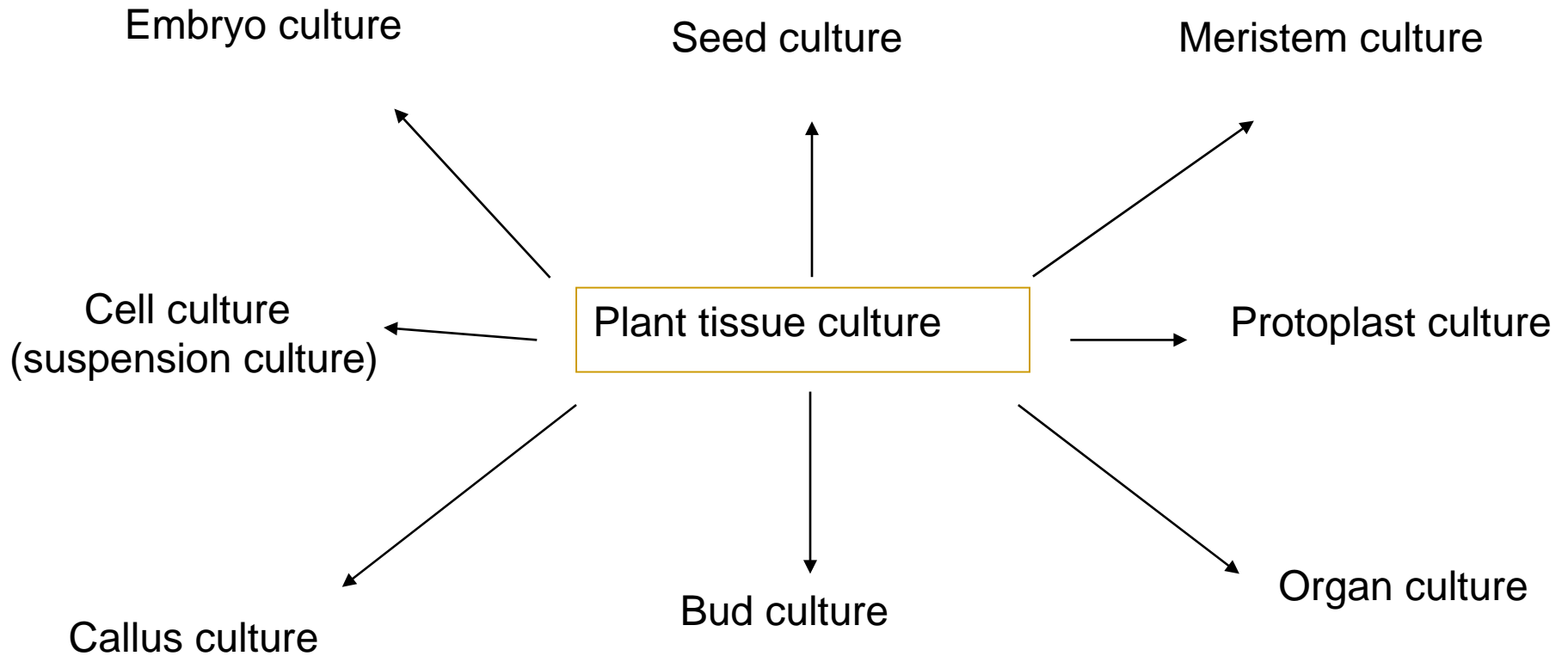


Organ Culture

Types of culture (Explant base)



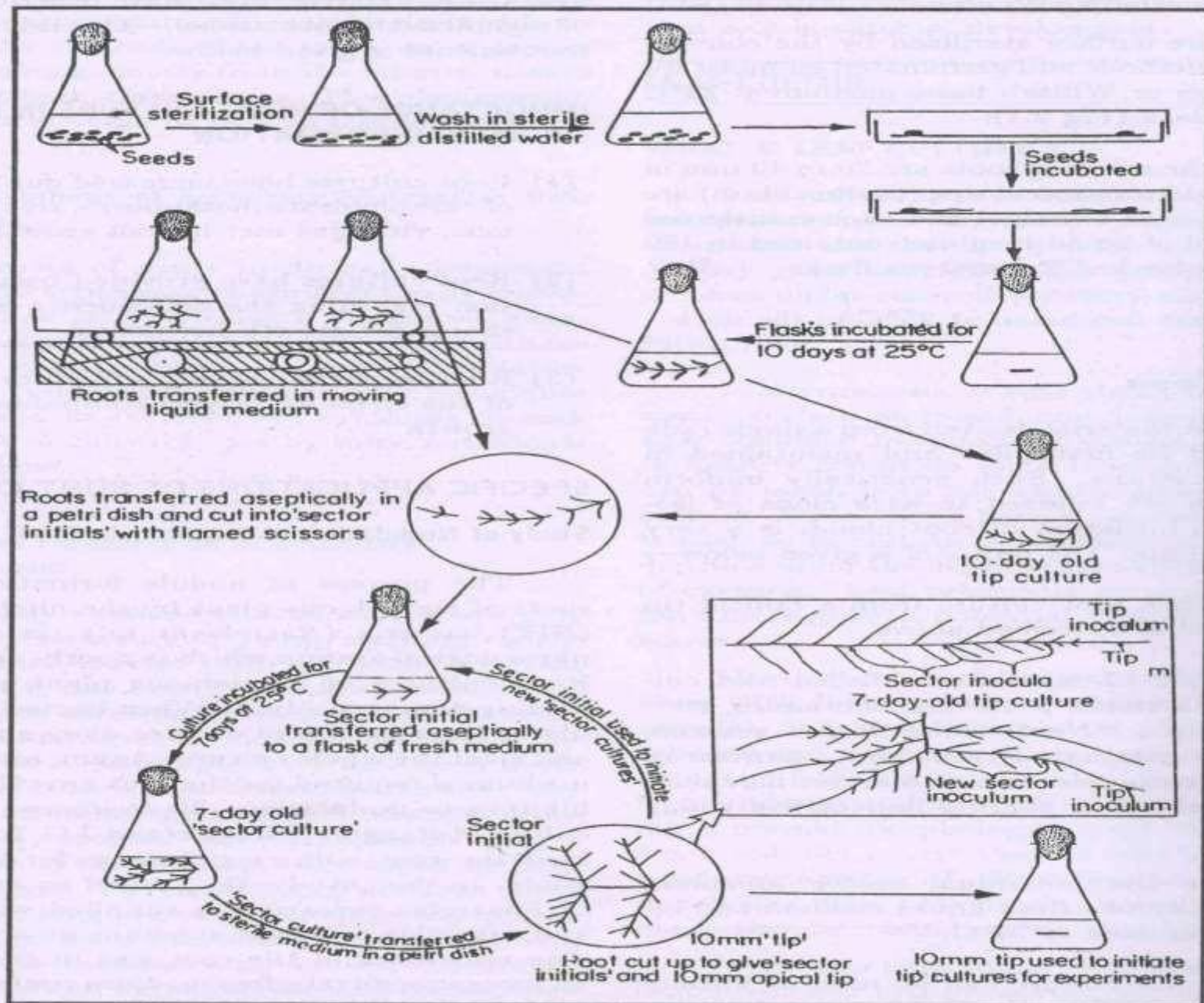
Organ culture

Any plant organ can serve as an explant to initiate cultures

No.	Organ	Culture types
1.	Shoot	Shoot tip culture
2.	Root	Root culture
3.	Leaf	Leaf culture
4.	Flower	Anther/ovary /ovule culture

Root culture

- **Defined as:** The culture of excised radical tips of aseptically germinated seeds in a liquid or solid medium where they are induced to grow independently under controlled condition .
- **Principle:** In vivo plants are not suitable, young seedling are very sensitive to toxic sterilants,.....so ...the excised radical tips of aseptically germinated seeds..



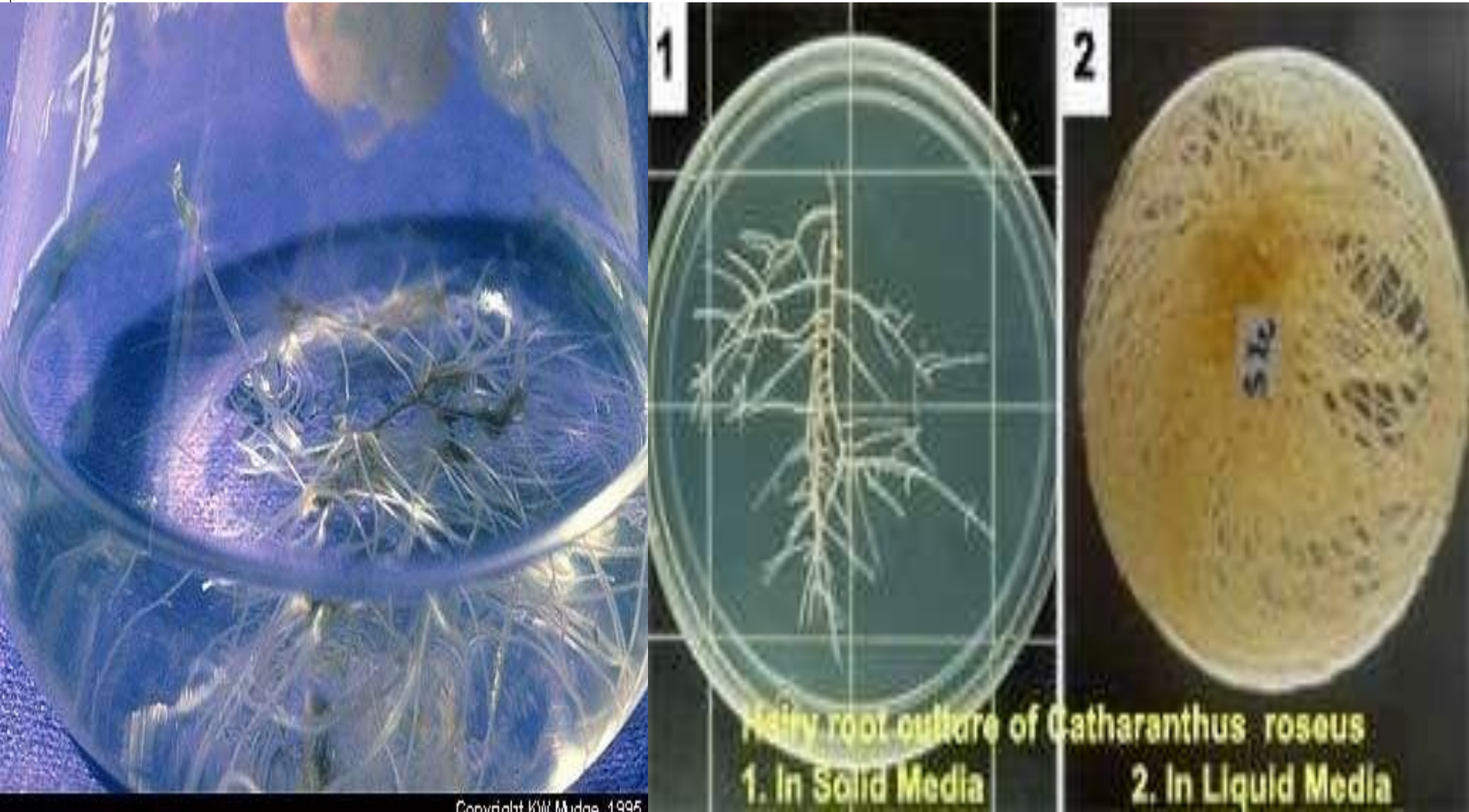
□ Fig 2.1

Procedure for the maintenance of isolated roots in continuous culture

IMPORTANCE

- Knowledge of Carbohydrates metabolism, role of minerals ions, vitamins ...etc in root growth.
- Information regarding the dependence of roots on shoots for growth hormones .
- Study of the effect of various compounds on root growth.

Root organ culture



Hairy root culture of *Catharanthus roseus*
1. In Solid Media
2. In Liquid Media

Advantages of hairy root cultures:

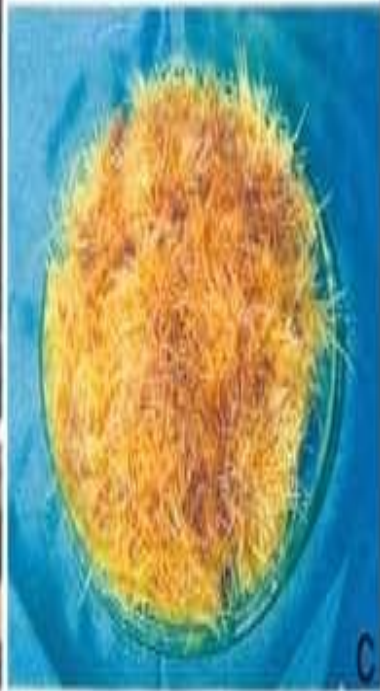
- The hairy root system is genetically and biosynthetically stable
- High production of secondary metabolites.
- The culture can grow under phyto-hormone-free conditions.
- The culture shows fast growth which reduces the culture time and easy the handling

Application of hairy root cultures:

- Functional analysis of genes.
- Study of nodulation of leguminous root in culture.
- Production of secondary metabolites.
- The culture may change the composition of metabolites.
- The culture can be used to regenerate a whole plant.
- Initiation and development of Secondary Vascular tissues.

secondary metabolites produced in root culture

- L-DOPA: a precursor of catecholamines, an important neurotransmitter used in the treatment of Parkinson's disease
- Shikonin: used as an anti-bacterial and anti-ulcer agent
- Anthraquinone: used for dyes and medicinal purpose
- Opiate alkaloids: particularly codeine and morphine for medical purposes
- Berberine: an alkaloid with medicinal uses for cholera and bacterial dysentery
- Valepotriates: used as a sedative
- Ginsenosides: for medicinal purposes
- Rosmarinic acid: for antiviral, suppression of endotoxin shock and other medicinal purposes
- Quinine: for malaria
- Cardenolides or Cardioactive glycosides: for treatment of heart disease



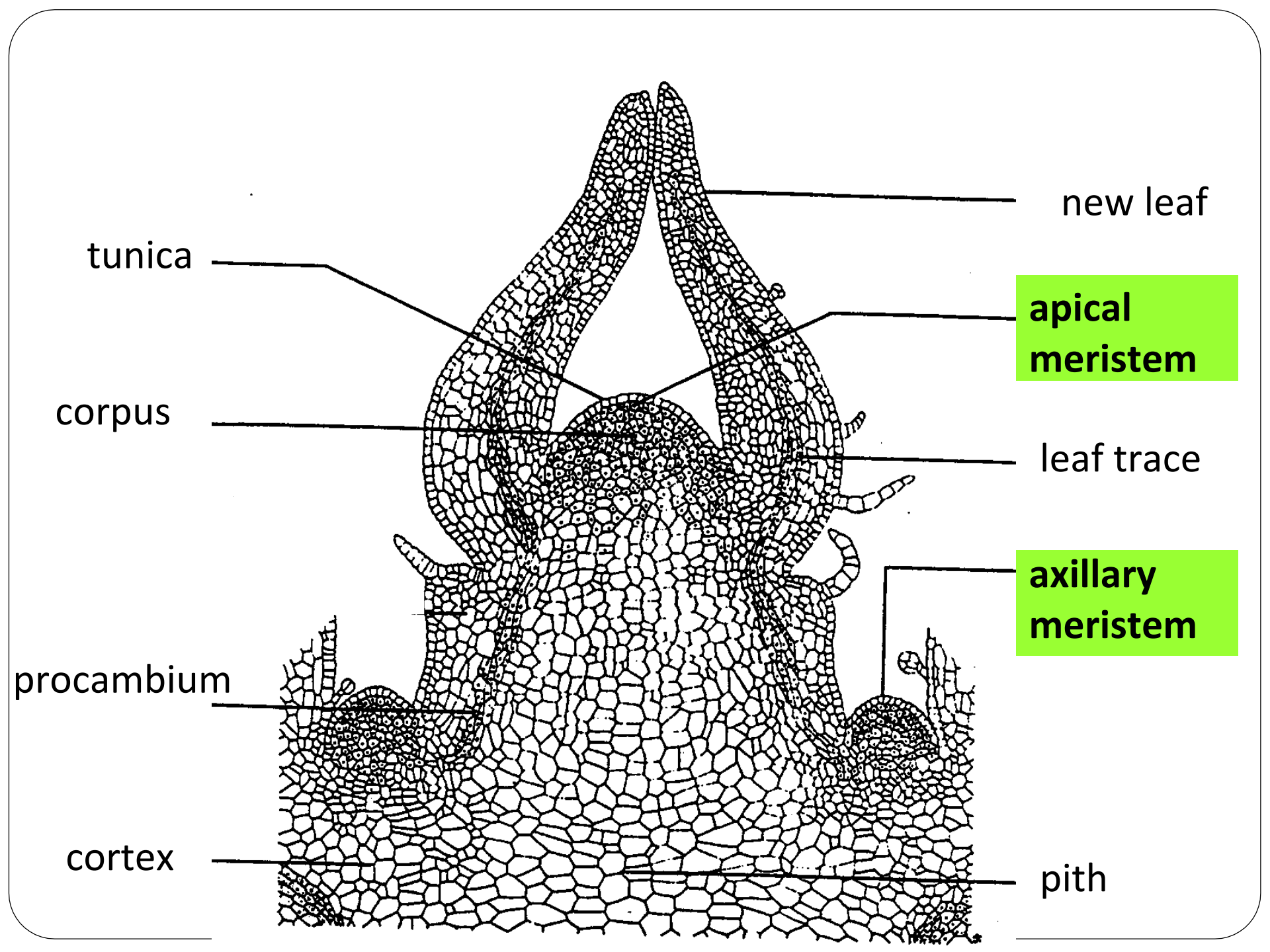
Bubble column with
Hairy roots of *B. vulgaris*

Stirred tank reactor with
suspension culture of
Helianthus annuus

Shoot apical meristem culture

- **Defined as:** The culture of terminal (0.1-1mm) portion of a shoot comprising the meristem(0.05-0.1mm) together with primordial and developing leaves and adjacent stem tissue.
- **Principle:** The excised shoot tips and meristem can be cultured aseptically on agar solidified simple nutrient medium or on paper bridges dipping in liquid medium...with required auxin and cytokinins.





new leaf

tunica

**apical
meristem**

corpus

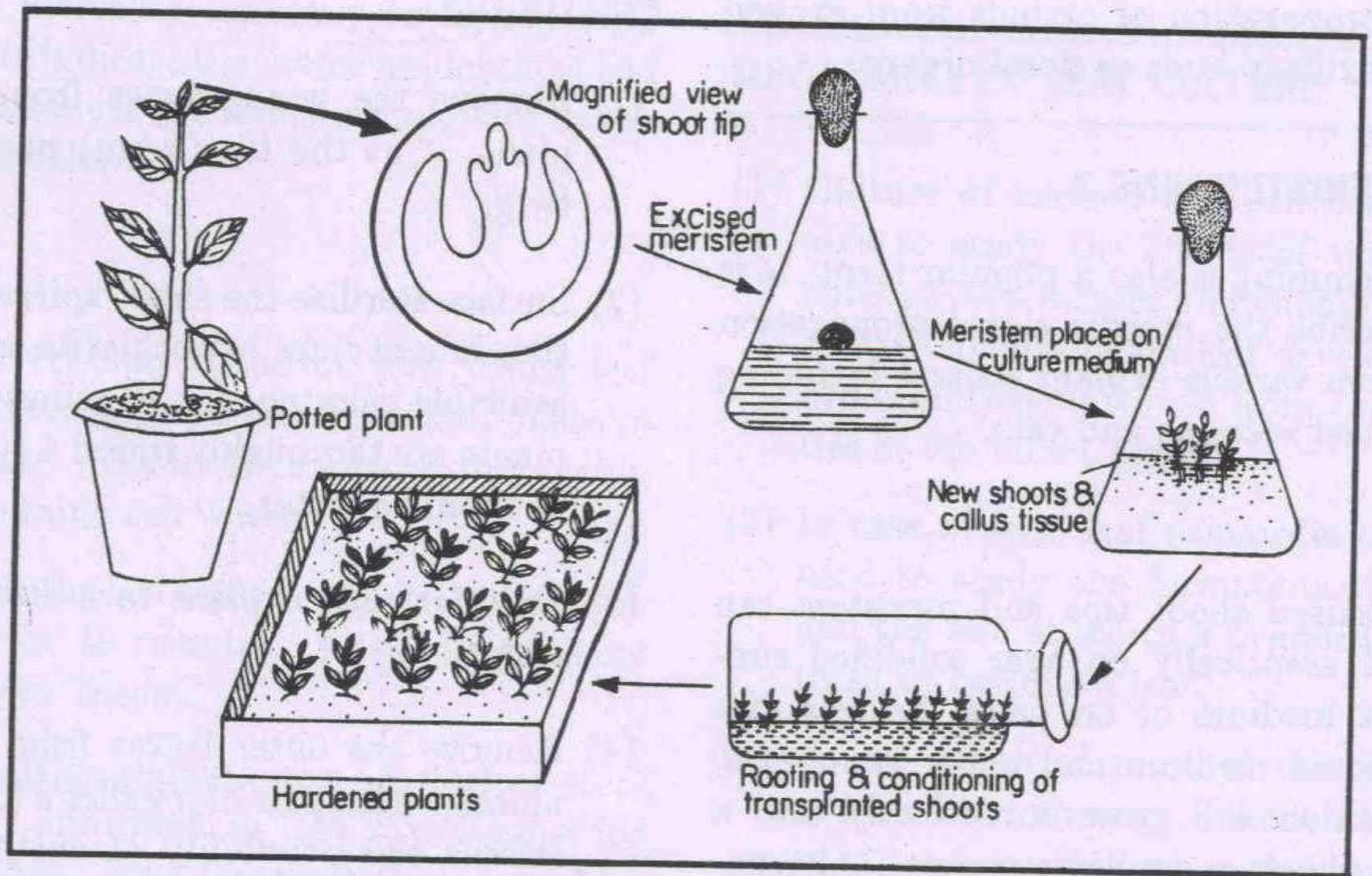
leaf trace

**axillary
meristem**

procambium

cortex

pith



□ Fig 2.3

Flow diagram illustrating the technique of shoot tip or meristem culture

Advantages

- ✓ Production of virus free germplasm.
- ✓ Mass production of desirable genotypes.
- ✓ Cryopreservation (cold storage) or *in vitro* conservation of germplasm.

Importance

- Virus Eradication .
- Micropropagation.
- Storage of Genetic Resources.
- Over come of abortive seeds or nonviable seeds.
- Propagation of haploid plants.
- Rejection by Quarantine authority avoided.

Flower Culture

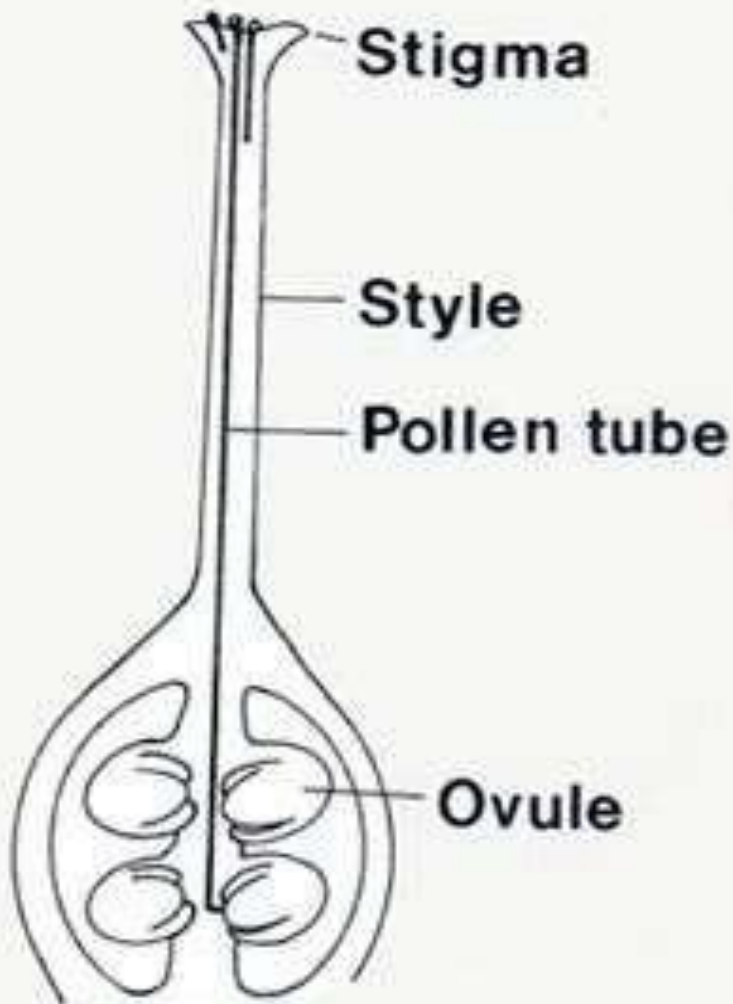


- Defined as: The aseptical culture of excised floral bud on a chemically defined nutrient medium where they continue their development to produce a full bloom in a culture vessel.
- Principle: cultured at different stage of development ,require a complex medium for floral

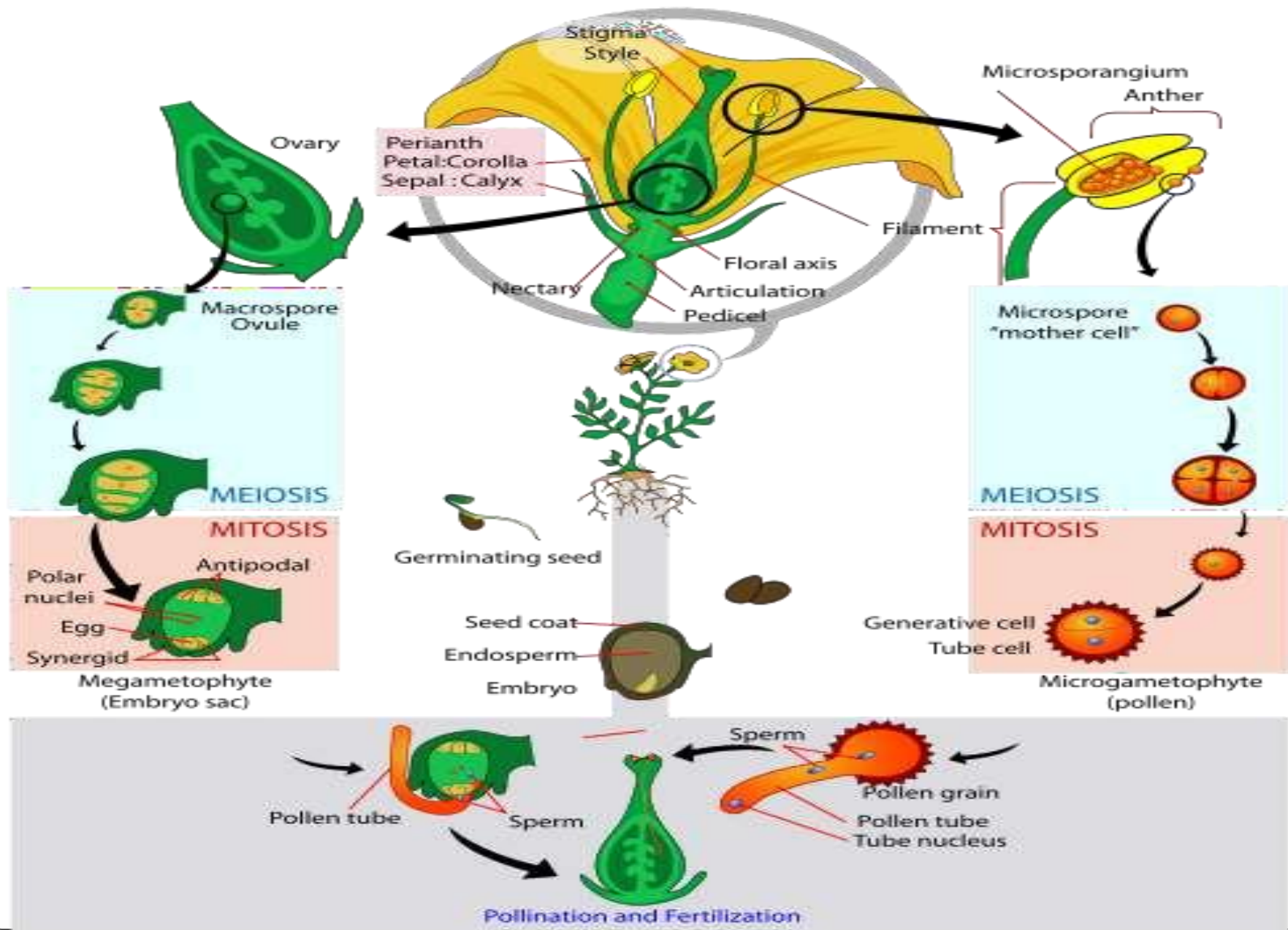
Importance

- Fundamental studies of development of flower.
- Fruit development studies.
- The culture of pollinated flowers is very important to study the fruit development .
- *In vitro* fruits are smaller than their natural counterparts, but the size can be increased by supplementing the medium.
- Floral morphogenesis studies.

ovule culture



- Defined as: the aseptical culture of ovules which are isolated from the ovary and are grown in defined nutrient medium under controlled condition.
- Principle: isolation, contains egg cellafter fertilization, single Zygote formation leads-embryo processing shoot and root primordia.



Importance

- Test tube pollination and fertilization.
- Application of Ovule culture in Hybridization.
- Production of haploid callus through ovule culture .
- Ovule culture of orchid plants.
- Induction of polyembryo by ovule culture.
- Virus free culture.