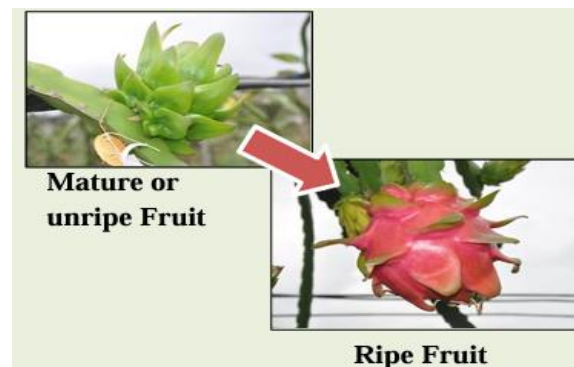
As it is a member of the Cactaceae family, it uses remarkably little water from March to June, when water availability is at its lowest. In this crop, flowering begins in June and lasts until October. Applying irrigation whenever a protracted dry spell occurs. But generally speaking, the crop faces water stress in April to May, the pre-bloom season, in order to yield more flowers. To maintain moisture in the soil during the fruit's development, a drip irrigation system is employed. In India, fruiting and flowering occur at the same. The excessive wetness and water logging conditions brought on by rainfall are avoided throughout the rainy season.

Flowering and Fruiting: Dragon fruit flowers are off-white in color and bloom at night. Their aroma aids in luring pollinators. Early in the morning is the best time to pollinate dragon fruit which includes honey bees (*Apis cerema*), little honey bees (*Apis florea*), and rock bees (*Apis dorsata*). (Pushpakumara *et al.*, 2005).



Flowering

Flowers should be thinned to keep no more than 80 blooms at a time on each pole. Additionally, fruits that are adjacent to one another on the same branch should be removed with care. After blossoming, fruits take 30 to 35 days to reach maturity. The dragon fruit has an indeterminate variety and historically produced both fruit and flowers simultaneously. When fruit turns from green to red, it is best to cover it with cotton bags to prevent bugs and bird bites from causing damage.



Mature or unripe Fruit

Ripe Fruit

Protection Technology:

Pest Management

Aphids, termites, and mealy bugs are among the pests that have been observed harming dragon fruit. They are essentially sap-sucking bugs that consume the plant's delicious sap. Ants are drawn to aphids and will subsequently consume the plant. Although they won't harm the plant, mites and thrips can potentially be a problem for the overall health of the plant.

Fruit flies are currently found in dragon fruit. Pheromone traps will be used to control fruit flies in the orchard.



Disease Management

Watery stem rot which is produced by *Xanthomonas campestris* cause vine damage in heavily precipitated areas. To help minimize the disease, broader spacing, sufficient air circulation, correct drainage, and enough sunlight are all important. When dark, sunken patches appear on a plant's stems and leaves, may indicate that there is a disease in your plant.



Sunburns may occur during the year's hottest season, when the sun is unbearably intense. To overcome this, application of Anti-transpirants and adequate irrigation maybe a mitigation strategy. If the plant receives excess water, **root rot** may also occur. To overcome this, pruning the affected portions, and adjusting watering habits could sort out the scenario.



Harvesting: Harvesting occurs in six to seven flushes, typically from July to November. When a fruit is still young, its outer layer is a vibrant green, and as it ripens, it progressively turns red. After blossoming, the dragon fruit reaches maturity in 30 to 35 days.

Storage: This fruit has good keeping quality, as seen by the first storage research, and may be kept for up to five to seven days at room temperature (28°C), ten to twelve days, and twenty to twenty-one days in cold storage (18°C and 8°C, respectively). Fruits in perforated bags reportedly last for 25–30 days at 8°C (Zee et al., 2004).

Conclusion:

The successful cultivation of dragon fruit hinges on a combination of precise production techniques and robust protection strategies. Optimal site selection, propagation, and maintenance through proper fertilization, irrigation, and pruning are essential to ensuring high yields and fruit quality. Effective pest and disease control, along with environmental stress management, further safeguard the crop. As global demand for dragon fruit grows, integrating sustainable farming practices and innovative protection methods will enhance productivity and open new market opportunities. By following these approaches, growers can achieve long-term profitability and sustainability in cultivation.

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