



PLANTS ARE THE KEY to life on Earth. Without them many other living organisms would soon disappear.

The plant Kingdom is divided into different groups and contains about 400,000 separate species.

All plants fall into two basic categories. Flowering plants, **angiosperms** (comes from the Greek word that means **seed in a vessel**), produce true flowers. Many plants do not have flowers. The non-seed plants include "primitive" plants, such as mosses, ferns, horsetails and liverworts, and the **gymnosperms**, a group of plants which includes the conifers.

There are many different types of plant reproduction

- All plants reproduce (make new plants like themselves). Many which reproduce through **flowers, fruits and seeds**.
- There are others which do not bear flowers, fruits or seeds, but still produce more of their kind. Such plants are **non-seed plants**, such as mosses, ferns, etc
- Other ways plants can make new plants are from **spores, rhizomes, bulbs, tubers, corms, cuttings, grafts and buds**.

Seeds are made by **flowers** in some plants and by **cones** in other plants, **conifers**.



Cones grow near the tree tips of conifer branches.

The majority of plant organisms belong to the flowering plant family, or Angiosperms.

Gymnosperms are plants whose seeds do not develop inside an ovary. Most gymnosperms are coniferous trees.



- **Flowering plants - Plants with flowers**

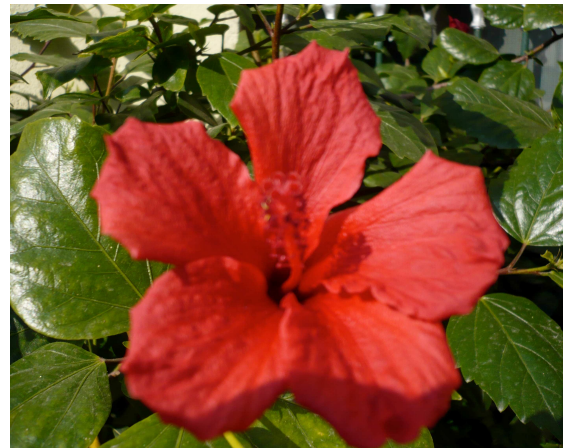
The Flowering plant group or **angiosperms**, contains more than 300,000 species, including flowers, herbs, grasses, vegetables and trees (but not conifers, which are gymnosperms).

- Flowering plants are divided into two main groups:

Monocots have a single cotyledon (food store), such as grasses, rushes, lilies and orchids. Monocots also include cereals, such as wheat, some vegetables, such as leeks and some fruits, such as pineapples. They number about 55,000 species.

Dicots are plants that have two cotyledons. Dicots total at least 250,000 species and they include most shrubs, most flowers and all the world's broadleaved trees.

Many flowers have brightly coloured petals to attract insects to pollinate them.



- * A flower is a specialized part of the plant and develops into a fruit, which contains one or more seeds housed in ovaries.
- * Flowers come in different shapes and sizes but most have the same parts.
- * The flower is the reproductive organ of the plant.

Sexual Reproduction



Requires the union of male and female cells, or gametes (sperm and eggs) in the formation of a new organism.

Parts of a flower:

Accessory structures: What are they for?

1. The **calyx** consists of all the **sepals**, which protects the flower before it opens.
2. The **corolla** consists of all the **petals**, which serve to attract pollinators through colour and scent.

3. Male Reproductive Structure:

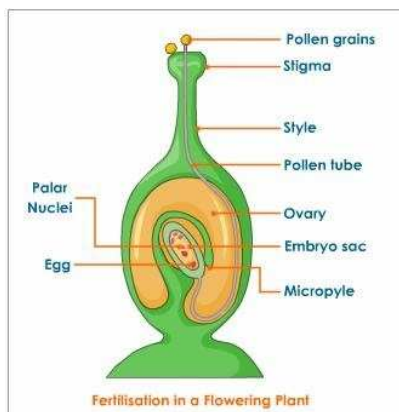
The **stamen** consists of two parts:

Stamen	<p>Anther where pollen is produced.</p> <p>Filament A stalk that supports the anther.</p>
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QuickTime™ and a decompressor are needed to see this picture.

4. Female Reproductive Structure:

The **pistil** consists of the **stigma**, **style** and **ovary**.



Pistil

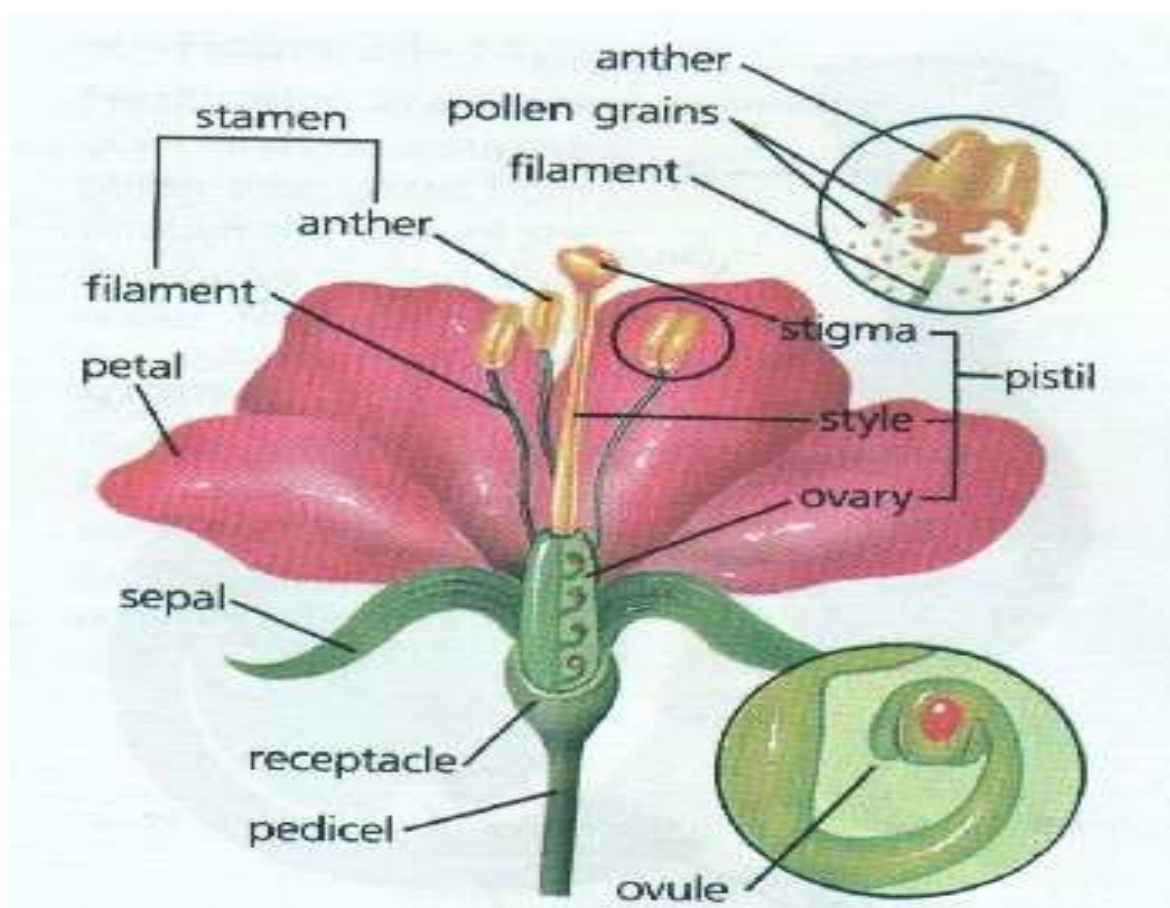
Stigma Receives the pollen from the anther.

Style The neck of the pistil.

Ovary Contains the female reproductive cells in their ovules (eggs).



Parts of a flower





How a plant is pollinated?

- Before a flower can make seeds, it must be pollinated.
- The pollen has to be transferred to the stigma of another flower of the same type.
- A flower can only use pollen that has come from the same type of plant.



Brightly coloured flower petals attract insects such as this bee, to land on flowers, thus encouraging insects to pollinate them.

Pollination \implies is the process by which pollen is moved from one flower to another.

A. Self-pollination \implies takes place when pollen is transferred from the stamen of one flower to the pistil of the same flower or plant.

B. Cross-pollination \implies the most common and occurs when the pollen goes from the stamen of one flower to the pistil of another flower.

Pollen can be carried: \implies a) by insects or other animals
 \implies b) by wind.
 \implies c) by water.

a) Attracting insects or other animals

Plants that are pollinated by animals often are **brightly coloured** and have a **strong smell** to attract the animal pollinators.

The colour or markings of a particular flower help attract and guide insects to them for pollination. For instance, **bees** are often attracted to bright blue and violet colours. **Hummingbirds** are often seen



on red, pink, fuchsia, or purple flowers. **Butterflies** also enjoy bright colours such as yellow, orange, pink and red as well as fragrant ones.

- To attract insects, some flowers have brightly coloured petals and a powerful scent.
- Near the base of the petals the flower makes a sugary juice called **nectar** for insects to drink.
- As insects search for the nectar, they pick up sticky pollen with their bodies from the stamens or anthers.
- When they visit another flower they transfer the pollen to the other plant's sticky stigma.

b) By the wind

The wind picks up pollen from one plant and blows it onto another.

- Wind-blown pollen is normally dry and dust-like.
- Wind-pollinated plants are generally not as bright as others are. These plants consist of feathery-looking flowers.
- Many trees and grasses rely on wind for pollination too.

- Plants that are pollinated by wind often have long stamens and pistils.
- They can be dull-coloured, unscented, and with small or no petals since no insect needs to land on them.



c) By water

Water can sometimes carry pollen from one plant to another. This often takes place with pond plants, such as pondweed.



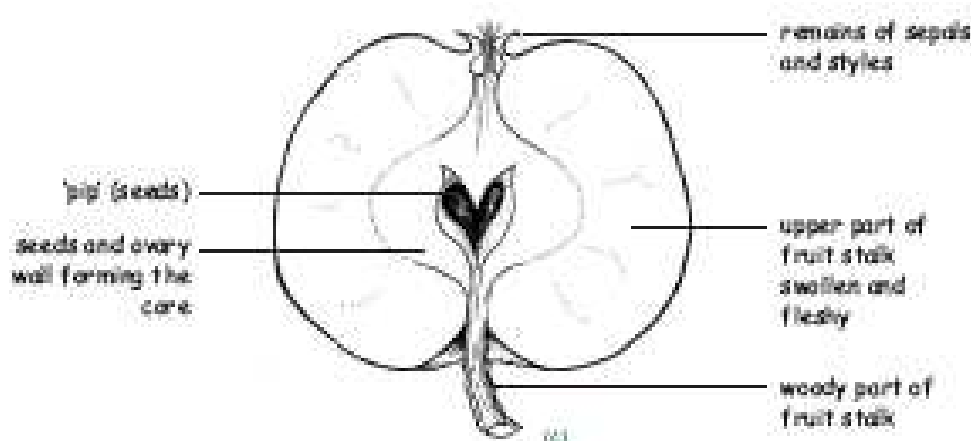


Fertilisation

Once pollination takes place, seeds begin to develop. Pollination is an important part of a plant's life cycle, from flowering plants to non-flowering ones. Without pollination, most plants could not produce fruit or set seeds.

Fusion between genetic material in the male and the female cells.

After fertilisation, the ovule develops into the seed. The seed or seeds, surrounded by the ovary wall develop into the fruit.



Germination

Before germination occurs, there is usually a waiting period (dormancy), until conditions are suitable.

When conditions are appropriate, the seed begins to grow into a new plant

The germination process

The seed begins to take up water. Oxygen enables energy to be released from the stored food and life processes in the cells to be speed up.



Fruit, Seeds and their Dispersal.

It is important for a plant to spread its seeds away from the parent plant and from each other. This prevents overcrowding, reducing competition for light, water and mineral salts.

Seeds, or fruits containing seeds, are dispersed in four main ways:

1. Animal dispersal - some are used as food resources (**juicy fruits and seeds** and **takeaways**) others have hooks and bristles that get caught in the animal's coat (**hitch-hikers**).
2. Wind dispersal - some are tiny and float in the air like dust, others have special structures such as wings and parachutes to keep them airborne longer.
3. Water dispersal - important for plants growing in or by water, the seeds need to be buoyant to float.
4. Self dispersal - **exploders**, where the seeds are forcibly flung out of the pod when ripe.
 - **pepperpot**, where the seeds are shaken free.





• Non Flowering Plants

CONIFERS

Trees that have **needle-like leaves** are called **conifers**. Conifers produce cones instead of flowers. Under each scale of a cone there is a part that produces either pollen or an ovule. But a cone cannot produce both.



The very small cones produce the pollen in spring. The wind carries the pollen to the large cone, which has the ovule producing part. Then, the pollen producing cones fall off while the fertilised ovules grow larger.

Eventually, they open and release the seeds, and some of the seeds sprout



Female pine cone



Male pine cone

Trees that can make seeds have a big advantage over earlier trees and ferns that only make spores.

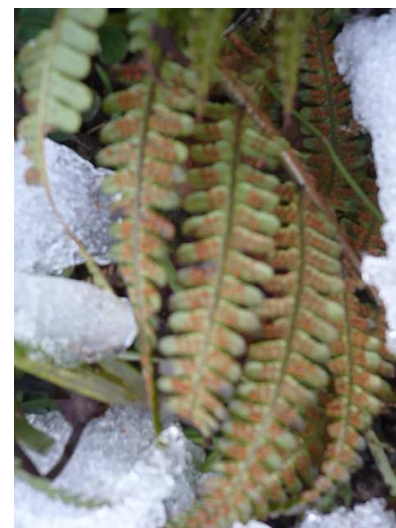
Thanks to their seeds, pine trees can grow in drier places than the older plants. - the pine trees have hard seeds that can produce a new tree without water.

MOSSES & FERNS

A **spore** is a tiny bag which contains a piece of the parent plant.

Spores are delicate and have to land on something wet in order to keep them alive so they can grow new plants. If the spore does not hit a good place right away, it will die. So all plants that make spores have to grow near water.

But seeds have a hard coating on them, and they can live for a long time, blowing around in the wind, until they find a good place to grow. If they fall on dry land, they can wait until a rainy season starts before they begin to grow - some of these seeds can wait for years and years if they have to.



PLANT REPRODUCTION

Asexual Reproduction



* Plants that reproduce asexually **only have one parent**. The offspring is a genetic copy (**clone**) of its parent plant.

* A "bit" of the plant becomes detached and then grows into a new plant. **There is no union of sex cells.**

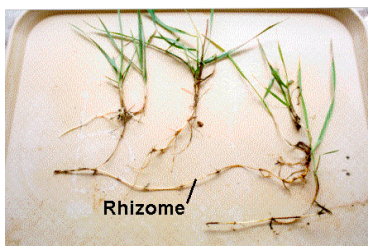
- Asexual reproduction in flowering plants is common.
- Many different seed plants utilize one of a number of different methods of this form of reproduction.

Advantageous reasons for Asexual Reproduction:

1. Is not as complex and requires far less energy.
2. When colonizing a new area, finding a male for sexual reproduction may be difficult or impossible.
3. If the environment is particularly rigorous, the more delicate organs of sexual reproduction may not be able to survive.

Types of Asexual reproduction

1. Rhizomes



- * Horizontal underground stems .
- * New shoots develop from buds in the axils of the scale leaves.

Plants such as grasses produce rhizomes. As these stems grow through the soil, they will periodically produce adventitious roots and a new above ground shoot.

2. Tubers

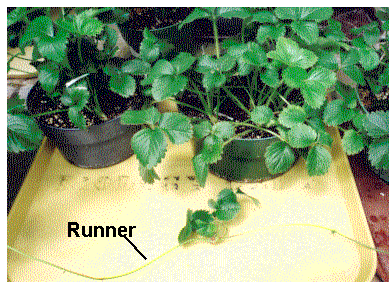


- * Swollen tips of underground stems.
- * Shoots develop from clusters of buds developing above leaf scars (**eyes**).

Examine the potato tuber and note the buds which are commonly called "eyes"

PLANT REPRODUCTION

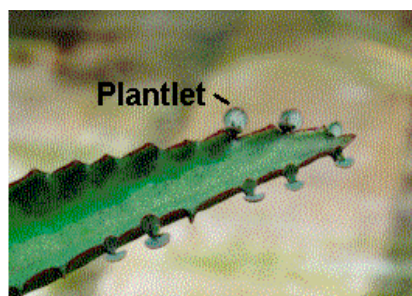
3. Runners (Stolons)



- * These are horizontally growing stems that produce few leaves.
- * At the spot where a leaf would normally develop a node, and new above ground shoots.

Examine the strawberry plant or the spider plant. Note the runner and the new shoots.

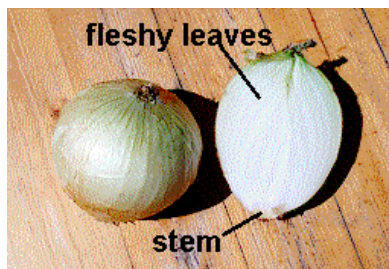
4. Plantlets



- * A few seed plants produce miniature plants on the margin of their leaves.
- * These drop off and develop into mature plants.

Observe the *duckweed*, which is an aquatic plant, Reproduces almost entirely by this method.

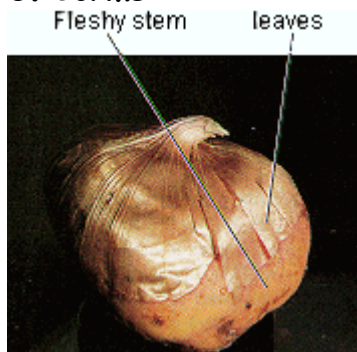
5. Bulbs



- * Each bulb has a very short stem which is surrounded by fleshy leaves.
- * In the spring the shoot apex begins to grow using the nutrients stored in the leaves.

Onions, chives and lilies reproduce by the use of bulbs.

6. Corms



- * This structure is similar to bulbs except that there are no storage leaves.
- * The nutrients are stored in the swollen stem.

Gladiolus and Crocus reproduce by the use of Corms.



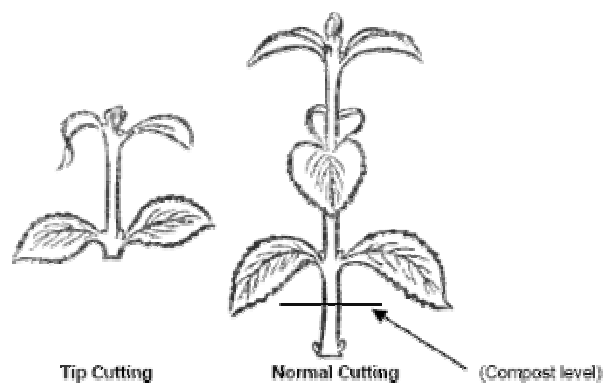
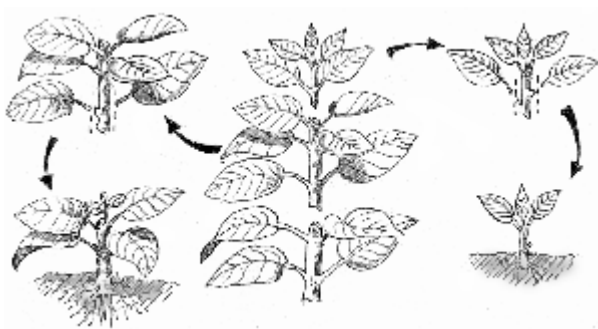
Gardeners who wish to reproduce exactly a favourite flower or fruit often use *vegetative reproduction* in preference to growing their plants from seed. Vegetative reproduction is used widely in the **horticultural industry** to produce large quantities of plants with the desired characteristics.

Often parts of a plant for which the main function is to act as a storage organ and thus allow the plant to survive hard winter conditions, also have the ability to produce new plants if they become separated from the parent plant.

Gardeners often deliberately detach bits of plants and encourage them to form new plants.

Artificial vegetative propagation allows gardeners and farmers to grow plants with certain traits.

Cuttings



- * A cutting is any vegetative part of the plant, stem, leaf, or root used to produce a new individual.
- * Many plants can be propagated from either tip or root cuttings. Generally, tip cuttings are easier to propagate than root cuttings
- * The four main types of stem cuttings are herbaceous, softwood, semi-hardwood, and hardwood. These terms reflect the growth stage of the stock plant, which is one of the most important factors influencing whether or not cuttings will root.

When cuttings from trees and other woody stems are attached to another tree, this is known as **grafting**. Grafts are another way of growing plants without using seeds.