

**Vivekanand College, Kolhapur  
(Autonomous)**

**Department of Botany**

**B.Sc. III**

**TOPIC: PLANT TISSUE CULTURE 2**

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# OBJECTIVES OF PLANT TISSUE CULTURE

- Mass propagation of uniform planting material

A lot of plants produces

If by seed :  
-Cant obtain a uniform planting material  
-Due to seed contains pool of genes

-Phenotypically and genotypically the same.  
-Tissues are taken from any parts of plants such as leaves, roots, and stems

- Disease-resistant plants

Apical bud do not contain any viral or bacterial infection yet. Therefore, this part was taken and cultures and DR plants can be obtained.

-differ from embryo cultured  
-If a plant were to cross between unfavorable plant, the embryo form will be aborted and the seed will drop and eventually died.  
-Therefore, we harvest the embryo before it matures into seed, and cultures them using TC technique.

- Embryo-rescue

- Safe transfer of germplasm across international borders

Some plant aren't clean from pathogen or plant's diseases that will affecting other countries' plant industries.

- To facilitate genetic transformation

-No genetic transformation without TC.  
- We cant introduce gene into plants without TC.

# TOTIPOPOTENCY

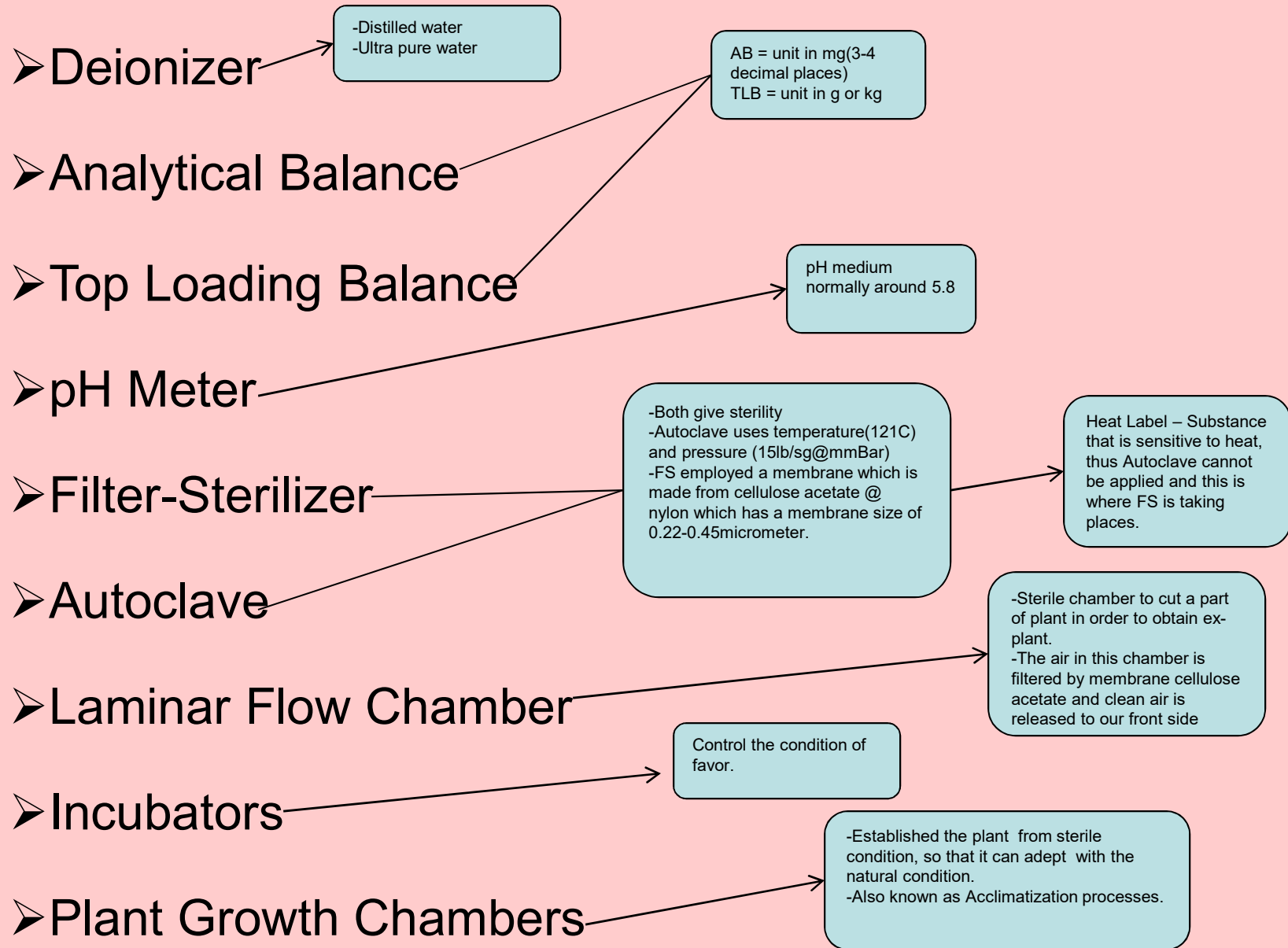
Property of plant cells

The ability of somatic cells of certain plants to undergo embryogenesis / or plantlet regeneration

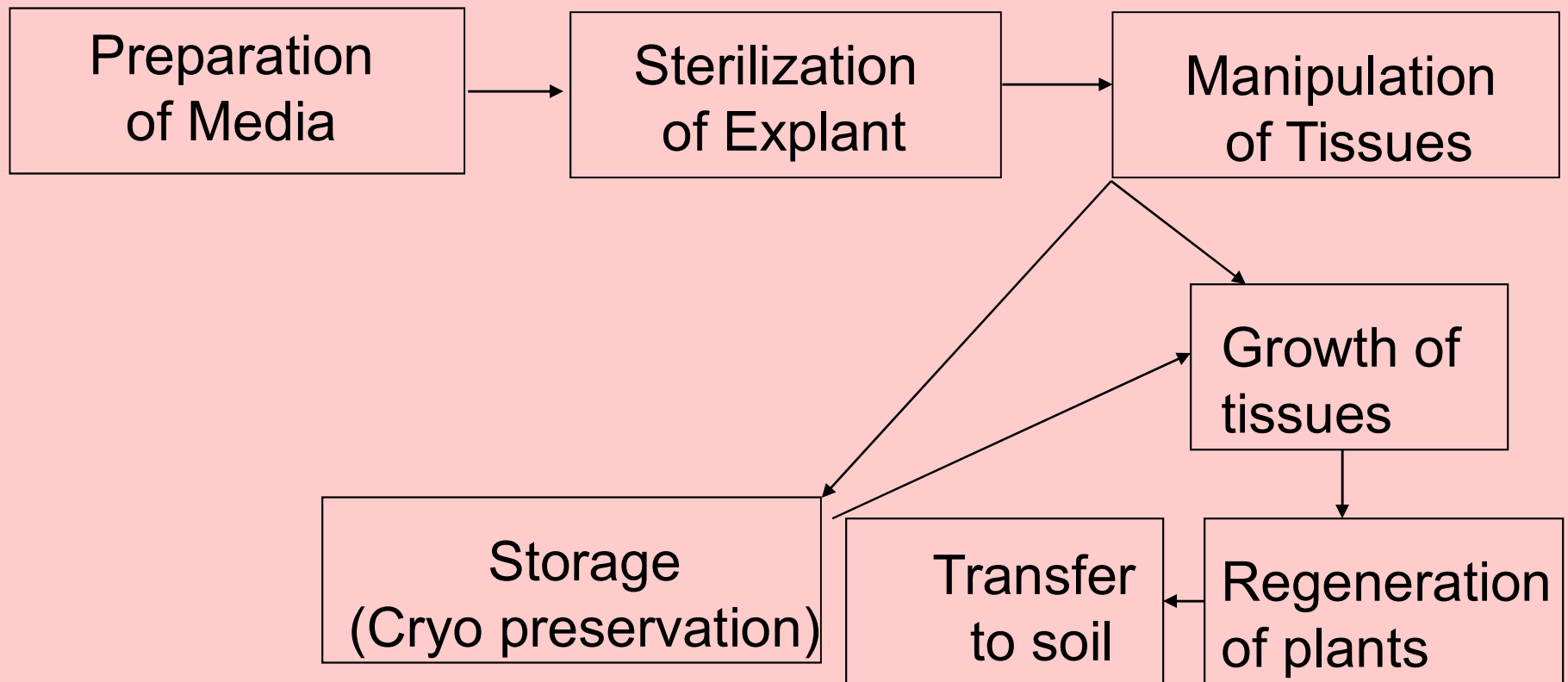
Production and development of embryoids (derived from somatic cells)

Embryos derived from gamete fusion (molecular processes in later stages of development may be identical, e.g. temporal and spatial expression patterns of proteins in somatic and zygotic embryos)

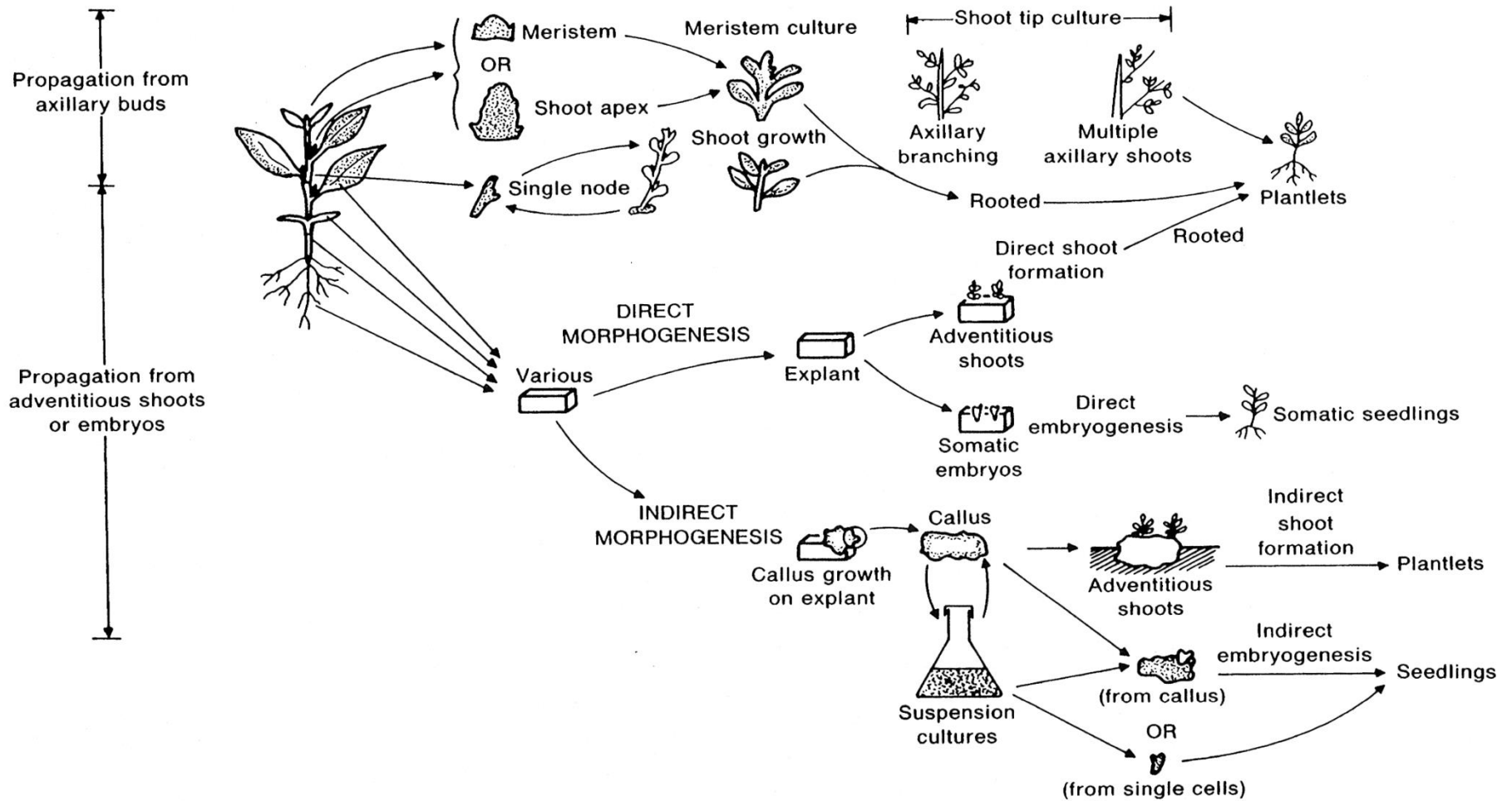
# EQUIPMENTS FOR TISSUE CULTURE



# BASIS OF TISSUE CULTURE



# PRINCIPAL METHODS OF MICROPROPAGATION



# PLANT TISSUE CULTURE TERMS

**Tissue Culture** – The maintenance or growth of tissues *in vitro* in a way that allows for dedifferentiation, differentiation and preservation of their architecture or function or both.

***In vitro*** – Growing cells on a defined medium under sterile conditions.

***In vitro* Propagation** – Propagation of plants in a controlled environment using culture vessels on a defined medium under sterile conditions.

**Clonal Propagation** – Asexual reproduction of plants that are considered to be physiologically and/or genetically uniform and to have originated from a single individual or explant / single cell.

# PLANT TISSUE CULTURE TERMS

**Micropropagation** – Clonal propagation of plants from small explants.

**Anther Culture** – The *in vitro* culture of anthers containing microspores on a defined medium.

**Haploid Plants** – The microspores in the anthers may form haploid callus or develop directly into haploid plants.

**Callus** – An unorganized, proliferative mass of dividing plant cells; a wound response.

**Differentiation** – Development of organization within a tissue to the formation of an organ, shoot or somatic embryo.



# PLANT TISSUE CULTURE TERMS

**Embryogenesis** - The process of embryo-like structure initiation and development.

**Embryoid** – Mass of cells that resembles an embryo (embryo-like structures). Somatic embryoids / Haploid embryoids

**Embryo culture** – *In vitro* development or maintenance of isolated mature or immature embryos.

**Embryo-rescue** – Embryo culture to facilitate recovery of progeny from wild crossing between different species (inter-specific cross).

**Meristem Culture** – *In vitro* culture of apical meristem (dome-like structure), excised from shoot apex.

# PLANT TISSUE CULTURE TERMS

**Morphogenesis** – The evolution of a structure from an undifferentiated to a differentiated state. The growth and development of differentiated structures.

**Organogenesis** – A process of differentiation by which plant organs are formed *de nova* or from preexisting structures of precursor cells.

**Plant regeneration** – The process of recovering plantlets from *in vitro* cultures through organogenesis or embryogenesis.

**Somoclonal variation** – Phenotypic variation, either genetic or epigenetic in origin.

**Suspension culture** – Cells in liquid culture.

# PLANT TISSUE CULTURE TERMS

**Plant Protoplast** – A plant cell from which the entire cell wall has been removed.

**Protoplast fusion** – Technique in which protoplasts are fused into a single cell. (To overcome compatibility barriers)

**Auxins** – A broad class of heterocyclic ringed compounds. Plant growth regulators – IAA, NAA, 2,4-D

**Cytokinins** – A broad class of substituted adenine derivatives. Plant growth regulators – Kinetin, BA, 2iP

**Explant** – Tissue taken from its original site and transferred to an artificial medium for growth or maintenance.