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NEET/CET 2020-21

UNIT VI

REPRODUCTION

Chapter 2 (Part I)

Sexual Reproduction in Flowering Plants

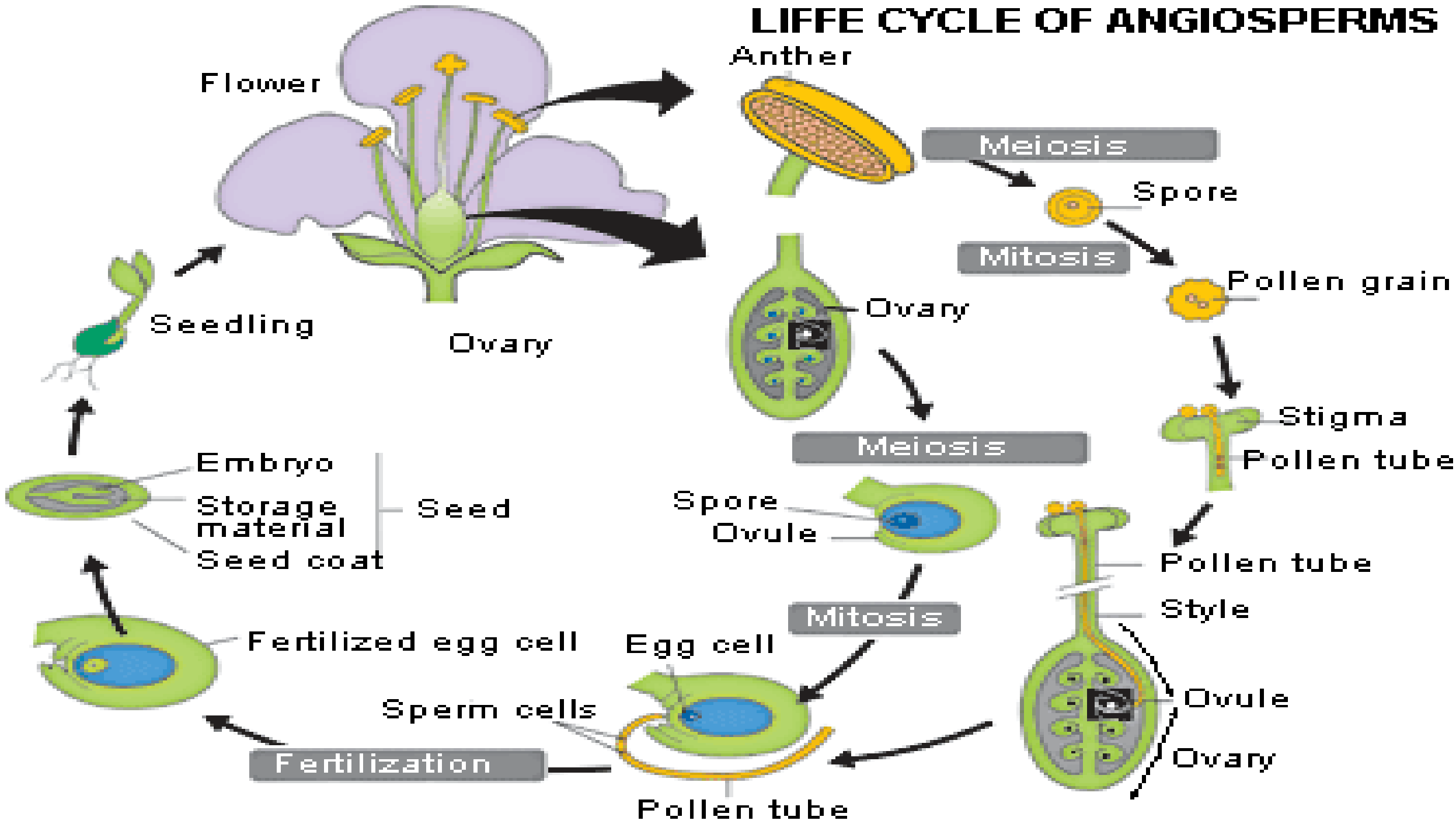
MR. PAWAR NAYAN
BIOLOGY EXPERT

- **Sexual reproduction is the process of development of new organisms through the formation & fusion of gametes.**

- **The organs specialised to perform sexual reproduction in angiosperm are FLOWER.**

LIFE CYCLE OF ANGIOSPERM OR ALTERNATION OF GENERATION

LIFFE CYCLE OF ANGIOSPERMS

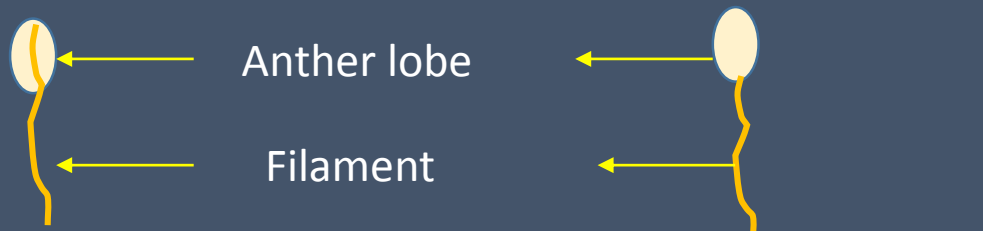


SEXUAL REPRODUCTION

PRE FERTILISATION PHASE	FERTILISATION PHASE	POST FERTILISATION PHASE
• GAMETOGENESIS • FORMATION GAMETES • TRANSFER OF GAMETES	• FUSION OF MLE & FEMALE GAMETES TO FORM ZYGOTE IS CALLED FERTILIZATION	• EMBRYOGENESIS i.e. FORMATION OF EMBRYO • NEW ORGANISMS

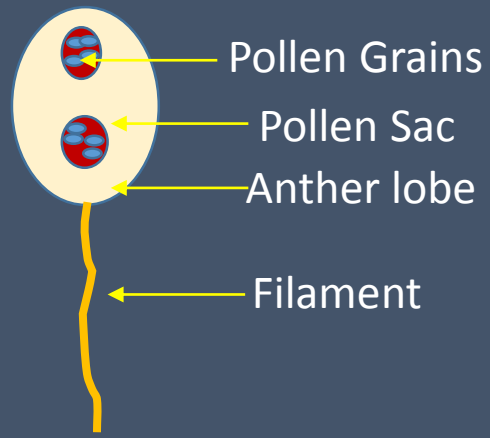
MALE REPRODUCTIVE SYSTEM

- Androecium consists of stamens.
- Stamen is the male reproductive organ or microsporophyll of a flower.
- Stamen consist of **anther & filament**

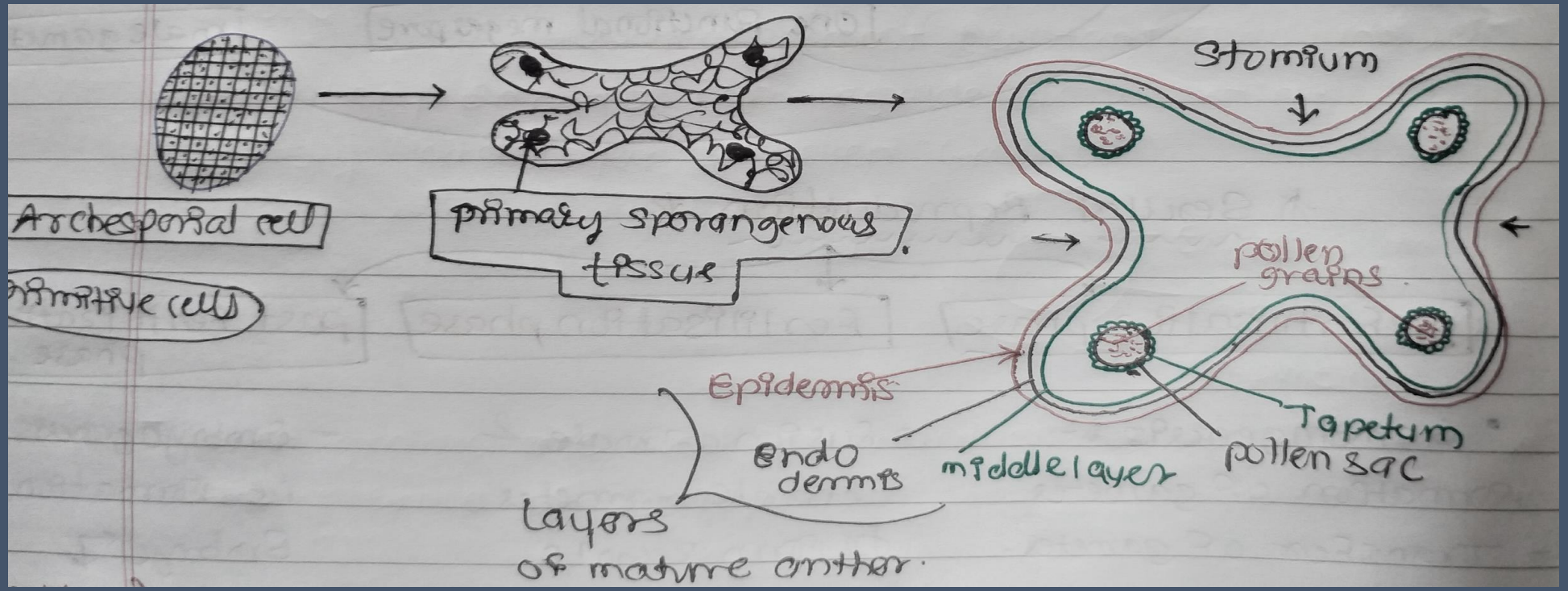


Bithecous anther
Or
Tetrasporogenate

Monothecous Anther



STRUCTURE OF ANTHER/MICROSPOROGENESIS/DEVELOPMENT OF ANTHER



- Archesporial cell modify to form primary sporogenus cells.
- Microsporogenous cells develop to become – “Pollen Sac”.
- Pollen sacs are located in the four corners of the mature anther.

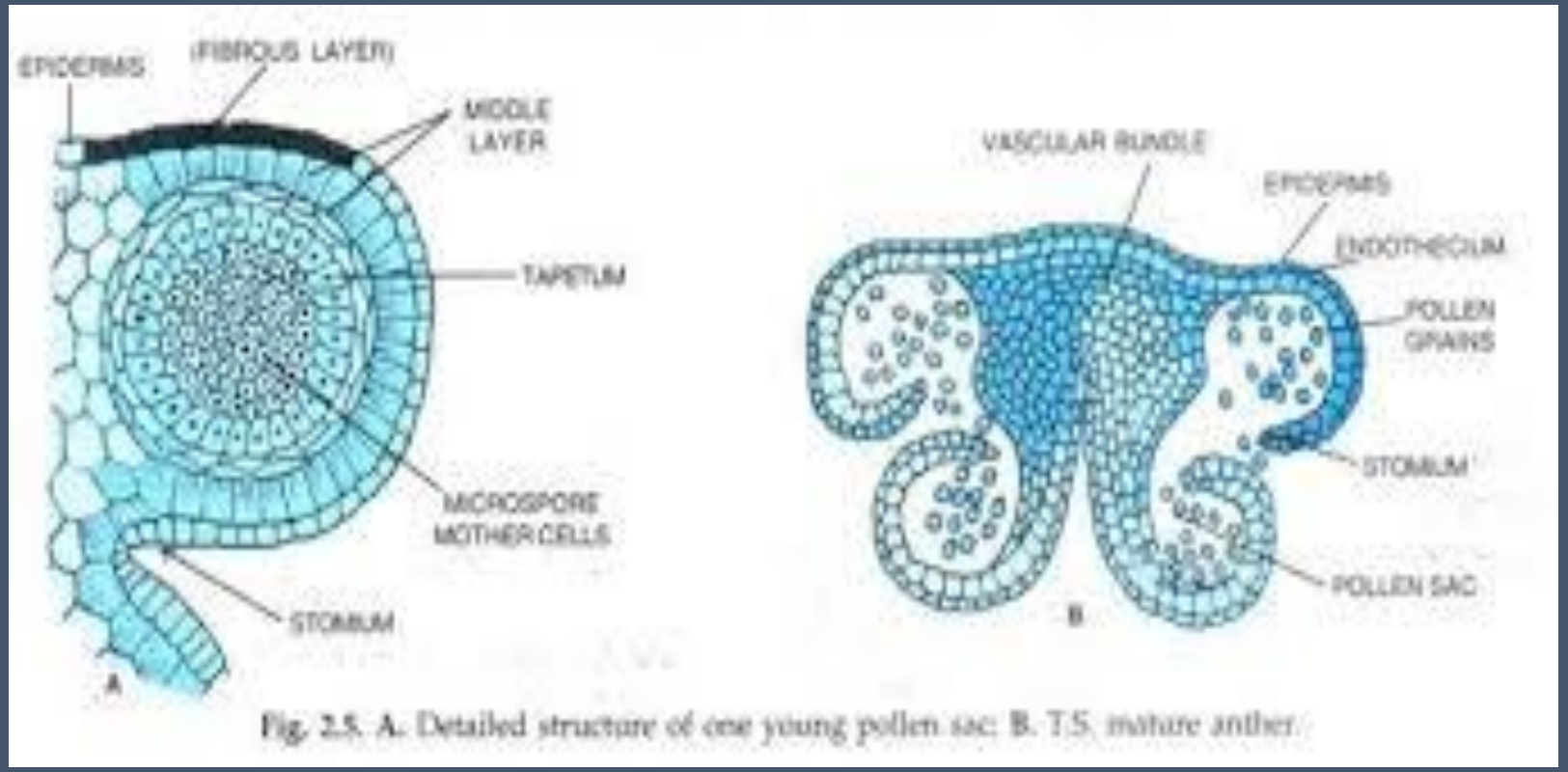


Fig. 2.5. A. Detailed structure of one young pollen sac; B. T.S. mature anther.

MICEROSPORE MOTHER CELL –SUROUNDED BY A CELLULOR WALL (NEET)

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UNIT VI

REPRODUCTION

Chapter 2 (Part II)

Sexual Reproduction in Flowering Plants

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WALLS OF ANTHER

The anther wall consists of four layers

- ✓Epidermis
- ✓Endothelium
- ✓Middle layers
- ✓Tapetum

1. Epidermis:

- ✓It is outermost layer of anther
- ✓It provide the shape & size of anther wall
- ✓It help in protection & dehiscence of anther to release pollen grains.

2. Endothelium:

- ✓Single layer, inner to the epidermis
- ✓The cells of the endothelium are tangentially elongated & having fibrous thickening
- ✓Fibrous thickening are “α – Cellulose” & help in dehiscence of anther

3. Middle layers:

- ✓Inner to endothelium – middle layer is present
- ✓At maturity of anther it usually disintegrate
- ✓They provided nutrition to the pollen grains

4. Tapetum:

- ✓This is the innermost layer of the wall
- ✓The cells are multinucleated
- ✓They provide nutrition for the development of pollen grains
- ✓It secrets both enzyme & hormone to form Ubish body – outer layer of pollen grains (Exine)

DEHISCENCE

With the loss of water – mature anther dried up.

↓

Differentially thickened dead cell of endothecium contract from their outer thin walls.

↓

It brings their outer radial wall nearer.

↓

Endothecium shortens & ruptures the anther lobe.

MICROSPOROGENESIS

- The process of formation of microspore from a “pollen mother cells” through meiosis called microsporogenesis.

POLLEN GRAINS

- 1st cell of male gametophyte
- It is unicellular & haploid.
- Pollen grains are generally spherical in shape, measuring about 25-50 µm in diameter
- The smallest pollen grains are present in “Myosotis”
- The largest pollen grains are present in some members of Cucurbitaceae & Nyctaginaceae.

LAYERS OF POLLEN GRAINS

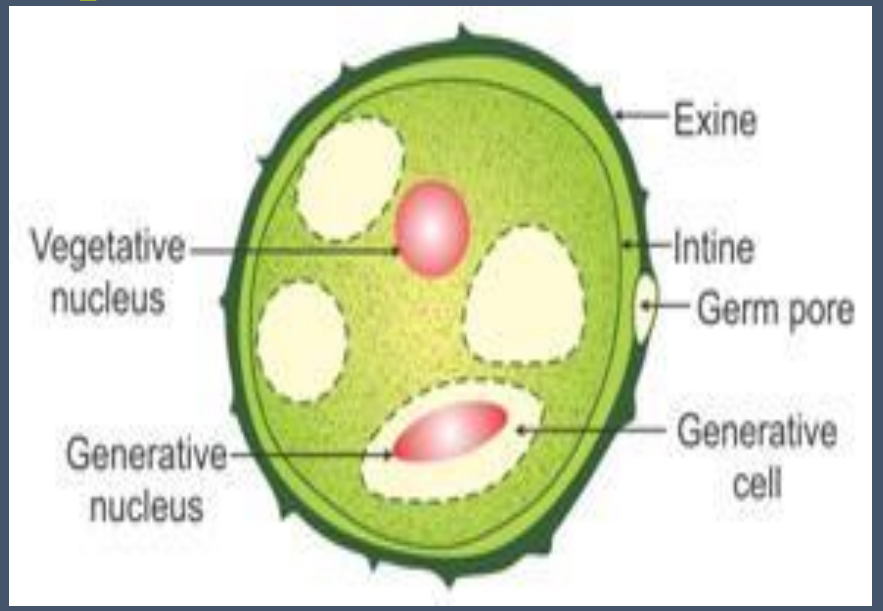
- **EXINE:**

✓Exine is made-up of **"Sporopollenin protein"** (Biologically most resistant compound).

✓No any enzymes can degrade sporopollenin.

✓Very hard layer of pollen grains.

✓Pollen grains are well preserved of fossils, because of the presence of sporopollenin.

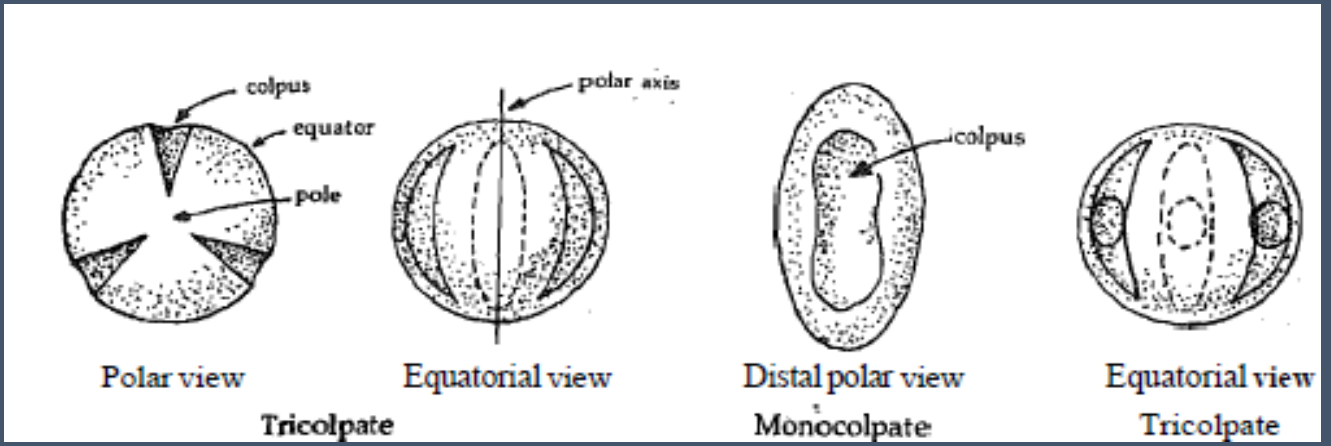


INTINE:

- ✓The inner wall of the pollen grains is called intine.
- ✓This is thin & continuous layer made up of cellulose & pectin.
- ✓The cytoplasm of pollen grain is surrounded by the plasma membrane.
- ✓At the time of germination, intine comes out from germ pore & they form “Pollen tube”.
- ✓Pollen tube help in carry male gametes.
- ✓Intine is pecto – cellulose in nature.

GERM PORE:

- ✓It is a natural gap between Exine layer of pollen grain where the “Sporopollenin protein” is absent.
- ✓In dicot, it is “Tricalpate”.
- ✓In monocot, it is “Monocolpate”.



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UNIT VI

REPRODUCTION

Chapter 2 (Part III)

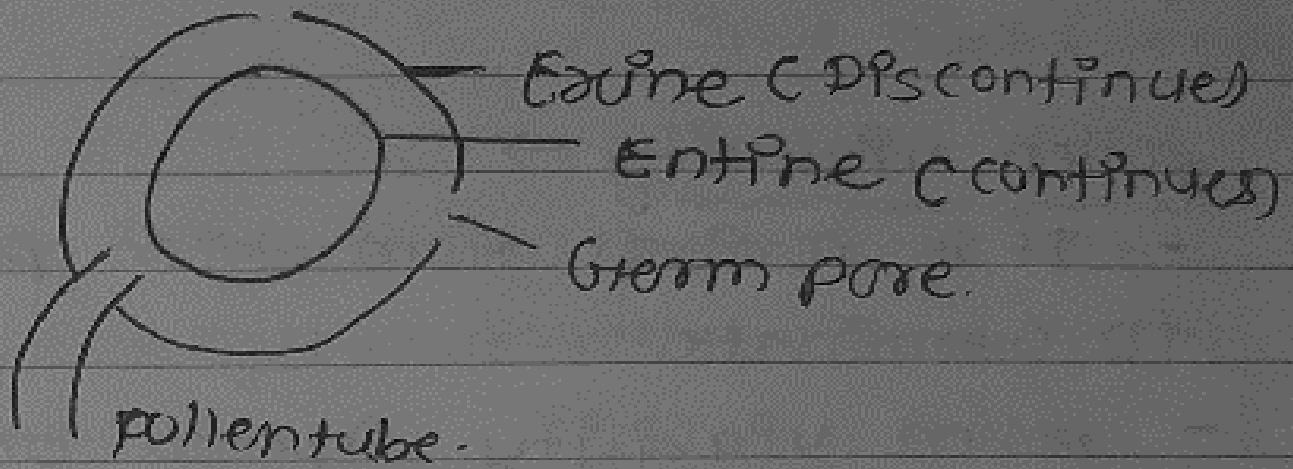
Sexual Reproduction in Flowering Plants

MR. PAWAR NAYAN
BIOLOGY EXPERT

* Pollen Grains.

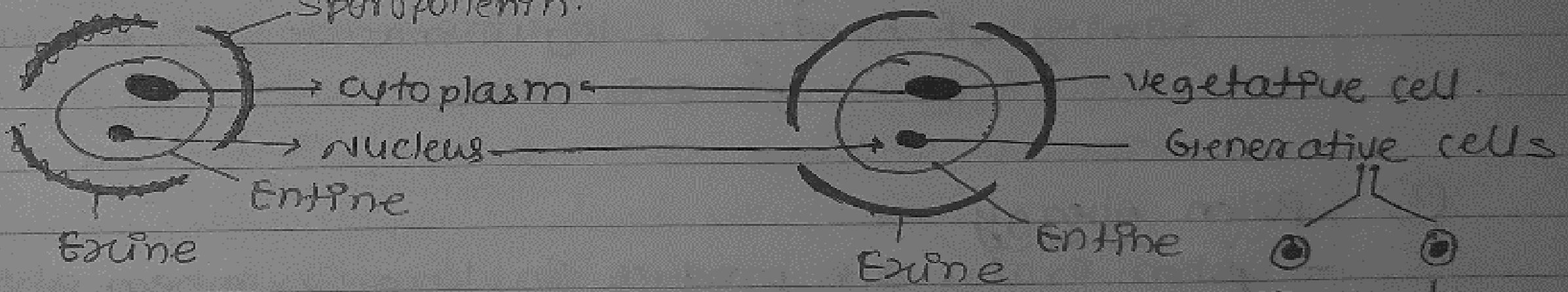
* outer layer :-
  Exine

* Inner layer :-
  Intine



Maturity of pollen Grains

Biologically most resistance.



a. VEGETATIVE CELLS:

- ✓Bigger in size formed from cytoplasm of pollen grain.
- ✓It help in storage of food material.
- ✓After maturity of vegetative cell, it comes out from the germ pore to form pollen tube.

b. GENERATIVE CELLS:

- ✓Smaller in size formed from nucleus of the pollen grain, it floats in cytoplasm.
- ✓In some species, generative cells divided to form two male gamete prior to dehiscence of anther, therefor at the time of pollination pollen grains 3 celled stage. (one vegetative cells + 2 generative cells)

CHARACTERS OF POLLEN GRAINS

1) POLLEN VIABILITY
2) POLLEN ALLERGY
3) POLLEN PRODUCTS
4) POLLEN STORAGE

1) POLLEN VIABILITY:

- ✓It is periods from which pollen grain retain the ability to germinate.
- ✓Pollen viability depends on environment conditions like – Temperature.
- ✓E.g. Pollen viability of rice & wheat = 30 min.

  Family of rosaceae, leguminosae & solanaceae = 1 month

2) POLLEN ALLERGY:

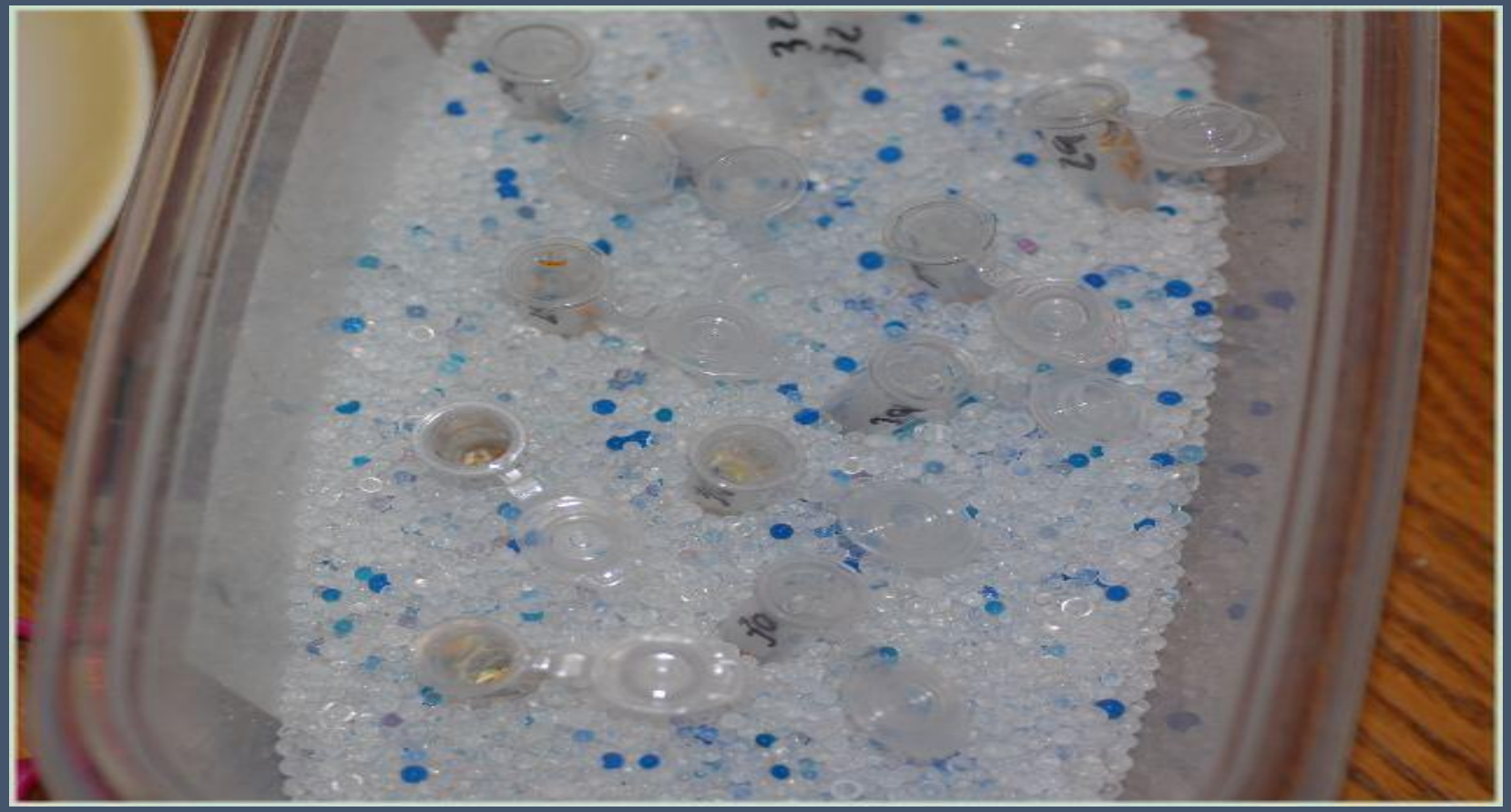
- ✓Pollen grains are produce in large number, which float in air & water which may enter in respiratory tract.
- ✓Some individual develop allergy to them, providing respiratory disease like – Asthma, Bronchitis etc.
- ✓Major contribution to pollen allergy from carrot grass(Parthenium) which contaminate with wheat & spread allergy – to all parts of INDIA

3) POLLEN PRODUCTS:

- ✓Pollen grains are rich in nutrients & it has become fashion in recent year to use pollen tablets as food supplements.
- ✓Pollen products being used for variety of functions – Nature cure, Cosmetics, Food supplement.
- ✓In western country a large number of pollen products in the form of tablets & syrup to enhance performance of athletes & race horses.

4) POLLEN STORAGE:

- ✓Pollen can store for many years in “Liquid Nitrogen” at (-196^{o} C)
- ✓Such stored pollen can be used as pollen banks & seed banks(Crop breeding programme)



1. Male gametophyte in angiosperm produce

   a.Single sperm & two vegetative cells b.Two sperm & a vegetative cells

   c.Three sperm d.Single sperm & a vegetative cells

2. Pollen tablets are available in market for

   a.In vitro fertilization b.Breeding programme

   c.Supplementing food d.Ex-sity conservation

3. What is the function of germ pore

   a.Emergence of radicle b.Absorption of water for seed germination

   c.Initiation of pollen tube d.Release of male gametes

4. Male gametes in angiosperm are formed by the division of

   a.Generative cell b.Vegetative cells

   c.Microspore mothercells d.Microscope

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REPRODUCTION

Chapter 2 (Part IV)

Sexual Reproduction in Flowering Plants

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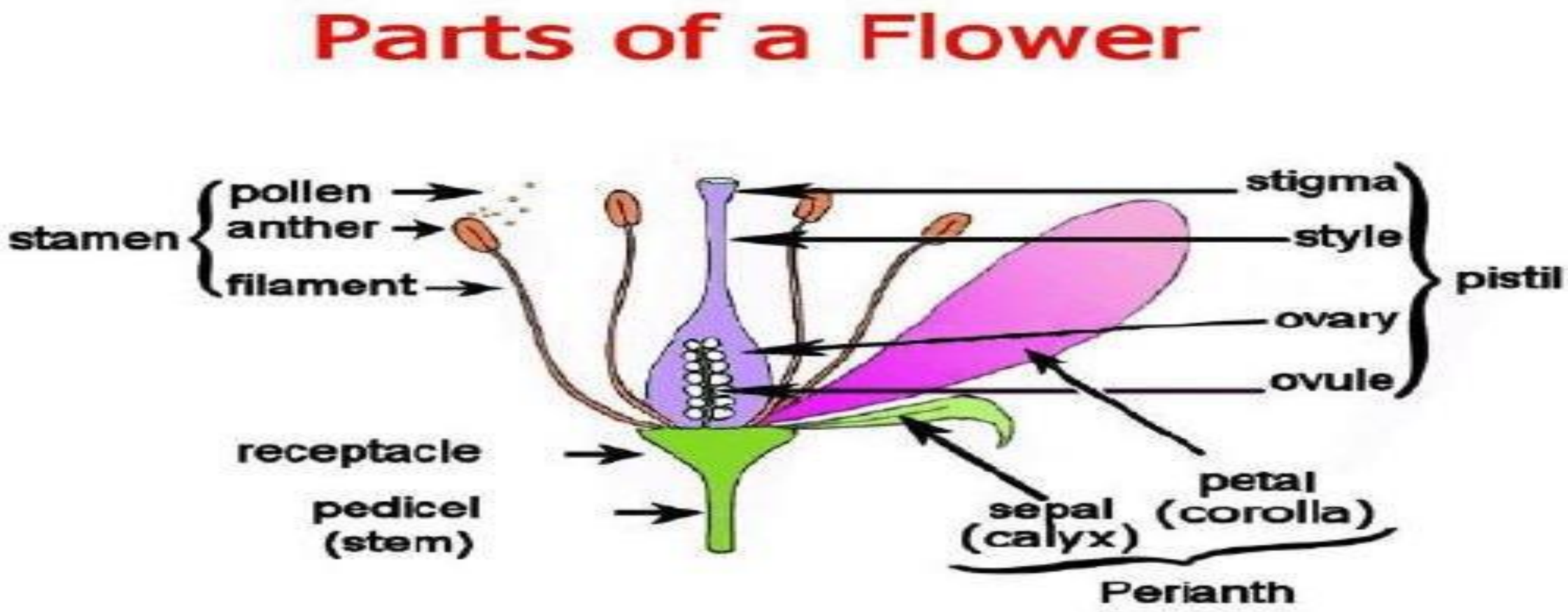
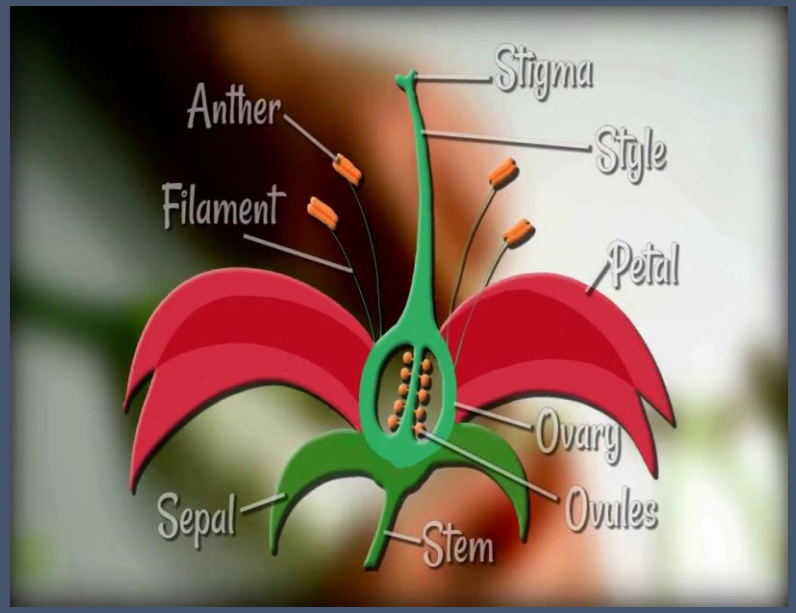
BIOLOGY EXPERT

FEMALE REPRODUCTIVE SYSTEM (CARPEL/PISTIL)



- Gynaecium represent the female reproductive part of the flower.
- Gynaecium consist of single pistil – Mono Carpellary
- Gynaecium consist of more than two pistil – Multicarpellary
- More than one pistil fused to each other is called – Syncarpous
- Pistils are not fused to each other is called – Apocarpous



STIGMA: It is disc shape structure, where pollen grains are germinate.

STYLE:

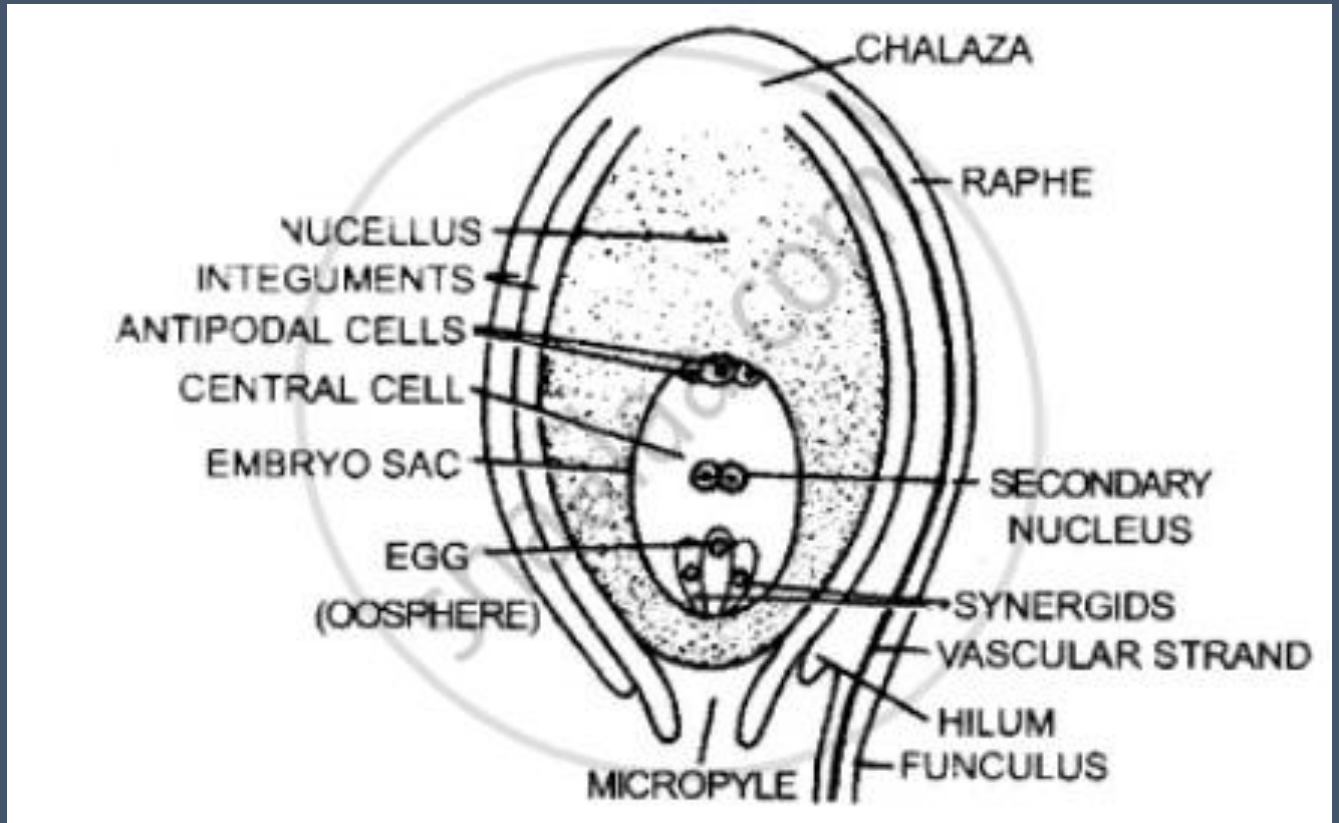
- It is long elongated stalk like structure present below the stigma.
- It helps in carry the male gamete during fertilization.

OVARY:

- The basal – Bulges part of the pistil called ovary.
- Inside the ovary ovule is present.

OVULE / MEGASPORANGIUM

1. **Funicle –** It is stalk like structure which attached ovule with placenta
2. **Hilum –** The point of attachment of ovule with funiculus.
3. **Integument –** It is protective layer which encircle to ovule, except chalazal pole, it is arises from micropylar pole



i. Number of integument may be one e.g. Dicot (wheat) (Monotegmic).
ii. Number of integument may be Two e.g. Monocot (Bitegmic).
iii. Number of integument Three e.g. Lichi (Teritegmic).
iv. Integument may be absent – “Santalium”

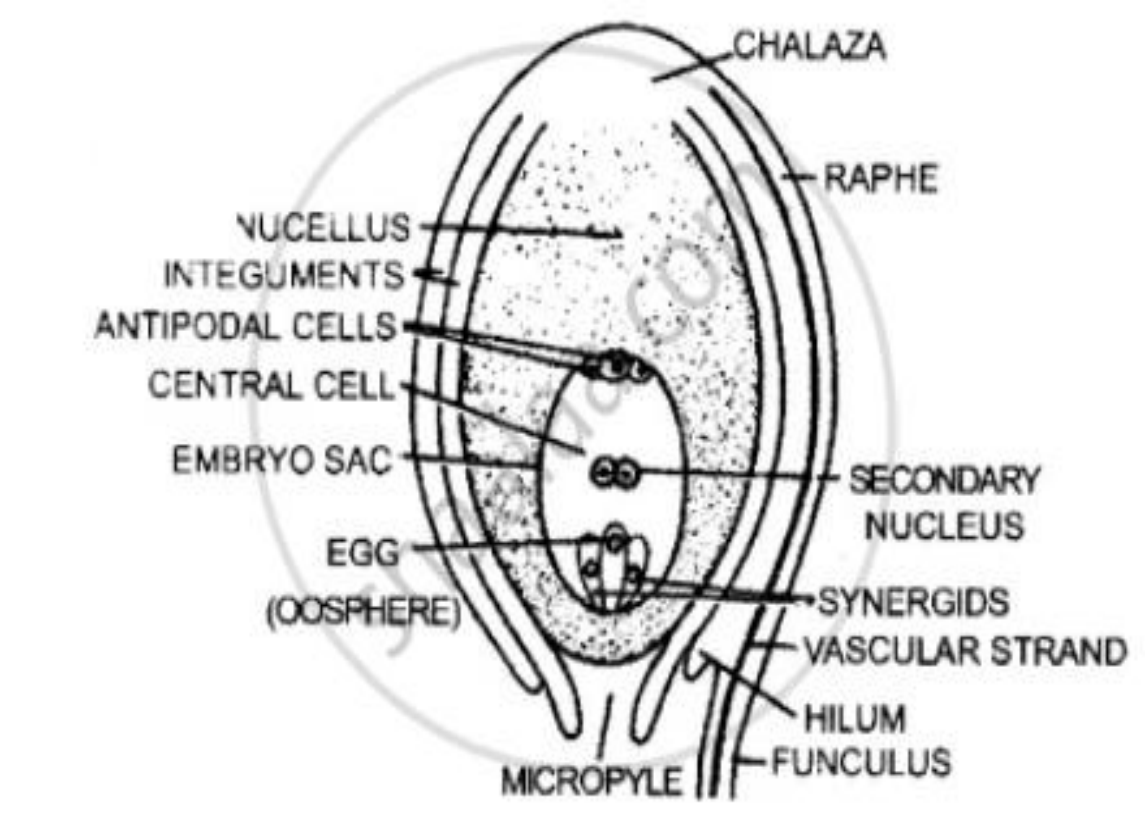
This condition is called – “ATEGMIC”.

4. Chalazal pole:

✓Where integument absent

✓This represented basal part of ovule

✓It is opposite to the micropylar end



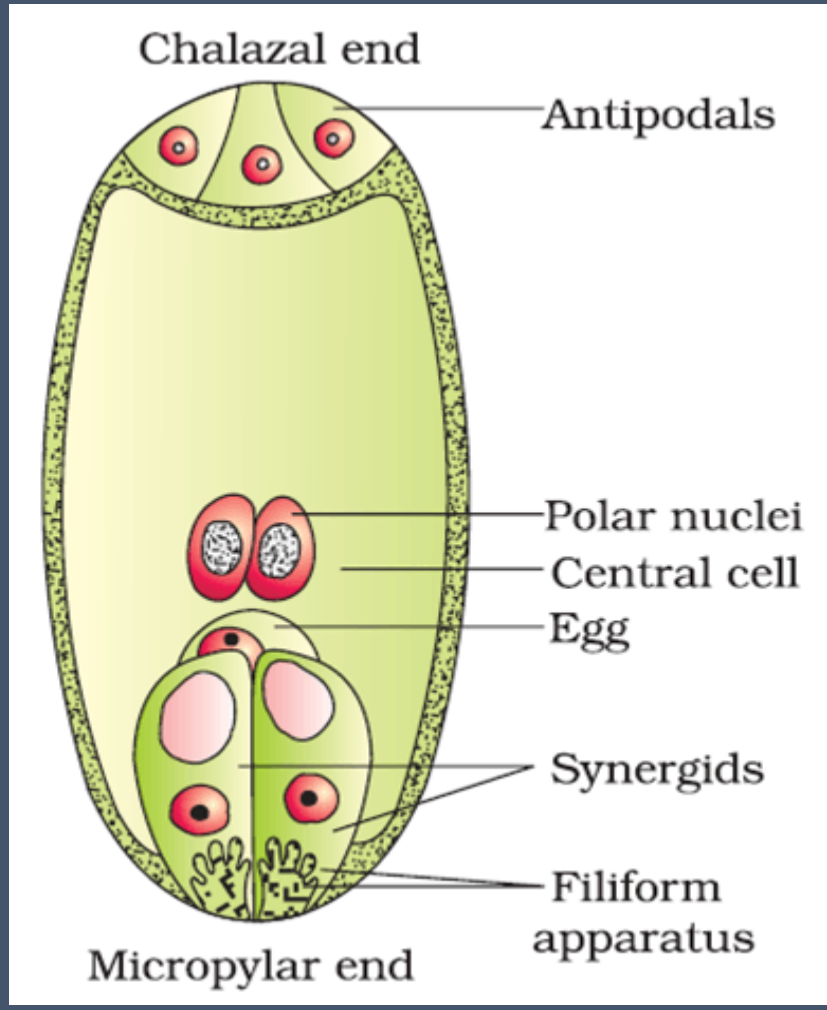
5. Micropylar pole:

✓It is a part of ovule where integument is arises

✓It lie opposite to the chalazal pole in – Anatropous ovule

6. Embryo sac/Female gametophyte:

- Antipodal cell: 3 in number at the chalazal pole
- Egg apparatus: it consist of synergid cell & egg cell.
- Embryo sac consist of 7 cells & 8 nucleate stage.
- Polar nuclei consider single cell but having two nucleus.



7. Synergid cell:

- It is also known as help cell.
- It help in obtain nutrition from the outer nuclear cell.
- It help in guide the entry of pollen tube inside the embryo sac
- It have special cellular thickening at the micropylar end called filliform apparatus.

8. Filliform apparatus:

✓The synergid having special cellular thickening is called filliform apparatus.

✓This apparatus present toward the micropylar end.

✓Guide entry of pollen tube inside the ovule.

✓Absorb nutrition from the polar nuclei.

NOTE: 7 CELLS & 8 NUCLEATED STAGE, BECAUSE POLAR NUCELI HAVING SINGLE CELL BUT HAVING TWO NUCLEUS.

TYPE OF OVULE

1. **ORTHOTROPOUS OVULE:** Straight with funiculus, embryosac, chalazal & micropyle laying on one straight line.

2. **POLYGONIUM OVULE:** Funiculus, chalaza, embryosac & micropyle end lie in the same vertical axis.

1. **Anatropous ovule:**

✓found in 80% of the Angiospermic plant.

✓It turns 180^{o} angle(Inverted ovule).

2. **Orthotropous ovule:**

✓Chalazal & Funicle present in single line.

✓Present in Polygonum & Cycas plant.

✓Very primitive structure.

3. **Hemitropous ovule:**

✓It turns at the 90^{o} angle, e.g. Ranunculus

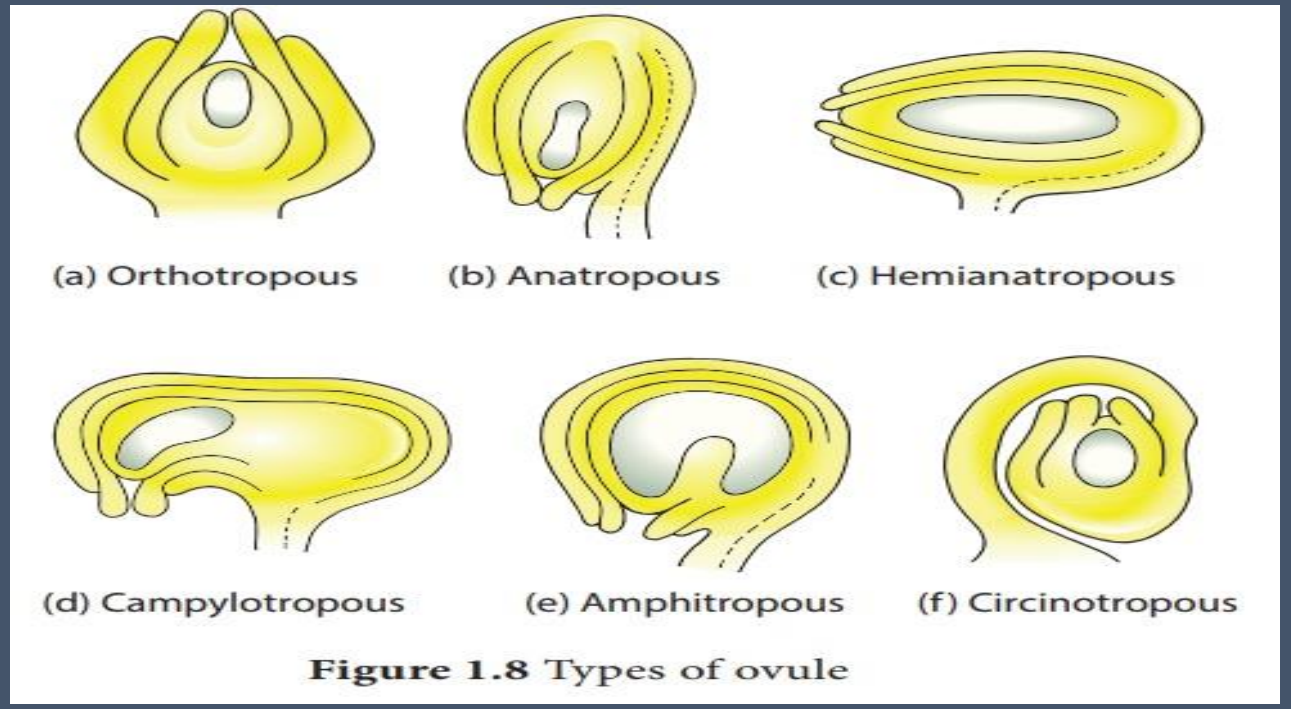


Figure 1.8 Types of ovule

4. **Campylotropous ovule:**

✓It turns at the right angle(90^{o}) but micropylar end bend downward. E.g. Leguminaceae

5. **Amphitropous ovule:** It is shape as horse shoe like. E.g. Poppy plant, Lemna

6. **Circinotropous ovule:** Like circle, coiled like e.g. Oppuntia.

❖ENTRY OF POLLEN TUBE

1. **POROGAMY:** When the pollen tube enter into the ovule through micropyle pole (PM).

2. **CHALAZAGAMY:** When the pollen tube enter the ovule through “chalazal end”.

3. **MESOGAMY:** When the pollen tube enter the ovule through integument/funiculus is called mesogamy.

1. Filliform apparatus is characteristic feature of

a. Apleurone cell b. Synergid c. Generative cell d. Nuclear embryo

2. Filliform apparatus is a characteristic feature of

a. Suspensor b. Egg. c. Synergid d. Zygote

3. Entry of pollen tube through micropylar is

a. Chalazogamy b. Mesogamy c. Porogamy d. Psedogamy

4. Ovule is straight with funiculus, embryosac, chalaza & micropyle lying on one straight line, it is

a. Orthotropous b. Anatropous c. Campylotropous d. Amphitropous

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UNIT VI

REPRODUCTION

Chapter 2 (Part V)

Sexual Reproduction in Flowering Plants

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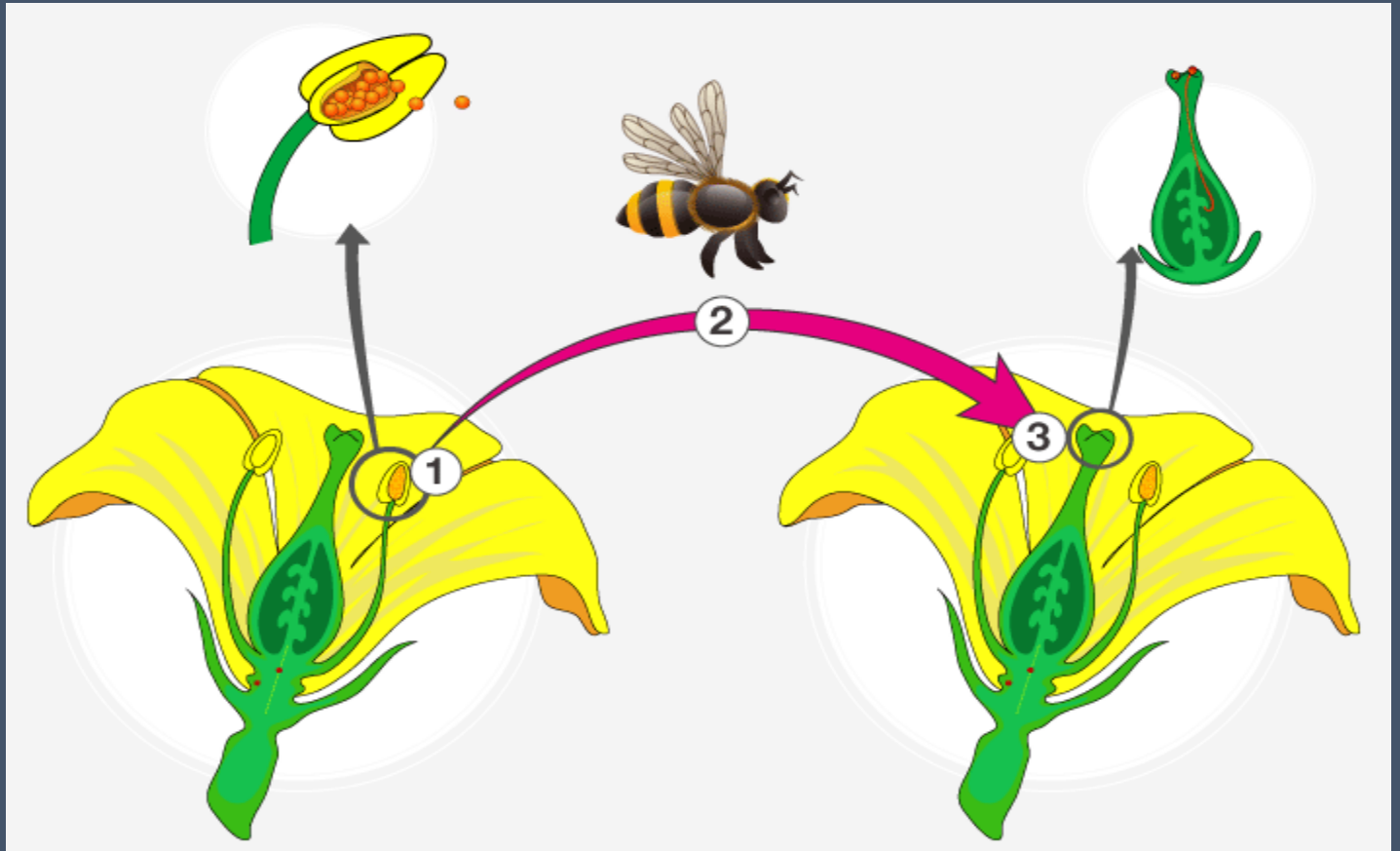
BIOLOGY EXPERT

POLLINATION

- POLLINATION IS DEFINE AS TRANSFER OF POLLEN GRAIN FROM ANTHER TO STIGMA OF THE FLOWER OR DIFFERENT FLOWER.



SELF POLLINATION

- The transfer of pollen grain from anther to stigma of same flower.
- It is also known as autogamy.

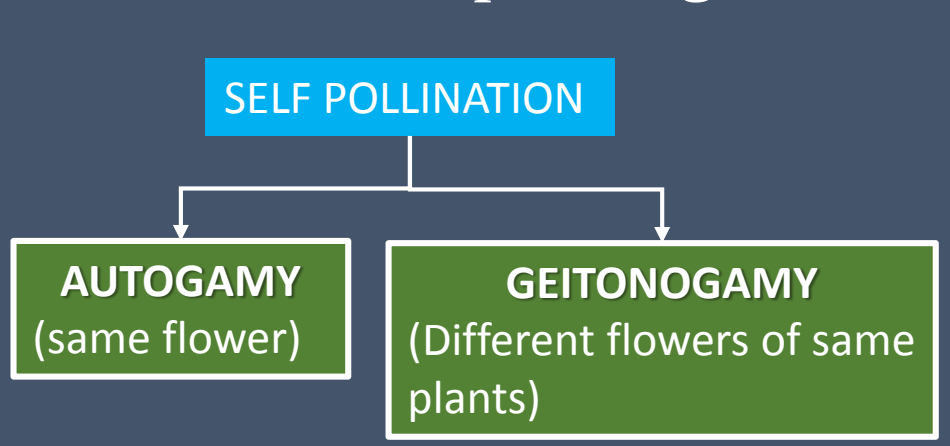
CROSS POLLINATION

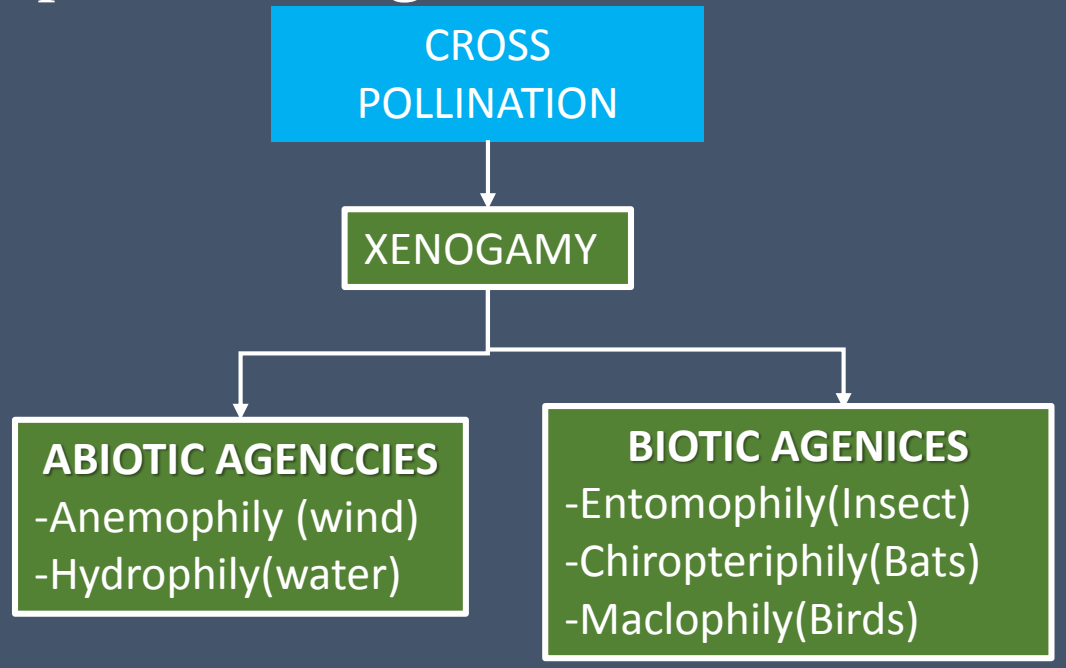
- Transfer of pollen grain from anther to stigma of different flower.
- It is also known as allogamy

CONTRIVANCES (METHOD TO PROMOTE) OF SELF POLLINATION

1. **BISEXUALITY:** Self pollination occur in bisexual flower
2. **HOMOGAMY:** Maturity of sex organ at the same time.

In some plants stamen & carpel of the flower mature at the same time, therefore pollen grains of flower can pollinate stigma.





3. CLEISTOGAMY FLOWER:

- ✓Some flower do not open even after maturity is known as Clestogamous flower.
- ✓It is a phenomenon in which flowers do not open at the time of fertilization.
- ✓In such flower, the anthers & stigma lie close to each other & self pollination occur in it.
- ✓In cleistogamous flower, there is no chance of cross pollination
- ✓E.g. Balsum, Oxalis, violas



4. FAIL SAFE MECHANISM:

- ✓When cross pollination fail, self pollination occur in some plants.
- ✓E.g. In potato – Stigma bend over anther to receive pollen grains.
- ✓E.g. In Mirabilis – Stamen bend so that anther come in contact with stigma.

ADVANTAGES OF SELF POLLINATION

1. It maintain the parental characters.
2. There is no need to produce large number of pollen grains.
3. Flower do not develop any devices for attracting insect.

DISADVANTAGES OF SELF POLLINATION

1. New characters are not appeared
2. Inbreeding depression.

1. Advantage of Cleistogamy is

    a. No dependence on pollinators b. Viviparous

    c. Higher genetic variability d. More vigorous offspring

2. Transfer of pollen grains from anther to stigma of another flower of the same plant is called

    a. Xenogamy b. Geitonogamy c. Karyogamy d. Autogamy

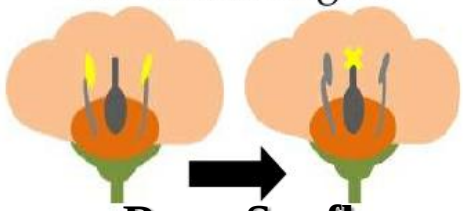
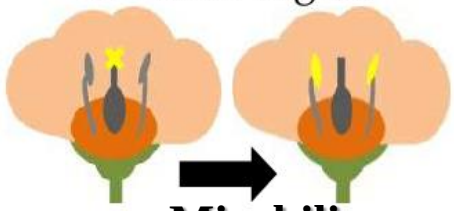
CROSS POLLINATION

TRANSFER OF POLLEN GRAINS FROM ANTHER TO STIGMA OF DIFFERENT FLOWERS.

CONTRAVANCES OF CROSS POLLINATION

1. **DICHOGAMY:** Male & female sex organ mature at different time

Schematic Description of Dichogamy Subtypes

Adichogamy	Proterandry	Proterogyny
Male and female organs gain reproductive activity at the same time.	Male organs gain reproductive activity before the female organ.	Female organ gains reproductive activity before the male organ.
		
	e.g. Rose, Sunflower	**e.g. Mirabilis**

2. SELF – INCOMPATIBILITY:

- ✓When pollen grain fail to germinate on own stigma
- ✓It is due to presence of similar self sterile gene (S1, S3 in pistil & S1 or S3 in pollen grains)
- ✓E.g. Tobacco, Potato, Crucifers



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BIOLOGY EXPERT

ADVANTAGES OF CROSS POLLINATION

1. Cross pollination introduce genetic recombination & hence variations in the progeny.
2. Cross pollination increases the adaptability of the offspring toward the changes in the environment.
3. It makes the organism better fitted in the struggle for existence
4. There is requirement of large number of pollen grains production

DISADVANTAGES OF CROSS POLLINATION

1. It is less economical.
2. Some undeniable characters may creep in the race.

TYPES OF CROSS POLLINATION

1. **Anemophily:** It is mode of cross pollination or transfer of pollen grains from mature anther to the stigma of a pistil through wind.

e.g. Coconut, Palm, Maize, Grasses, Cannabis, Mulberry.

Characteristics of Anemophilis Flower

- ❑Flower are small & inconspicuous.
- ❑Non essential parts are either absent or reduced.
- ❑The flowers are colourless, odourless & necterless.
- ❑Pollen grains are light. E.g. Cannabis, Maize.

2. **Hydrophily:** It is made up of pollination or transfer or pollen grains from anther to stigma through water.

Characteristics:

- Flowers are smaller & inconspicuous.
- Nector & odour are absent
- Pollen grains are light & unwettable due to the mucilage cover.
- Stigma is long, sticky but unwettable.
- E.g. Vallisneria, Zostera, Ceratophylum

EPIHYDROPHILY

Take place over the surface of water.

e.g. Vallisneria

HYPOHYDROPHILY

Take place below the surface of water..

e.g. Zostera

Largest pollen grains (only in marine angiosperm)

❖**ZOOPHILY:** Pollination through the animals, most common type of animals pollination insect. E.g. Asteraceae family

❖**ORINTHROPHILY:** Birds pollination

E.g. Bombox (Red silk cotton tree)

❖**CHIROPTEROPHILLY:** Bat pollination

E.g. Adenosow

FATHER OF ORINTHROLOGY IS DR. SALIM ALI

1. Wind pollination is common in

    a. Legume b. Lilies c. Grases d. Orchids

2. Animal vector are required for pollination in

    a. Vallisneria b. Mulberry c. Cucumber d. Maize

3. Wind pollinated flowers are

    a. Small, Brightly coloured, producing large number of pollen grains

    b. Small, producing large number of dry pollen grains.

    c. Large, producing abundant nector & pollen.

    d. Small producing nector & dry pollen.

4. Anemophily type of pollination found in

    a. Bottle brush b. Salvia c. Vallisneria d. Coconut

OUT BREEDING DEVICES OR CONTRIVANCE TO ENSURE CROSS POLLINATION

- Plant produce hermaphrodite flower & pollen grain likely to come in contact with stigma of same flower.
- Continued self pollination result in inbreeding depression,
- Flowering plants have developed many devices to discourage self pollination & encourage cross pollination.
- Pollen grains releases before the stigma development.
- In some species the anther & stigma are placed at different position so that pollen can not come in contact with stigma.
- Self incompatibility
- Unisexual flowers

POLLEN – PISTIL INTERACTION

- Pistil has the ability to recognise the pollen grains, whether it is right type or wrong type.
- It is the right type of pollen grains, then it accepted the pollen grain & promote post pollination & finally leads to fertilization.
- The acceptance & rejection by pistil is due to chemical present in the pistil & pollen tubes are formed.

- If the chemical composition of pollen grains & pistil are same then pistil accept pollen grains other wise rejected.
- This is the newly concept developed by grain germinate on stigma.
- Formation of pollen tube, if the pollen grain germinate on stigma.
- Pollen – pistil interaction is a dynamic process involving pollen recognition followed by promote or inhibition of the pollen.

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UNIT VI

REPRODUCTION

Chapter 2 (Part VII)

Sexual Reproduction in Flowering Plants

MR. PAWAR NAYAN
BIOLOGY EXPERT

ARTIFICIAL HYBRIDISATION

- This is act in which breading with the one verities of plant to the another verities of plant.
- Artificial Hybridisation done in both plants & animals.
- It help in crop improvement programme.

METHOD FOR ARTIFICIAL HYBRIDISATION

1. **EMASCULATION :** The removal of male parts(anther) from the future parents plants is called emasculation.

2. BAGGING :

- ✓The emasculated male flowers are immediately cover by paper, plastic & polythene bags.
- ✓It is important for prevent contamination from foreign pollen grains.
- ✓Pollen grains of male parents are collected as their anther mature.
- ✓The stigma of emasculated flower of the female parents mature, the covering bags are removed one by one for dusting their stigma with pollen grains of desired variety.

FERTILIZATION

- The process of fertilization was discovered by STRASBURGER.
- The process of fusion of male & female gamete to form zygote is called fertilization.
- Fertilization take place in embryo sac.
- Pollen grain received by the stigma have to germinate & produce pollen tube & carry male gamete toward the Egg cell & Polar nuclei.

MCQ

1. Embryo sac represents.

a. Megaspore b. Mega gametophyte c. Mega sporophyll d. Mega gamete.

DOUBLE FERTILIZATION

- Double fertilization was discovered by – NAWASCHIN in Lilium & Fritillaria plants.
- The fusion of one male gamete with egg & fusion of other male gamete with polar nuclei is called double fertilization.
- (Syngamy) Male gamete(n) + Egg(n) = Zygote(2n)
- (Triple fusion) Male gamete(n) + Polar nuclei(2n) = Primary endosperm nucleus(3n)PEN = Primary endosperm cell(3n)PEC = endosperm.

- Syngamy & triple fusion consists of – “Double fertilization”
- PEN modified to form PEC (Primary endosperm cell) which finally developed into endosperm.
- Zygote modified to form – Embryo.

1. Syngamy means

a. Fusion of gametes b. Fusion of cytoplasm

c. Fusion of two similar spores d. Fusion of two dissimilar spores

2. Double fertilization is fusion of

a. Two eggs

b. Two eggs & polar nuclei with polar nucleus

c. One male gamete with egg & other with synergid

d. One male gamete with egg & other with secondary nucleus

3. The role of double fertilization in angiosperm is to produce.

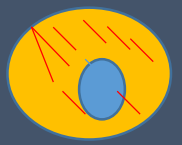
a. Cotyledons b. Endocarp c. Endosperm d. Hormones

POST FERTILIZATION

POST FERTILIZATION CHANGES INCLUDES

a. Endosperm formation
b. Embryo formation
c. Seed formation
d. Fruit formation

A. ENDOSPERM FORMATION

- Male gamete(n) + Polar nuclei(2n) = Primary Endosperm Nucleus(PEN) = Primary Endosperm Cell(PEC) = Endosperm.
- Endosperm is characteristics – storage, tissue, which supply nutrition to the developing embryo.
- Male gamete – Central cell(2n) =PEN = PEC = Endosperm 
- Male gamete(n) – Egg(n) = Zygote(2n) = Embryo(2n) = Ovule = Seed.

DEPENDING ON MODE OF ITS FORMATION, ANGIOSPERMIC ENDOSPERM IS OF 3 TYPES.

1. **NUCLEAR ENDOSPERM** – E.g. Coconut.
2. **HELOBIAL ENDOSPERM** – E.g. Pea, Beans, Caster.
3. **CELLULAR ENDOPSERM** – E.g. Balsam, Dhatura, Petunia.

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UNIT VI

REPRODUCTION

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1. NUCLEAR ENDOSPERM

- ✓The primary endosperm nucleus divides repeatedly without wall formation to produce large number of free nuclei.
- ✓A central vacuole appears in a central cell & push the cytoplasm containing the nuclei to periphery.
- ✓The cytoplasm thickens so that the vacuole decreases in size.
- ✓Coconut water is nothing but it is nuclear endoplasm (Made up of thousand of free nuclei)

- ✓White kernel deposited at periphery.
- ✓Endosperm may either be completely consume by the developing embryo e.g. Pea, Groundnut, Beans.
- ✓Endosperm may be persist in mature seed.
- ✓E.g. Coconut & Caster

B. EMBRYO FORMATION (EMBRYOGENY)

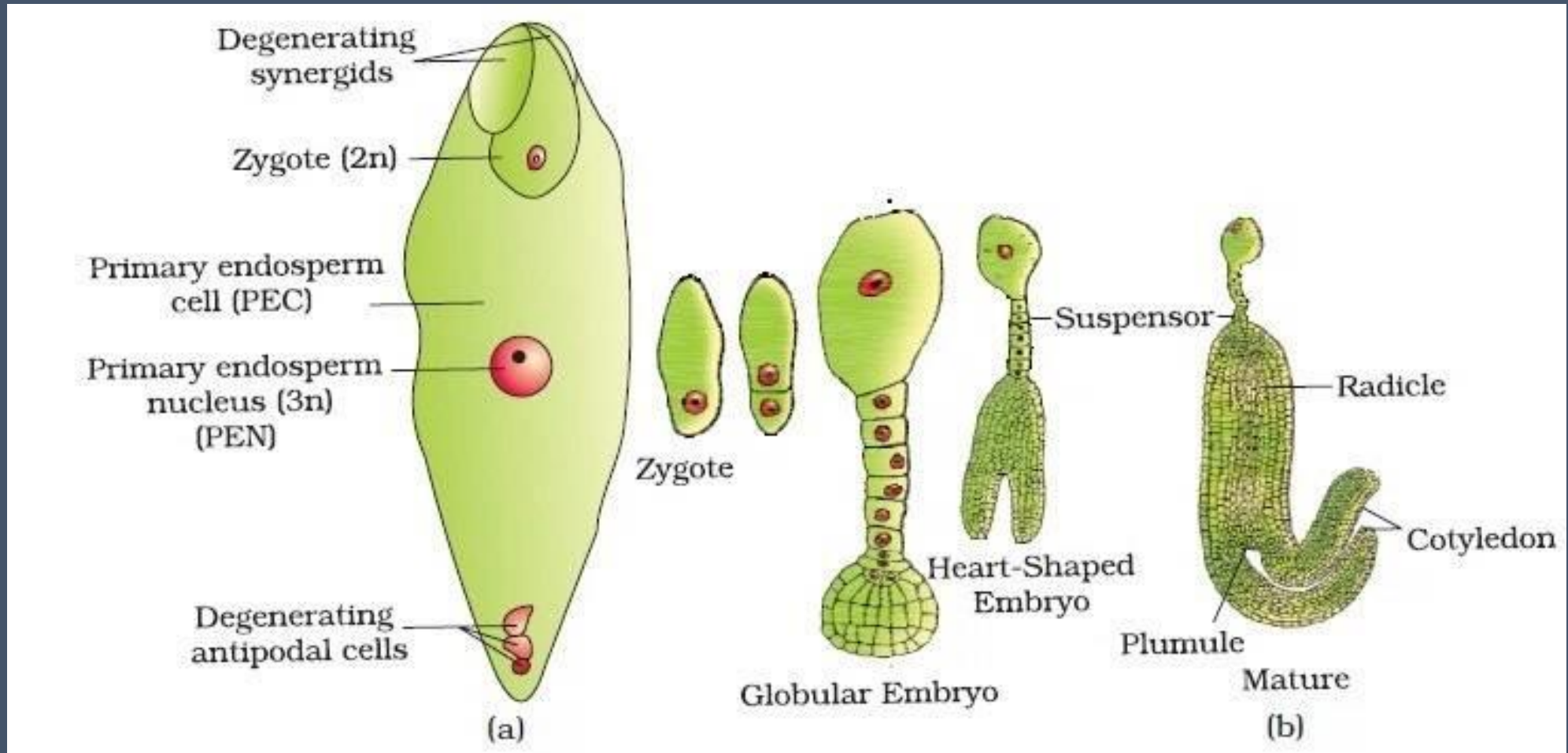


Diagram showing embryogenesis in Capsella bursa pastoris

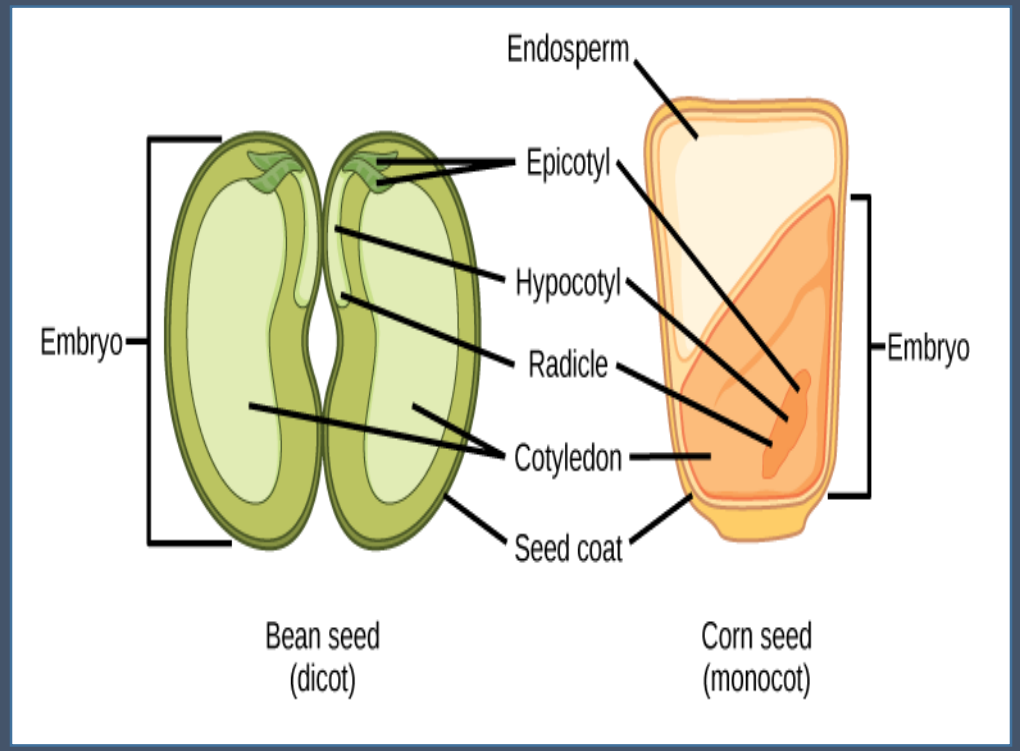
- Zygote undergo transverse unequal division to form large suspensor cell & small embryo cell.
- Suspensor cell help in pushing the embryo in the endosperm.
- The embryo cell undergo two vertical division & one transverse division to form eight cell which arrange into Hypobasal tier & Epibasal tier.
- Hypobasal tier form Hypocotyl.
- Epibasal tier to form two cotyledons & plumule.

IN DICOTS

- Two cotyledons is produces in dicot plant. E.g. Pea

It consists of

- Two cotyledons
- Epicotyl
- Plumule
- Hypocotyl
- Root tip which cover by root cap.



DICOT EMBRYO

❑EPICOTYL:

✓It covered the cotyledons.

✓Epicotyl modified to form plumule which give rise to shoot of the plant.

❑Hypocotyl:

✓It is cylindrical portion below the epicotyl, which modified to form radicle which give rise to root tip covered by root cap.

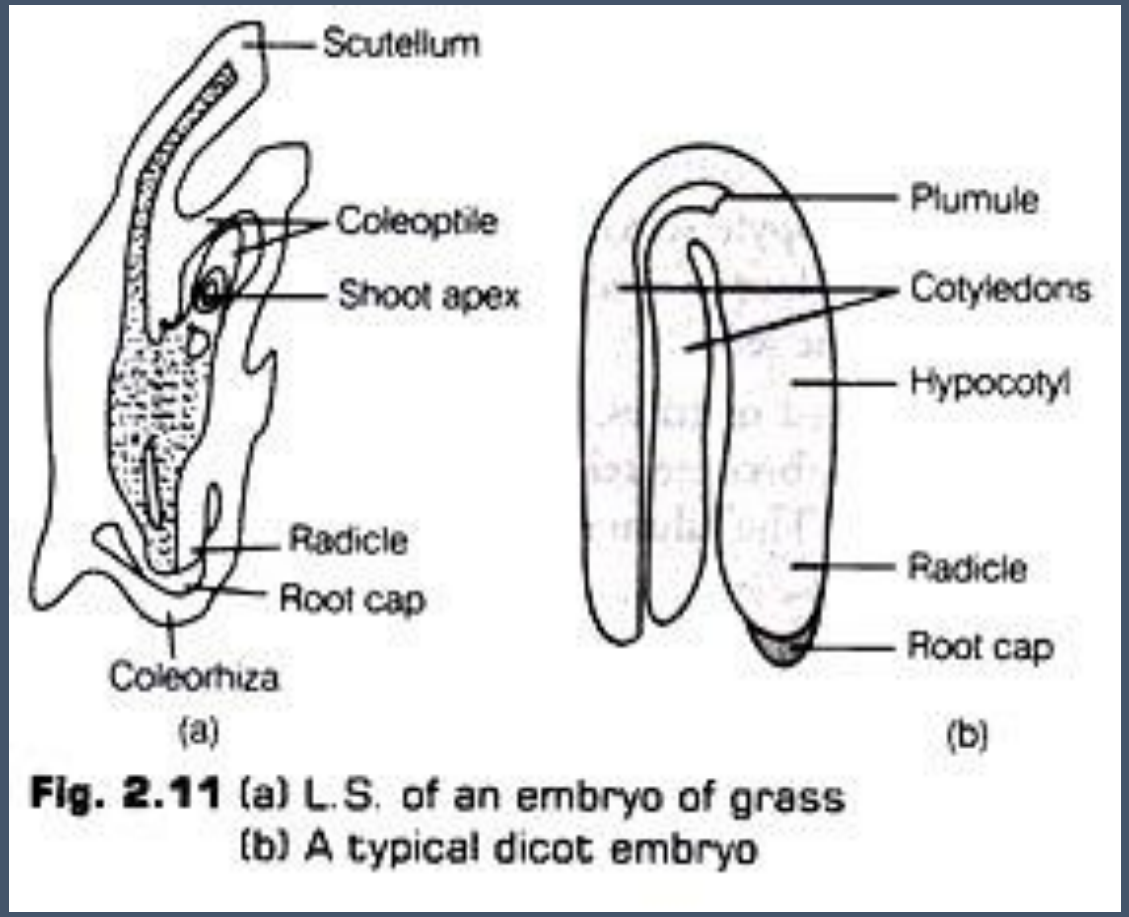


Fig. 2.11 (a) L.S. of an embryo of grass (b) A typical dicot embryo

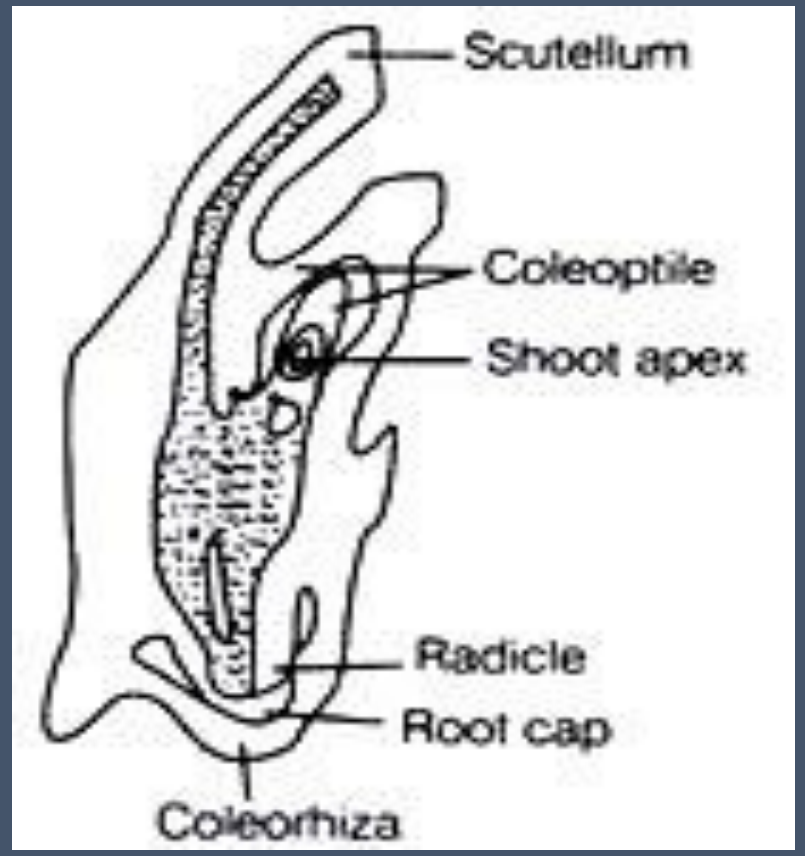
PLUMULE GIVE RISE TO SHOOT

RADICLE GIVE RISE TO ROOT

IN MONOCOT

- Only one cotyledons is produced in monocot e.g. Maize, Onion, Palm
- In grasses family cotyledons called SCUTELLUM.
- **It consists of**

a. One cotyledons
b. Epicotyl
c. Hypocotyl
d. Plumule
e. Coleoptile - Covering of plumule.
f. Radicle
g. Coleorhiza – Covering of radicle.



1. Coconut water from tender coconut is.

a. Innermost layer of the seed coat. b. Degenerate nucellus

c. Immature embryo d. Free nuclear endosperm

2. Syngamy means

a. Fusion of gametes b. Fusion of cotyledons

c. Fusion of two similar spores d. Fusion of two dissimilar spores.

3. Double fertilization & triple fusion were discovered by.

a. Hofmeister b. Nowaschin & Guignard c. Leeuwenhoek d. Strasburger

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UNIT VI

REPRODUCTION

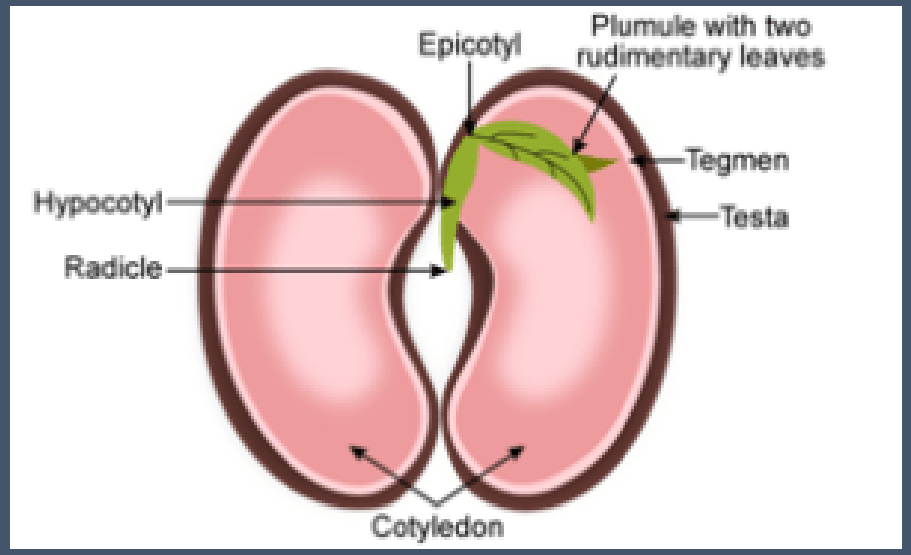
Chapter 2 (Part IX)

Sexual Reproduction in Flowering Plants

MR. PAWAR NAYAN
BIOLOGY EXPERT

SEED FORMATION

- Biologically seed is defined as ripened ovule.
- Seed developed from ovule inside the ovary after fertilization.
- Seed consist of a) Seed coat & b) Embryo



a) SEED COAT:

✓It consist of outer Testa & Inner tegument.

✓Testa formed by – Outer integument

✓Tegument formed by – Inner integument

b) EMBRYO:

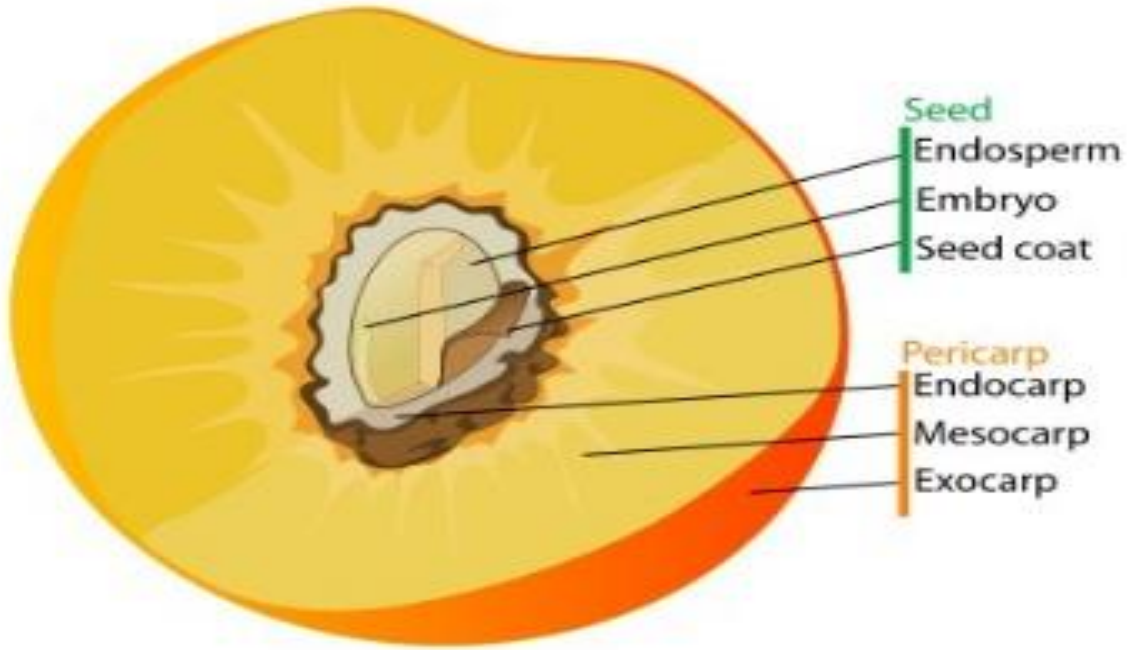
✓Embryo consist of embryonal axis known as "Tigellum" which is tipping downward into Radicle.

✓Part of "Tigellum" above the cotyledon is Epicotyl which is tipper to plumule.

✓Part of tegument below cotyledon is Hypocotyl.

The Parts of a fruit and its seed

The pericarp is different from the **seed coat or testa.**



MATURE SEED	
NON ALBUMENOUS SEED / NON ENDOSPERMIC	**ALBUMINOUS SEED / ENDOSPERMIC**
- There is no residual endosperm as - It is completely consumed during embryo development.	- They have retain a part of endosperm as it is not completely used up during embryo development.
e.g. Pea, Ground nut etc.	e.g. Wheat, Maize, Barley, Caster

- ❖In some seed such as “Black pepper” & Beat, remnant of nucleus are also persist.
- ❖This residual persistent nucleus is - PERISPERM

PROCESS OF GERMINATION

a) **IMBIBITION:** water enter into seed through micropylar end & seed will be germinated.

b) **RESPIRATION:** Initially respiration is anaerobic, later it become aerobic when mitochondria differentiate into cells. E.g. ALBUMINOUS SEED, NON ALBUMINOUS SEED.

FACTORS FOR SEED GERMINATION

A) water, B) Temperature, C) Light, D) Oxygen.

❖**DORMANCY:** Inactive form of seed is called dormancy.

❖ADVANTAGES OF SEED:

- ✓They are used in reproductive process such as pollination & fertilization.
- ✓They store reserved food material.
- ✓Seed is the basis of our agriculture.
- ✓The hard seed coat provide the protection to the young embryo.

1. Albuminous seed store their reserve food mainly.

a) Endosperm b) Cotyledons c) Hypocotyl d) Perisperm

2. Non - Albuminous seed is produced in.

a) Maize b) Caster c) Wheat d) Pea

3. Perisperm is

a) Remnant of endosperm b) Persistent nucellus

c) Peripheral part of endosperm d) Disintegrated secondary nucleus

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UNIT VI

REPRODUCTION

Chapter 2 (Part X)

Sexual Reproduction in Flowering Plants

MR. PAWAR NAYAN
BIOLOGY EXPERT

FRUIT FORMATION

BIOLOGICALLY FRUIT IS DEFINED AS RIPPENED OVARY.

TRUE FRUIT

When fruit developed from ovary is called true fruit.

E.g. Mango

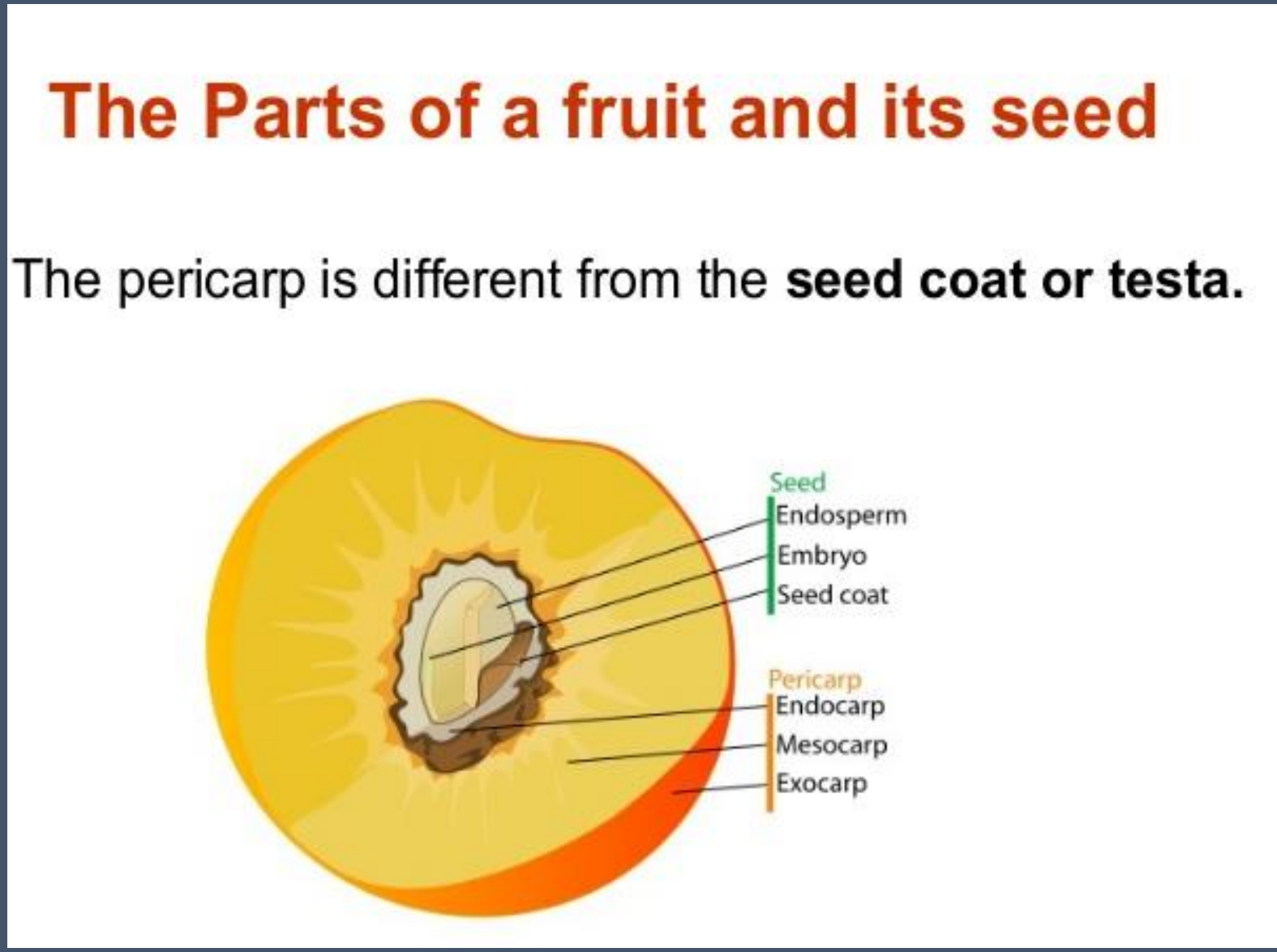
FALSE FRUIT

When fruit developed other than ovary is called false fruit.

e.g. apple, strawberry – developed from thalamus.

- Pericarp is also called fruit wall which consist of

1. Epicarp – outer covering
2. Mesocarp – middle covering
3. Endocarp – innermost covering



PARTHENOCARPIC FRUIT

- Fruit develop without fertilization is called parthenocarpic fruit.
- They are seedless fruit.
- It can induced through the application of growth hormones.
- E.g. Banana.

APOMIXIS

- Greek word – apo – without, mixis – mixing
- Made up of – asexual reproduction in which formation of seed with the formation of male & female gametes.
- Incitrus & opuntia – the embryo is developed directly from a diploid cells other than egg like nucleus & integument.

RECURRENT AGAMOSPERMY

- All the cells of embryo sac Diploid as it form directly either from a nucellus cell (Apospory) or Diploid megaspore mother cell (Diplospory).

POLYEMBRYONY

- Discovered by “Leeuwenhoek”
- Polyembryony is the characteristic features of gymnosperm but it can also report in angiosperm.
- Polyembryony is define as “Occurrence of more than one embryo in a seed”.
- E.g. Onion, Ground nut, Mango
- Lemon & Orange – citrus plant(most common)

POLYEMBRYONY	
SIMPLE POLYEMBRYONY	**ADVENTIVE POLYEMBRYONY**
- Presence of more than one embryo sac & hence fertilization of more than one egg.	Development of embryo from nucellus or integument cell.
e.g. Brassia	e.g. Citrus, Magnifera

1. The Polyembryony commonly occur in

a. Tomato b. Potato c. Citrus d. Turmeric