PLANT TISSUE CULTURE

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What is plant tissue culture

Plant tissue culture is a technique of growing plant cells, tissues, organs, seeds or other plant parts in a sterile environment on a nutrient medium

Applications of plant tissue culture

- The following points highlight the top ten applications of plant cell and tissue culture.
- The applications are:
- 1. Clonal Propagation and Micro-Propagation
- 2. Biomass Energy 3. Secondary Metabolites 4. Genetic Variability 5. Somatic Embryogenesis and Synthetic Seed 6. Breaking Dormancy 7. Haploid Plants 8. Somatic Hybrids 9. Transgenic Plants 10. Germplasm Conservation

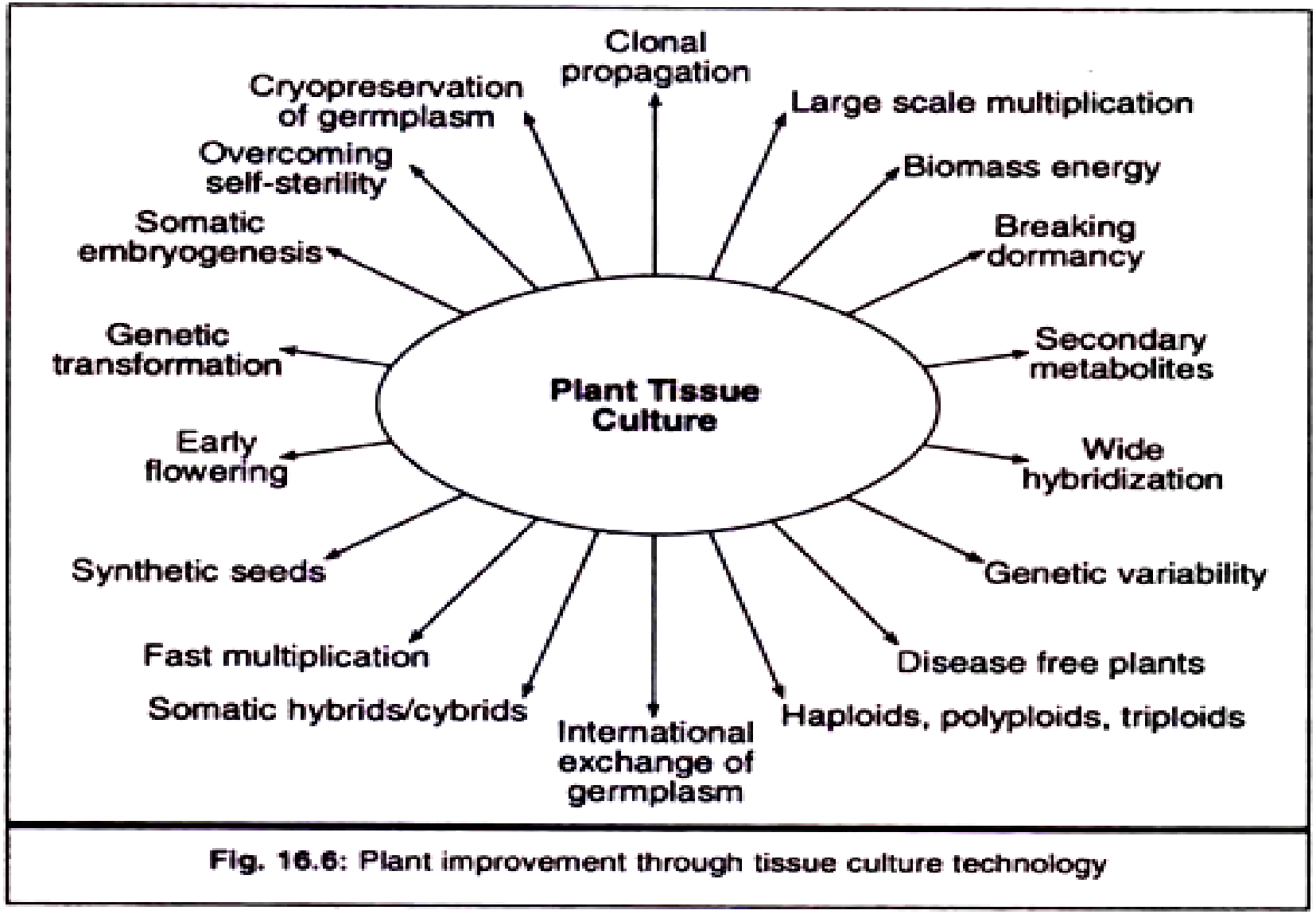


Fig. 16.6: Plant improvement through tissue culture technology

Advantage of plant tissue culture

- The production of clones of plants that produce particularly good flowers, fruits, or have other desirable traits.
- To quickly produce mature plants.
- The production of multiples of plants in the absence of seeds or necessary pollinators to produce seeds.
- The regeneration of whole plants from plant cells that have been genetically modified.

Advantage of plant tissue culture

- The production of plants in sterile containers reduces disease transmission

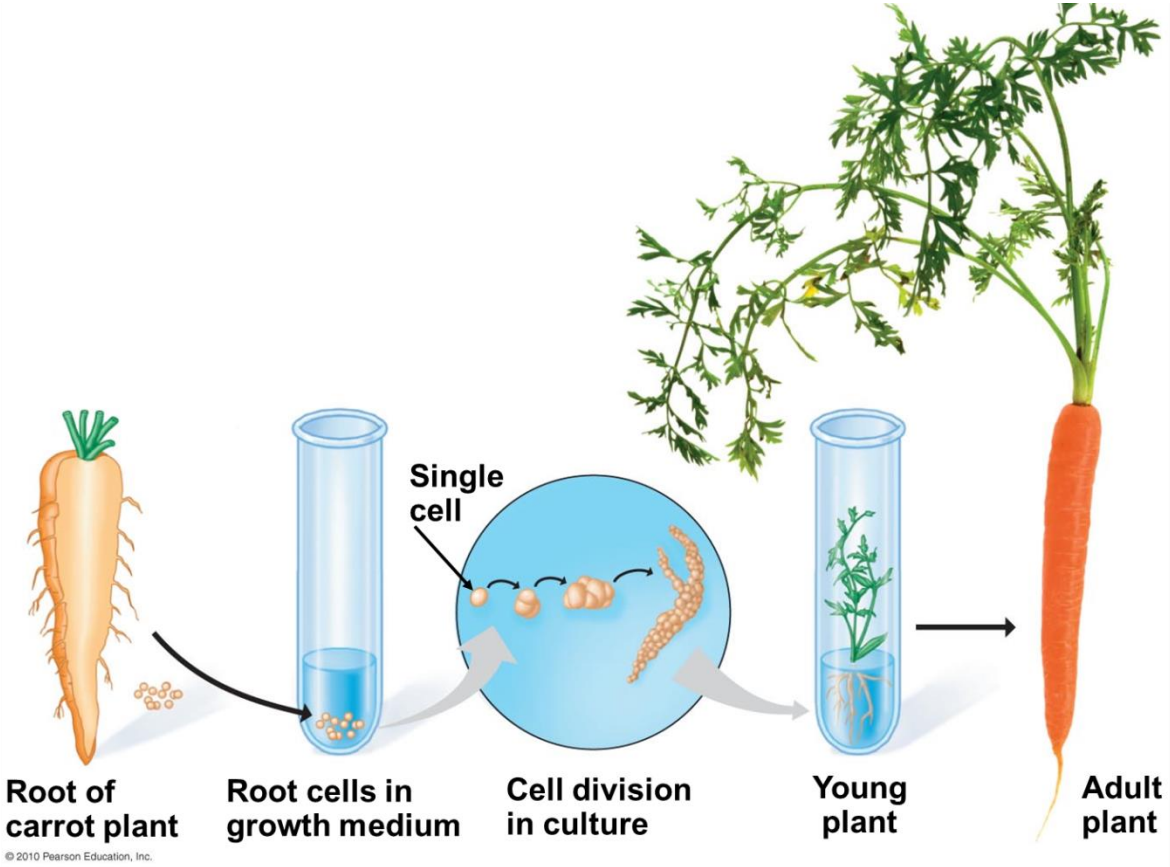
- Allows production of plants from seeds that otherwise have very low chances of germinating and growing, i.e.: orchids and *Nepenthes*.

- To clean particular plants of viral and other infections and to quickly multiply these plants as 'cleaned stock' for horticulture and agriculture.

How

Adult plant cells are **totipotent**

totipotent meaning they have the ability to give rise to a fully differentiated plant. Because of this, it is possible to collect cells from a mature plant and use those cells to produce clones of that plant.



The step of Plant tissue Culture Basics

- Modern plant tissue culture is performed under **aseptic conditions**

- Living plant materials from the environment are naturally contaminated on their surfaces (and sometimes interiors) with microorganisms, so surface sterilization of starting material (**explants**) in chemical solutions (usually alcohol and sodium or calcium hypochlorite is required).

The step of Plant tissue Culture Basics

- Explants are then usually placed on the surface of a solid culture medium, but are sometimes placed directly into a liquid medium, when cell suspension cultures are desired.

- **Culture media** are generally composed of inorganic salts plus a few organic nutrients, vitamins and plant hormones.

The step of Plant tissue Culture Basics

- As cultures grow, pieces are typically sliced off and transferred to new media (subcultured) to allow for growth or to alter the morphology of the culture.

The aims of Plant Tissue Culture Applications

- The commercial production of plants used as potting, landscape, and florist subjects
- To conserve rare or endangered plant species.
- To screen cells rather than plants for advantageous characters, e.g. herbicide resistance/tolerance.
- Large-scale growth of plant cells in liquid culture in bioreactors for production of valuable compounds, like plant-derived secondary metabolites and recombinant proteins used as biopharmaceuticals.

The aims of Plant Tissue Culture Applications

- To cross distantly related species by protoplast fusion and regeneration of the novel hybrid.
- To produce clean plant material from stock infected by viruses or other pathogens.
- Production of identical sterile hybrid species can be obtained