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Constraints in production and marketing of Dragon fruit: Insights from Farmers in Telangana

¹Sai Niharika M, ²T Lavanya, ³Ch. Srilatha, ⁴B Savitha and ⁵A Nirmala

¹P.G. Scholar, Department of Agricultural Economics, College of Agriculture, Rajendranagar, Hyderabad, Telangana, India

²Professor and Head, Department of Agricultural Economics, BJR Agriculture college, Sircilla, Telangana, India

³Associate Professor, Department of Economics, Extension Education Institute (EEI), Rajendranagar, Hyderabad, Telangana, India

⁴Professor and Head, Department of Agricultural Extension Education, College of Agriculture, Rajendranagar, Hyderabad, Telangana, India

⁵Scientist, DAATTC, Jogipet, Sangareddy, Telangana, India

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Corresponding Author: Sai Niharika M

Abstract

A survey was conducted during 2024-25 to assess the major production and marketing constraints faced by dragon fruit growers in the study area. A total of 60 farmers were selected and their responses were analyzed using a scoring and ranking method. Results revealed that high initial investment, labour shortage and unavailability of quality planting material were the foremost production constraints. Marketing challenges were dominated by price fluctuations high market commission and competition from recent imports. The study highlights the need for financial support, improved extension services, enhanced market infrastructure and stronger value-chain linkages to improve profitability and sustainability in dragon fruit cultivation.

Keywords: Dragon fruit, production constraints, marketing constraints, price fluctuations, labour shortage, planting material quality, import competition, horticulture, farmer perspectives, value chain, Telangana agriculture, sustainability, agricultural economics.

Introduction

Dragon fruit (*Hylocereus* spp.) has emerged as a promising horticultural crop due to its high market demand, nutritional value and suitability to semi-arid conditions. Kamalam or Dragon Fruit a herbaceous perennial climbing cactus widely known as Pitaya, has its origin in Southern Mexico, Central America and South America. It is widely cultivated in South-East Asia, India, USA, Caribbean Islands, Australia throughout the tropical and sub-tropical world. Pitaya, called as Dragon fruit in English, is popular by different names such as Pithaya in Mexico, Pitaya Roja in Central and Northern America, Pithaiah in Thailand and Kamalam after the Sanskrit name lotus in India. It is also known as "Wondrous Fruit of the 21st century". The Dragon fruit has recently drawn much attention of the growers worldwide, not only because of their red purple colour and economic value as food products but also for their enormous health benefits. The skin of the fruit is covered with bracts or scales which may have attributed the fruits resembling the mythical creature "dragon", hence the name dragon fruit. Currently it is being cultivated in at least 22 countries of tropics. Historical evidence indicates that the French introduced the crop to Vietnam about 100 years ago and it was grown for the King. Later, it became popular among the wealthy families of the entire country.

Dragon fruit [*Hylocereus undatus*] is a fastgrowing evergreen cactus with leafless, thin vinelike branches belongs to the family Cactaceae. It has received worldwide recognition, first as an ornamental and then as a fruit crop. The flower of dragon fruit is so beautiful, that it has nicknamed as "Noble Woman" or "Queen of the Night". that can reach one and five-tenths to two five-tenths of a meter in height (Hossain *et al* 2021) ^[2].

It is a terrestrial with three-winged succulent green stalks (Patel and Ishnava, 2019) and is a native fruit of Central America (Bellec *et al* 2006). In recent years, its cultivation has expanded significantly. In 2022-23, it was cultivated in an area of 5300 ha with production of 21,220MT (Indiastat.com). The major states in India that produce dragon fruit are Gujarat, Karnataka and Maharashtra. These states contributes about 70 per cent of India's dragon fruit production. But the area under dragon cultivation is not sufficient to meet the domestic demand, hence majority of the dragon fruits available in Indian market are imported from Thailand, Malaysia, Vietnam and Sri Lanka. However, farmers continue to face multiple constraints that hinder efficient production and profitable marketing.

Hence, the present study has been undertaken in state of Telangana to identify constraints in production and marketing of Dragon fruit in state of Telangana.

Methodology

In state of Telangana, dragon fruit is being cultivated in Rangareddy, Siddipet and Nalgonda districts. A Purposive sampling technique was used for the selection of farmers for the study in the of Telangana since these are the major dragon fruit producing districts with highest area in the recent years. In each district 20 farmers were selected randomly and making the total sample size of 60 farmers. Detailed interviews were conducted with the selected farmers in all the three districts. Responses were analyzed using the Garatte ranking technique. Constraints related to production and marketing were scored and ranked based on total and mean scores to determine their relative importance.

Results and Discussion

Production Constraints

The production constraints reported by farmers were ranked based on mean scores and are presented in Table 1

Table 1: Constraints in Dragon Fruit cultivation in state of Telangana

Sl. No.	Constraint	Mean Score	Rank
1	High initial investment	66.00	1
2	Labour shortage	59.92	2
3	Unavailability of quality planting material	47.53	3
4	Decrease in fruit size in succeeding years	46.72	4
5	Infestation of ants	44.57	5
6	Improper pruning and training	36.07	6

1. High Initial Investment

High initial investment was identified as the most serious constraint in dragon fruit cultivation by the farmers. Establishment of a dragon fruit orchard requires substantial expenditure on cement poles, iron wires, planting material, drip irrigation systems, fencing and land preparation. Since the crop is a cactus climber, a strong support structure is essential for proper growth and yield. Farmers also need to invest in irrigation and nutrient management during the early years before full bearing starts. This high establishment cost discourages small and marginal farmers from adopting the crop.

2. Labour Shortage

Labour shortage was identified as the second major production constraint among the selected sample farmers. Dragon fruit cultivation is labour-intensive and requires workers for activities such as pit digging, erection of cement poles, tying and training of branches, pruning, weeding, harvesting, and post-harvest handling. Farmers particularly reported a shortage of skilled labour for pruning and canopy management, which are essential for maintaining plant shape, proper growth and higher productivity.

The problem becomes more severe during peak agricultural seasons, when labour demand increases and availability declines. As a result, wage rates rise considerably, increasing the overall cost of cultivation for the sample farmers. Delays in carrying out timely operations such as pruning, harvesting, and training were also observed, which negatively affected orchard management and yield performance. Small and medium farmers were found to be more affected, as they often depend on hired labour and

have limited financial capacity to manage rising labour costs.

3. Unavailability of Quality Planting Material

Unavailability of quality planting material was another important problem reported by farmers. Dragon fruit cultivation depends heavily on healthy and disease-free stem cuttings or rooted plants for uniform establishment and early bearing. Many farmers face difficulty in obtaining true-to-type varieties with good yield potential, fruit quality and market demand. Use of poor-quality or infected planting material results in weak growth and lower productivity. Limited certified nurseries further aggravate this issue. Farmers in the selected sample predominantly procure planting material from Rangareddy district, along with a few nurseries located within and around the same district. However, they are commonly encountering challenges related to transportation, including delays in timely delivery and high transportation costs.

4. Decrease in Fruit Size in Succeeding Years

A decline in fruit size over the succeeding years was reported as an important production constraint among the selected sample farmers. Many farmers observed that as the dragon fruit plants aged, the size and uniformity of fruits gradually decreased. This was mainly attributed to overcrowding of branches, improper pruning practices, nutrient depletion in the soil and inadequate canopy management.

In several sample farms, excessive vegetative growth and retention of too many fruits on a single plant resulted in competition for nutrients, leading to the development of smaller-sized fruits. Farmers also reported that imbalanced fertilizer application and insufficient irrigation during the fruit development stage further affected fruit growth and quality. The reduction in fruit size negatively influenced market preference, as traders and consumers generally prefer larger and uniform fruits with better appearance. Consequently, smaller fruits fetched lower market prices, reducing the income and profitability of the selected sample farmers. Proper nutrient management, regular pruning and balanced crop load management were found to be essential for maintaining fruit size and quality in dragon fruit cultivation.

5. Infestation of Ants

Ant infestation was reported as a notable problem in many of the sample dragon fruit orchards. Farmers observed that ants were highly active during the flowering and fruiting stages, particularly attracted to the sweet nectar of flowers and the sugary content of ripening fruits. Their presence was frequently noticed around flower buds, young fruits and damaged fruit surfaces. Several farmers also reported that ant infestation indirectly increased other pest problems in the orchards. Ants were found protecting sap-sucking insects such as mealybugs and aphids in exchange for honeydew secretion, which led to a higher spread of these pests on the plants. In heavily infested orchards, farmers faced inconvenience during harvesting and field operations due to continuous ant movement on the poles and branches. Moreover, fruits affected by ants and associated pests often

showed reduced external quality and poor appearance, lowering their market acceptance. Since dragon fruit is sold largely based on visual quality, severe infestation negatively affected the price realization and marketability of produce among the selected sample farmers.

6. Improper Pruning and Training

In the selected sample of farmers, proper pruning and training practices were found to be crucial for maintaining yield, fruit size and the longevity of dragon fruit orchards. Since dragon fruit is a climbing cactus, it requires systematic training on support poles and regular pruning to ensure a well-balanced canopy. However, many farmers in the sample were observed to follow inadequate or improper pruning practices.

As a result, dense vegetative growth was common in several orchards, leading to poor sunlight penetration and limited air circulation. These conditions create a favorable environment for pest and disease incidence. Moreover, excessive vegetative growth reduces flowering and fruiting efficiency, ultimately affecting productivity. Therefore, improper pruning and training practices were identified as a significant production constraint among the selected dragon fruit farmers.

Marketing Constraints

Constraints in marketing of dragon fruit were ranked based on mean scores and are presented in Table 2.

Table 2: Constraints in marketing of Dragon Fruit in the state of Telangana

Sl. No.	Constraint	Mean Score	Rank
1	Price fluctuations	67.28	1
2	Market commission	61.13	2
3	Recent imports	55.85	3
4	Lack of market knowledge	47.12	4
5	Perishability	46.87	5
6	Lack of awareness of market linkages	42.15	6
7	Lack of storage facility	41.73	7
8	High transportation cost	39.52	8

1. Price Fluctuations

Among the selected sample farmers, price fluctuation was identified as the most critical marketing constraint in dragon fruit cultivation. As dragon fruit is still an emerging crop, its market price shows wide variation due to seasonal arrivals, changing price consumer demand and the presence of imported fruits in the market. During peak harvesting periods, the influx of produce often leads to oversupply in local markets, resulting in a sharp decline in prices.

The majority of the sample farmers sell their produce in Batasingaram Fruit Market, which is one of the major fruit markets in Telangana, while some farmers depend on nearby local markets for disposal. However, the lack of organized marketing systems and heavy reliance on intermediaries or traders further aggravate price instability. This high level of uncertainty significantly affects farmers' income and influences their marketing decisions.

2. Market Commission

High commission charges of about 4% in Rangareddy district and sometimes more or less in Nalgonda and

Siddipet districts which is 4-6% imposed by intermediaries were identified as the second most significant marketing constraint among the selected sample farmers. Most farmers sell their produce through commission agents, wholesalers and retailers, particularly in urban fruit markets. In this process, they incur several charges such as commission fees, grading costs, packing expenses and unloading charges, which significantly reduce their net returns.

Additionally, since dragon fruit requires careful handling and attractive presentation to fetch better prices, farmers often have to bear extra marketing costs. These cumulative expenses ultimately reduce the producer's share in the final consumer price, thereby affecting the overall profitability of the selected sample farmers.

3. Recent Imports

In India, Dragon fruit import started during 2017 with a quantity of 327 tonnes, which has increased sharply to 9,162 tonnes in 2019 and the imports for 2020 and 2021 is 11,916 and 15,491 tonnes, respectively. India imported 16.39 million metric tons of dragon fruit, worth

\$19.77 million and imported 2,842 shipments of Dragon Fruit during Mar 2023 to Feb 2024. Which significantly challenges in domestic marketing. Imported dragon fruits from countries like Vietnam, Thailand and Malaysia are often available in supermarkets and wholesale markets. These fruits may attract consumers due to uniform size, bright colour and better packaging. Increased imports create competition and sometimes reduce prices of locally produced fruits. Farmers face difficulty competing unless they improve quality and branding.

4. Lack of Market Knowledge

Limited access to reliable market information was identified as an important marketing constraint among the selected sample farmers. Most of the farmers market their produce through Batasingaram Fruit Market, one of the major fruit markets in Telangana, while a few depend on nearby local markets. However, many farmers lack timely information regarding consumer demand, preferred fruit size, colour varieties, quality standards and prevailing prices in different urban markets. Since dragon fruit cultivation is still emerging in the region, organized market channels and information networks are not yet fully developed. As a result, the sample farmers largely depend on traders and commission agents at the market for price-related information and sales decisions. This dependency often weakens their bargaining capacity and limits their ability to negotiate better prices. Farmers also reported that awareness about changing market preferences and demand trends could help them plan harvesting, grading and marketing more effectively. Improved market intelligence and direct access to price information would enable the selected farmers to target more profitable markets and improve their income realization.

5. Perishability

In the study area, perishability emerged as a significant marketing challenge for the sampled dragon fruit growers. Although the fruit is relatively durable compared to many other fruits, maintaining its visual appeal and freshness still requires proper post-harvest care something not all farmers

consistently achieve. Several farmers reported that delays in reaching the market, especially when transport is not immediately available, often lead to a decline in fruit quality.

During transit, inadequate packaging or rough handling can cause bruising and minor skin damage, which directly affects the selling price. In some cases, farmers also lack access to suitable storage facilities, forcing them to sell the produce quickly, even at unfavorable prices. It was also observed that fruits showing signs of shriveling or external damage are less preferred by traders and consumers, leading to lower price realization. As a result, timely marketing and better handling practices become crucial for the sample farmers to minimize losses and secure better returns.

6. Lack of Awareness of Market Linkages

Lack of awareness regarding market linkages was another key issue among dragon fruit growers. Many farmers are unaware of direct channels such as supermarkets, fruit chains, exporters, online delivery platforms, juice processors and premium retail outlets. Due to this, they continue selling through local traders at lower prices. Limited contact with organized buyers reduces opportunities for better margins. Stronger linkages can significantly improve returns from this high-value crop.

7. Lack of Storage Facility

Among the selected sample farmers, large farmers store dragon fruit in their own facilities. However, small and marginal farmers lack access to proper storage and are forced to sell immediately after harvest. Inadequate storage facilities were identified as a major post-harvest constraint. Although dragon fruit has a relatively good shelf life, it still requires cool and hygienic conditions to maintain quality. The absence of such facilities leads to distress sales, especially during peak supply periods when prices are low. Limited awareness and high storage costs further restrict usage, highlighting the need for improved storage infrastructure to help farmers obtain better prices.

8. High Transportation Cost

Among the selected sample farmers, transportation of dragon fruit is carried out through different means depending on location. In districts such as Rangareddy, farmers largely depend on market-linked vehicles for transporting their produce to major markets. In contrast, farmers from the other selected districts often rely on their own vehicles, which results in higher transportation costs and ultimately reduces their profit margins.

Dragon fruit from the sample farms is predominantly marketed in distant urban centers, where consumer demand and price realization are relatively higher. This necessitates long-distance transportation, increasing both logistical complexity and expenses. Moreover, the fruit requires careful handling and packaging in cartons or plastic crates to prevent bruising and damage during transit, adding further to the cost. These challenges are particularly burdensome for small and marginal farmers in the sample, as the high cost of transportation directly reduces their net returns and overall profitability.

Discussion

The study indicates that both production and marketing constraints significantly influence the economic viability of dragon fruit cultivation. High initial investment which is around 4-5 lakhs per acre, emerged as the major production constraint due to expenditure on support structures, drip irrigation, fencing and quality planting material, which restricts adoption by small farmers. Labour shortage and lack of skilled workers for pruning, training and harvesting further increase cultivation costs and reduce operational efficiency. Problems such as poor planting material, decline in fruit size, ant infestation and improper canopy management adversely affect yield and fruit quality. On the marketing side, price fluctuations and high market commission (4%) were the most severe constraints, reflecting unstable returns and intermediary dominance in the value chain. Competition from imported fruits also affects domestic price realization and market share. Inadequate market knowledge, weak linkages, perishability and lack of storage facilities limit farmers ability to access remunerative markets. High transportation costs further reduce net returns, particularly for growers located far from urban consumption centres. These findings suggest that profitability in dragon fruit farming depends on simultaneous improvements in production technology and market infrastructure. Hence, targeted policy support, extension services, input quality regulation and efficient marketing systems are essential for sustainable expansion of the crop.

Conclusion

Dragon fruit growers face multiple and interconnected production and marketing challenges. High establishment cost, labour shortage, poor planting material and pest incidence constrain productivity, while price fluctuations, import competition and weak market infrastructure reduce profitable sales. Inadequate storage, transport facilities and market information further limit income realization. These constraints can be addressed through farmer-oriented support, quality input supply, skill development and improved post-harvest infrastructure. Strengthening market linkages and policy interventions will enhance profitability and encourage sustainable expansion of dragon fruit cultivation in emerging regions.

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