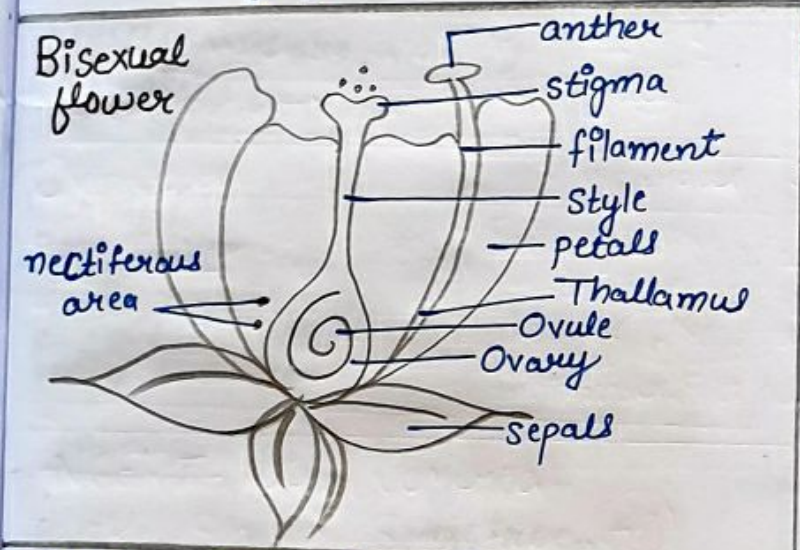
SEXUAL REPRODUCTION IN FLOWERING PLANTS...

Flowers → Objects of aesthetic, ornamental, social, religional and cultural value.

- Symbols for conveying human feelings, Love ♡, affection, happiness...
- Biologist → Flowers are morphological and embryological marvels of sexual rep.?

Floriculture → growing and marketing flowers.



* Male rep.ⁿ str. → Androcium (whorl of stamens).
* Female rep.ⁿ str. → Gynocium.

Stamen, Microsporangium and Pollen grain..

Stamen → Filament (long and slender stalk)

Anther (terminal, bilobed str.)

proximal end of filament → attached to thallamus/petal of flower.

Anther → Bilobed, Dithecous (2 theca), 4 microsporangia (2 in each lobe)

↓

Pollen sac

↓

pollen grains

Dehiscence → Rupturing of anther.

Line of dehiscence → Stomeum.

Structure of Microsporangium

Surrounded by 4 walls → PYQ ★

out
1. Epidermis
2. Endothecium
3. Middle layers

→ protection and dehiscence of anther, to release pollen.

in
4. Tapetum → innermost Nourished developing pollen grain.

Cells of tapetum → dense cytoplasm, and generally have more than one nucleus.

Sporogenous Tissue → group of compactly arranged homogenous cells.

↓ meiosis

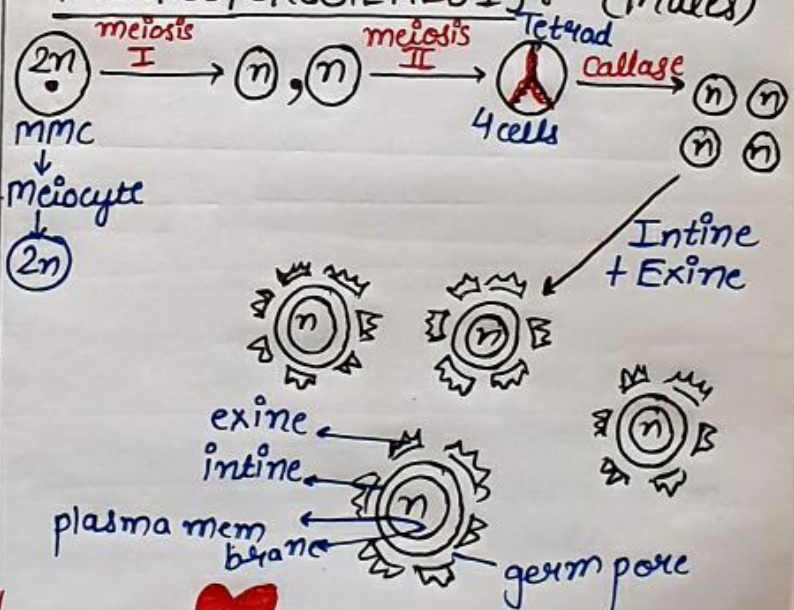
Microspore Tetrad

↓ - anther mature, microspore develop into.

pollen grains - released during dehiscence of anther.

* each cell of sporogenous tissue is capable of giving rise to tetrad.
* each one is potential/microspore mother cell.

* MICROSPOROGENESIS :- (Males)



neet slayer

Pollen Grain → male gametophyte

Generally spherical (25-50 mm diameter)

prominant 2 layered wall. PYQ

① Hard Outer layer — Exine — made of sporopollenin
- One of most resistant organic material
- Withstand ↑gh temp., strong acids and alkali.
- No enzyme can degrade.
- pollen grains are preserved as fossils becoz of sporopollenin.

② Inner wall of pollen grain. — Intine
- Thin and continuous layer.
- Made of Cellulose and pectin.

Germ pore → prominent apertures, sporopollenin absent.

* Pollen Grain

Vegetative Cell → Bigger, abundant food, large irregular shaped nucleus.

Generative Cell → Small, floats in cytoplasm of vegetative cell. Spindle shaped. Dense cytoplasm and nucleus.

60% Angiosperms	40% Angiosperms.
pollen grain shed at 2 celled stage.	pollen grain shed at 3 celled stage.

Pollen Grains → Allergies and Bronchial affilications.

Chronic respiratory Disorders (asthma, Bronchitis).

* parthenium (Carrot grass) → Came to India, contaminated with imported Wheat.

* Ubiquitos → Causes pollen allergy.

pollen grains are rich in nutrients.
- pollen tablet/syrup — food supplements.
- ↑se athletes and race horse performance.

Viability → Highly Variable. PYQ
↳ depends on temp. and humidity.
① Rice and Wheat → 30 min.
② Rosaceae, Leguminoscea, Solanacea → Viability for months.

Artificial Insemination	sperm stored.

→ Liquid Nitrogen (-196°C).
→ pollen/seed Banks used in crop breeding

The Pistil, Microsporangium, and Embryo Sac →

Gynocium → Female rep. part.
① Monocarpellary → Single pistil (Hibiscus)
② Multicapellary → More than 1 pistil
↳ Syncarpous → fused together (papaver)
Apocarpous → free (Michelia)


Hibiscus


Michelia


papaver

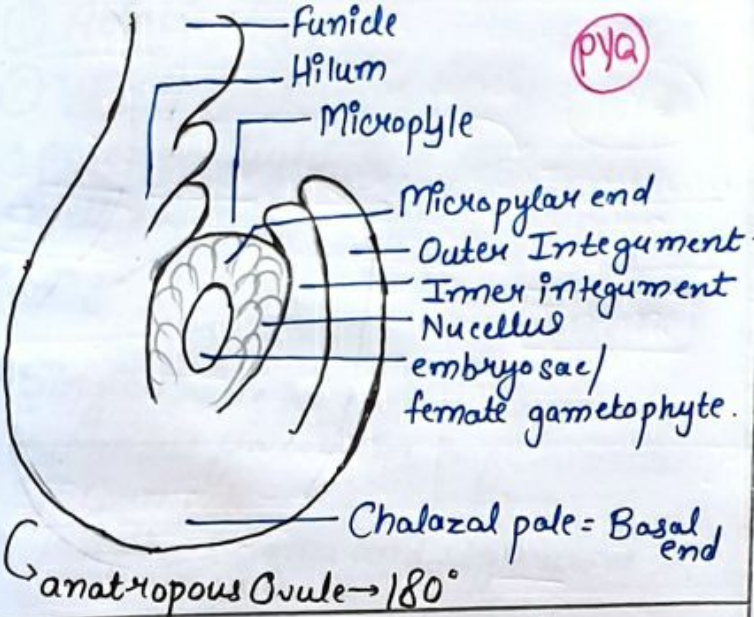
PYQ
neet slayer.

Pistil → 3 parts.
① Stigma: landing platform of pollen grain
② Style: elongated slender part.
③ Ovary: Basal bulged part.
↓
Ovarian Cavity (locule) → placenta → Ovules.

1 Ovule in an Ovary → Wheat, paddy, Mango.

Many Ovule → papaya, Watermelon, Orchids.

The Megasporangium / Ovule →



PYQ

↳ anatropous Ovule → 180°

Funicle → Small str. attached to placenta by means of stalk.

Hilum → Body of ovule fuses with funicle here / Junⁿ b/w ovule and funicle.

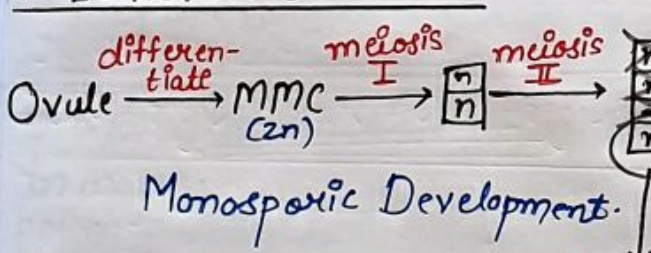
Integuments → protection / Coverings.

Micropyle → Small opening. Integuments encircle nucellus except this tip.

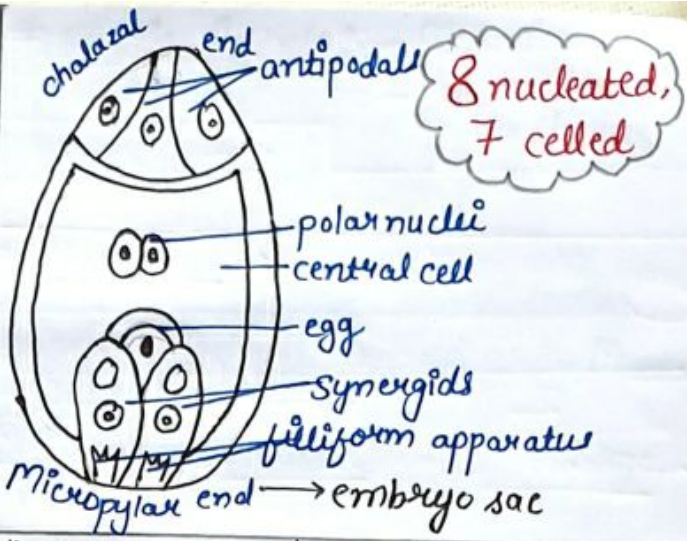
Chalaza → Basal part of Ovule.

Nucellus → These cells have abundant food reserve.

MEGASPOROGENESIS :– (females)



mitosis → free nucleus, Not immediate followed by cell wall formatⁿ



Pollination

Transfer of pollen grains from anther to stigma.

Kinds of pollination →

① **Autogamy** → B/w same flower's anther and stigma.

↓ requires synchrony in pollen release and stigma

• Anther, Stigma → Very close for self pollinatⁿ

eg → Viola (Common pansy), Oxalis, Commelina ★

* **Chasmogamous flower** → exposed anther and stigma.

* **Cleistogamous flower** → Do not open at all.

↳ pollinatⁿ by anther dehiscence.

→ pollen agent not required. ★ dia. imp

→ Invariably autogamous

② **Geitonogamy** → B/w another flower of same plant. ★

functionally → Cross pollination.

Genetically → Autogamy.

③ **Xenogamy** → Different plant.

Brings genetically diff. pollens.

Complete cross pollination.

Other flowers and plants, Same species.

Agents of Pollination :→

① Abiotic Agents :→ (uncertain)

(i) Wind Pollination (Anemophily)

- pollens → light and non-sticky.
- Well exposed stamens.
- Large feathery stigma (to easily trap air borne pollens).
- Single Ovule in each ovary.
- Numerous flowers in inflorescence
  eg - Corn cob
- Tassels → Stigma and style wave in wind to trap pollen.
- Quite common in grasses.

(ii) Water Pollination (Hydrophily)

- quite rare (limited to 30 genera, mostly monocots).
- algae, bryophytes, pteridophytes.
- eg - Vallisneria and Hydrilla (fresh water)
- eg → Zostera (marine sea grasses)
- pollen grains → protected from water by mucilaginous covering.

Vallisneria → female flower → long stalk.
pollen grains → surface of water
→ They are carried passively by water currents.

Sea Grasses → female flower submerge in water.
pollen grains → long ribbon, carried passively inside water.

Not all aquatic plants do water pollina.
Water Hyacint and Water lily pollinated by insects or wind.

Wind and water pollinated flowers
↳ No Colour, No nectar

neet Slayer..

② Biotic Agents :→ Majority

1) By animals → Bees, Butterfly, beetles, wasps, ants, moth, bird, bats...
among insects → Bees dominant.

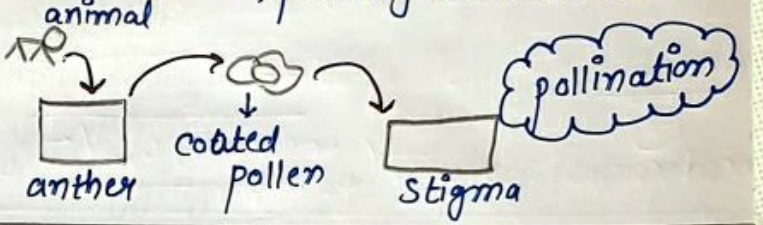
2) Large Animals → primates, lemur, arboreal, rodents, Reptiles (gecko lizard, garden lizards).

3) Insect pollinated flowers → Large, Colourful, fragrant, rich nectar.

4) Small flowers → Cluster into inflorescence → Conspicious.

5) Animals attract by → Colour, fragrance, nectar.

6) Flowers → Secreate foul odours → to attract flies/bees.
↓
provide nectar, pollen grains as rewards



* Safe Places (Rewards) → to lay eggs.
Tallest Flower → Amorphophallus (6 feets)

Moth and Yucca plant → can't complete life cycle without each other.

Moth —eggs→ locule of Ovary → gets pollinated as seeds start developing, larvae of moth comes out.

Pollen / Nectar Robbers → They consume pollen or Nectar, and inturn do not pollinate flower.

① Entamophily - by insects
② Ornithophily - by birds
③ Chireptophily - by bats
④ Malacophily - by snails, slugs
⑤ Myrmecophily - by ants

Outbreeding Devices

Hermophodite flowers → Continuous self pollination → Inbreeding depression.

↓ To overcome

Outbreeding Devices.

Dichogamy →

① pollen, stigma receptivity unsynchronised. eg → China rose, lady finger, Jasmine, Custard apple.

Herchogamy → anther, stigma placed at different position. pollen can't reach stigma of same flower.

Self Sterility / Imcompatibility → pollen of flower have no fertilizing effect on stigma of same flower.
eg – passiflora, potato.

Unisexuality → Monocious plants with unisexual flowers (Maize, cucurbity) Castor) avoids autogamy.

Diocious plants (papaya, mulberry) results in Xenogamy.

Pollen Pistil Interaction

pistil have ability to ~~rego~~ recognise

Compatile → accepts ✓

incompatible → rejects ✗ pollen

- Continuous dialogue b/w pollen grain and pistil.
- Chemical components of pollen inteacting with pistil.
- pollen pistil interaction can be manipulated by breeder.

pollen-pistil interaction

pollen grains
↓
Germinate
↓
pollen tube reaches Ovary

2 celled → micropyle → Synergids (through filiform)

3-celled

Artificial Hybridisation

- Superior Varieties.
- Crop improvement
- Desired pollens used.
- Stigma protected from contamination.

Steps :→ ① Emasculation → Bisexual flowers se anther cut Karo before mature

② Bagging → Emasculated flowers ko butter paper se cover Karo.

③ Required pollens dusted on stigma.

④ Rebagging, and fruits allow to develop.

Unisexual flowers → no need emasculation

Double Fertilization

after entering 1 synergid → pollen tube releases 2 male gamete into cytoplasm of synergid.

① **Syngamy** →

1st male gamete —move to→ Egg cell —fuse with→ Nucleus → complete Syngamy result

(2n) Zygote

② **Triple fusion** →

2nd male Gamete —moves to→ Central Cell —fuse with→ 2 polar Nuclei

↓ produce

primary Endosperm Nucleus (3n)

Syngamy + Triple fusion → Double Fertilization

Central cell after Triple fusion becomes PEN P.E.C. —develop→ Endosperm.

Zygote —develop→ Embryo

Post Fertilization : Structure and Events.

1. Endosperm Development → Nutrition
2. Embryo Development.
3. Ovule → Seed.
4. Ovary → Fruit.

① Endosperm

Endosperm development preceeds embryo development.

Primary Endosperm Cell divides repeat. and form Endosperm Tissue (3n) (food Materials)
↓
Nutrition of Developing Embryo.

primary Endospermic Nucleus (3n)
↓
Successive Nucleus Divisions

- Free Nucleus Endosperm (free nucleus division) → Coconut Water
- Cellular Endosperm (Cell wall form) → Surrounding White Kernal of Coconut

Endosperm

Ex-Albuminous	Albuminous
No endosperm in seed.	Endosperm persist.
Pea, Bean, Groundnut	Coconut, Castor, Maize, Barley, Wheat.

② Embryo

Early Stages of embryogeny are Same in monocots and dicots.

Zygote → Procembryo → Globular → Healt shaped → Mature Embryo

Dicot Embryo

Embryonal Axis — 2- Cotyledons

- above cotyledons → Epicotyl → Plumule (stem tip)
- below cotyledons → Hypocotyl → Radicle (Root tip) → Root Cap

Monocots (grass family.)

1 cotyledon → Scutellum. (lateral to embryo. axis)

- Lower end of Embryonal axis → Radicle and root cap (undifferentiated sheath) Coleorrhiza
- Embryonal axis above level of attachmen of Scutellum is Epicotyl
  - Shoot apex
  - leaf primodia Coleoptile

③ Seed — fertilized Ovule.

- Final product of sexual rep.n
- Seeds are formed inside food.

Seed Consists of :—

- Seed Coats
- Cotyledons (food reserves) eg- legumes
- Embryonal axis

*perisperm → Residual persistant Nucellus
Black pepper, Beet

Integuments of Ovule → Seed Coat.
Micropyle → O_2, water entry, (small pore)
Maturation → H_2O ↓↓se (dry seed, 10-15% moisture)
Metabolism ↓↓se
↓
Inactivity → Dormacy.

Ovule → Seeds ; Ovary → Fruit
(simultaneously)
Ovary Wall → Fruit Wall → Pericarp

Fruits
- **Fleshy** — Guava, Orange, Mango...
- **Dry** — Groundnut, Mustard...

True Fruits — fruit develop from Ovary, other parts degenerate and fall off.

False Fruits — Thallamus also contribute to fruit form.
Apple, Strawberry, Cashew

Parthenocarpic Fruits — fruit develop without fertilization
- Seedless fruit — Banana
- Growth hormones

Oldest Seed → Lupine (Lupinus arcticus) evacuated from Arctic Tundra.
- Seed germinated and flowered after 1000 yrs of Dormancy.

2000 Yrs Old → Date palm, Phoenix dactylifera.
archeological excavation at King's Herod palace near dead Sea.

Orchid Fruit → 1000's of tiny seeds
Striga, Orobanche → parasitic species.

Apomixis — Seeds without fertilization
Form of asexual rep.n that mimics Sexual rep.n
Asteraceae, Grasses.
(2n) egg cell formed w/o reductional division develop into Embryo (w/o fertili.n)

Polyembryony → >1 embryo in seed.
each ovule contain many embryo.
- Some Nuclear Cells surrounding Embryo Sac start dividing, and protude into Embryo Sac and develop into Embryo's.

Many Citrus and Mango Varieties.

I took 8 hours, to prepare these notes for you..
Drop a ♥..
Like, Share, Subscribe..

NEET SLAYER

pdf available on telegram, link in description..