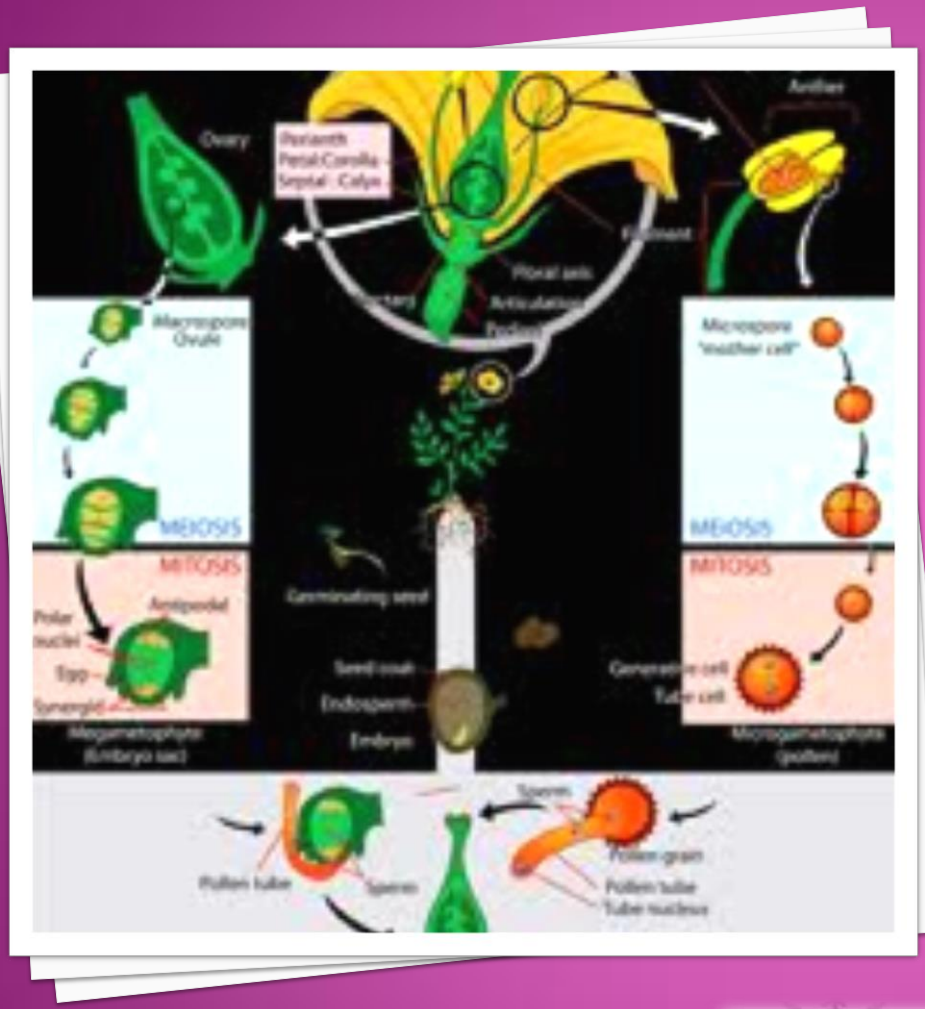


LIFE SCIENCES GRADE 11 CAPS

STRUCTURED, CLEAR, PRACTICAL - *HELPING TEACHERS UNLOCK THE POWER OF NCS*

KNOWLEDGE AREA: Diversity, change and continuity
TOPIC 1: Biodiversity of Plants and Reproduction

Reproduction in Plants

Sangari SouthAfrica
THINK. DO. LEARN.

GAUTENG
PROVINCIAL GOVERNMENT

ASEXUAL REPRODUCTION

- **Asexual reproduction** occurs in **absence of gametes**.
- In this type of reproduction only **one parent** is involved, and **all offspring** have the **same genetic composition** as the parent.
- This process occurs through **mitosis**

ASEXUAL REPRODUCTION – ADVANTAGES AND DISADVANTAGES OF ASEXUAL REPRODUCTION

ADVANTAGES:

- In favourable conditions – large amounts of offspring are produced rapidly
- Energy expenditure is low
- The **offspring** will be **successful** in the **environment** because **they are identical** to the **parents**, who lived **successfully** in the same environment.

ASEXUAL REPRODUCTION – ADVANTAGES AND DISADVANTAGES OF ASEXUAL REPRODUCTION

DISADVANTAGE:

- If **any changes** occurs in the environment then all the **offspring** in the environment will be **affected** since they are **genetically identical**.
- All share the same characteristics and if the environment changes, it can be fatal to the plants
- Some produce so many offspring which leads to overpopulation and then competition for space and food increases

SEXUAL REPRODUCTION

- **Sexual reproduction** is reproduction that occurs with two parents and their genetic material combines.
- **Gametes**: the **sperm** and **ova** are produced by Meiosis
- During sexual reproduction a **sperm fertilizes a single egg** to produce a **zygote** that develops into a new individual

SEXUAL REPRODUCTION – ADVANTAGES & DISADVANTAGES OF SEXUAL REPRODUCTION

Advantages:

- Sexual reproduction results in **genetic variation**. This means that the **offspring** produced are **genetically different from each other**. This allows the **species to survive** because if something changes in the environment then at least **some of the organisms would survive**.
- It forms the basis of evolution because it can result in formation of new species
- Since The genetic material is shuffled the chances of inheriting a weak characteristic decreases.

SEXUAL REPRODUCTION – ADVANTAGES & DISADVANTAGES OF SEXUAL REPRODUCTION

DISADVNTAGES:

- Takes longer than asexual reproduction
- Fewer offspring are produced, decreasing the chances of survival
- Energy expenditure is higher. Special reproductive organs form
- Plants need agents to disperse seeds and pollen.

FLOWERS AS REPRODUCTIVE ORGANS

- The **flower** is the **reproductive organ** in a plant.
- We shall look at a monocot and dicot flower.

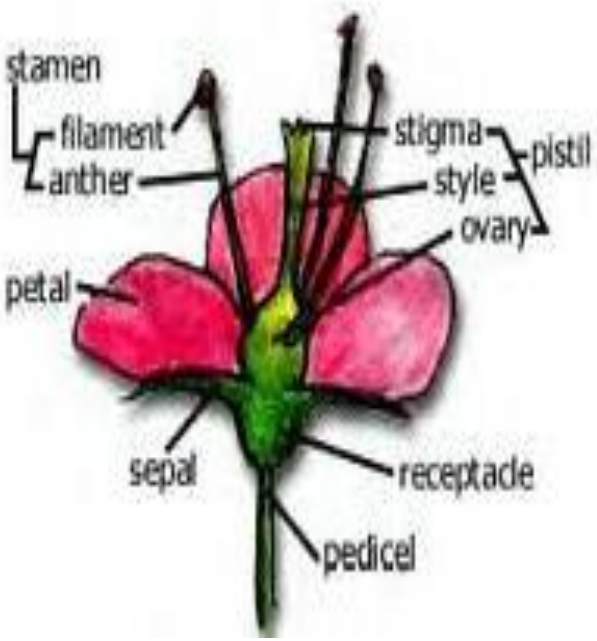
REPRODUCTIVE ORGAN IN A PLANT

DICOT FLOWER:

- We shall look at an example of a dicot flower.
- We will look at the ***Petunia*** as an example.

REPRODUCTIVE ORGAN IN A PLANT

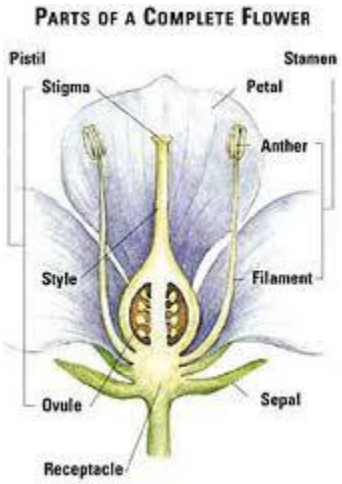
- The perianth in dicotyledonous flowers is differentiated into two parts: **calyx** and **corolla**
- The petunia **flower** is made up of **4 whorls**.
  - Calyx
  - Corolla
  - Androecium
  - Gynoecium



REPRODUCTIVE ORGAN IN A PLANT

The Calyx:

- The **calyx** is the **outermost whorl** of the flower.
- It is made up of **5 sepals**
- Which **protects the inner whorls of the flower, especially in the bud stage**.



REPRODUCTIVE ORGAN IN A PLANT

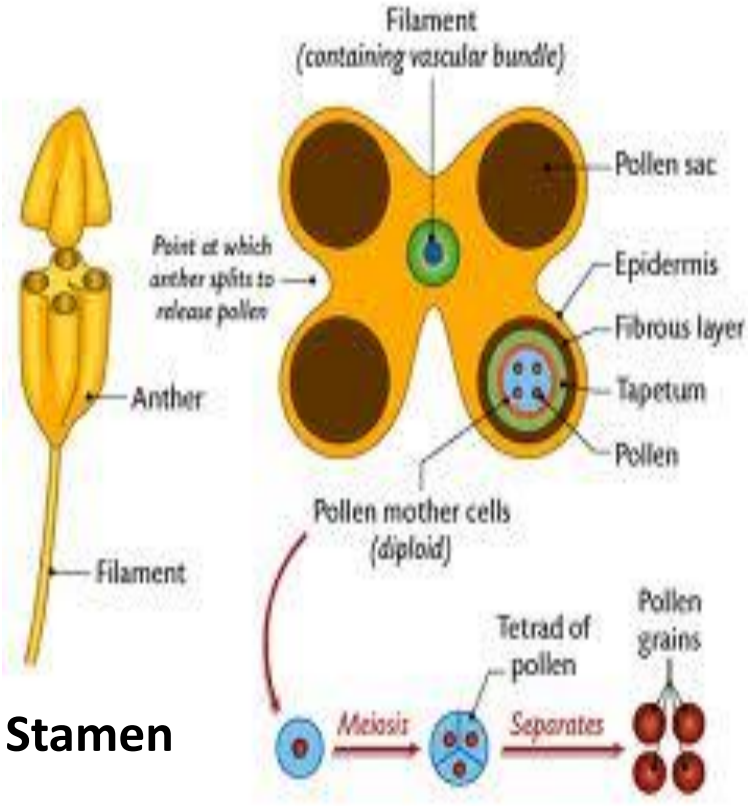
The Corolla:

- This is the **second whorl** of the flower.
- It is made up of 5 **brightly coloured petals**.
- These petals in the *Petunia* are **joined** to form a **corolla tube**.
- The corolla tube is **trumpet shaped**.
- The petals attracts **pollinating agents**. (birds and insects)

REPRODUCTIVE ORGAN IN A PLANT

The Androecium:

- This is the **male whorl** of the flower. Also called **stamens**
- In the *Petunia* there are **5 stamens**.
- Each **stamen** is made up of **2 parts**.
- These are the **anther** and the **filament**.
- The **anther** contains **pollen sacs**.
- The pollen sacs contain **pollen grains**.



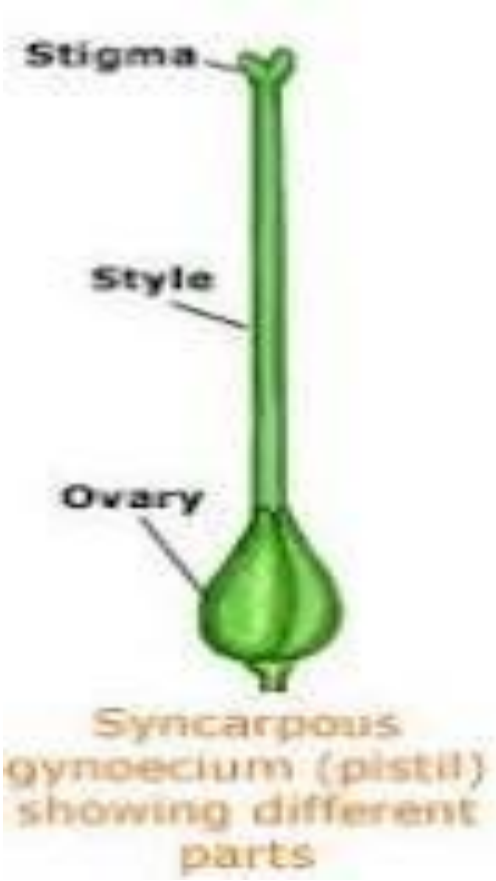
Stamen

The Androecium

REPRODUCTIVE ORGAN IN A PLANT

The Gynaecium:

- This is the **female whorl** of the flower.
- It is made of **floral whorls** called **carpels**.
- The **gynaecium** of the ***Petunia*** has **2 carpels**.
- The **carpels** go on to form the **pistil**.
- Each pistil is made up of **3 parts**.
- These 3 parts are the **stigma, style and ovary**.



REPRODUCTIVE ORGAN IN A PLANT

- The **stigma** is **sticky** to **receive the pollen grains**.
- The *Petunia* has a **bi-lobed stigma**.
- The **style** is a **long tube like structure**.
- It has **2 functions**.
- They are:
- to hold the **stigma in a favorable position** to **receive pollen grains** during **pollination**.
- To serve as a **passage for the growth of the pollen tube towards the egg**.

REPRODUCTIVE ORGAN IN A PLANT

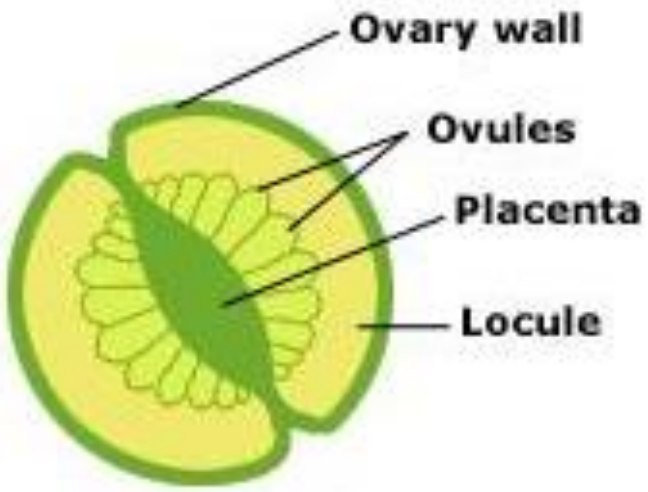
- A tissue occurs in the centre of the ovary.
- This tissue is called the **placenta.**
- The **ovules** are **attached** to the **placenta**.
- Since the **ovules** are **attached** to the **placenta** and the placenta is found in the **centre of the ovary**, we say that the **ovule** are **arranged in axile placentation**.

Placentation

axile

REPRODUCTIVE ORGAN IN A PLANT

- The **ovary** also has chambers or cavities.
- These **chambers** or **cavities** are called **locules.**
- The *Petunia* has **2 locules** .
- Therefore it is called bi-locular.
- The *Petunia* has a **superior ovary** because the **ovary arises** from **above the receptacle**.



T.S. of ovary

REPRODUCTIVE ORGAN IN A PLANT

MONOCOT FLOWER:

- We shall look at an example of a monocot flower.
- We will look at the ***Aloe*** as an example.

REPRODUCTIVE ORGAN IN A PLANT

- This is an example of an **incomplete flower** because is made up of **3 whorls instead of 2**.
- The 3 whorls are:

a. The perigone
b. Androecium
c. Gynoecium

- Lets look at each whorl…

a. **The perigone**

- The **perigone** is made up of a **fused calyx and corolla**.
- The **perigone** is made up of individual **petal like structures** called the **tepals**.

REPRODUCTIVE ORGAN IN A PLANT

- The *Aloe* is made up of **6 orange coloured tepals**.
- These **tepals** are **arranged in 2 circles**.
- There are an **outer ring of 3 tepals** that **alternate with an inner ring of 3 tepals**.
- In most *Aloe* the **tepals are fused at the bottom to form a perianth tube**.
- The **perianth tube attracts pollinating agents such as insects and birds**.

Flower of Aloe

REPRODUCTIVE ORGAN IN A PLANT

The Androecium

- This is the **male whorl**.
- It is made of **stamens**.
- Each **stamen** is made up of an **anther and filament**.
- In the *Aloe* there are **6 stamens**.
- These **stamens** are **arranged in 2 circles of 3**.

Stamen of Aloe

REPRODUCTIVE ORGAN IN A PLANT

The Gynaecium:

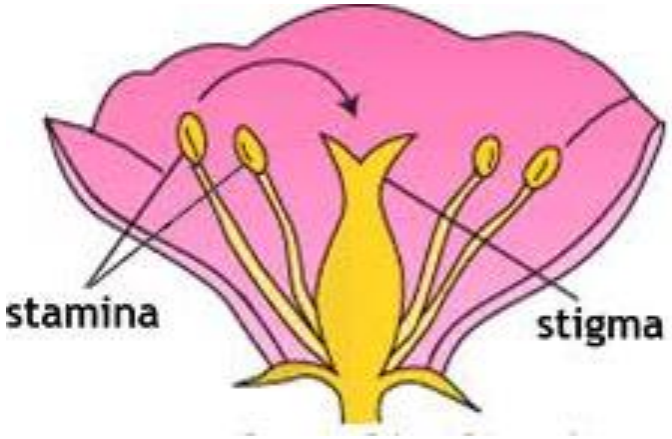
- The **gynaecium** consists of a simple stigma, a long thin style and an ovary that consists of three lobes.
- There are three rows of ovules
- The ovary is **superior**

POLLINATION AND FERTILIZATION

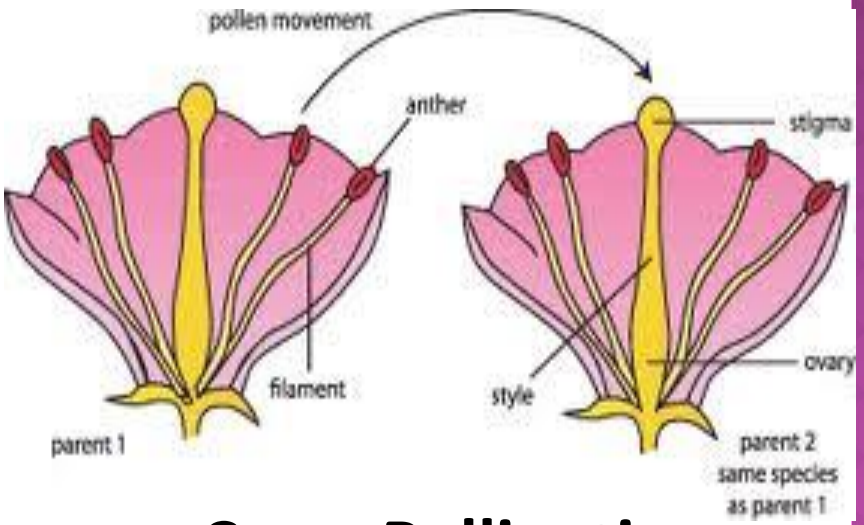
- **Pollination** is the **transfer** of **ripe pollen grains** from the **anther** to the **stigma** of a flower.

POLLINATION AND FERTILIZATION

- There are **two types** of pollination.
- These are **cross or self pollination**.
- **Cross pollination** is when the **pollen grains** from the **anther of one flower is transferred to the stigma of another flower**.
- **Self pollination** is when the **pollen grains from the anther of one flower is transferred to the stigma of the same flower**.



Self Pollination



Cross Pollination

POLLINATION AND FERTILIZATION

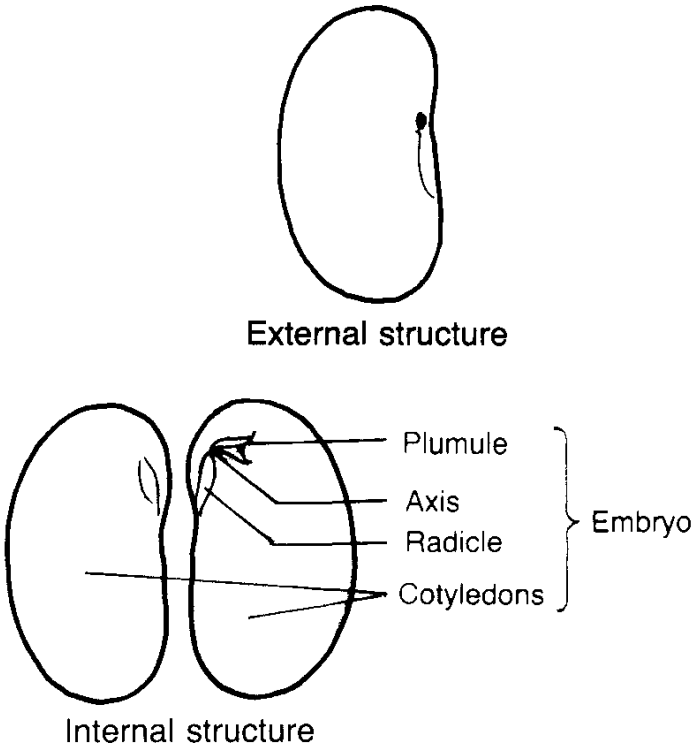
- The **pollen grains** are released form the **anther**, when the **anther bursts**.
- The **wind, water, insects or birds** can be **pollinating agents**.

POLLINATION AND FERTILIZATION

- As the **pollen grain develops** it eventually contains **two sperms**.
- At this stage it **grows down into the style** by means of a **pollen tube**.
- **One sperm** would **fuse** with the **egg** to form a **zygote**.
- This process is called **fertilization**.
- The **zygote undergoes mitosis several times** to form an **embryo**.

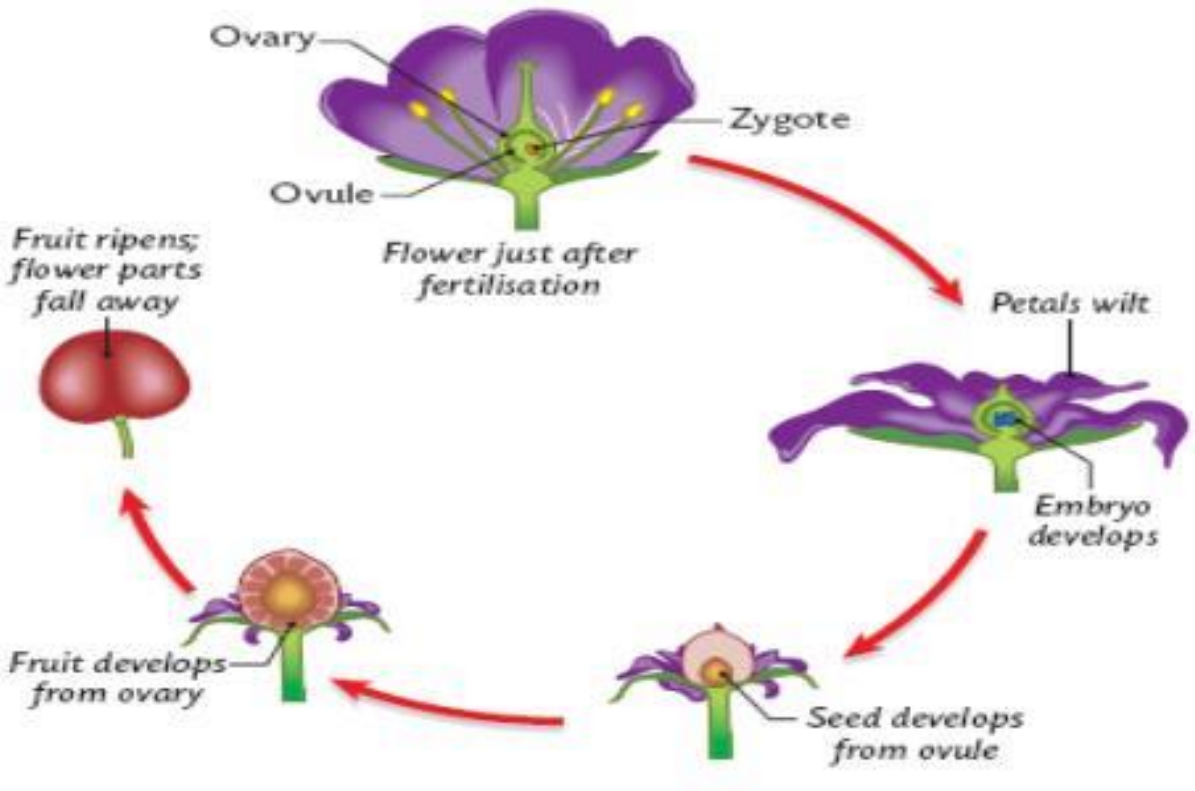
POLLINATION AND FERTILIZATION

- The **embryo occurs within the seed**.
- The embryo is made up of **3 parts**.
- These are the **radical, the plumule and the axis**.
- The **radical** is the **first root** and would **develop into the root system**.
- The **plumule** is the **first leaves**.
- The **axis** is the **first shoot**.



POLLINATION AND FERTILIZATION

- The **embryo occurs within the ovary**.
- The **mature ovule** develops into the **seed**.
- The **ovary** becomes the **fruit**.



SEED DISPERSAL AND GERMINATION

- When the **fruit ripens** it **splits** and the **seeds are released**.
- The **seeds can be dispersed** by the **wind, water, insects, birds and mammals**.
- The seeds are adapted to their pollinating agent.
- For example seeds that are **dispersed by animals** have **hooks or bristles to stick onto the animals coat**.
- **Seeds that have wings or parachutes** are **dispersed by the wind**.

SEED DISPERSAL AND GERMINATION

- When the **conditions are favorable** the **seed germinates**.
- The **seed absorbs water** and the **testa breaks**.
- The **radical and plumule** then **emerges**.
- The **radical develops into the roots**.
- The **plumule develops into the first leaves**.
- The **cotyledon acts as the leaf** until the **true leaves appear**.

ADAPTATION OF FLOWERS TO THE DIFFERENT POLLINATING AGENTS

- We will look at how the flower is adapted for **self pollinating agents**.
- The **main agents** of self pollination are **wind, insects and birds**.

ADAPTATION OF FLOWERS TO THE DIFFERENT POLLINATING AGENTS

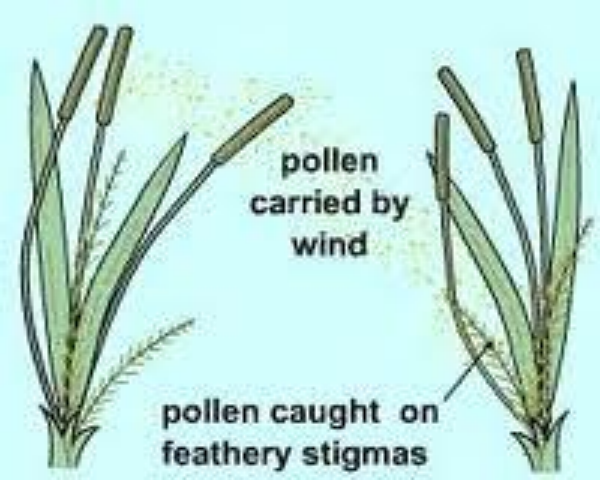
Wind Pollinated Flowers:

- These flowers are **small and green**.
- Their **petals are not brightly coloured**.
- They **produce little nectar** and **do not have a very strong scent**.
- Some examples of such plants are maize, grass, polar and oak tree.

ADAPTATION OF FLOWERS TO THE DIFFERENT POLLINATING AGENTS

Adaptations to Wind Pollination:

- The **filaments** are **long and thin** so that they can **sway in the wind**.
- The **anthers** are attached to the filament in such a way so that they are **exposed and can be moved easily**.
- **Stigma** is **large and feathery** to **trap as many pollen grains as possible**.



ADAPTATION OF FLOWERS TO THE DIFFERENT POLLINATING AGENTS

- The **stigma** is also **sticky** to **trap as many pollen grains as possible**.
- A **large amount of pollen grains** are produced to **ensure at least some of them reach the stigma**.
- The **pollen** are **light, dry and smooth** so that they can be **easily carried by the wind over long distances**.

ADAPTATION OF FLOWERS TO THE DIFFERENT POLLINATING AGENTS

Insect Pollinated Flowers:

- These **flowers** are **brightly coloured**.
- They give off a **strong fragrance** and are **usually large**.
- These **flowers provide** the **insect with pollen or nectar for food**.
- When the **insect visits the flower** some of the **pollen is rubbed of onto its body**.
- When it visits the next flower the **pollen from its body is rubbed off onto the stigma of the new flower**.

ADAPTATION OF FLOWERS TO THE DIFFERENT POLLINATING AGENTS

- **Butterflies, bees and moths** are some of the insects that are involved in **pollinating flowers**
- Some examples of flowers that are **insect pollinated are sunflowers and daises**.

Adaptations of Insect pollinated Flowers:

- **Flowers** are **brightly coloured** to **attract insects**. All **brightly coloured flowers attract butterflies**, flowers that are **blue, purple and red attract bees** and **moths** are attracted by **white and yellow flowers**.

ADAPTATION OF FLOWERS TO THE DIFFERENT POLLINATING AGENTS

- Flowers are **large**, or sometimes when **flowers are small** the are **grouped together to make them more visible**.
- Flowers with **pleasant scents attract bees, butterflies and moths**. Flowers with **unpleasant scents attract flies**.

ADAPTATION OF FLOWERS TO THE DIFFERENT POLLINATING AGENTS

- Some flowers have **hairs or markings** that **lead the insect to the nectaries** which **produce the nectar**. Example *Iris*.
- **Pollen grains** are **sticky or rough** so that they can become **attached to the insect's body**.

ADAPTATION OF FLOWERS TO THE DIFFERENT POLLINATING AGENTS

- Some flowers have **structural adaptations** that **help transfer the pollen grains from the flower to the insect**. One example is the ***Salvia***, when the **insect lands on the lower petal (called a lip) the stamens bend over from above and press down on the insects back, transferring the pollen onto the insects back**.