AN OVERVIEW OF DRAGON FRUIT CULTIVATION IN ANDHRA PRADESH

Abstract:

Dragon fruit is a wonderous fruit belonging to the Cactaceae family. This fruit is familiar as strawberry pear, pitaya, and pitahaya. It is indigenous to the country of South America but is extensively cultivated in Southeast Asian countries like Vietnam, China, and Singapore on a large scale. [2] It's a very nutritious fruit that is fleshy inside and covered wi leathery skin with spike-like structures. These can be propagated via stem cuttings or vis seeds. We can grow this at home in a pot by shallow planting. If it is propagated via stem cuttings it grows a notable height vertically. So, it needs anchorage, and commonly cement poles are used for that purpose. They range from 160 to 240 rupees per kilogram in the Andhra market. It has the potential to develop high revenues for the farmers. [1] White fleshed variety is the most common commercial variety cultivated. Dragon fruit is used against type-II diabetes i.e., diabetes mellitus, prediabetes, high blood pressure, high cholesterol levels, and obesity. Pitahaya contains anti-cancer properties. Its flowers are used in the brewing industry. The horticultural university of Andhra Pradesh (Dr. YSR Horticultural University) have been made several trials on it and has observed very successful fruit growth in the agency areas of Vishakhapatnam (Chintapalli and Lambasingi villages). [3] The government should also implement new schemes for dragon fruit cultivators. The government can install cold storage and make proper transport facilities for the farmers.

Keywords: *selenicerus, hylocerus spikes, shallow planting, vertical poles, sternocerus, linoeic acid, brewing industry, megalanthus spp.*

1. Introduction:

Dragon fruit, commonly called pitahaya or strawberry pear is scientifically known as Selenicerus spp. (formerly Hylocerus) belonging to the Cactaceae family. The pitaya grown in America comes under the genus Sternocerus. These are characterized by their leathery skin and scaly spikes on the exterior side of the fruit whereas the interior is fleshy. [4] Commonly grown varieties in India are white-fleshed, yellow-fleshed. But there are also black-fleshed and red-fleshed varieties. These are native to Mexico and the Americas. This fruit is cultivated in Southeast Asia, India, Thailand, Singapore, Japan, China, the United States, the Caribbean, and Australia. In India, the western and the southern states are more apt for dragon fruit cultivation. [5] This fruit has many health benefits and can help in weight loss and also contains anti-cancer properties that help in curing cancer and is rich in antioxidants. News reports say that it was first introduced in Andhra Pradesh by a farmer and a young entrepreneur T. Vijaya Sriram and Dr. C. Chandrasekhara Rao, Sr. Scientist & head, Horticultural research station, Dr. YSR Horticultural University, Chintapalli, Vishakhapatnam in 2013-14. It was seen as productive and further research is also being done. [7]

2. Cultivation:

Climatic and soil requirements: Sandy loam to clay loam soil is required and required soil PH ranges from 5.5 to 7. The soil must be rich in organic humus. It can also survive in poor soil conditions. [6] The minimum temperature ranges from 20 degrees to 30 degrees Celsius. These fruits can resist very short periods of frost, but cannot thrive long exposure to freezing temperatures. It requires an annual rainfall of 40 to 60 cm.

2.1. Planting

It can be propagated via seeds and stem cuttings commercially. [8] If they are planted via seeds they need to be planted in pots and will be germinating after

11 to 14 days of shallow planting. Commercial plantings are done at high density with 1,100 to 1,350 plants per hectare. [9] Plants will take up to five years to reach the required stage for full commercial production, where a yield rate of 20 to 30 tons per hectare is expected. A beneficial tip for the cultivator is to plant this crop at the start of the monsoon to achieve a higher yield.

2.2. Spacing

The distance between the plants depends on the type of support used (either vertical or horizontal) while being planted. In the case of vertical support, the distance between the plants should be 2-3 meters while in horizontal support the distance can be reduced to almost 50 cm which allows the farmer to achieve intensive farming. [10] The vertical support like cement poles should be between 1m-1.2 m high while the horizontal support should be between 1.4 m-1.6 m for appropriate and healthy growth.

2.3. Flowering

Once the plant reaches maturity around a mass of 4.5 kilograms (10 pounds) in weight, the flowers of the plant start blooming. An interesting thing about the flowers of dragon fruit is that they bloom overnight and will be wilted by evening. They rely on nocturnal pollinators such as bats and moths. Generally, self-pollination in these plants does not cause the formation of fruit set, cross-pollination goes well but cross-pollination may differ from its mother kind. [12] So generally, while growing for a commercial purpose we use the self-pollinating method. Its flowers are light yellowish in color. [13] The flower takes 20 days to develop fruit after fertilization and needs 40 to 45 days to rip completely. [Fig.1]

Fig.1. flowering bud of Dragon fruit

2.4. Nutrient requirement

Farmyard manure can be used 20 to 25 kg per acre. A water-soluble NPK@20-20-20 can be given twice in a season, the first one in early spring and after the complete bloom of flowers. [14] A tablespoon in a gallon of water is efficient enough.

2.5. Irrigation

Dragon fruit doesn't need much water for irrigation as it belongs to the cactus family. However, at the time of planting, flowering, fruit development stage, and hot dry climatic conditions, frequent irrigations are required. [15] Drip irrigation can be used for effective water usage.

2.6. Harvesting

The plants bearing fruits can be found in the first year only. Generally, the flowering period of this plant is found to be between May to June month and the fruit-bearing period varies from Aug to Dec month. The fruits become available for harvesting after a month of flowering. The fruit turns red which indicates that the fruit is ready for harvesting. [Fig. 2] The fruit should be plucked and collected safely as soon it is fully grown because a delay of 4-5 days makes it rot causing heavy losses to the farmer. The interesting thing about this plant is that we do not need to use ethylene or something for the ripening of the fruit. [16]

A single plant typically produces around 1 kilogram of the fruit and each pole will be hosting 4 plants so 4 kg/pole will be received. An acre produces about 6 – 7 tons of dragon fruits per harvest. In a year, 45 to 50 tons of dragon fruits per hectare could be produced under superior and apt farming conditions and prerequisites. The trail run of dragon fruit at Chintapalli of Andhra Pradesh in 2013 showed 420gm fruit weight which is very good and higher than the dragon fruit grown in Vietnam which ranges around 300 gm. [3]

Fig.2. Fruit ready to harvest.

3. Varieties

Selenicerus updates: it is the white-fleshed variety covered with pink skin. Also known as *Pitahaya*, the variety has white flesh with pink skin. The fruit is 6 to 12 cm in length and 4 to 9 cm in thickness with edible black seeds immersed in white-colored flesh.

Selenicerus polymerizes: it is the red fleshed one wrapped with pink skin around it. Also known as *Red Pitaya*, it is recognized by its red flesh with its pink skin. It is indigenous to the country of Mexico but is now grown in many countries.

Selenicerus megalanthus: White fleshed and yellow-skinned. This variety belongs to its homeland South America and is known for its white flesh with yellow skin wrapped around it. [18]

1. Uses of dragon fruit
    - Helps in curing cancer as it contains anti-cancer properties.
    - Dragon fruit contains anti-inflammatory properties.
    - It aids in reducing cholesterol and helps in weight loss.
    - The Flowers can be used to make tea. [17]
    - It is used to process into different products such as jam, juice, ice cream, squash, and wine.
    - The flower bud is used in soup, making the salad, and as a vegetable.
    - The dragon fruit is used to flavor and color juices and alcoholic beverages like the "Dragon's Blood Punch" and the "Dragotini"
    - The Niti Aayog in its report in 2017 says that dragon fruit Doubles Farmer’s Income and aids in crop diversification. [19]
    - This crop has the potential to double the farmer’s profit.
    - Besides its various health benefits this fruit also improves your skin health. Dragon fruit could do miracles to your skin health that completes your skincare routine.
    - Helps ward off anemia during pregnancy. [20]

2. Nutrition values of Dragon fruit

100 gm of dry pitaya provides 1,100 kilojoules which are approximately 264 kilocalories of food energy comprising 82% of carbohydrates, 4% of protein, and 11% of vitamin C and calcium each which compensates for the daily requirement for a person. This contains many important and beneficial oils such as useful fatty acids like linoleic acid around 50.1% and a minute quantity of linolenic acid about 1%. Besides these, it also contains seed oils such as myristic acid consisting of 0.3%, palmitic acid at 17.6%, stearic acid at 4.4%, oleic acid at 23.8%, and palmitoleic acid at 0.6%.[23]

*These values are taken from the white-fleshed pitahaya.

3. Pests and diseases of dragon fruit

- Dragon fruit can be affected by viruses, bacteria, fungi, and nematodes.
- Heavy watering or excess rainfall cause the drooping of flowers and also leads to the rotting of fruits.
- The bacterium *Xanthomonas campestris* causes stem rot. [Fig.2]
- The fungi *Dothiorella* cause brown spots on the fruit. [Fig.3]
- Other fungi known to infect pitaya include *Botryosphaeria dothidea* and *Colletotrichum gloesporioides* majorly. [22]

Fig.2. stem rot of dragon fruit caused due to *Xanthomonas campestris.*

Fig.3. brown spot on the fruit of dragon fruit caused due to fungi *Dothiorella.*

4. Economics of dragon fruit:

Generally, dragon fruit plants can be propagated through seed, and for commercial purposes, we propagate via stem cuttings. Now these cuttings after planting need cement poles or bamboo for anchorage. As this plant can give crop for 20-25 years, we use cement poles for that as a long-term investment. A pole must be 8-8.5 feet long. It should be placed 1.5 feet deep and 6.5 feet height and at the top of the pole, we have to place rings. The plants should be trained through the rings for their growth. As these plants have clinging roots they will easily adapt around the pole. We can place 500 poles per acre and that costs up to 10 lakhs and the same quantity of rings. [21] The rings cost around

1500-2000 rupees per unit. A pole can withstand 4 plants which means 2000 plants per acre and each plant gives a 5 kg yield. Hence, a pole gives 20 kgs yield, and therefore an acre produces 10,000 kgs of yield. Dragon fruit costs 160 to 200 rupees per kg. the metros like Bangalore, Chennai, Delhi, Mumbai, Kolkata, and Hyderabad are showing high demand for this fruit which is a great deal for the dragon fruit farmers. We can market through online market retails such as reliance fresh, amazon groceries, big basket, etc. supermarkets like Spencer's, more, reliance, Dmart are there to market our product. [14] It can be exported to get high returns. We can sell it wholesale also which can generate good profits. The primary investment is 18 lakh per acre in the first year. The investment from the second year will only be 1 lakh per acre. The profit will be 15 lacks per acre per year and may further increase to 17-18 lakhs after two or three years. This crop has high foreign exchange. So, this will be one of the best crops to get such cool returns. [19]

5. Conclusion:

So, overall comparing all the pros and cons we can conclude that dragon fruit is a wonderous fruit and it is highly suitable to be cultured in Andhra Pradesh. This can also generate higher income for the farmers. This can be a great foreign exchange for the country. Its cost of cultivation is high in the start but the government can provide a subsidiary to the farmers and also the government should increase awareness about the cultivation. Young farmers of Andhra are coming forward to grow this exotic crop on a large scale. Many farmers got succeeded and research is being done for the further development of the fruit in the country. This fruit is also having such a great medical value so it shouldn't be ignored. It can be a boon to many patients.

6. References:

1. Islam, M. Z., M. T. H. Khan, M. M. Hoque and M. M. Rahman. 2012. Studies on the Processing and Preservation of Dragon Fruit (Hylocereus undatus) Jelly. The Agriculturist, 10 (2): 29-35. [1]
2. Jacobs and Dimitri. 1999. Pitaya (Hylocereusundatus), is a potential new crop for Australia. Australian New Crops Newsletter, 11: 16.3. [2]
3. Dr. C. Chandrasekhara Rao, V. Mrinalini Sasanka. 2015. Dragon Fruit – "The Wondrous Fruit" – for the 21st century. GJRA - GLOBAL JOURNAL FOR RESEARCH ANALYSIS. Volume-4, Issue-10, Oct-2015 • ISSN No 2277 – 8160. P. 261-262. [3]
4. Mizrahi, Y., A. Nerd and P. S. Nobel. 1997.Cacti as crops. Horticultural Review, 18:291-320.Morton, J. F. 1987. Fruits of warm climates. Strawberry Pear. Florida Flair Books, Miami. pp. 347-348, 505. [4]
5. Nerd, A., Gutman, F. and Mizrahi, Y. 1999.Ripening and postharvest behavior of fruits of two Hylocereus species (Cactaceae). Postharvest Biology and Technology, 17 (1): 39-45. [5]
6. Nobel, P. S. and E. de la Barrera. 2002. Stemwater relations and wet CO2 uptake for ahemiepiphytic cactus during short-term drought. Environmental and Experimental Botany, 48: 129-137. [6]
7. Pushpakumara, D. K. N. G., Gunasena, H. P. M.and Kariayawasam, M. 2005. Flowering and fruiting phenology, pollination vectors, and breeding system of dragon fruit (Hylocereus spp.). Sri Lankan Journal of Agricultural Science, 42:81-91. [7]
8. Rahim, M. A., S. A., Mithu, M. R. I., Titu, M.T., John, J. and Bhuya, M. A. H. 2009.Dragon Fhaler Chas Korun (Bengali). Bangladesh Agricultural University, Mymensingh and Swiss Foundation Development and International Cooperation, Paragon press ltd., Taiwan Food Industry Development and Research Authorities. 2005.[8]

9. https://www.researchgate.net/publication/314426331_Study_on_the_Growth_and_Development_of_two_Dragon_Fruit_Hylocereus_undatus_Genotypes [accessed May 06, 2023]. [9]
10. http//swarnabhumi.com/dragonfruit/health_benefits_of_dragonfruit.htm. 18 February 2011. [10]
11. http://en.wikipedia.org/wiki/Hylocereus_undatus. 12 October 2012. [11]
12. Mizrahi, Y and A. Nerd. 1999. Climbing and columnar cacti: New arid land fruit crops. In: Janick, J. (ed) Perspective on new crops and new uses. ASHS Press, American Society of Horticultural Science, Alexandria, Virginia: 358-366. [12]
13. https://www.agrifarming.in/tag/dragon-fruit-cultivation-in-andhra-pradesh [13]
14. https://www.thebetterindia.com/244707/jestin-joseph-dragonfruit-farmer-earns-lakhs-vizag-agency-cannabis-ganja-dragonfruit-cake-bun-wine-rotis-success-story-him16/ [14]
15. https://www.deccanchronicle.com/nation/current-affairs/140516/exotic-dragon-fruit-makes-a-debut-in-andhra-pradesh.html. [15]
16. https://www.agrifarming.in/dragon-fruit-cultivation [16]
17. https://en.wikipedia.org/wiki/Pitaya [17]
18. https://www.healthline.com/nutrition/dragon-fruit-benefits [18]
19. https://www.youtube.com/watch?v=bWw9H5AiDvc [19]
20. Parinya Chuachoochat (Kasetsart University, Bangkok (Thailand). 2004. Study on vegetative growth, flowering, and fruit development of dragon fruit (Hylocereus polarizes), Thai National AGRIS Centre. URL: Study on vegetative growth, flowering, and fruit development of dragon fruit (Hylocereus polyrhizus) (fao.org) [20]

21. Raveh E, Nerd A, Mizrahi Y. Responses of two hemiepiphytic fruit crop cacti to different degrees of shade, Sci. Hort. 1998; 73:151-164.25. [21]
22. Rondón JA. Cactáceas epifitas y trepadoras de la reservaforestal de Caparo, estado Barinas, Venezuela, Rev. For.Venez. 1998; 42:119-129.26. [22]
23. Spichiger RE, Savolainen VV, Figeat M. Botaniquesystématique des plantes à fleurs – une approchephylogénétique nouvelle des angiospermes des régionstempérées et tropicales, Presses Polytech. Univ. Romand,Lausanne, Suisse. 2000, 372.27. [23]
24. Tel-Zur N, Abbo S, Bar-Zvi D, Mizrahi Y. Genetic relationships among Hylocereus and Selenicereus vine cacti (Cactaceae): evidence from hybridization and cytological studies. Ann. Bot. 2004; 94:527-534.28. [24]
25. Weiss J, Nerd A, Mizrahi Y. Flowering behavior and pollination requirements in climbing cacti with fruit crop potential. Hort Sci. 1994; 29:1487-1492. [25]
26. *Tamanna Perween, KK Mandal and MA Hasan. Dragon fruit: An exotic super future fruit of India*. Journal of Pharmacognosy and Phytochemistry 2018; 7(2): 1022-1026. https://www.researchgate.net/publication/323966688_Dragon_fruit_An_exotic_super_future_fruit_of_India. [26]