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Micropropagation: A Novel Technique for Propagation of Horticulture Crops

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ARTICLE ID: 39

Abstract

Micropropagation or tissue culture has revolutionized horticulture crop propagation by enabling rapid multiplication in a controlled environment. This technique involves growing plant cells or tissues in a nutrient medium under sterile conditions. Its advantages include rapid multiplication of elite varieties year-round, disease elimination, and maintaining genetic stability. Micropropagation conserves space, making it suitable for commercial production in limited areas, and preserving rare varieties. Through growth condition adjustment enhances propagation efficiency. Overall micropropagation ensures speed, disease control, genetic stability, and space efficiency in fruit crop propagation, Its global demands for high-quality produce.

Keywords-: Micropropagation, Horticulture Crop, Multiplication, Artificial, Seasonality, Stability, Space, Conservation, Efficiency.

Introduction

Micropropagation is the artificial method of growing plants vegetatively using tissue or cell culture techniques. Plants are propagated artificially by asexual or vegetative techniques. Plant tissue culture is used for large-scale commercial multiplication of plant materials.Tissue culture-based plant propagation has developed as one of the most important worldwide agro-technologies over the last 30 years. Micropropagation technology is more costly than traditional techniques of plant multiplication and necessitates a variety of abilities. It is a capital-intensive sector. In some circumstances, the unit cost per plant becomes expensive.

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(Mahendra *et.*al.,2020). The fundamental advantage of micropropagation is the speedy creation of high-quality, disease-free, homogeneous planting materials. Plants may be replicated in a controlled setting at any time of year, regardless of season or weather. Production of high quality and healthy planting material of ornamentals, and forest and fruit trees, propagated from vegetative parts, has generated new prospects in worldwide commerce for producers, farmers, and nursery owners, as well as rural jobs (Savangikar,2004). Asexual reproduction via multiplication of vegetative components is the only alternative for in vivo replication of some plants that do not produce functional seeds, such as figs, grapes, and bananas. Clonal propagation has been employed effectively with potatoes, apples, and a wide range of ornamental plants (Idowu, *et* al., 2009).

Stages of Micropropagation: -

Stage 0 - Selection of an explant

This is the first stage of micropropagation. Before being used for culture initiation, the stock plants are carefully selected and developed in regulated circumstances.

Stage I - Culture initiation and establishment

The explants are established in an appropriate culture medium. This stage includes the following steps: Isolate the explant and sterilize its surface.

Wash the explant and place it on the appropriate culture media.

Stage II - Shoot multiplication

This stage is characterized by fast shoot multiplication or somatic embryo development in a specified culture medium.

Stage III - Rooting of the shoots

During this stage, the shoots are put to a medium where they will form roots. Shoots are either placed directly in the soil for root formation or moved to a nutritional medium in the laboratory.

Stage IV - Transfer of plantlets in the greenhouse environment

At this phase, the plantlets have settled into the soil. The shoots from the laboratory are transported to a greenhouse under regulated temperature, humidity, and light conditions (Loberant,et.al, 2010 and Lal,*et al.* 2023).

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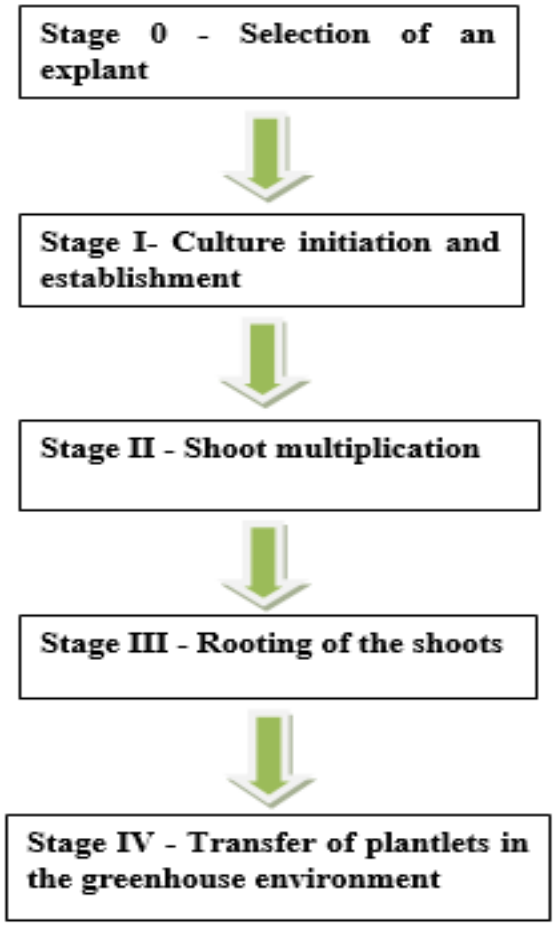

Methods of Micropropagation: -

These artificial process of producing plantlet involves different methods:

1. **Meristem Culture:** This micropropagation method involves placing a subtending leaf primordial and a meristem in their respective growth medium culture and let them to flourish. After a few weeks, an extended rooted plantlet is formed. These plantlets are put into the soil once they have grown to a sufficient height. This approach produces a disease-free plant that may be effectively utilized for the fast reproduction of diverse herbaceous plants like babaco, banana, lulo, papaya, passionfruit, pineapple, plantain and tamarillo (Litz,*et*.,al, 1991)
2. **Callus Culture:** This procedure involves placing chosen plant tissue in an artificial growth media culture until a callus forms. After callus formation, the cells are transferred to a culture medium containing plant growth regulators to induce adventitious organs. After a few weeks, a new plantlet is gradually exposed to the surrounding conditions.

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3. **Suspension Culture/cell culture:** In this micropropagation procedure, cells or groups of cells are distributed and allowed to proliferate in an aerated and sterile liquid culture media.
4. **Embryo Culture:** In the procedure of embryo cultivation, the embryo is harvested and put in a culture medium with sufficient nutrients in aseptic conditions.
5. **Protoplast Culture:** This approach isolates the plant cell and cultures it in a suitable medium to reconstruct the cell wall and callus. Later, given appropriate conditions, the cell forms a cell wall, followed by an increase in cell division and cellular differentiation, and eventually matures into a new plant.
6. **Anther culture/haploid culture:** In this method plant produce free from virus like banana, chilli (Chunling, *et*.al, 1993) potato (Sonnino, 1984), strawberry (Svensson, *et.al)*
7. **Organ culture:** Culture of isolated plant organ (Torres, 2012)
8. **Micro grafting / budding:** Micrografting protocols have been developed for various fruit crops including almond, apple, cherry, chestnut, *Citrus*, grapes, mulberry, olive, peach, pear, pistacio, walnut, etc.(Hussain, *et.al*, 2014)

Conclusion:

A ground-breaking method in horticulture, micropropagation allows for the quick and large-scale generation of genetically homogeneous, disease-free plants. It provides year-round propagation, rare species conservation, and superior plants with enhanced characteristics. Technological advances are making it more and more feasible, despite obstacles including high starting prices and technical demands. Micropropagation ushers in a new age in horticulture crop propagation by dramatically increasing production, sustainability, and biodiversity conservation. The effect and applications of research and technology will only increase, revolutionizing the horticultural sector as they develop.

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