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What Is Micropropagation?

Micropropagation is the artificial process of producing plants vegetatively through tissue culture or cell culture techniques. In this artificial process of propagation, plants are produced invitro by asexual means of reproduction or by vegetative propagation.

Plants can be produced both asexually i.e, via vegetative parts' multiplication or sexually i.e., seed production. One of the means of asexual reproduction is by multiplying genetic replicas of plants that are referred to as clonal propagation wherein plants can be populated from a single individual through asexual means of reproduction.

For the in vivo propagation of specific plants, **asexual reproduction** via multiplication of vegetative parts is the only resort since they do not generate functional seeds as seen in figs, grapes, bananas etc. Successful application of clonal propagation to the following is observed: potato, apple and many other ornamental plants.

Methods of Micropropagation

These artificial process of producing plantlet involves 5 different methods:

Meristem Culture

In this method of micropropagation, subtending leaf primordial and a meristem is placed into their respective growing media culture and allowed to grow. After some weeks, an elongated rooted plantlet is produced. Once after they reach a considerable height, these plantlets are transferred into the soil. In this method, a disease-free plant can be produced and can be successfully used for rapid multiplication of various herbaceous plants.

Callus Culture

In this method, selected plant tissue is placed in an artificial growing medium culture until the callus is formed. After the production of callus, they are transferred into a culture medium containing **plant growth regulators** for the induction of adventitious organs. After a few weeks, a new plantlet is exposed gradually to the environmental condition.

Suspension Culture

In this method of micropropagation, cells or groups of cells are dispersed and allowed to grow in an aerated and sterile liquid culture medium.

Embryo Culture

In the method of embryo culture, the embryo is extracted and placed into a culture medium with proper nutrient in aseptic condition.

Protoplast Culture

In this method, the plant cell is isolated and cultured in an appropriate medium to reform the cell wall and callus. Later, under suitable conditions, the cell develops a cell wall followed by an increase in cell division and cellular differentiation and grows into a new plant.

Stages of Micropropagation

Stages	Methods Involved
Stage 0	Selection of an explant
Stage I	Culture initiation and establishment
Stage II	Shoot multiplication
Stage III	Rooting of the shoots
Stage IV	Transfer of plantlets in the greenhouse environment

Stage 0

This is the initial stage of micropropagation. The stock plants are selected and grown under controlled conditions before using them for culture initiation.

Stage I

The explants are established in a suitable culture medium. This stage involves the following steps:

- Isolation of the explant
- Surface Sterilization
- Washing
- The explant is established on an appropriate culture medium.

Stage II

This stage involves the rapid multiplication of shoots or rapid somatic embryo formation in a defined culture medium.

Stage III

In this stage, the shoots are transferred to a medium for the development of roots. The shoots are either transferred directly in the soil for the root development or transferred to a nutrient medium in the laboratory.

Stage IV

In this stage, the plantlets are established in the soil. The shoots from the laboratory are transferred to a greenhouse under controlled conditions of temperature, humidity and light.

Advantages of Micropropagation

The micropropagation technique has proved beneficial in many ways. Following are the advantages of micropropagation in plant production:

1. This is an alternative method for vegetative propagation with enhanced multiplication rate.
2. Large quantities of identical plants can be obtained from a single plant tissue within a very short time period.
3. The shoot multiplication has a very short cycle and each cycle results in a logarithmic increase in the number of shoots.
4. The small-sized propagules can be stored and transported easily.
5. The germplasm stocks can be maintained for several years using this technique.
6. It helps in the production and maintenance of pathogen-free plant varieties.
7. In a dioecious plant, the seed progeny yield is 50% male and 50% female. This method helps in obtaining the desired sex of the plant.
8. Millions of plantlets can be maintained in the cultural vials.
9. Genetic uniformity of the propagules can be maintained through this technique.
10. It is a cost-effective process.
11. New varieties of species can be propagated.
12. A requirement of less space and human resources.
13. This method is independent of season and can be carried out anytime.
14. Assists in the regenerating genetically modified cells after protoplast fusion.
15. Often produces healthier plants, leading to quicker growth compared to those plants produced by a conventional method.

Disadvantages of Micropropagation

The disadvantages of micropropagation are given below:

1. The plants produced are not autotrophic.
2. It cannot be implemented in all the crops.
3. The plants find a problem acclimatizing to the natural environment.

Key Points of Micropropagation

- It is the propagation of plants by growing plantlets in tissue culture and then planting it.
- It helps to produce plants with desired characteristics.
- It is a stepwise process in which a large number of plants are produced from a single explant.
- The plants produced are genetically identical to the parent plant.
- The plants are produced in the following stages including the establishment of the explant, multiplication of the explant in a culture medium, transfer of growing shoots into a medium for

shoot development, transferring the plant in the soil for root growth, and allowing the growth and development of plants under optimum conditions.

This was a brief introduction to micropropagation and different methods of micropropagation. Stay tuned with BYJU'S to know more in detail about the various techniques of Plant tissue culture.

