



## Dragon Fruit Cultivation in India: Opportunities and Challenges

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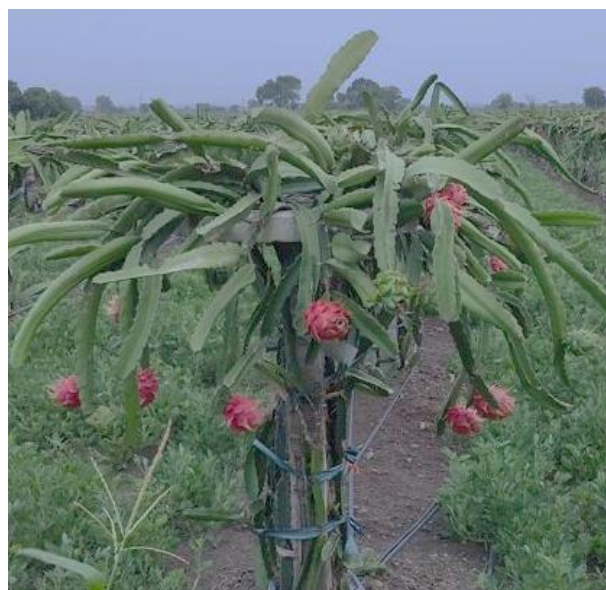
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### INTRODUCTION

Dragon fruit scientifically known as *Hylocereus* spp. has become an important fruit crop in India because of its beautiful look and rich nutritional value and its ability to grow in different agricultural and climatic conditions. This fruit known as Pitaya or Kamalam comes from the cactus family which makes it suitable for growing in regions that experience low water availability and semi-arid conditions. Dragon fruit which originated in Central and South America now grows commercially in multiple countries including Vietnam and Thailand and Israel and Malaysia while its presence in India continues to spread throughout Gujarat and Maharashtra and Karnataka and Andhra Pradesh and Telangana and Tamil Nadu and West Bengal and Odisha and Uttar Pradesh. The Indian government supports its cultivation through the Mission for Integrated Development of Horticulture (MIDH) scheme which provides both financial assistance and technical resources for horticultural development initiatives.



### Botanical Description

The dragon fruit plant establishes itself as a perennial climbing cactus which develops fleshy triangular green stems that perform photosynthesis because the plant does not develop normal leaves. The plant develops aerial roots which support its climbing ability while it produces large white fragrant flowers which open at night and receive their common name "Queen of the Night." The fruit displays an oval to oblong shape that shows brightly colored skin with scale-like patterns which

contains juicy pulp that holds many tiny black seeds. The primary commercial plants consist of three *Hylocereus* species which include *Hylocereus undatus* with its white flesh and pink exterior and *Hylocereus monacanthus* which has red flesh and red exterior and *Hylocereus megalanthus* which possesses white flesh and yellow exterior, and Indian farmers primarily grow red and white fruiting types because these variants have more market value and can thrive in local conditions.



### Climate and soil

Dragon fruit performs well under tropical and subtropical climatic conditions where moderate temperatures ranging from 20°C to 35°C are available, and it can tolerate annual rainfall between 500 and 1500 mm, although excessive rainfall and waterlogging conditions can adversely affect plant growth and fruit quality. The crop requires direct sunlight to achieve its best growth and fruit production, and it can be cultivated at elevations reaching 1500 meters above sea level. Dragon fruit thrives in sandy loam soils which have a pH level between 5.5 and 7.0 because its cactus nature and Crassulacean Acid Metabolism

(CAM) system enable it to conserve water effectively, which allows it to endure drought conditions more successfully than most other fruiting plants, making it ideal for arid and semi-arid areas found in India.

### Cultivation Practices

Dragon fruit propagation mainly uses vegetative propagation methods through stem cuttings which require cuttings from healthy and disease-free plants that must undergo shade curing before their use as planting material.

### Propagation

- ✓ Mainly through stem cuttings (20–30 cm)
- ✓ Cuttings are cured (shade dried) before planting to avoid rot

### Planting

The planting arrangement requires spacing between plants to be either  $2 \times 2$  m or  $3 \times 3$  m according to the selected training method, while concrete or cement poles serve as plant support, with each pole supporting three to four plants.

- ✓ Spacing:  $2 \times 2$  m or  $3 \times 3$  m
- ✓ Support system: Cement/concrete poles with circular frames
- ✓ 3–4 plants per pole

### Irrigation

Drip systems provide most of the irrigation needs because they deliver water efficiently, although the crop withstands drought conditions, regular watering during flowering and fruit development stages leads to higher yields and larger fruits.

- ✓ Drip irrigation is recommended
- ✓ Irrigation frequency: 7–10 days (depending on season)
- ✓ Critical stages: flowering and fruit development

### Nutrient management

The nutrient management process requires farmers to apply organic manures through farmyard manure together with controlled chemical fertilizer applications and

micronutrient treatments, while integrated nutrient management practices enable soil fertility maintenance and fruit quality enhancement.

- ✓ FYM: 10–15 kg/plant/year
- ✓ Balanced NPK application
- ✓ Micronutrients (Zn, B) improve fruit quality

Adoption of Integrated Nutrient Management (INM) enhances sustainability

### Training and pruning

Proper training and pruning maintain plant structure, which helps plants receive more sunlight and prevents diseases, while flowering starts 12 to 18 months after planting and fruits develop 30 to 50 days after flowering.

- ✓ Single stem training up to pole height
- ✓ Allow branching at top
- ✓ Regular pruning improves light penetration and reduces disease

### Flowering and Fruiting

- ✓ Starts from 12–18 months after planting
- ✓ Multiple flowering cycles (May–October)
- ✓ Fruits mature in 30–50 days



## Opportunities of Dragon Fruit Cultivation in India

Dragon fruit cultivation creates multiple business opportunities in India because urban consumers increasingly demand exotic fruits which provide high nutritional value and the fruit qualifies as a "super fruit" containing antioxidants together with vitamins and minerals and dietary fiber. The crop generates higher profits for farmers than traditional crops because it delivers greater financial benefits and continues to produce harvests for 15 to 20 years after farmers establish it on their fields. The plant achieves drought resistance, which makes it suitable for agricultural use in areas that experience water shortages and have reduced groundwater resources. The plant enables land use on degraded areas, which helps create income opportunities through its operation. The potential of dragon fruit to be exported exists because international markets in the Middle East, Europe, and Southeast Asia show increasing demand for the product, which will result in foreign exchange earnings. The crop receives backing from government programs that provide subsidies and horticulture development scheme incentives, which drive its adoption, and the crop creates jobs through its nursery production work and its activities in cultivation, harvesting, post-harvest handling, and marketing.

## Challenges in Dragon Fruit Cultivation

Dragon fruit cultivation needs to overcome specific problems to achieve sustainable growth in India because the high costs of concrete poles and planting material and drip irrigation systems make it difficult for small farmers to start plantations. Farmers in the area face difficulties because they cannot access certified planting material and certified planting material, which creates a higher chance that plants will contract diseases. The breeding process faces difficulties because certain plant varieties need cross-pollination or manual pollination to produce seeds because their self-incompatibility prevents successful seed production, and the absence of pollinators

directly affects agricultural output. The crop faces emerging threats from newly discovered pests and diseases, which include anthracnose and stem canker and bacterial soft rot and viral infections, that will harm its production capacity and the quality of its harvested fruit. The adverse effects of extreme heat and heavy rainfall and waterlogging on plant flowering and fruiting and plant health are worsened by farmers' lack of technical knowledge about cultivation practices and pruning methods and nutrient management. The price volatility that results from market fluctuations creates additional dangers for farmers who lack access to organized marketing systems while India's research and varietal development limitations prevent farmers from accessing improved cultivars that suit their specific regions.

## Future Prospects

The future of dragon fruit cultivation in India appears highly promising due to increasing health awareness, changing dietary patterns, and strong government support for horticultural diversification, and advanced technologies which include drip fertigation and protected cultivation and high-density planting and precision agriculture will enable better resource efficiency while improving agricultural productivity. The agricultural industry requires dedicated research efforts to create high-yielding varieties which also resist diseases and establish standard cultivation methods for each specific agro-climatic region. Farmers can achieve better financial returns after they harvest their crops by implementing post-harvest management practices which include processing their products into juice and jam and wine and nutraceuticals while market linkages and export infrastructure development and Farmer Producer Organizations (FPOs) strengthen their ability to achieve higher prices. The agricultural industry will benefit from capacity building initiatives which include farmer training programs and extension services and digital advisory systems because they will help

farmers adopt scientific farming methods and achieve sustainable crop growth.

### CONCLUSION

The Indian horticultural industry has found a promising new business opportunity through dragon fruit farming which provides farmers with multiple benefits such as high profits and ability to withstand drought conditions and capacity to export their products and ability to cultivate their crops on less productive farmland. The project faces multiple obstacles which include high start-up costs and problems with controlling pests and diseases and difficulties with pollination and absence of technical expertise and unstable market conditions which need to be solved through research efforts and government policy backing and training programs. Dragon fruit production will grow as farmers start using modern farming methods and better handling techniques and structured distribution channels which will create new income streams and job opportunities and advance the horticultural industry development in India.

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