

REPRODUCTION IN PLANTS

Reproduction is the process that makes more of the same kind of an organism.

There are 2 types of reproduction: **sexual** and **asexual**.

Sexual: reproduction in which two gametes (sex cells) fuse to create a new offspring that is genetically different to the parents. Two parents are involved.

Asexual: reproduction without fusion of gametes. It involves one parent only and produces offspring that are genetically identical to the parent.

<https://youtu.be/jk2RJm5RBEk>

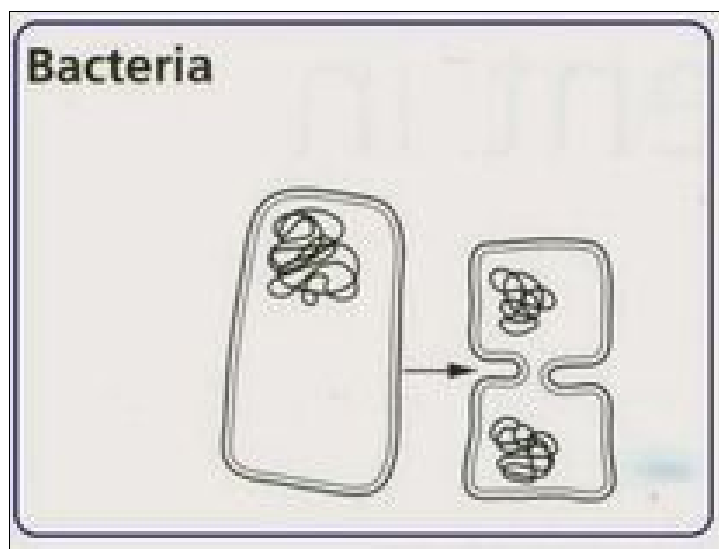
Examples of asexual reproduction-

Bacteria

Bacteria reproduce asexually by binary fission. Inside an individual bacterium, the DNA replicates.

Then the cell divides into two, with each daughter cell containing a copy of the parental DNA.

Once the daughter cells have grown, they can also reproduce.

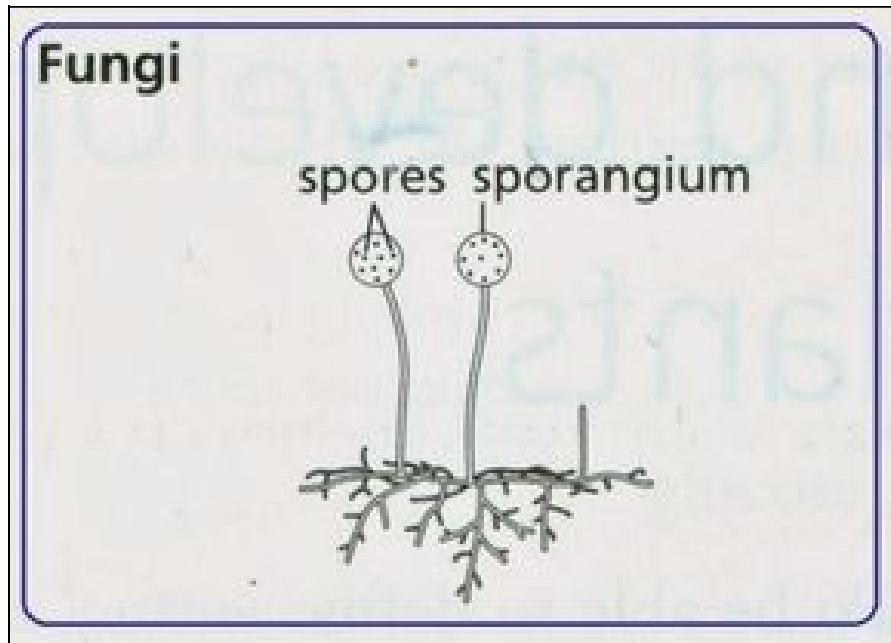


Fungi

Fungi can reproduce asexually by producing spores, which may be formed inside a structure called a sporangium. When ripe, the sporangium bursts open allowing the spores to be dispersed.

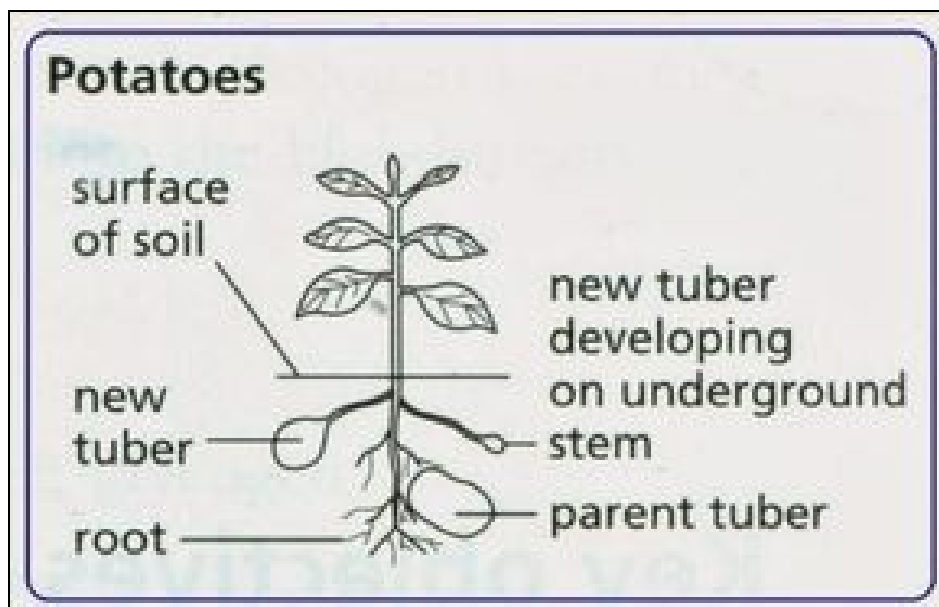
In suitable conditions the spores germinate and grow to form new individuals.

<http://biology-igcse.weebly.com/types.html>



Potatoes

Potatoes are stem tubers. The parent plant photosynthesises and stores the food produced in underground stems, which swell to form tubers. Each tuber contains stored starch, and there are buds in depressions in the surface known as eyes. In suitable conditions the buds use the stored food to form shoots, from which roots also develop. Each tuber can form a new plant.



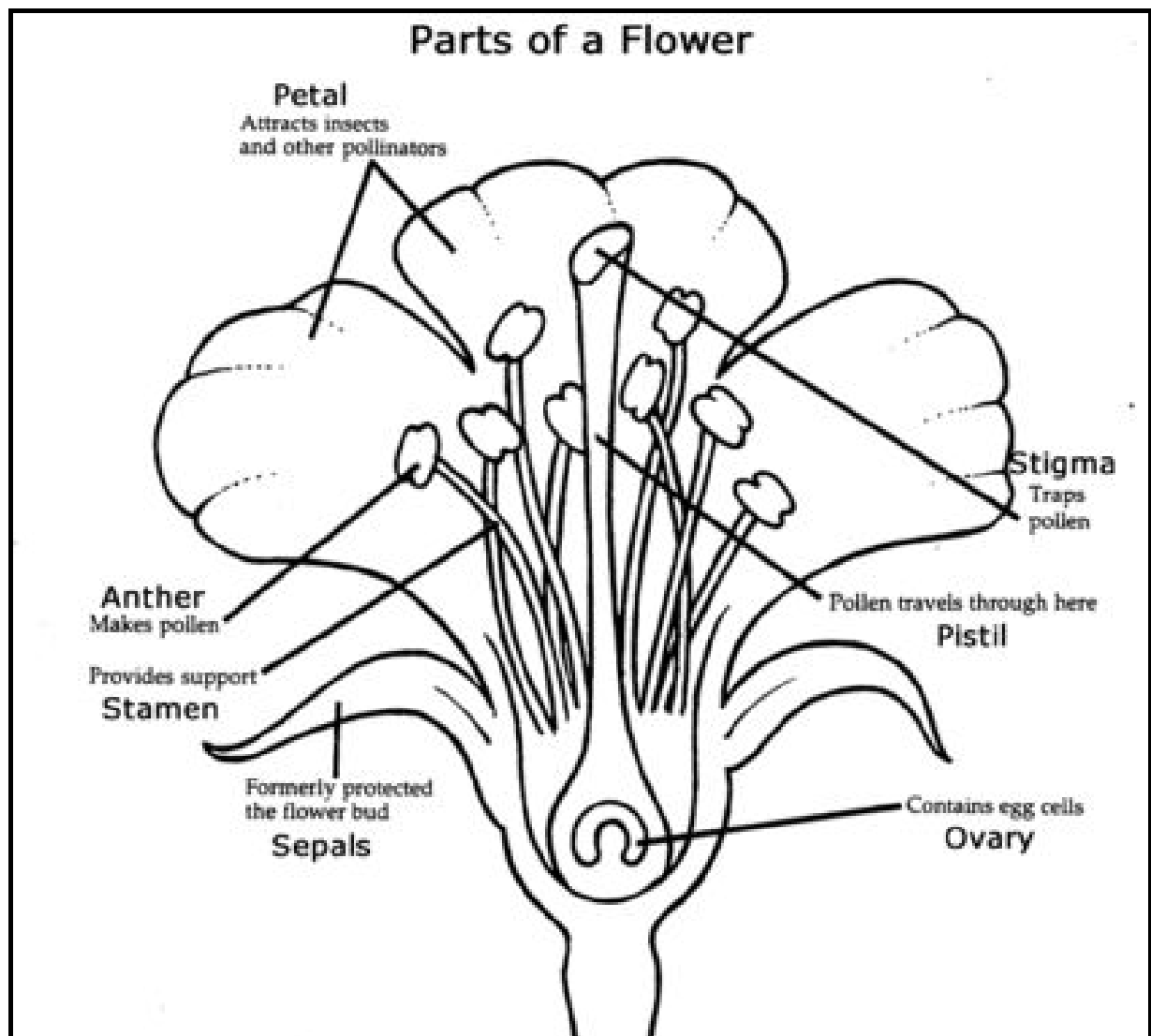
Rose

Cuttings – a branch from one plant is removed and planted in soil. It will grow new roots and become a new plant.

Advantages and disadvantages of asexual reproduction-

Advantages	Disadvantages
<ul style="list-style-type: none">- quick- only one parent needed- no gametes needed- all good characteristics passed on- no dispersal (potato tubers) --> grow in same favourable environment as parent- store large amounts of food ---> rapid growth	<ul style="list-style-type: none">- little variation ---> adaptation to environment is unlikely- offsprings inherit bad characteristics (e.g.: resistance from a disease)- lack of dispersal ---> competition (nutrients, water, light)

Sexual reproduction in plants-



Part	Function
Pediceal	Supports the flower
Thalamus	Holds all the floral whorls
Nectary	Makes nectar to attract insects in insect-pollinated plants
Sepal	Protects the flower when it is in bud condition
Petal	Colourful part of the flower. Attracts insects in insect-pollinated plants
Anther	Male part of the plant. Makes pollen.
Filament	Joins the anther to the rest of the flower.
Pollen	Male gamete
Stigma	Female part of the plant. Receives pollen.
Style	Helps to transfer male gamete to the ovule
Ovary	Contains the ovules
Ovules	Eggs – female gamete

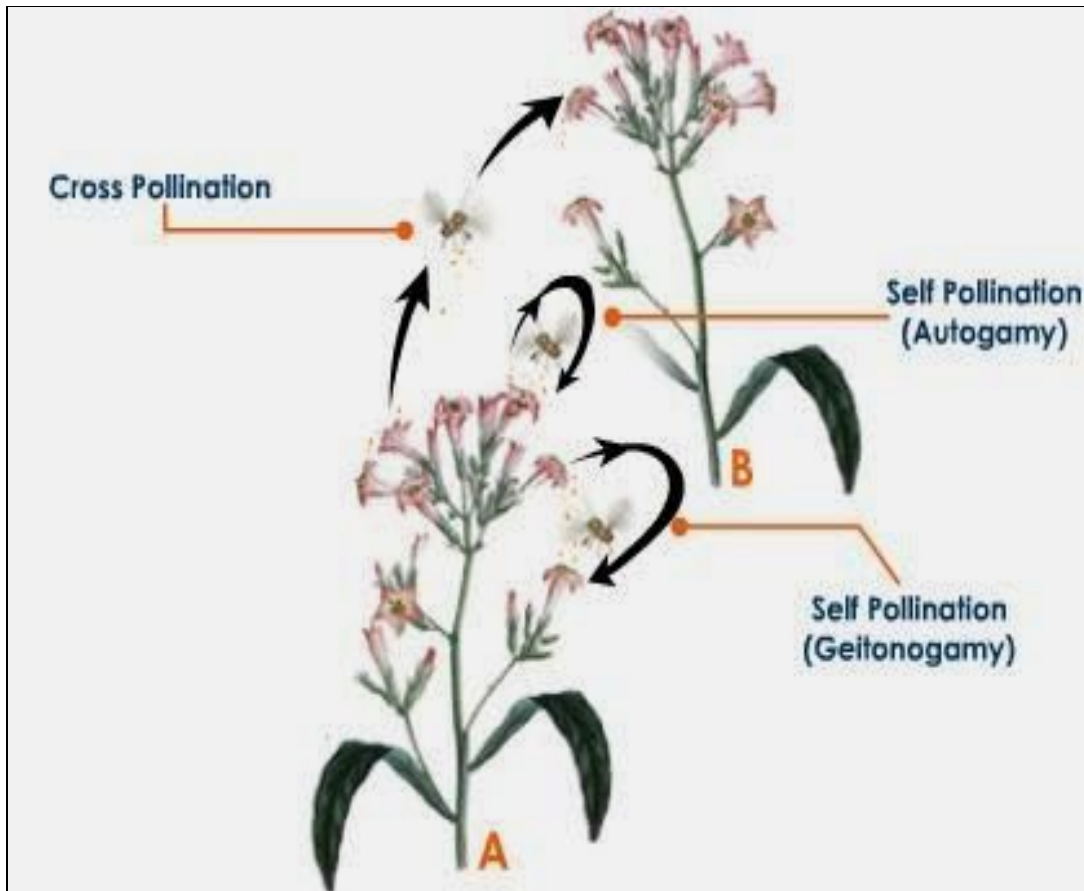
Pollination- https://youtu.be/YqM6rgB_I_o

Pollination: transfer of **pollen grains** from the male part of the plant (**anther**) to the female part (**stigma**).

Types of pollination-

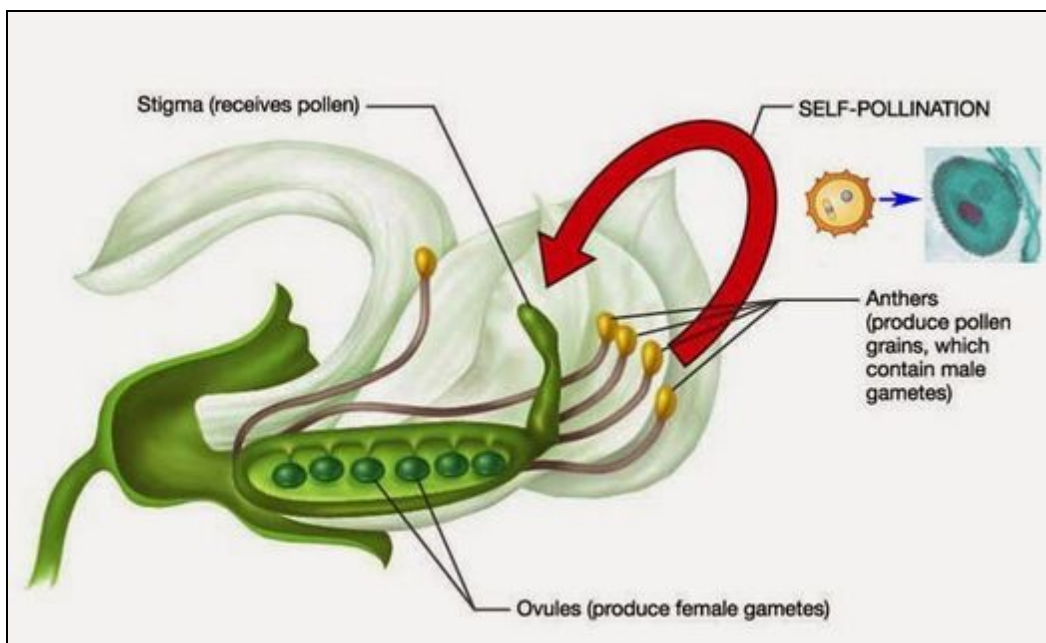
Self-pollination - transfer of pollen from the anther to the stigma of the same flower, or to another flower of the same plant.

Cross-pollination - transfer of pollen from the anther of a flower to the stigma of a flower on a different plant of the same species.



Credit: TutorVista

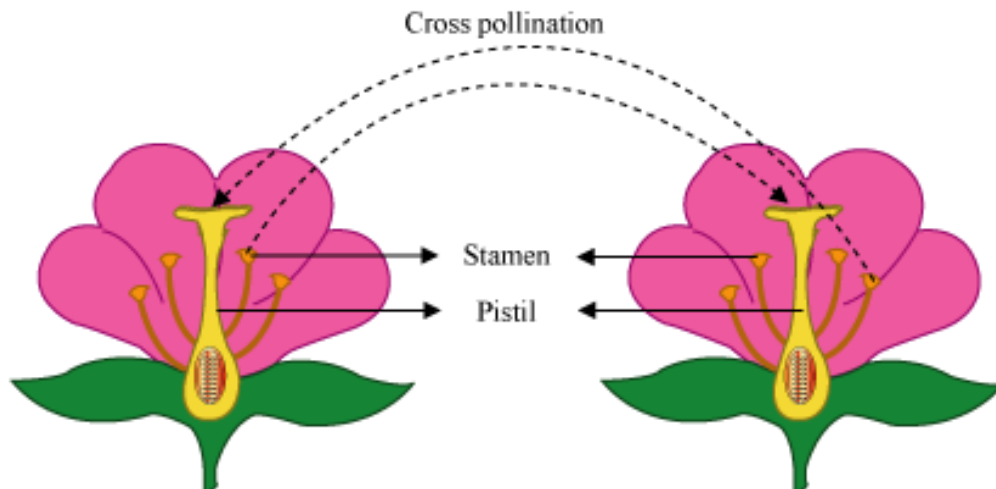
Self-pollination



Source: DNA2life

- chance of successful pollination with smaller numbers of pollen
- chance of fertilisation and seed formation
- variation in the offspring.
- ability to adapt to environmental change.

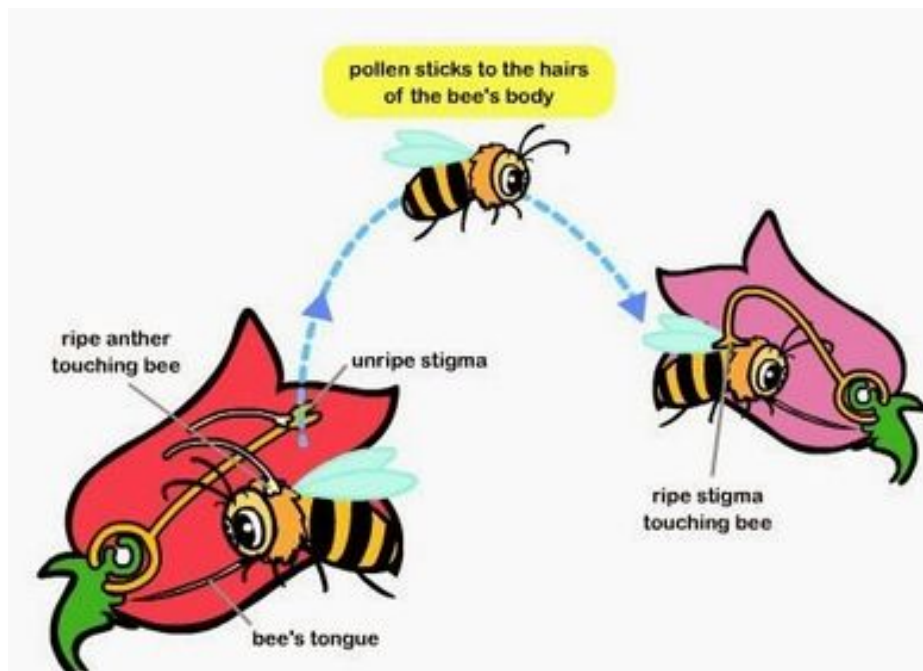
Cross-pollination

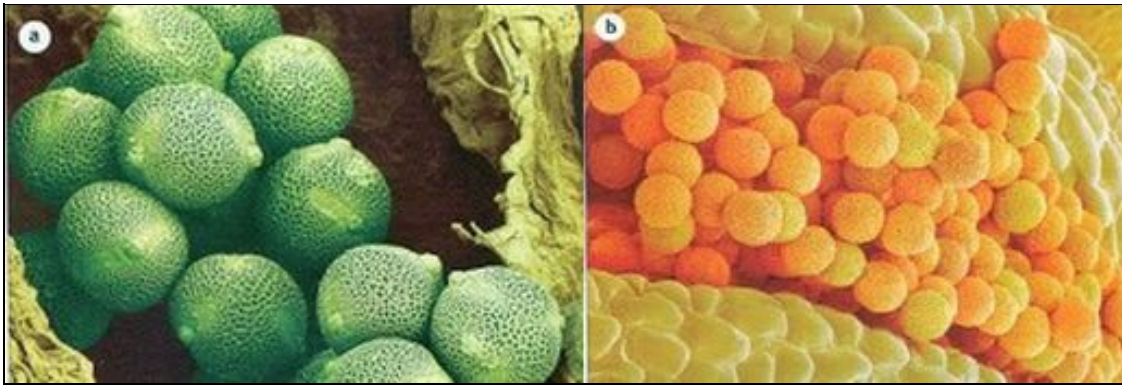


- chance of successful pollination with large amounts of pollen
- chance of fertilisation
- variation
- ability to adapt to environmental change.

Pollination can take place with the help of agents : **wind** or **insects**

These flowers then produce seeds which can be **dispersed** by either the **wind** or other **animals**.





Pollen grains.

Structural adaptations-

Features of wind- and insect-pollinated flowers

Feature	Insect-pollinated	Wind-pollinated
Petals	- large, coloured, scented - guidelines for insects into flower	- absent/small
Nectar	- produce by nectarines - attract insects	- absent/small and green
Stament	- inside flower	- long filaments: anther hang freely outside flower → pollen exposed to wind
Stigme	- small, sticky - inside flower → insects rub against	- large, feathery - hang outside flower → catch pollen
Pollen	- smaller amount - grain round and sticky or covered in spikes to attact to insects	- larger amount - grain smooth, light, easily carried by wind
Bracts (modified leaves)	- Absent	- Sometime present

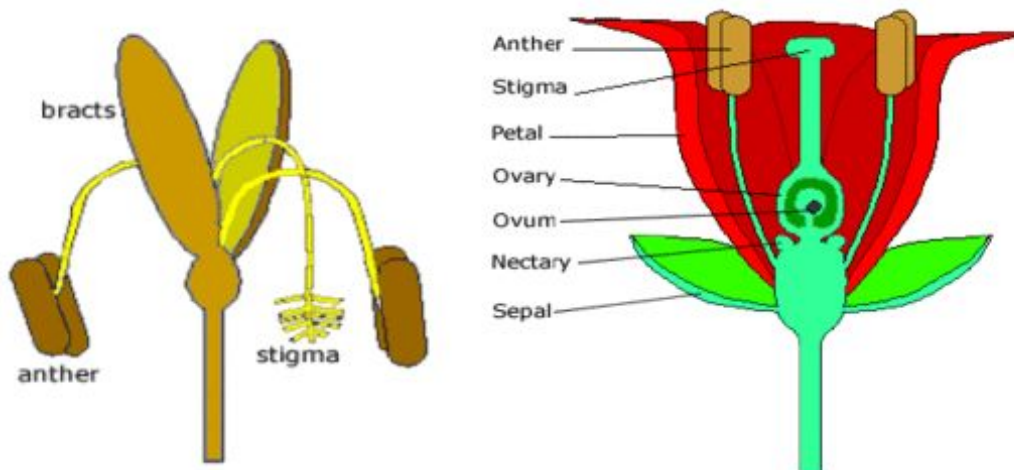
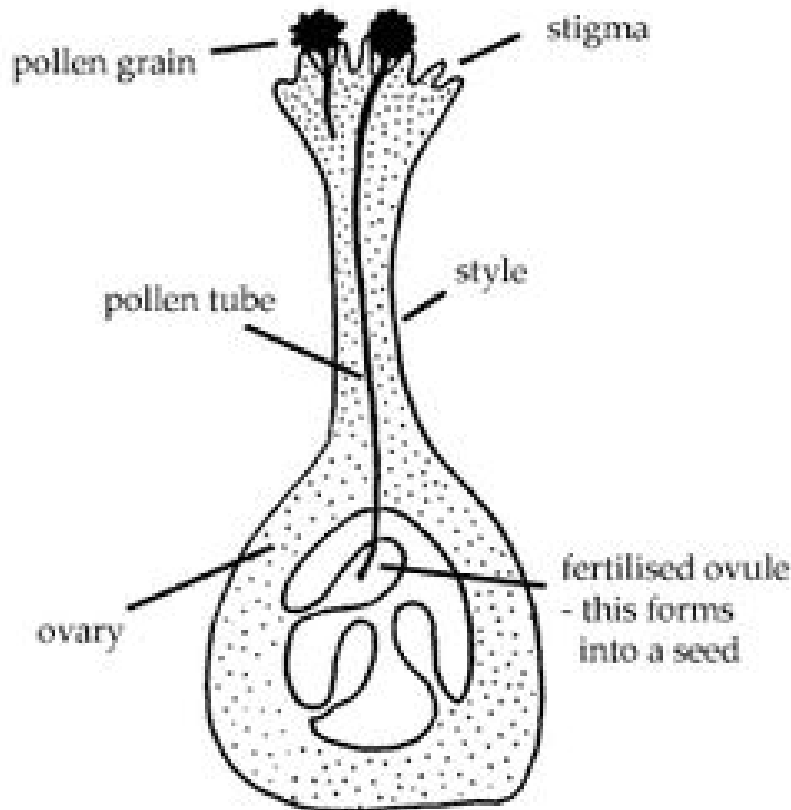


Image by Ray Hushwaite

Growth of pollen tube and the process of fertilization-

Figure below shows a section through a single carpel.



If pollen grains are of the same species as the flower they land on, they may germinate.

Germination is triggered by a sugary solution on the stigma, and involves the growth of a pollen tube from the pollen grain.

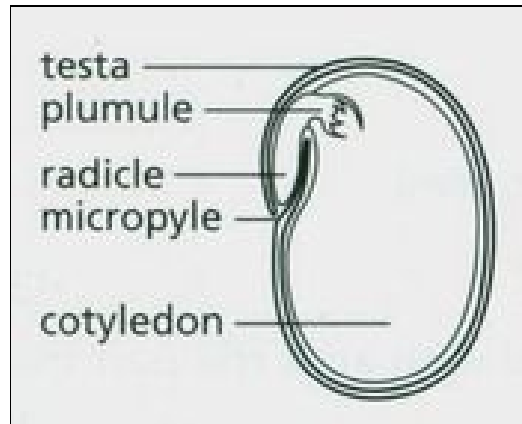
The pollen tube contains the male nucleus, which is needed to fertilise the ovule inside the ovary. The pollen tube grows down the style, through the ovary wall, and through the micropyle of the ovule.

Fertilisation is the fusion of the male nucleus with the female nucleus. If the ovary contains a lot of ovules, each will need to be fertilised by a different pollen nucleus.

When fertilization has happened the flower will change in the following ways;

1. Petals die and fall away
2. Fertilized ovule turns into a seed
3. Ovary may fill with sugars and turn into a fruit

Structure of a non-endospermic seed



In order to germinate (grow into a new plant) seeds need the following conditions;

- Presence of water
- Presence of O₂ (seed needs to respire)
- Correct temperature (recall enzymes work at optimum temp)

When a seed germinates the cells inside it start to grow rapidly and form the new shoot and root. The seed contains a limited store of carbohydrate and lipid, which it uses as a fuel for respiration to provide the energy for growth. During this stage the seed must produce leaves so it can begin to photosynthesize. The danger is that the seed will run out of stored energy before it makes leaves. If this happens it will die.

Seed dispersal

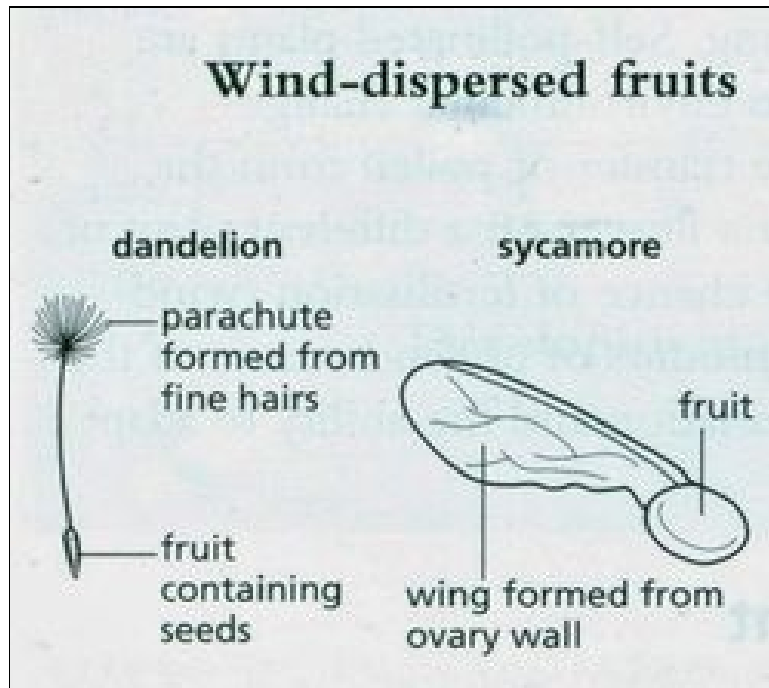
The flowers produce seeds which can be **dispersed** by the **wind** or other **animals**, providing a means of **colonising** new areas.



Nutmeg is dispersed by birds. Photo credit: russolab.unl.edu

1. Wind-dispersed seeds

- Fruits contain seeds, and usually have a **parachute** or a **wing** to help them be carried away from the parent plant by the wind.
- Examples: dandelion, sycamore



The **dandelion** fruit has a group of fine hairs called a pappus, which catches the wind and acts like a **parachute**. The fruit counterbalances the pappus.

The **sycamore** has a **wing** with a large surface area. When the fruit drops off the tree it spins, slowing down in descent. If caught by the wind the seed will be carried away from the parent plant, reducing competition for nutrients, water and light.

2. Animal-dispersed seeds

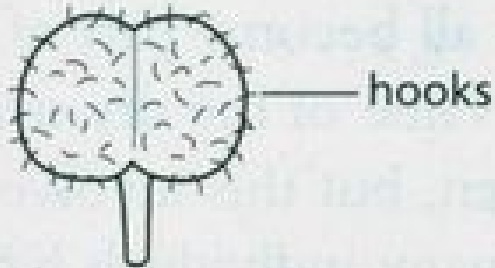
There are 2 main modification of fruits for animal dispersal: **succulent** fruits and **hooked** fruits.

Succulent fruits attract animals because they are brightly coloured, juicy and nutritious. When **eaten**, the seed pass through animal's **faeces**, which may be a long way from the parent plant. The faeces provides nutrients when the seeds germinate.

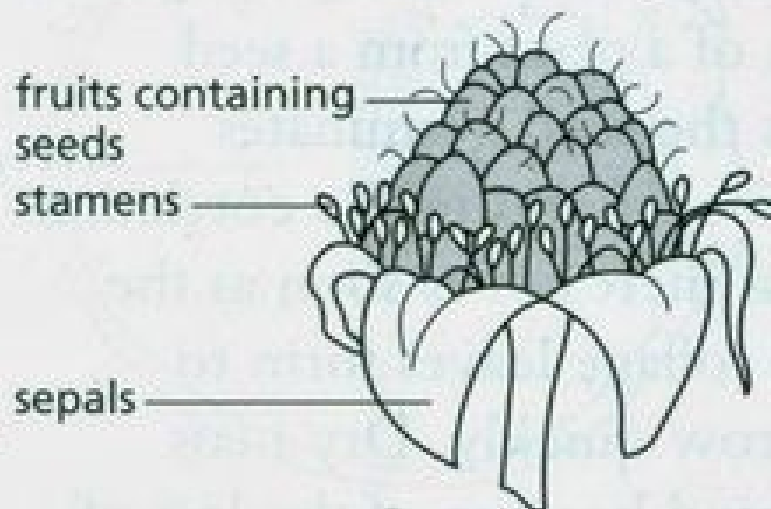
Hooked fruits catch on to an **animal's fur** as it brushes past the parent plant. Eventually the seeds drops off, or the animal grooms itself to remove them. This disperses the seeds away from the parent plant.

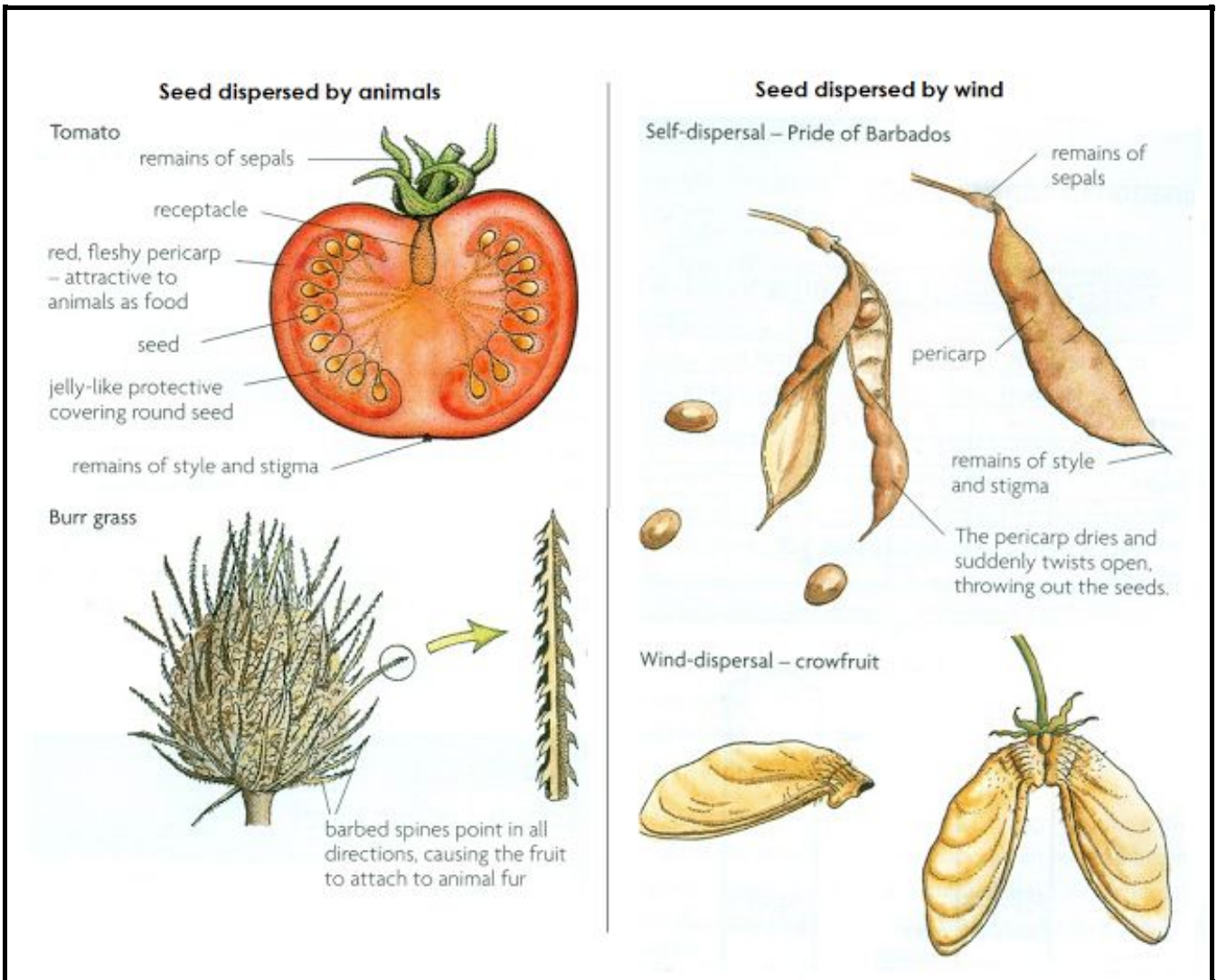
Animal-dispersed fruits

bur



blackberry





Videos-

Sexual reproduction in plants- <https://youtu.be/CkBNEM2mD30>

Notes from-

<http://biology-igcse.weebly.com/plant2.html>

"Plant." *Biology Notes for IGCSE 2014*. N.p., n.d. Web. 13 Feb. 2017.