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Evaluation of Morphogenic Response and Optimization of Micropropagation in Physalis peruviana

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Abstract: The species Physalis peruviana is of significant agronomic and nutritional interest due to its high content of bioactive compounds and adaptability to diverse environmental conditions. In this context, in vitro culture represents an efficient method for rapid propagation and production of pathogen-free plant material. The present study aimed to evaluate the morphogenic response of different explant types and to optimize the in vitro micropropagation protocol.

Nodal and leaf explants were cultured on Murashige and Skoog (MS) medium supplemented with various concentrations of cytokinins (BAP) and auxins (IBA/NAA). The evaluated parameters included regeneration rate, number of shoots per explant, and rooting capacity. The results highlighted a significant influence of hormonal balance on organogenesis, with BAP stimulating shoot proliferation, while auxins promoted root formation.

Optimization of culture conditions resulted in the development of an efficient micropropagation protocol, with practical applications in the large-scale production of high-quality planting material.

Key words: *Physalis peruviana*, *in vitro* culture, micropropagation, organogenesis, plant growth regulators, explants

• Introduction

Physalis peruviana (*Cape gooseberry*) is a valuable species from the Solanaceae family, appreciated for its high nutritional and medicinal value due to the presence of vitamin C, carotenoids, polyphenols and flavonoids. In recent years, interest in its cultivation has increased because of its adaptability and growing demand for functional foods (Ramadan, 2011; Fischer et al., 2014). Conventional propagation through seeds presents limitations such as high genetic variability and non-uniform plant material. Therefore, in vitro culture techniques represent an efficient alternative for rapid clonal propagation and production of disease-free plants (George et al., 2008).

The success of in vitro regeneration depends mainly on explant type and the balance between cytokinins and auxins, which regulate shoot proliferation and root induction. The present study aimed to evaluate the morphogenic response of different explants of Physalis peruviana and to optimize the micropropagation protocol under in vitro conditions.

• Material and method

The biological material consisted of Physalis peruviana plants obtained from certified seeds. Seeds were surface sterilized using ethanol (70%) and sodium hypochlorite (1.5%), then inoculated on Murashige and Skoog (MS) medium for aseptic germination.

After four weeks, nodal segments and leaf explants were excised and cultured on MS medium supplemented with sucrose (30 g/L), agar (6–7 g/L), and different concentrations of plant growth regulators.

For shoot induction and multiplication, 6-benzylaminopurine (BAP) was used at 0.5, 1.0 and 2.0 mg/L. Root induction was performed using indole-3-butyric acid (IBA) at 0.5 and 1.0 mg/L, and naphthaleneacetic acid (NAA) at 0.5 mg/L.

Cultures were maintained at 24 ± 2°C under a 16 h photoperiod. After 4 and 6 weeks, regeneration percentage, shoot number, shoot length and rooting percentage were recorded and statistically analyzed.

• Conclusions

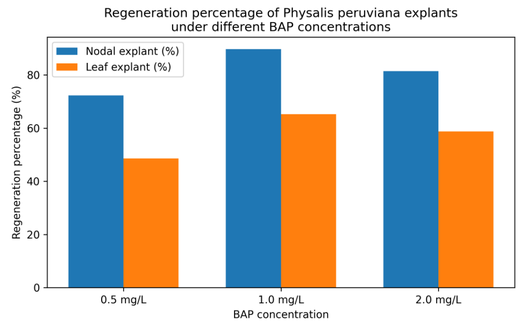
Nodal explants showed superior morphogenic potential compared to leaf explants, ensuring higher regeneration and shoot proliferation rates. The optimal concentration for shoot induction and multiplication was 1.0 mg/L BAP, while IBA at 1.0 mg/L provided the best rooting response. The results highlight the importance of hormonal balance in in vitro regeneration and demonstrate that the developed protocol can be successfully applied for rapid micropropagation of *Physalis peruviana*.

• Results and discussions

The morphogenic response of Physalis peruviana was significantly influenced by explant type and plant growth regulator concentrations.

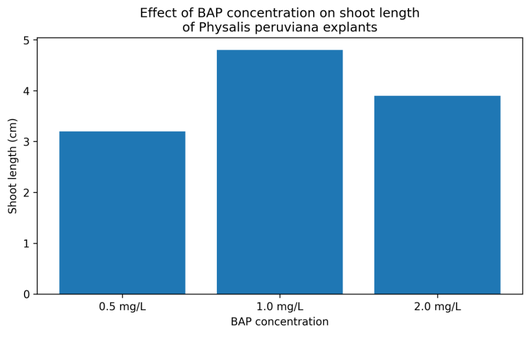
Regeneration percentage

The highest regeneration percentage (89.7%) and shoot proliferation (5.4 shoots/explant) were obtained on MS medium supplemented with 1.0 mg/L BAP. Higher cytokinin concentrations slightly reduced regeneration and shoot elongation, suggesting inhibitory effects on morphogenesis.



Shoot length

Maximum shoot length (4.8 cm) was also recorded at 1.0 mg/L BAP, indicating an optimal hormonal balance between cell division and elongation. Similar responses have been reported in other Solanaceae species (George et al., 2008; Fischer et al., 2014).



Rooting percentage

For rooting, IBA proved more effective than NAA, with the highest rooting percentage (91.2%) obtained at 1.0 mg/L IBA. The results confirm the important role of plant growth regulators in controlling in vitro regeneration and micropropagation efficiency.