RAMA UNIVERSITY

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FACULTY OF ENGINEERING & TECHNOLOGY

Course: B. Tech Biotechnology
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LECTURE 9

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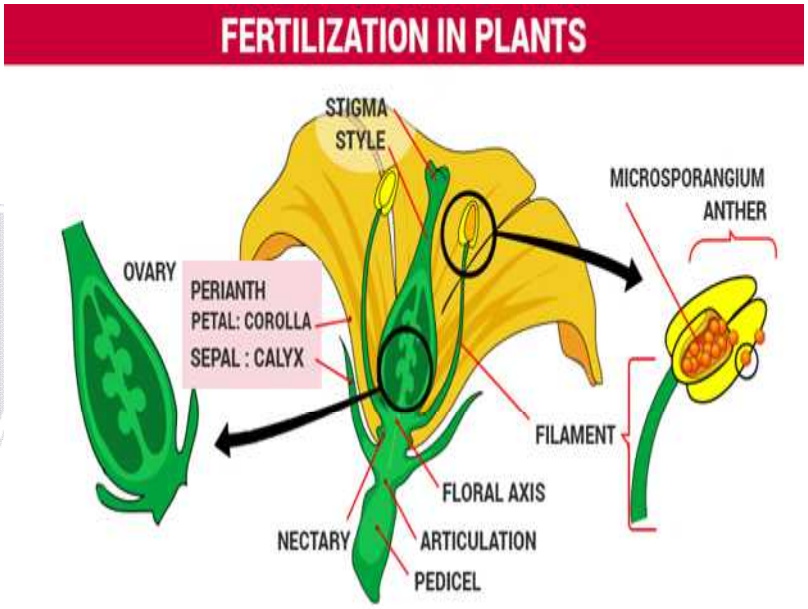
In vitro POLLINATION AND FERTILIZATION

'*vitro*' means glass or glassy substances.

So, 'in vitro' means in glass or glass tube.

Cultivation of plant tissue or other organs on artificial media in a test tube or conical flask is called in vitro technique.

The process of seed formation following stigmatic pollination of cultured pistil has been referred to as in vitro pollination and the development of seed through in vitro fertilization.



https://byjus.com/biology/fertilization-in-plants/

TYPES OF IN VITRO POLLINATION

1. **Ovular pollination:**
   Application of pollen to excised ovule.

2. **Ovarion pollination:**
   Application of pollen to excised ovary.

3. **Placental pollination:**
   Application of pollen to ovules attached to the placenta.

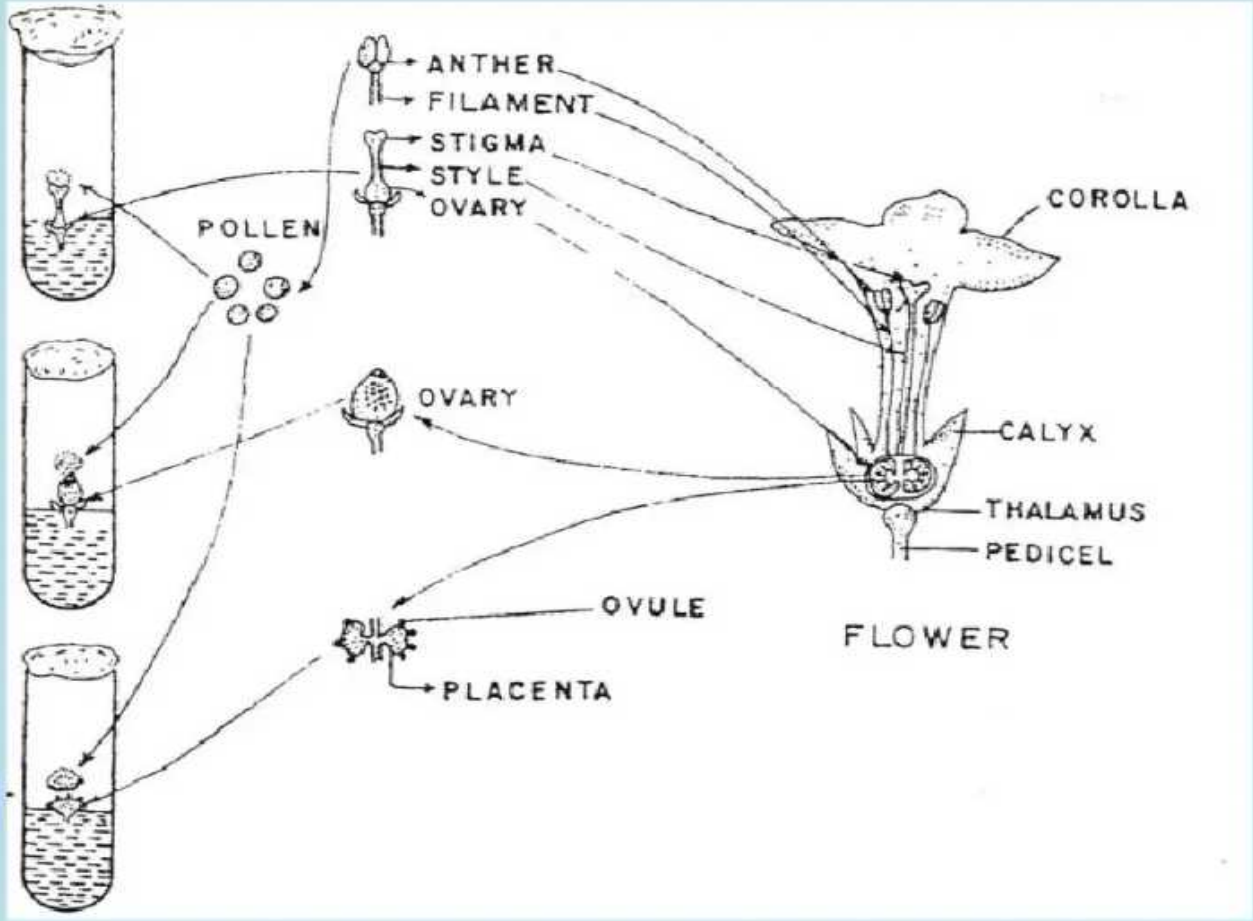
4. **Stigmatic pollination:**
   Application of pollen to stigma.

In vitro pollination

Stigmatic pollination

Ovarian pollination

Placental pollination



Diagrammatic representation of the in vitro pollination

https://www.scribd.com/doc/7833883/Lect-8-in-Vitro-Pollination-Fertilization-and-Embryo-Culture

PURPOSE OF IN VITRO POLLINATION

- Intergeneric hybridization
- Intraspecific hybridization
- Interspecific hybridization
- Intra-familiar crossing

Why in vitro pollination is needed?

- For the production of homozygous plant.
- For the conservation of extinct plant species.
- Hybrid production
- Reducing the breeding cycle.
- Overcome the dormant period.
- Production of hybrid species by distant hybridization.
- Production of haploid plant.
- Conservation of germplasm.

APPLICATION OF IN VITRO POLLINATION & FERTILIZATION:

1. Overcoming self-incompatibility:

Petunia axilaris and Petunia hybrida are self-incompatible species. Germination of pollen is good on self- pollinated pistils but a barrier exists in the zone of the ovary as a result, the pollen tube cannot fertilize the ovule. The barrier of these taxa can be overcome by in vitro pollination.

2. Overcoming cross-incompatibility:

Successful culture of in vitro pollinated ovules has raised the possibility of producing hybrids which are unknown because of pre-fertilization incompatibility barriers.

3. Production of haploid plant:

Another application of in vitro pollination reported, is the production of haploids of Mimulus luteus CV. Tigrinus grandiflorus by pollinating its exposed ovules with Torenia fournieri. The haploids of Mimulus luteus developed parthenogenetically, which otherwise could not be obtained through anther culture.

4. Production of stress-tolerant plant:

Maize plants tolerant to beat stress have been produced through in vitro pollination at high temperature. Additionally these plants exhibited increased vigour and grain yield.

5. Development of young hybrid embryo:

Development of young hybrid embryos can be achieved in extremely widely crosses through in vitro pollination. The efficiency of this technique needs much improvement.

6. Haploid production through parthenogenesis

EMBRYO CULTURE

- The term embryo culture means excision of embryos regardless of age, size and developmental stage from their natural environment and growing them under artificial environmental conditions.

- Embryo culture is a sterile isolation and growth of an immature or mature embryo in vitro, with the goal of obtaining a viable plant.

- Embryo abortion in wide crosses often occurs during embryogeny (e.g. endosperm degradation) and it is sometimes possible to culture these embryo and recover hybrid plants.

- Embryo culture may include the culture of embryos within an ovule or ovary. In these instances test-tube fertilization may overcome stigmatal or stylar, and pollen incompatibility barriers

- Types of Embryo culture

    1) Mature Embryo culture
    2) Immature embryo culture

QUIZ