

IN-VITRO MICROPROPAGATION OF SWISS CHEESE PLANT (*monstera deliciosa*) USING NODAL EXPLANTS

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Abstract

The present investigation was carried out to standardize an efficient in-vitro micropropagation protocol for Swiss Cheese Plant (*Monstera deliciosa*) using nodal explants. Healthy mother plants were collected from Sanket Nursery, Vakodi, Tal.-Rahata, Dist.-Ahilyanagar, and Maharashtra. Nodal segments were excised and subjected to surface sterilization treatments using 0.1% Bavistin, Tween-20, and sodium hypochlorite under aseptic conditions. The sterilized explants were cultured on Murashige and Skoog (MS) medium supplemented with different concentrations of Benzyl Amino Purine (BAP) and Naphthalene Acetic Acid (NAA) for shoot initiation. The best response for shoot initiation was observed on MS medium fortified with 1.0 mg/l BAP and 1.5 mg/l NAA, where maximum survival percentage and shoot elongation were recorded after five weeks of inoculation. For shoot multiplication and rooting, different concentrations of Thidiazuron (TDZ) were evaluated. Among the treatments, MS medium containing TDZ at 15 µl/l produced the highest number of shoots and better root development. The developed protocol can be effectively utilized for rapid mass multiplication and production of disease-free planting material of *Monstera deliciosa*.

Keywords: *Monstera deliciosa*, Micropropagation, Tissue culture, Nodal explants, BAP, NAA, TDZ

Introduction

Plant tissue culture is an important biotechnological tool used for rapid multiplication, conservation, and production of disease-free plants under controlled aseptic conditions. The technique involves culturing plant cells, tissues, or organs on artificial nutrient media supplemented with growth regulators. Micropropagation has become one of the most efficient methods for large-scale multiplication of ornamental and horticultural crops.

Swiss Cheese Plant (*Monstera deliciosa*), belonging to the family Araceae, is one of the most popular ornamental foliage plants worldwide. The plant is native to tropical forests of southern Mexico and Central America and is extensively cultivated as an indoor ornamental due to its attractive perforated leaves. Conventional propagation through stem cuttings and seeds is slow and often results in limited multiplication. Therefore, tissue culture techniques provide an effective alternative for rapid and large-scale multiplication.

In addition to its ornamental value, *Monstera deliciosa* possesses medicinal and ecological importance. The plant contains several phytochemicals such as flavonoids, glycosides, alkaloids, and phenolic compounds that exhibit antioxidant, antibacterial, antifungal, and anti-inflammatory activities. Due to increasing commercial demand and slow conventional propagation, development of a standardized in-vitro propagation protocol is essential.

The present study was undertaken to evaluate the effect of different hormonal concentrations on shoot initiation, multiplication, and rooting of *Monstera deliciosa* using nodal explants.

Materials and Methods

Plant Material: - Healthy and disease-free mother plants of *Monstera deliciosa* were collected from Sanket Nursery, Vakodi, Tal.-Rahata, Dist.-Ahilyanagar, and Maharashtra. Nodal segments were used as explants for culture initiation.

Surface Sterilization of Explants:- The explants were washed thoroughly under running tap water for 10–15 minutes followed by repeated washing with distilled water. The explants were treated with 0.1% Bavistin overnight and washed with sterile distilled water. Further sterilization was carried out using Tween-20 for 5 minutes followed by sodium hypochlorite treatment for 4 minutes. Finally, explants were rinsed several times with sterile distilled water.

Preparation of Culture Medium: - Murashige and Skoog (MS) medium was used as the basal medium. The medium was supplemented with 3% sucrose and solidified with 0.8% agar. The pH was adjusted to

5.6–5.8 before autoclaving at 121°C and 15 psi pressure for 15–20 minutes.

Hormonal Treatments: - For shoot initiation, nodal explants of *Monstera deliciosa* were cultured on Murashige and Skoog (MS) medium supplemented with a constant concentration of BAP (1.0 mg/l) in combination with varying concentrations of NAA (0.5, 1.0, 1.5, 2.0, 2.5, and 3.0 mg/l). The cultures were maintained under controlled environmental conditions and evaluated for shoot initiation, survival percentage, and shoot growth. For shoot multiplication and rooting, healthy shoots obtained from the initiation stage were transferred to MS medium supplemented with different concentrations of Thidiazuron (TDZ) at 10, 15, 20, and 25 µl/l. The cultures were observed for shoot proliferation, shoot elongation, and root development. Among the various treatments tested, MS medium containing 1.0 mg/l BAP and 1.5 mg/l NAA was found to be most effective for shoot initiation, while TDZ at 15 µl/l showed superior performance for shoot multiplication and rooting in *Monstera deliciosa*. All inoculations were carried out under aseptic conditions in a laminar airflow cabinet. The inoculated cultures were incubated under controlled environmental conditions.

Results and Discussion

Shoot Initiation

Nodal explants of *Monstera deliciosa* cultured on MS medium supplemented with different concentrations of BAP and NAA exhibited varying responses for shoot initiation. Among the treatments evaluated, the combination of 1.0 mg/l BAP and 1.5 mg/l NAA produced the best results, with 8 out of 10 inoculated explants surviving and achieving the maximum shoot length of 3.7 cm. The medium containing 1.0 mg/l BAP and 2.0 mg/l NAA also showed a good response, with 6 surviving explants and an average shoot length of 3.4 cm. Lower concentrations of NAA resulted in reduced shoot initiation and growth, while the treatment containing 1.0 mg/l BAP and 0.5 mg/l NAA failed to produce any surviving cultures. The results indicate that the combination of 1.0 mg/l BAP and 1.5 mg/l NAA was the most effective hormonal treatment for shoot initiation and early shoot development in *Monstera deliciosa*.

Shoot Multiplication: - Different concentrations of TDZ significantly influenced shoot multiplication in *Monstera deliciosa*. The highest shoot multiplication response was observed on MS medium supplemented with 15 µl/l TDZ, which produced an average of 3 shoots per explants with the maximum shoot length of 3.5 cm and healthy green coloration. The medium containing 10 µl/l TDZ also produced 3 shoots per explants however; the shoots were comparatively shorter (2.4 cm) and exhibited a yellowish-green appearance. Higher concentrations of TDZ (20 and 25

µl/l) resulted in reduced shoot proliferation and shoot elongation, producing only 2 shoots per explants with shoot lengths of 2.7 cm and 1.2 cm, respectively. These results indicate that TDZ at 15 µl/l was the most effective concentration for promoting shoot multiplication and healthy shoot growth in *Monstera deliciosa* fig No 1.

Rooting: - Rooting of regenerated shoots was successfully achieved on MS medium supplemented with different concentrations of TDZ. Among the treatments tested, TDZ at 15 µl/l exhibited the best rooting response, producing healthy roots with improved survival and growth of plantlets fig No

1.

		
Shoot initiation BAP1.0mg/l+NAA1.5 mg/l	Shoot initiation BAP1.0mg/l+NAA2.0 mg/l	Shoot Multiplication MS Media + TDZ 15µl/l
		
Shoot Multiplication MS Media +TDZ 20µl/l	Shoot Multiplication MS Media +TDZ 25µl/l	Rooting after 6 week MS Media + TDZ 15µl/l

Fig. No.-1:-Results of shoot initiation, Multiplication and rooting

Conclusion

The present investigation successfully established an efficient micropropagation protocol for *Monstera deliciosa* using nodal explants. Surface sterilization using Bavistin, Tween-20, and sodium hypochlorite was effective in obtaining contamination-free cultures. MS medium supplemented with 1.0 mg/l BAP and 1.5 mg/l NAA proved most effective for shoot initiation. For shoot multiplication and rooting, TDZ at 15 µl/l gave superior results with better shoot elongation and root formation. The rooted shoots remained vigorous and showed further development during the culture period. The enhanced rooting response observed at this concentration suggests that TDZ plays an important role in root induction and overall plantlet establishment. The findings of the present study are in agreement with the results reported by Fonnesebech *et al.* (1980), who demonstrated successful in-vitro propagation of *Monstera deliciosa* using growth regulators. Similar observations regarding cytokinin-mediated shoot proliferation and growth enhancement were also reported by Di Benedetto and De Lojo (2014). The standardized protocol developed in the present study can be effectively used for rapid mass multiplication and commercial production of disease-free planting material of Swiss Cheese Plant.

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