Optimizing Growth: Water and Nutrient Management for Dragon Fruit Cultivation

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INTRODUCTION

Dragon fruit, also known as pitaya, is a captivating and exotic fruit that has gained popularity in India over the past few decades. Native to Central America, dragon fruit has found a welcoming home in various regions of India due to its adaptability to diverse climates and soils. Its unique appearance, vibrant colours, and numerous health benefits have made it a sought-after choice among health-conscious consumers and fruit enthusiasts. In the context of India, where diverse climatic conditions prevail, effective water management practices play a pivotal role in the successful cultivation of dragon fruit. The country's varied landscapes, ranging from arid regions to areas with abundant rainfall, necessitate meticulous water management strategies to ensure the optimal growth and fruit production of this intriguing cactus plant. Furthermore, nutrient management is equally vital in the successful cultivation of dragon fruit in India. Proper nutrition and soil enrichment are essential to maximize the yield and quality of dragon fruit. India's agricultural diversity requires a nuanced approach to nutrient management, considering the differing soil compositions and regional requirements.

WATER MANAGEMENT

The Dragon Fruit tree, being a succulent plant, exhibits excellent drought tolerance and doesn't necessitate frequent watering. However, to ensure robust growth and abundant yields, maintaining adequate soil moisture is imperative. An interesting practice adopted by some farmers involves deliberately withholding water just before the flowering phase to stimulate flower formation. Effective irrigation becomes a critical factor during key stages, such as when applying fertilizers and throughout the periods of flower and fruit development.

For newly planted pitaya, it is advisable to allow the soil to dry slightly before irrigating, as this helps prevent root rot issues. Moreover, an extended drying period between watering sessions reduces the incidence of fruit splitting, a common issue associated with excessive moisture. How often you should water a Dragon Fruit Plant depends on the conditions. In general, under normal circumstances, it's good to water them about once every two weeks. You want the soil to be dry or slightly damp but not extremely dry like a rock or too soggy like a swamp. You can check the soil's moisture level using a moisture meter (tensiometer) or simply by sticking your finger into the soil.

In the context of dragon fruit cultivation in India, a member of the Cactaceae family, a fascinating feature comes to the forefront: its ability to thrive with minimal water during the critical period of water scarcity, which typically occurs from March to June. This unique characteristic makes dragon fruit cultivation particularly well-suited to the diverse climatic conditions across the country. Starting in June, the dragon fruit plants enter their flowering phase, which continues until October. During this crucial period, irrigation is employed as needed, primarily in response to extended dry spells. An interesting facet of dragon fruit cultivation in India is the deliberate introduction of water stress during the pre-bloom period, typically observed in April and May. This counterintuitive practice is undertaken to stimulate greater flower production, emphasizing the plant's adaptability to variable water conditions. To ensure that soil moisture levels remain optimal during fruit development, a drip irrigation system is commonly used. This system plays a significant role in maintaining

consistent and adequate soil moisture, ensuring the healthy growth of dragon fruit. The water use efficiency of the plants can be dramatically improved (even up to 90%) when drip-irrigation is used since the water is added in smaller quantities and with higher precision closer to the active root system of the plants. At the same time, this system reduces runoff and evaporation of the applied or stored soil water. Finally, when installed on a plantation, it gives the farmer the option to apply fertigation (application of fertilizers through the irrigation system, together with water). In the early years of cultivation, the estimated irrigation requirement for dragon fruit in India ranges from 1000 to 1500 liters per pole annually.

In the Indian subcontinent, the timing of flowering and fruiting often coincides with the monsoon season, when rainfall is abundant. To counter the risk of excess moisture and waterlogging resulting from heavy rains, a well-designed drainage system is a key component in dragon fruit cultivation. These drainage systems are strategically installed around the plant or pole, helping to mitigate the adverse effects of excessive soil moisture and ensuring the health and productivity of dragon fruit plants in the Indian setting.

NUTRIENT MANAGEMENT: Dragon fruit cultivation requires a careful and strategic approach to manure and fertilizer application to achieve optimal yields. During the initial growth stage, a higher amount of nitrogen is beneficial for encouraging robust vegetative growth. As the plant matures, the focus shifts towards increased phosphorus and potassium application. Additionally, the addition of calcium and micronutrients has been shown to be advantageous for this crop. Organic matter, such as compost and organic fertilizers, plays a crucial role in the development and overall growth of dragon fruit plants. Each plant should receive an application of 10 to 15 kg of organic compost or organic fertilizers. In regions with poor soil fertility, such as rocky and barren lands, special attention is required. When planting, it's recommended to apply 10-15 kg of farmyard manure (FYM) and 100 g of single superphosphate (SSP) per plant hill. Chemical fertilizers should only be introduced 2 to 3 months after planting, once the dragon fruit plants have started to establish themselves. The choice of chemical fertilizers should be determined by the specific soil conditions. For rocky and infertile soils, a tailored fertilizer schedule is necessary. During the first two years, each pole should receive 500 g of urea, 500 g of phosphorus (P), and 300 g of potassium (K) per year, divided into four applications at three-month intervals. After the first two years, as the plants grow more rapidly and demand more nutrients from the soil, a more substantial amount is needed. For each pole, which typically has four plants, it's advisable to provide 800 g of nitrogen (N), 900 g of phosphorus (P), and 550 g of potassium (K) per year. These nutrients should be distributed across six applications. To ensure that the dragon fruit plants receive the necessary nutrients, a combination of basal fertilization and fertigation through a drip irrigation system installed at the top of the pole,

which feeds the aerial roots, is recommended. This approach helps maintain the plant's health and promote higher yields. Table. Fertilizer management in dragon fruit
Time of application

Time of application	Type of fertilizer	Application rate (g per pole)
1. Immediately after final harvest	N	200
	P_2O_5	250
	Manure	25
2. Two months later	N	200
	P_2O_5	200
	K_2O	150
3. Just before flowering	N	150
	P_2O_5	200
	K_2O	100
4. One month after 3rd application	N	100
	P_2O_5	100
	K_2O	75
5. One month after 4th application	N	100
	P_2O_5	100
	K_2O	75
6. One month after 5th application	N	100
	P_2O_5	100
	K_2O	75

Sources: FAO (2002) and https://www.healwithfood.org

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Dragon fruit cultivation can also be carried out through organic methods, completely avoiding the use of chemical fertilizers and pesticides. Instead, organic sources like farmyard manure and poultry manure can be utilized to enhance soil nutrition. Organic dragon fruits, cultivated in this manner, often have greater appeal in the market due to their natural and chemical-free production methods, meeting the growing demand for organic products.

References

FAO/Latinfoods, Tabla de Composición de Alimentos de América Latina (2002).