Journal of Plant Biota

Short Communication: 08 to 12
ISSN: 3048-4863
https://plant.researchfloor.org/

From Seed to Succulence: Mastering Dragon Fruit Propagation Techniques

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Abstract

From Seed to Succulence: Mastering Dragon Fruit Propagation Techniques delves into the intricacies of propagating dragon fruit, a fascinating tropical fruit known for its exotic appearance and nutritional benefits. This article explores various propagation methods, including seed germination, stem cuttings, and grafting, shedding light on the challenges and rewards associated with each technique. By elucidating the principles of dragon fruit propagation and offering practical tips for success, this article equips growers with the knowledge and skills to cultivate thriving dragon fruit plants from seed to succulence. Whether you're a novice enthusiast or an experienced horticulturist, this comprehensive guide serves as an invaluable resource for mastering the art of dragon fruit propagation and reaping the rewards of homegrown delicacies.

Keywords: *dragon fruit, propagation, horticulturist, practical*

Introduction

Dragon fruit, which belongs to the family Cactaceae, is a well-liked fruit that is both healthy and has therapeutic qualities. It is recognized for its gorgeous night-blooming blooms, which have given it local titles such as "night-blooming cereus," "belle of the night," and "queen of the night" [1]. Its origins may be traced back to tropical and subtropical forest regions and can be found in Central and South America. Other names for it include "noblewoman," "conderella plant," and "Jesus in the cradle." [2] It is also known as "Pitaya" or "Pitayaha." Other names for it include its other names. Its capacity to limit transpiration loss through Crassulacean Acid Metabolism (CAM) is only one of the reasons that dragon fruit has gained universal recognition. Other reasons include its tasty fruits, its efficient use of water, its early yielding potential, and its ability to yield early [3]. The regions of Northeastern, Southeastern, and Western India that are characterized by a lack of cold and dry conditions are ideal for its growth. At the same time as dragon fruit is becoming increasingly popular, it is essential to produce planting materials on a wide scale [4]. It has been demonstrated in previous research that dragon fruit may be reproduced both sexually and asexually. Several different ways of propagation, micropropagation, and other variables linked to the multiplication of dragon fruit are discussed in this article. The purpose of this study is to evaluate these diverse approaches and determine which one is the most effective technique for mass production [5].

20 November 2023: Received | 28 January 2024: Revised | 08 March 2024: Accepted | 11 March 2024: Available Online

Citation: Anushi, A. Krishnamoorthi, Pabitra Kumar Ghosh (2024). From Seed to Succulence: Mastering Dragon Fruit Propagation Techniques. *Journal of Plant Biota.* **DOI: https://doi.org/10.51470/JPB.2024.3.1.08**

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Sexual propagation method in dragon fruits

With a viability rate of 83%, the seeds of the dragon fruit are utilized for sexual propagation. Seed propagation, on the other hand, is uncommon since it takes a long time to produce a crop and results in seedlings that are less robust than those that are vegetatively propagated. When it comes to genetic research, seed propagation is necessary for achieving genetic variety, extending longevity, and developing resistance to diseases and pests [6]. The amount of published material on the multiplication of dragon fruit seeds is low. It is possible to acquire a better germination rate by sowing the seeds immediately after extraction, which results in the seeds being tiny and black [7]. The seedlings are then moved to containers until they are mature enough to be moved to the main field using the transplanting process. Even after one year has passed after the germination of seeds, seedlings are not yet ready to be transferred. Germination of dragon fruit seeds is influenced by a variety of elements, including the growth medium, temperature, and the amount of light that is present [8]. Using a combination of peat moss and sand at a temperature of 24 degrees Celsius, Ahmed et al. found that peat moss had the highest germination percentage (82%) and required the least amount of time (18 days) for germination. While germination was at its peak at 160 degrees Celsius, an increase in light intensity of 2000 lux resulted in a 19% decrease in germination [9].

Asexual methods and plant growth regulators used in dragon fruit cultivation.

There has been a limited amount of study done on grafting, even though dragon fruit propagation is a conventional approach. The most frequent method for propagating dragon fruits is called stem cutting, and it is the one that produces fruits that are true to type in the least amount of time. Several factors, including the size of the cuttings, the maturity or age of the cuttings, the time at which the cuttings are taken, the portion of the stem that is used for cutting preparation, the media that is used for rooting the cuttings, the application of PGRs, the fresh weight of the cuttings, and the environmental conditions under which the cuttings are raised, all play a role in determining the success of this technique [10].

The size of the cuttings is extremely important for the process of rooting or initiating shoots. This is because larger cuttings have a greater carbohydrate content and a faster rate of photosynthesis, which results in the formation of roots and shoots at an earlier stage and of higher quality. It has been discovered via research that cuttings of 15 centimeters in size result in superior root and shoot growth even in the absence of IBA use [11]. It was advised that cuttings be between 35 and 45 centimetres in size for optimal growth and development. After being treated with a 10 mM IBA solution, it was discovered that cuttings of a size of 5 centimeters were an effective size [12]. The age of the cuttings, often known as their maturity, is another significant component. Fumuro suggested using stems that were between one and two years old for improved growth and survival. It is important to take cuttings at a specific period of the year since the amounts of endogenous plant growth regulators, rooting cofactors, and carbohydrates in the mother plant can fluctuate greatly from season to season [13]. It is possible that fluctuations in the quantities of phenolic compounds in the mother plant and the levels of shoot RNA are responsible for the seasonal variation in the success of cuttings grown from the mother plant. Additionally, it has been found that there is a higher cambial activity during the season that has the greatest rooting percentage [14].

Auxins and cytokinins are examples of plant growth regulators that are responsible for the planting of cuttings into the soil. Although there are larger levels of endogenous auxins during the peak season for cutting, the administration of these auxins from the outside is necessary for production throughout the year and for improving the roots of smaller cuttings. Extensive research has been carried out to ascertain the amounts of Indole Butyric Acid (IBA) and Indole-3-Acetic Acid (IAA) that are suitable for promoting the rooting of cuttings [15]. It is possible to graft dragon fruit cuttings to acquire root and shoot characteristics of a higher grade. It is advised that different concentrations of IBA solution be used for better establishment. The IBA concentration of 250 ppm is the one that results in the highest quantities of nitrogen and protein in the shoots among the other concentrations [16]. The piece of the stem that is utilized for cutting also plays an important part in the process of rooting the cuttings, with the basal or proximal portion being the area that has the highest rooting percentage [17].

The rooting medium that is used for rooting the cuttings needs to have the appropriate capacity for retaining water as well as the capacity to drain water to supply an adequate amount of water without causing stagnation. As an illustration, peat moss has the largest root number (43), as well as the longest root length (8.2 cm), in sand-based environments. When taking stem cuttings of dragon fruit, it is advisable to use a combination consisting of soil, farmyard manure, and sand in the proportions of 1:1:2 [18].

The fresh weight of the cuttings is a significant component in determining the success of the cuttings. This is because the cuttings include food resources that are stored, which aid in the rooting process. It was stated by Fumuro that the root fresh weight and root rooting percentage were at their maximum when the fresh weight was between 6-7 grams per centimeter of cutting length [19].

When it comes to rooting dragon fruit cuttings, environmental variables such as the amount of sunshine, the temperature of the atmosphere, and the relative humidity all play a very vital role. An optimal amount of sunshine should be provided to the cuttings to facilitate the process of photosynthesis and reduce the amount of endogenous auxins that are degraded while they are stored in the cuttings. It is advised that dragon fruit cuttings be partially shaded between 23 and 42 percent in order to promote better growth of the roots and shoots [20]. In dragon fruit, grafting is an essential asexual propagation strategy that allows species that are more suited to particular soil and climate conditions to be utilized as rootstock, while species that are less adaptive to those circumstances can be used as scions. To achieve a survival rate of more than 95%, Wang developed a grafting process that was patented [21].

Propagation in dragon fruit using micropropagation or in vitro propagation.

Micropropagation is a procedure that includes delivering specialized growth media to plant tissues or seeds in an environment that is both sterile and beneficial. The technique used to cultivate dragon fruit is influenced by some elements, including the explant that is utilized, the medium that is used, shoot culturing, sub culturing, invitro rooting, and the acclimation of the plantlets that are grown in vitro. To prevent contamination, a disease-free mother plant is chosen, and the explants are then disinfected and cultivated in a nutritional medium that is both aseptic and sterile [22].

With dragon fruit, explants typically consist of stem segments, areoles that have thorns, and immature in-vitro germinated seedlings that are around four weeks old and forty days old, respectively. Cotyledonary leaves of the seeds that were germinated in the past are also employed. When compared to the other two forms of explants, in-vitro germinated seedlings have a little advantage since they are able to identify the fundamental properties of the fruit, such as the colour of the pulp. This is something that is not achievable when utilizing the different types of explants [23].

Before being placed into the culture medium, the explants that have been removed from the mother plant are subjected to a series of precise procedures that are designed to disinfect them. Following the removal of the seed pulp, the seeds are washed in sterile distilled water three times before being rinsified with 15% Bayclin for fifteen minutes [24]. This process is then repeated for seed sterilization. In the case of stem explants, the explants are first rinsed in flowing tap water, and then they are cleaned in a fungicide solution that contains one drop of tween-20 for fifteen minutes while being shaken intermittently. Following that, the segments that have been sterilized are rinsed thoroughly with distilled water that has been sterilized [25]. Explants are used to foster the development of new shoots, callus, and somatic embryos during the culture phase of the process. In the culture stage, the process of shoot induction takes place with the addition of 3 μM zeatin and 0.5 micromolar IBA. On the other hand, callus induction is induced in the in vitro environment by the combination of two plant growth-boosting hormones, namely auxin and cytokinin [26]. The process of artificially inducing embryogenesis from somatic cells or tissues is referred to as somatic embryogenesis [27].

Following the establishment of the explants on the first culture medium, the process of multiplication takes place. The callus, explants, or somatic embryos are then moved to the multiplication media to facilitate large-scale production. Several methods may be utilized for multiplication in tissue culture [28]. These include callus-mediated multiplication, adventitious shoots-mediated multiplication, apical or axillary shoots, and direct embryogenesis. Suman, Rani, and Reddy found that the optimal multiplication media for the highest number and length of shoots was MS media supplemented with 3 mg/l BAP + 1 mg/l KIN and 40 mg/l sucrose. This was the conclusion reached by the researchers [29].

When it comes to determining whether or not in-vitro-generated shoots can successfully survive, root induction is a crucial aspect. Their rooting effectiveness, which enables the in-vitro plantlets to endure the transplanting shock, is a critical factor in determining whether or not the roots that were created in vitro will survive. During the process of root induction, Thiha suggested using media that had 0.3μM NAA. Additionally, Kasim and Basri found that the medium that contained 3 mg/l BAP and 0.5 mg/l NAA exhibited the highest root induction [30]. Acclimatization is a crucial component that plays a significant role in determining the survival of plantlets that are grown in vitro. After four to six days, the polythene coverings are removed from the plantlets that were formed in vitro and they are then transferred to settings that are not in vitro for further development. After 20 to 25 days, the plants that have been regenerated are subsequently placed in circumstances similar to those of their natural habitat (ex-vitro) [31].

Conclusion

In conclusion, "From Seed to Succulence: Mastering Dragon Fruit Propagation Techniques" serves as a comprehensive guide for enthusiasts and horticulturists alike, providing valuable insights into the diverse methods of propagating dragon fruit. By exploring seed germination, stem cuttings, and grafting techniques, this article empowers readers to embark on their journey of cultivating thriving dragon fruit plants. The rewards of successful propagation extend beyond the garden, as growers can enjoy the exotic beauty and nutritional benefits of homegrown dragon fruits. With a deeper understanding of propagation principles and practical tips for success, readers are equipped to harness the potential of dragon fruit cultivation and experience the satisfaction of nurturing these captivating plants from seed to succulence.

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