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Center for Smart Agriculture

Applied Hi-Tech Horticulture



Module 2: Micro-propagation
Session 12: Micro-propagation in horticultural crops



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Propagation

Sexual and Asexual propagation: Plants can be propagated by sexual (through generation of seeds) or asexual (through multiplication of vegetative parts) means

Clonal propagation refers to the process of asexual reproduction by multiplication of genetically identical copies of individual plants

In vitro clonal propagation In vitro clonal propagation through tissue culture is referred to as micro propagation.

Micropropagation: Micropropagation is the practice of rapidly multiplying stock plant material to produce a large number of progeny plants, using modern plant tissue culture methods.



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Micropropagation

- Micro-propagation also known as tissue culture, mass propagation, in-vitro culture and cloning.
- It not only provides economy of time and space but also gives greater output and allows further augmentation of elite disease free propagules.
- It is mainly used for banana, orchid, gerbera, many foliage plant.





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Plant Tissue Culture

The culture of plant seeds, organs, tissues, cells, or protoplasts on nutrient media under sterile conditions.



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Why use Tissue culture?

- Propagation through seed is not desire due to cross pollination heterozygous progenies
- Poor germination and low viability of seeds
- Minute seed size and presence of reduced endosperm
- Vegetative propagation is slow and cannot keep pace with increasing demand
- To produce high quality planting material
- Maintain uniform production throughout the year in seasonal floricultural crops
- For the production of new varieties through bio technology and rapid multiplication through tissue culture



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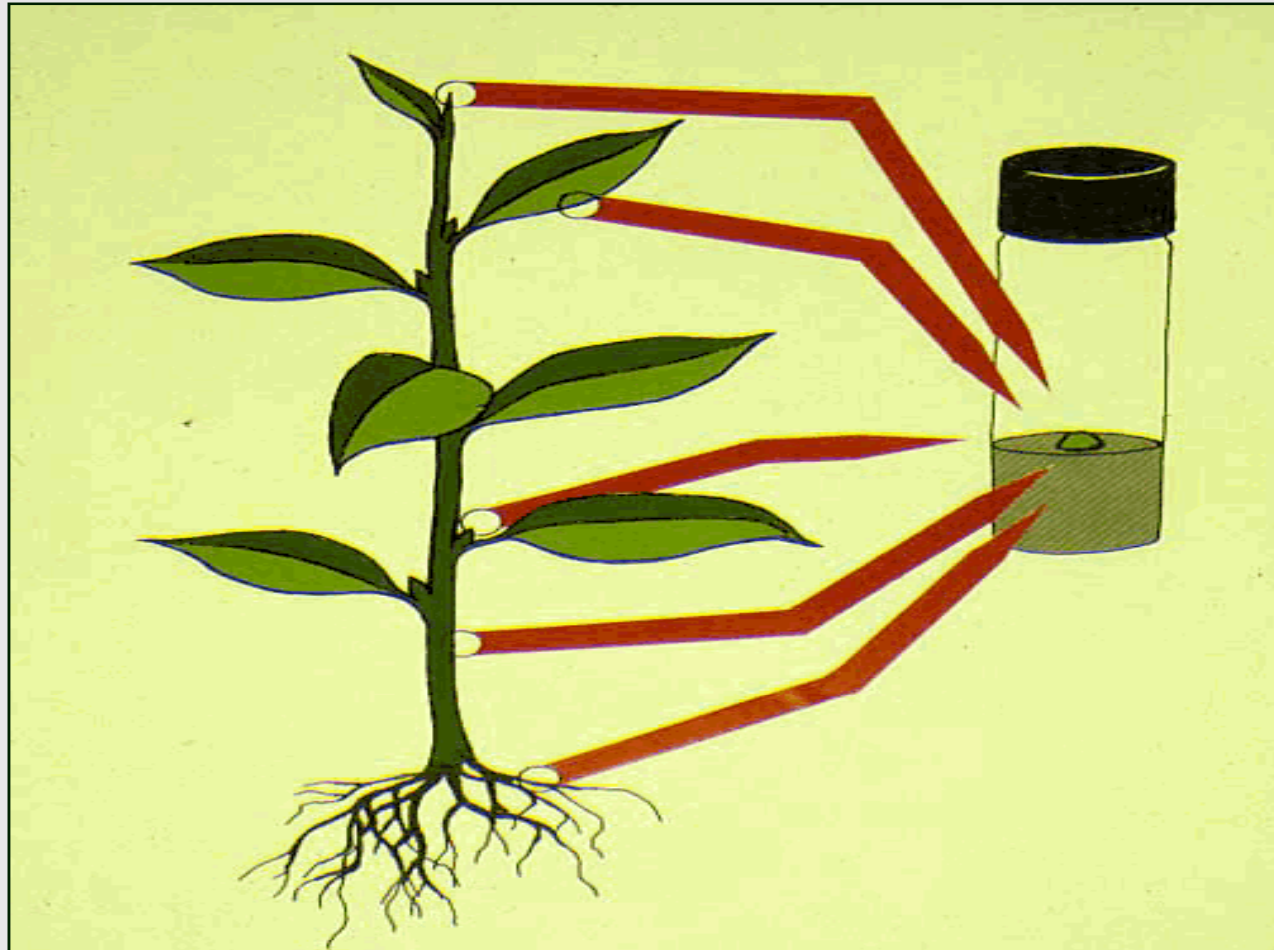
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Application of tissue culture

- ✓ Propagating disease free floricultural crops
- ✓ Through meristem culture- excision of the organized apex of the shoot from a selected donor plant and culture
- ✓ Production of virus free germplasm



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Starting material for micropropagation



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Features of micropropagation

- ✓ Clonal reproduction
- ✓ Multiplication stage can be recycled many times to produce an unlimited number of clones
- ✓ Easy to manipulate production cycles
- ✓ Disease-free plants can be produced



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Selection of planting material

- ✓ Part of plant
- ✓ Genotype
- ✓ Physiological condition
- ✓ Season
- ✓ Position on plant
- ✓ Size of explants



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The Medium and physical environment

- ✓ Minerals
- ✓ Sugar
- ✓ Organic ‘growth factors’
- ✓ Growth regulators
- ✓ Gelling agent
- ✓ Other additives
- ✓ Temperature
- ✓ Moisture
- ✓ Light



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Stages of micropropagation

1. Selection of plant material
2. Establish aseptic culture
3. Multiplication
4. Shoot elongation
5. Root induction / formation
1. 6. Acclimatization



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Steps of Micropropagation

Stage 0-I–Establishment

- Selection of the explants plant
- Sterilization of the plant tissue takes place
- Establishment to growth medium

Stage II - Proliferation

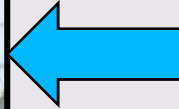
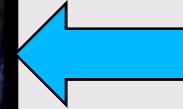
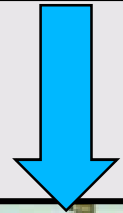
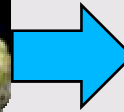
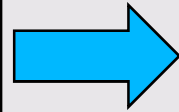
- Transfer to proliferation media
- Shoots can be constantly divided

Stage III – Rooting & Hardening

- Explants transferred to root media
- Explants returned to soil



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**Proliferation via multiple
shoots**

Mother plant

**Mass production via liquid or solid
culture**

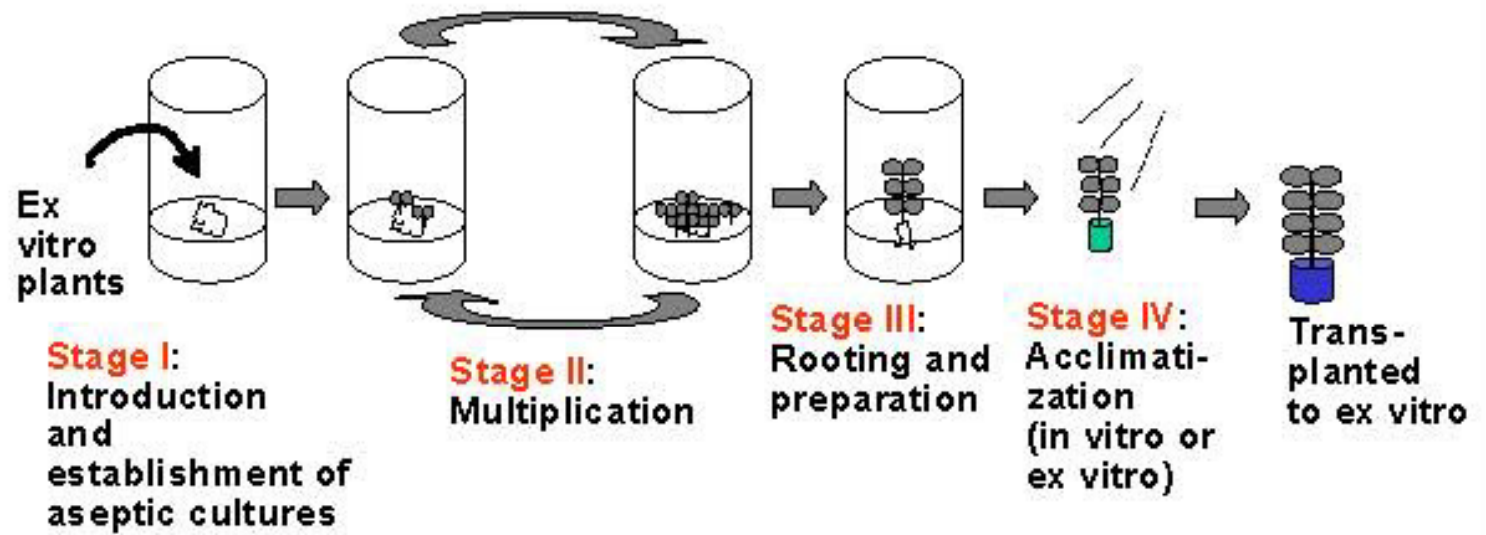
Acclimatization



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Four stages in micropropagation





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Micropropagation

Advantages

- ✓ Precise crop production scheduling
- ✓ Reduce stock plant space
- ✓ Long-term germplasm storage
- ✓ Production of difficult-to-propagate species



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Micropropagation

Advantages

- ✓ Specialized equipments are required.
- ✓ More technical expertise required.
- ✓ Protocols not optimized for all species.
- ✓ Plants produced may not fit industry standards.
- ✓ Relatively expensive to set up.



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THANK YOU

