RAMA UNIVERSITY

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FACULTY OF ENGINEERING & TECHNOLOGY

Course: B. Tech Biotechnology
Sub Code: BBT-515

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Sub Name: Plant Biotechnology

LECTURE 5

Dr. NIHARIKA SINGH
Assistant Professor
Dept. of Biotechnology

1. Direct embryogenesis

In direct somatic embryogenesis, cells of explant undergo direct embryogenesis from proembryonic determined cells in absence of callus proliferation.

2. Indirect embryogenesis

In indirect somatic embryogenesis, cells of explant first undergo callus proliferation and embryoids develop within the callus tissue from induced embryonic cells.

Importance of Somatic Embryogenesis

- ✓ The mass production of adventitious embryos in cell culture is still regarded by many as the ideal propagation system.
- ✓ The adventitious embryo is a bipolar structure that develops directly into a complete plantlet and there is no need for a separate rooting phase as with shoot culture.
- ✓ Somatic embryo has no food reserves, but suitable nutrients could be packaged by coating or encapsulation to form some kind of artificial seeds. Such artificial seeds produce the plantlets directly into the field.
- ✓ Unlike organogenesis, somatic embryos may arise from single cells and so it is of special significance in mutagenic studies.
- ✓ Plants derived from asexual embryos may in some cases be free of viral and other pathogens. So it is an alternative approach for the production of disease-free plants.

ADVANTAGES OF MICROPROPOGATION

1. Clonal mass propagation - extremely large numbers of plants can be produced. Rather than getting 10000 plants per year from an initial cutting in vegetative propagation, one can obtain more than 1,000,000 plants per year from one initial explant through micropropagation.

2. Culture is initialized from small parts of plants – so no need of much space: from 1 m2 space in culture room, 20000 - 100000 plants can be produced per year.

3. Production of disease and virus free plantlets. This leads to simplification of international 8 exchange of plants

4. Micropropagation enables growers to increase the production of plants that normally propagate very slowly such as Narcissus and other bulbous crops.

5. Introduction of disease free new cultivars is possible through micropropagation

6. Vegetative propagation of sterile hybrids can be used as parent plants for seed production. Eg. Cabbage

7. One of the rapid methods for cloning of disease free trees.

8. In vitro cultures can be stored for long time through cryopreservation.

9. Breeding cycle can be shortened.

DISADVANTAGES OF MICROPROPOGATION

1. Expensive laboratory equipment and service
2. No possibility of using mechanization
3. Plants are not autotrophic
4. Poor Acclimatization to the field is a common problem
5. Risk of genetic changes if 'de novo' regeneration is used
6. Mass propagation cannot be done with all crops to date. In cereals much less success is achieved
7. Regeneration is often not possible, especially with adult woody plant material.
8. More problems in inducing rooting

APPLICATIONS OF MICROPROPOGATION

1. Clonal mass propagation

The important point here is that extremely large numbers of plants can be produced. Rather than getting 10000 plants per year from an initial cutting, one can obtain upwards of 1,000,000 plants per year from one initial explant.

2. Difficult or slow to propagate plants

Micropropagation enables growers to increase the production of plants that normally propagate very slowly such as narcissus and other bulbous crops.

3. Introduction of new cultivars

For example: Dutch iris. Get 5 daughter bulbs annually. Takes 10 years for commercial quantities of new cultivars to be built up. Can get 100-1000 bulbs per stem section.

4. Vegetative propagation of sterile hybrids

Used as parent plants for seed production. Eg. cabbage.

5. Pathology - Eliminate viruses, bacteria, fungi

Use heat treatment and meristem culture. Used routinely for potatoes, carnation, mum, geranium, garlic, gypsophila

6. Storage of germplasm

Generally the only successful method to date is keeping them in refrigerator. Slows down, but does not eliminate, alterations in genotype.

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