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Role of Micropropagation on Improving Efficiency of Dieffenbachia Picta cv. Rudolph Roehrs

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Abstract: **Micropropagation, sometimes referred to as tissue culture or clonal propagation, has considerably aided in the commercial production of ornamental plants and revolutionised the area of plant propagation. Horticulturists and plant lovers have paid close attention to the famous indoor foliage plant Dieffenbachia picta cv. Rudolph Roehrs, which is well-known for its lovely variegated leaves. The effectiveness of Dieffenbachia picta cv. Rudolph Roehrs is examined in this review article in terms of improved plant multiplication, disease-free propagation, and genetic preservation.**

A superior potting media was sphagnum moss rather than sand-peat combinations. Larger plants were generated by single-node cuttings from the highest point of the stem, just below the leaves, than by cuttings from basal nodes. The diameters and lengths of cuttings were directly correlated with the height of plants 117 days after planting. Additionally, cutting length has an indirect relationship with the amount of time needed for emergence. Greater plants were formed from cuttings that were pushed into the potting medium than from cuttings that were buried three inches deep. The treatments were well-tolerated by all the Dieffenbachia types, although D. amoena grew more quickly than D. picta, D. picta 'Exotica,' and D. picta cv. Rudolph Roehrs.

Keywords: Dieffenbachia, Review, Tissue culture, Multiplication, Indirect regeneration.

Introduction:

A tropical plant species from the Americas known as Dieffenbachia picta cv. Rudolph Roehrs is renowned for its colourful and patterned leaves. The creation of micropropagation techniques to get around the drawbacks of conventional propagation techniques was sparked by the plant's commercial significance. Numerous advantages of micropropagation include quick growth, the creation of disease-free plants, and the retention of desired characteristics.

One of the most significant genera of tropical decorative leaf plants is Dieffenbachia. For its ornamental appeal, ease of growing, and tolerance of indoor settings, it is widely appreciated (Henny et al., 2000). Cuttings can be used to propagate Dieffenbachia, however the poor rate of this traditional mode of propagation has constrained its growth and extensive application. Therefore, quick clonal multiplication as well as the prevention of pathogens and disease transmission, particularly Erwinia spp. infection, which is difficult to control with chemicals and results in slow growth rate and quality loss (Paola et al., 1986), could be greatly benefited by rapid in vitro propagation (Torres, 1989). Dieffenbachia in vitro propagation is preferred for a second reason: the resulting plants have a tendency to spread out more freely at first. According to Voyiatzi&Voyiatzis (1989), this is a desirable trait that raises the market value of plants.

The Araceae genus Dieffenbachia may be the most poisonous one. The toxicity has been linked to calcium oxalate crystals, a protein, and a nitrogen-free substance, although the strength of the evidence is questionable. The plants have also been employed as punishment, food, medicine, and stimulants.

Micropropagation Techniques:

2.1. Explant Selection and Sterilization: The selection of appropriate explants, such as shoot tips or nodal segments, is crucial for successful micropropagation. The explants are subjected to surface sterilization using disinfectants to eliminate contaminants and ensure a sterile culture environment.

The type of explants or the physiological stage of the donor plant at the moment of excision determines how a culture is initiated. The kind of explant depends on the micropropagation goal. Dieffenbachia was in vitro cultivated utilising a variety of explants and direct or indirect organogenesis. As with other plants, axillary branching utilising an axillary bud and stem node is the most popular explant method used for Dieffenbachia direct shoot propagation.

2.2. Media Composition and Culture Conditions: The choice of culture media and growth regulators significantly influences the efficiency of micropropagation. A balanced nutritional media that is supplemented with hormones that control plant growth, such as auxins and cytokinins, encourages the growth of roots and shoots. To get the best growth and multiplication rates, culture factors like as temperature, light intensity, photoperiod, and humidity must be optimised.

2.3. Shoot Multiplication: Shoot multiplication is a critical step in micropropagation, as it allows for the rapid production of a large number of uniform plantlets. Multiple techniques, such as axillary bud proliferation, adventitious shoot formation, and somatic embryogenesis, have been employed successfully for Dieffenbachia picta cv. Rudolph Roehrs

Fig. 1 Multiple Shoot from a single node

2.4. Rooting and Acclimatization: The rooting stage involves the induction and development of adventitious roots on micropropagated shoots. Auxins, such as indole-3-butyric acid (IBA) or indole-3-acetic acid (IAA), can be added to the rooting media to promote the production of roots. Acclimating plantlets to ex vitro settings after roots is essential for their effective establishment and development in a greenhouse or field environment.

Fig.2 Dieffenbachia plantlet in a jar suitable for acclimatization

An essential step in Dieffenbachia micropropagation research is the transfer of in vitroregenerants to external settings. The primary goal of the commercial species sector is the production of healthy plants and novel kinds. It was claimed that regenerated plants

were successfully acclimated to potting soil in greenhouses.

Advantages of Micropropagation:

3.1. Rapid Multiplication:

Micropropagation techniques allow for the production of a large number of uniform plantlets within a short period. This rapid multiplication provides a consistent and cost-effective means to meet the market demand for Dieffenbachia picta cv. Rudolph Roehrs.

3.2. Disease-Free Propagation:

Micropropagation offers a controlled and sterile environment, minimizing the risk of pathogen contamination. To ensure the development of healthy and vigour stock for commercial reasons, disease-free plants can be obtained through meristem culture or shoot tip culture.

3.3. Genetic Preservation: The retention of desired qualities, like as leaf variegation patterns and growth characteristics, is made possible through micropropagation. Because micropropagation is clonal, the genetic make-up of the replicated plants stays the same as the parent plant, maintaining the desired characteristics.

Challenges and Future Directions:

Despite its many benefits, Dieffenbachia picta cv. Rudolph Roehrsmicropropagation has several drawbacks. Further study is required to improve techniques for the effective micropropagation of some cultivars since they can be resistant to in vitro propagation. Additionally, somaclonal variation can cause genetic variability over time, emphasising the significance of routinely monitoring and maintaining stock cultures.

The use of cutting-edge methods such somatic embryogenesis, genetic engineering to improve traits, and the fusion of micropropagation with other biotechnological tools to increase efficiency and production are some of the future approaches in the micropropagation of Dieffenbachia picta cv. Rudolph Roehrs.

Conclusion:

Micropropagation is a useful method for increasing the productivity of Dieffenbachia picta cv. Rudolph Roehrs production. It overcomes the drawbacks of conventional propagation techniques by providing quick multiplication, disease-free propagation, and retention of desired features. As the demand for Dieffenbachia picta cv. Rudolph Roehrs rises, micropropagation's function in guaranteeing a steady supply of healthy, high-quality plants becomes more and more important. The success and expansion of the ornamental horticulture sector will be facilitated by ongoing research and technology developments that will further optimise micropropagation procedures.

Tissue culture makes it possible to grow a lot of material, which makes rigorous selection possible. About 156 ornamental taxa, including Begonia, Ficus, Anthurium, Codiaeum, Chrysanthemum, Rosa, Saintpaulia, Gerbera, and Spathiphyllum, have been subjected to tissue culture procedures. Additionally, tissue culture plays a significant role in enhancing the productivity and quality of the plantlets generated in ornamental breeding programmes. As a result, given the findings in Table 1, there is no justification for not using tissue culture in commercial Dieffenbachia propagation. However, it is still challenging to develop and improve ideal growth conditions for Dieffenbachia in vitro. Because of this, there will continue to be a pressing need for in-depth research into the fundamental tissue culture techniques for Dieffenbachia spp. plants.

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