PRIMARY SCIENCE

TOPICAL REVISION

PLANTS

SUMMARIZED SCIENCE REVISION NOTES

PLANTS

CROPS

Crops are useful plants grown by farmers in the farm.

Types of Crops

-There are two types of crops

(a) Food crops

(b)Cash crops

a) FOOD CROPS

Grown mainly for food

Examples of food crops

a) Cereal

- Maize
- Rice
- Wheat
- Barley
- Sorghum
- Millet

b) Legumes

- Beans
- Peas
- Black beans
- Green grams
- Groundnuts
- Cow peas
- Soya beans

c) Vegetables

- Kales
- Cabbage
- Spinach

d) Fruits

- Pawpaws
- Oranges
- Lemons
- Pineapples
- Mangoes
- Tangerines

e) Tuber crops

- Sweet potato
- Cassava
- Yams
- Irish potatoes
- Arrow roots
- Carrots

CASH CROPS

Grown for sale to get money.

They are processed in factories into new products.

Examples of cash crops

a) Beverage crops – for making drinks e.g. Tea, Coffee, Cocoa
b) Fibre crops – produce threads woven to make ropes, baskets, cloths, sacks, mats, etc. e.g. Sisal, Cotton, Palm tree
c) Oil crops – produce oil e.g. Sunflower, Coconut

Oil Crops

-Plants that produce cooking oil
-These crops include:
(a) Coconut tree
(b) Sunflower plants
(c) Groundnuts
(d) Macadamia

WEEDS

These are plants that grow where they are not wanted

Examples of weeds

Blackjack- has hooks that stick on clothes or fur

Sodom apple- flowers are purple and white in colour.

Fruits are yellow with short sharp thorns in the stem and leaves.

Pigweed- used as a vegetable

Wandering Jew

Mexican marigold – yellow flower, Unpleasant smell

Oxalis

WEEDS

Wandering jew

Sodom apple

Oxalis

Pigweed

Mexican marigold

Blackjack

Control of Weeds

The removal of weeds from a farm is called weeding.

The removal of the unwanted parts in a plant is called pruning.

Ways/Methods of controlling weeds

a) Digging them out – is the best method
b) Slashing
c) Mulching
d) Uprooting
e) Using chemicals (herbicides)

Effects of Weeds on Crops

Weeds are harmful to crops in the following ways:

Compete with crops for:

- nutrients in the soil
- carbon dioxide for photosynthesis
- sunlight for photosynthesis
- moisture content in the soil

b) Weeds harbour diseases and pests that damage the crops.

PLANTS

Plants are living things.

The grouping of plants together with common characteristics or features is called the classification of plants.

Plants can be grouped into:

a) Green and non-green plants

b) Flowering and non-flowering plants.

1 a) <u>Green Plants</u>

They contain the green colouring matter called chlorophyll.

They make their own food through a process called photosynthesis. e.g.

Algae – grow in water bodies

Moss – grow in damp places e.g. walls, cliffs, stones, etc.

Conifers e.g pine, cedar, cypress.

b) <u>Non-green Plants</u>

They do not contain green matter (chlorophyll)
They do not make their own food - They feed on organic matter (dead decayed matter)
Non-green plants comprise of fungi and bacteria

.Examples of fungi

- Bracket tree
- Penicillium
- Puffballs
- Mushrooms
- Moulds
- Toadstools
- Lichen
- Ringworms
- Athlete's foot
- Dandruffs
- Yeast
- Mucor

Penicillium – used to make medicine.

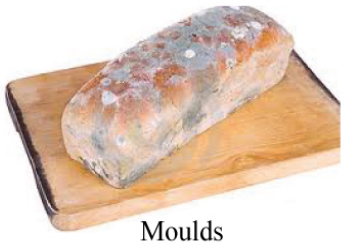
Yeast – used for baking.

NON-GREEN PLANTS

Ringworms

Mushrooms

Puffballs



Moulds

Athlete's foot

Lichens

2 a) <u>Flowering Plants</u>

They produce flowers.

Flowers bear fruits that contain seeds.

They are green in colour and make their own food.

b) Non-flowering Plants

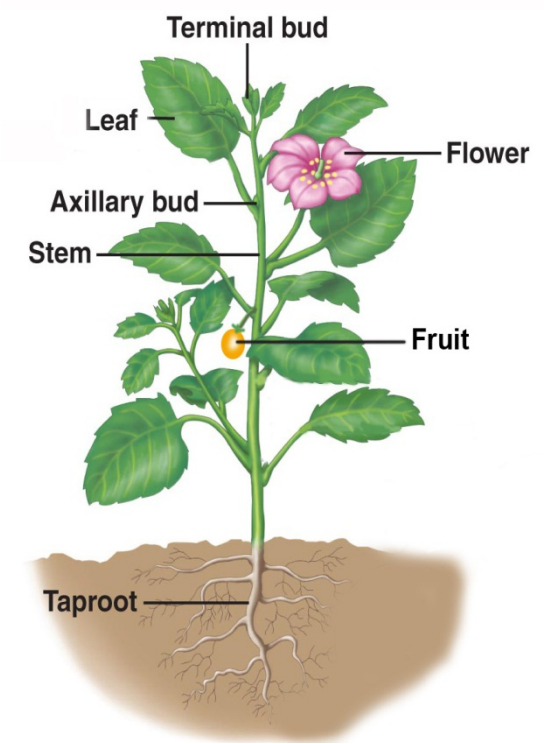
They do not produce flowers.
They are both green and non-green.
All non-green plants are non-flowering (fungi and bacteria)
They reproduce by means of spores and cones which germinate into new plants.
Plants that produce by means of cones (hard seeds) are called coniferous plants e.g. pine, cedar, cypress.

Examples of non-flowering plants / how they reproduce

Ferns	-	spores
Algae	-	Spores
Mosses	-	Spores
Fungi	-	Spores e.g. mushrooms, mucor, puffballs etc.
Coniferous plants	-	cones e.g. pine, cedar, cypress

EXTERNAL PARTS OF A PLANT

Parts of the plant are:



FUNCTIONS OF THE PARTS

Roots

a) Support/hold/anchor the plant firmly in the soil
b) Absorption of water and mineral salts
c) Food storage

Points to Note:

Plants that store food in the roots are called root tubers.

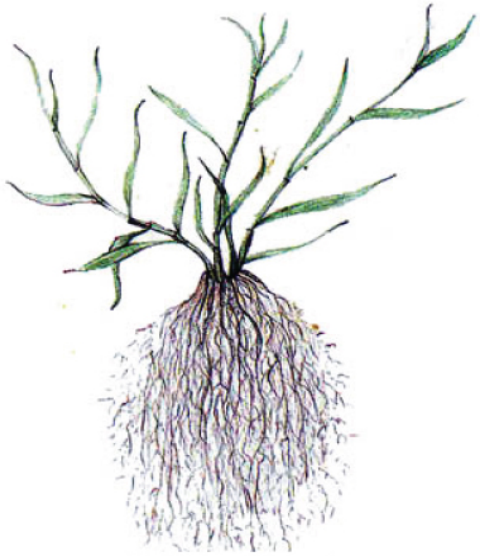
Examples of plants that store food in the roots:

- Arrow roots
- Cassava
- Carrots
- Sweet potatoes

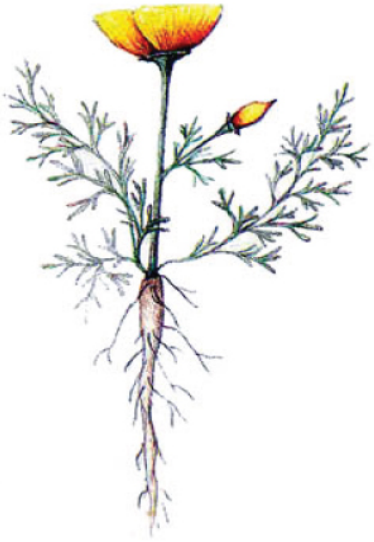
There are two main types of roots:

a) Tap root - extension of stem with side roots.
b) Fibrous roots-many similar roots.

i) Plants with tap roots include:-
Legumes,
Acacia,
Fruit trees, etc.
ii) Plants with fibrous roots include:-
Cereals,
Oats,
Grass,
Sisal,
Onions,
Sugarcane,
Coconuts, etc.



Fibrous root



Tap root

Other types of roots include:

a) Aerial roots – for breathing
b) Prop roots – used in maize for support

Stem

- Transports water and mineral salts from the roots to the leaves
- Carries food made by the leaves to the roots for storage
- Holds or supports the upper parts of the plant in good position
- Protects the plant
- Some stems store food and water for the plant

N.B. Plants that store food in the stem are called stem tubers.

Examples of plants that store food in the stem are:

a) Cactus

b) Sugar cane

c) Irish potato

Leaves

a) Breathing – Exchange of gases through small tiny holes called stomata.

b) Photosynthesis – Process of making its own food

Requirements of photosynthesis are:-

Chlorophyll – green colouring matter

Water

Carbon dioxide

Sunlight

c) Storage of food – Edible vegetables

d) Transpiration – Process in which plants lose excess water through small holes called stomata.

Transpiration is high when it is hot, sunny, dry, windy.
It is low when it's cold, wet, calm and rainy.

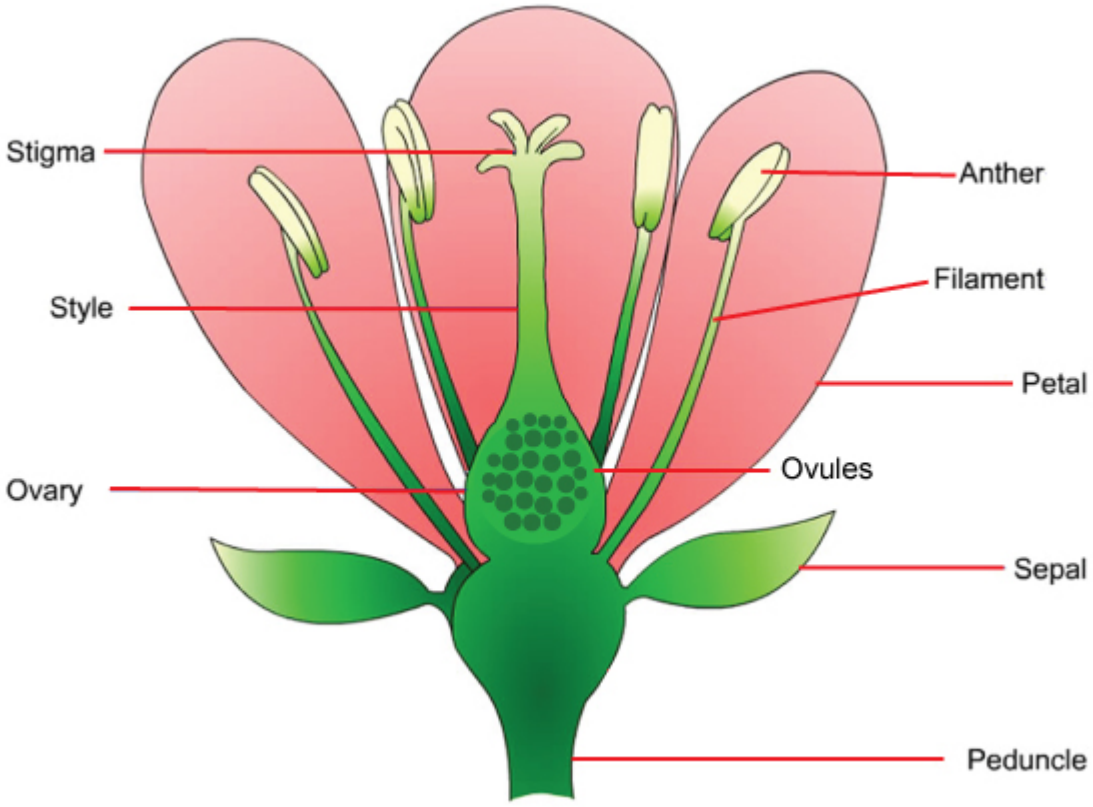
Flower

– Reproductive organ of a plant

It bears fruits which contains seeds that germinate into a new plant
Seeds germinate into new young plants called seedlings

What is a flower?

A flower is a reproductive part of a flowering plant.
Most plants have both male and female reproductive parts.



Functions of the Parts

***Flower stalk*:** It joins the flower to the plant i.e. on the stem or a branch. It holds and supports the flower.

***Sepals*:** They are green in colour. Sepals protect the inner parts of the flower while it is growing in the bud.
A collection of sepals is called calyx. Sepals can assist in photosynthesis.

***Petals*:** These are the outermost parts of the flower. They are usually brightly coloured to attract insects and some birds that help in pollination
A collection of petals is called a corolla.

***Filament*:** It is a stalk that holds/supports the anthers.

***Anther*:** It produces pollens
The pollen contains pollen grains which are the male sex cells of a flower.

***Stigma*:** It receives pollen grains during pollination from the anthers.

***Style*:** It is a long and narrow tube that joins the stigma and the ovary.

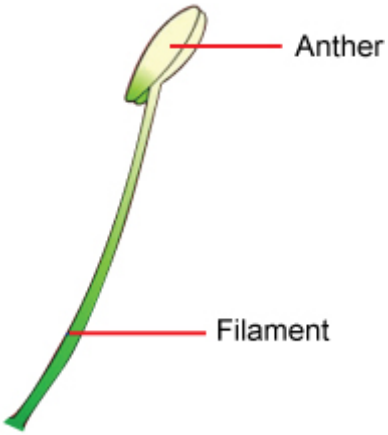
***Ovary*:** It contains and encloses the ovules.
The ovary develops into a fruit after fertilization.

Ovules: Ovules are the female sex cells of a flower.
Ovules develop into seeds that germinate into new plants after fertilization.

***Receptacle*:** It connects the flower stalk and the 'ovary base'.

Stamen: The male part of a flower is the stamen. The stamen consists of :-

- Anthers
- Filament



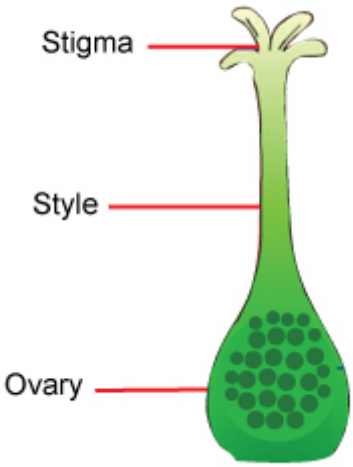
In a pawpaw plant, male and female reproductive parts are on separate plants.

***Pistil*:** The female part of a flower is the pistil. A group of pistils are called a carpel. The pistil comprises:

- Ovary
- Stigma
- Ovules
- Style

Ovules are the female reproductive cells of a flower.

The pistil consists of:-

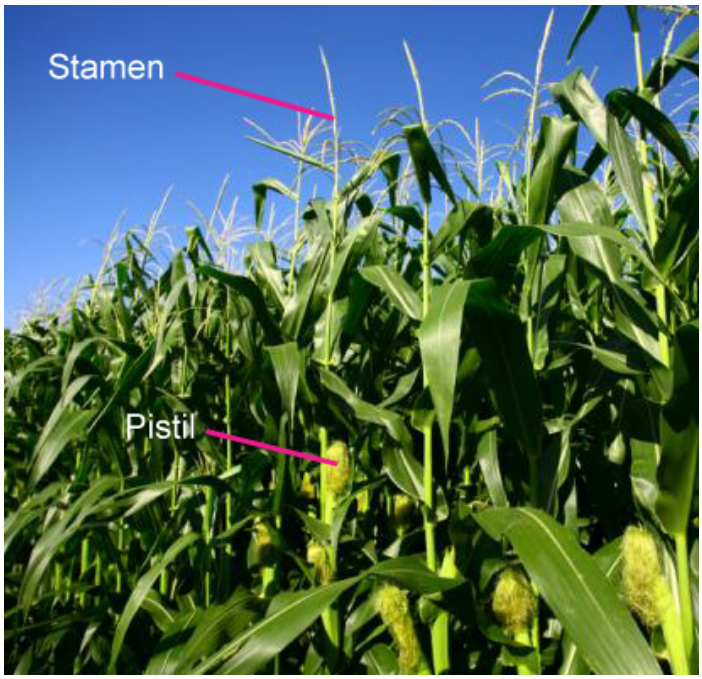


The Nectary is at the base of the sepals. It produces sugary substances called nectar which is food for insects such as bees and butterflies.

Female pawpaw plant

Male pawpaw plant

In the maize plant the female and the male reproductive parts are in different positions on the same plant.



POLLINATION

What is pollination?
It is the transfer of pollen grains from the anthers to the stigma.

TYPES OF POLLINATION

There are two types:

a) Self pollination
b) Cross pollination

What does the pollen grain contain?
- The male reproductive cells of a plant

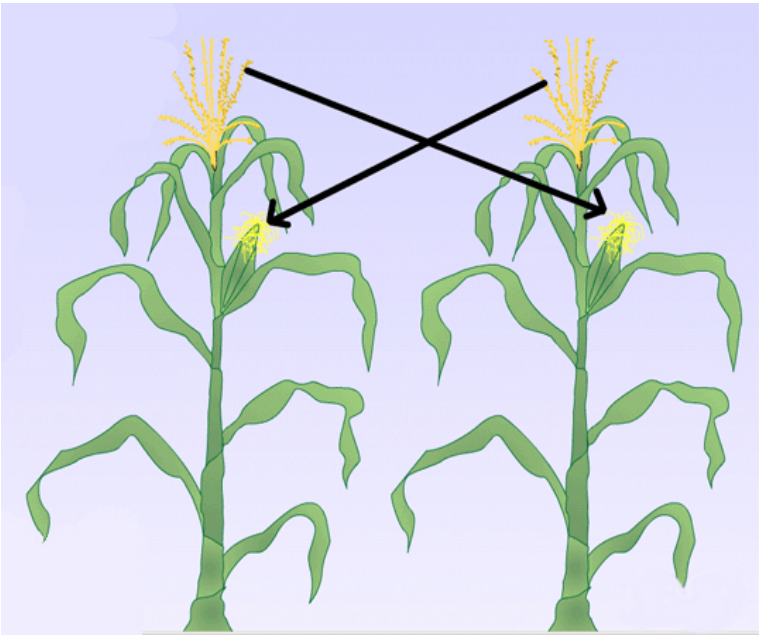
a) Self pollination

What is self pollination?
It is the transfer of pollen grains from the anther within the same flower or to the stigma of the same flower or of another flower on the same plant.

b) Cross pollination

What is cross pollination? |

It is the transfer of pollen grains from the anther to the stigma from one plant to another.



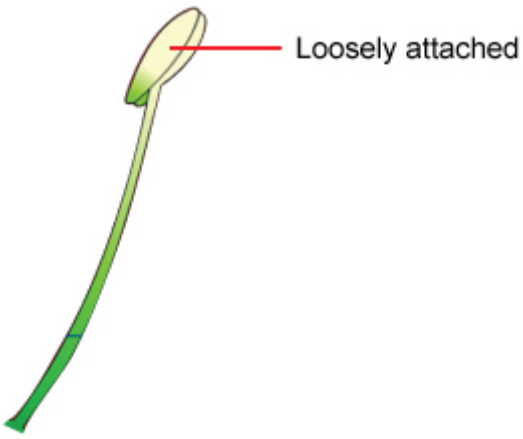
AGENTS OF POLINATION

What are agents of pollination?
These are the things that help transfer pollen grain from the anther to the stigma.

Agents of pollination are:
a). Insects - bees -butterfly
b). Wind
c). Birds -sun bird -humming bird -honey bird
d). Water

N.B. Birds and insects visit flowers to collect nectar. They are attracted by coloured petals and the sweet smell of the petals (scent). They carry the pollen grains from one flower to another.

Characteristics of wind-pollinated flowers



Wind-pollinated flowers:

- Are small in size.
- Have dull petals i.e. not brightly coloured.
- Have no scent (no sweet smell)
- Have no nectar.
- Have large anthers which are loosely attached to the filament. This makes them shed the pollen grains when the air moves slightly around.
- Produce a large amount of light and powdery pollen grains which can be easily carried by the wind.

N.B. Large amounts of pollen grains are produced because a lot of them are lost on the way to the next plant.

- Have large hairy or feathery stigmas. The stigmas hang outside the flower and trap any pollen grains that may be floating in the air.

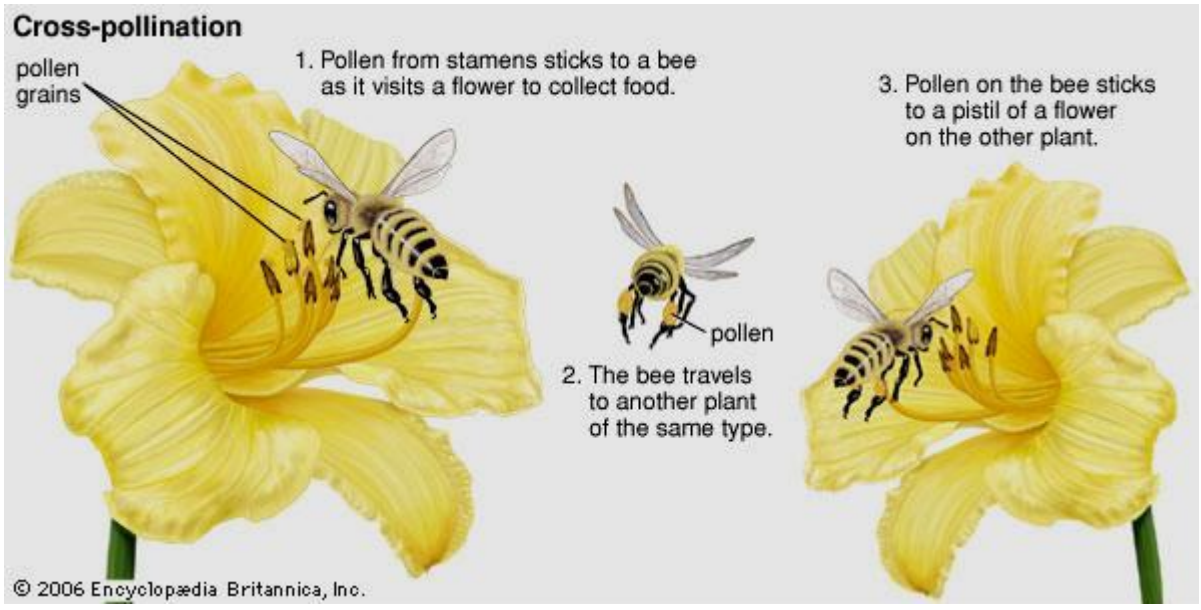
N.B. An example of a wind-pollinated flower is the maize flower.

Characteristics of insect-pollinated flowers

Insect pollinated flowers;

- Have flat and sticky stigmas that are found inside the flowers to stick pollen grains deposited by an insect.
- Produce a small amount of heavy and sticky pollen grains which can stick firmly to the bodies of visiting insects.
- Have anthers which are not very large.
- Produce nectar which acts as food for the insects.
- Have a strong, sweet smell called scent that attracts the insects.
- Have brightly coloured petals that attract the insects.
- Are usually large in size.

N.B. An example of an insect-pollinated flower is the sunflower



FERTILIZATION IN PLANTS

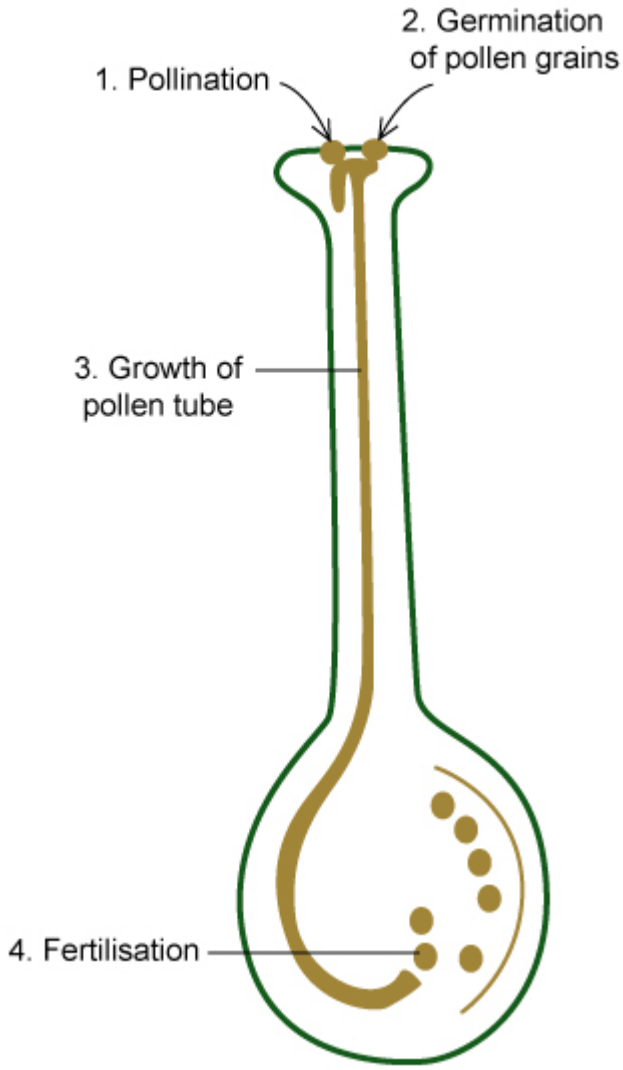
Fertilization is the fusion of the male cell in the pollen grain and the female cell in the ovary to form a seed.

Fusion is the joining of the two cells.
When pollen grain falls in the stigma, it germinates to form a pollen tube.
The pollen tube grows/develops down the style to the ovary.
The pollen tube carries the male reproductive cells (gametes) to the ovary.
In the ovary, the pollen grain fuses (joins) with ovules (female reproductive cells). Fertilization is then said to have taken place.

After fertilization:

a) Ovules become seeds.
b) The ovary develops into a fruit.
c) The other parts of the flower wither and fall off.

Stages that lead to fertilization



What is found when pollen grains germinate?

A pollen tube is formed.

Where does the pollen tube grow?
In the stigma and through the style

What is carried along the tube?
Pollen grains

After fertilization what forms the seed?
The ovules

What does the ovary develop into?
The fruit

PARTS OF A SEED

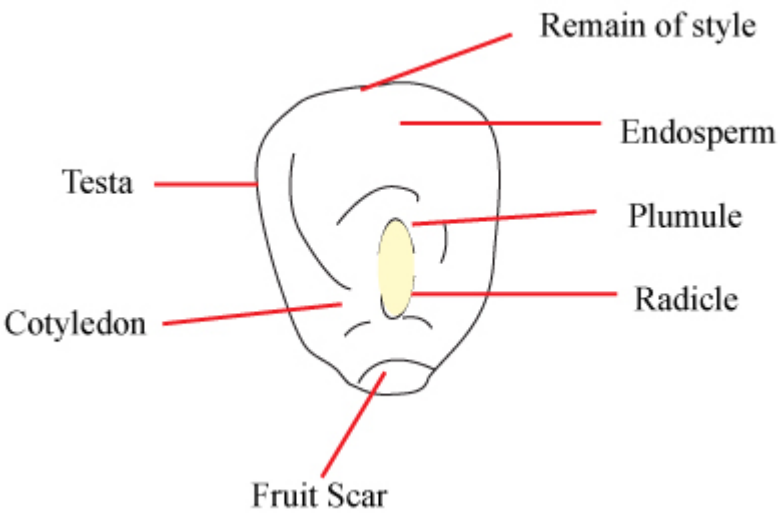
There are two types of seeds:

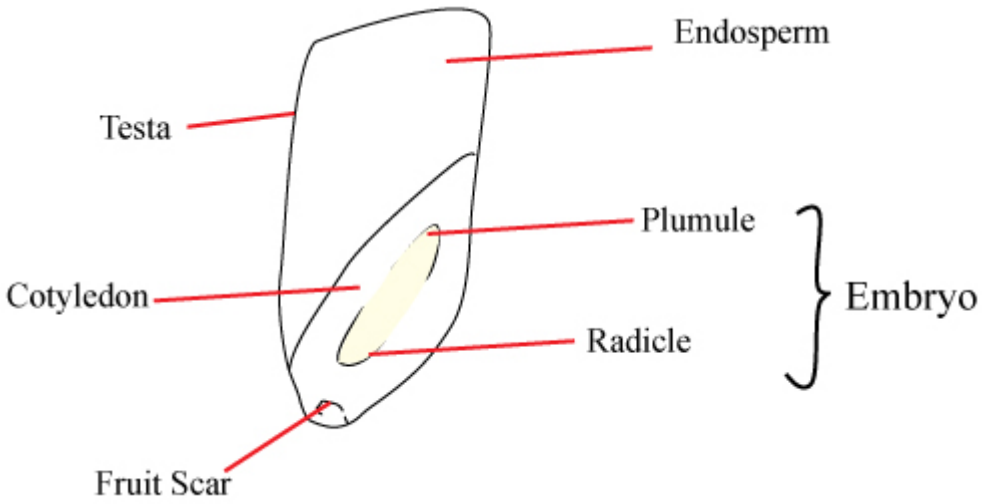
a) Monocot seed

b) Dicot seed

PARTS OF A MONOCOT SEED

An example of a monocot seed is Maize.





***Testa/Seed coat*:** It is the outermost skin of a seed that protects the inner parts of the seed.

***Embryo*:** This is the part which can grow into a new plant. It has two parts:

a) Radicle – Develops into a root

b) Plumule – Embryo part that grows into a shoot (leafy part)

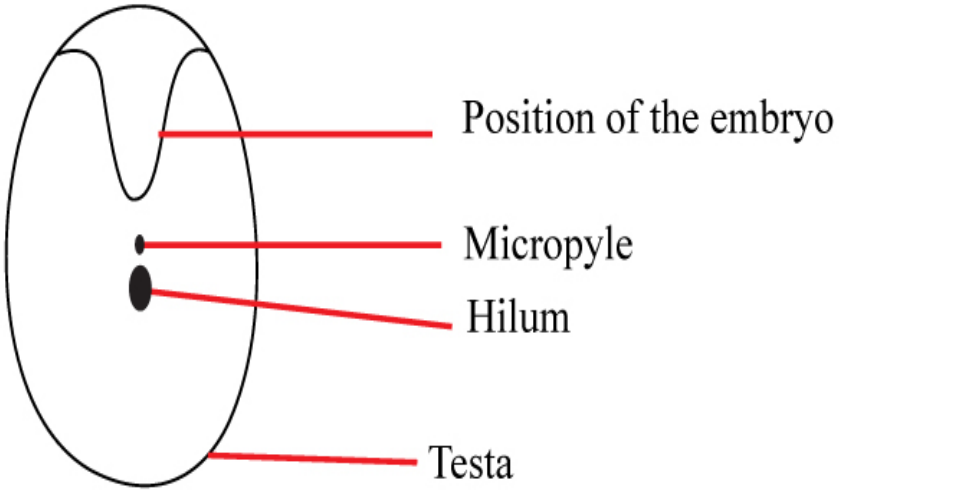
***Endosperm*:** Stores food for the seed.

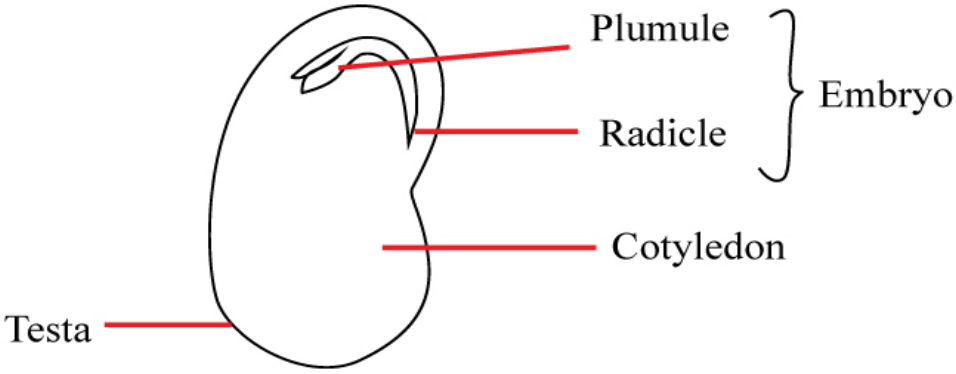
***Fruit scar*:** Point where the maize grain was attached to the cob (ovary)

***Style scar*:** Marks the point that was attached to the style (remains of the style)

N.B. A maize seed has two scars.

An example of a dicot seed is a bean seed.





***Testa*:** For protection of inner parts.

***Radicle*:** Grows into a root

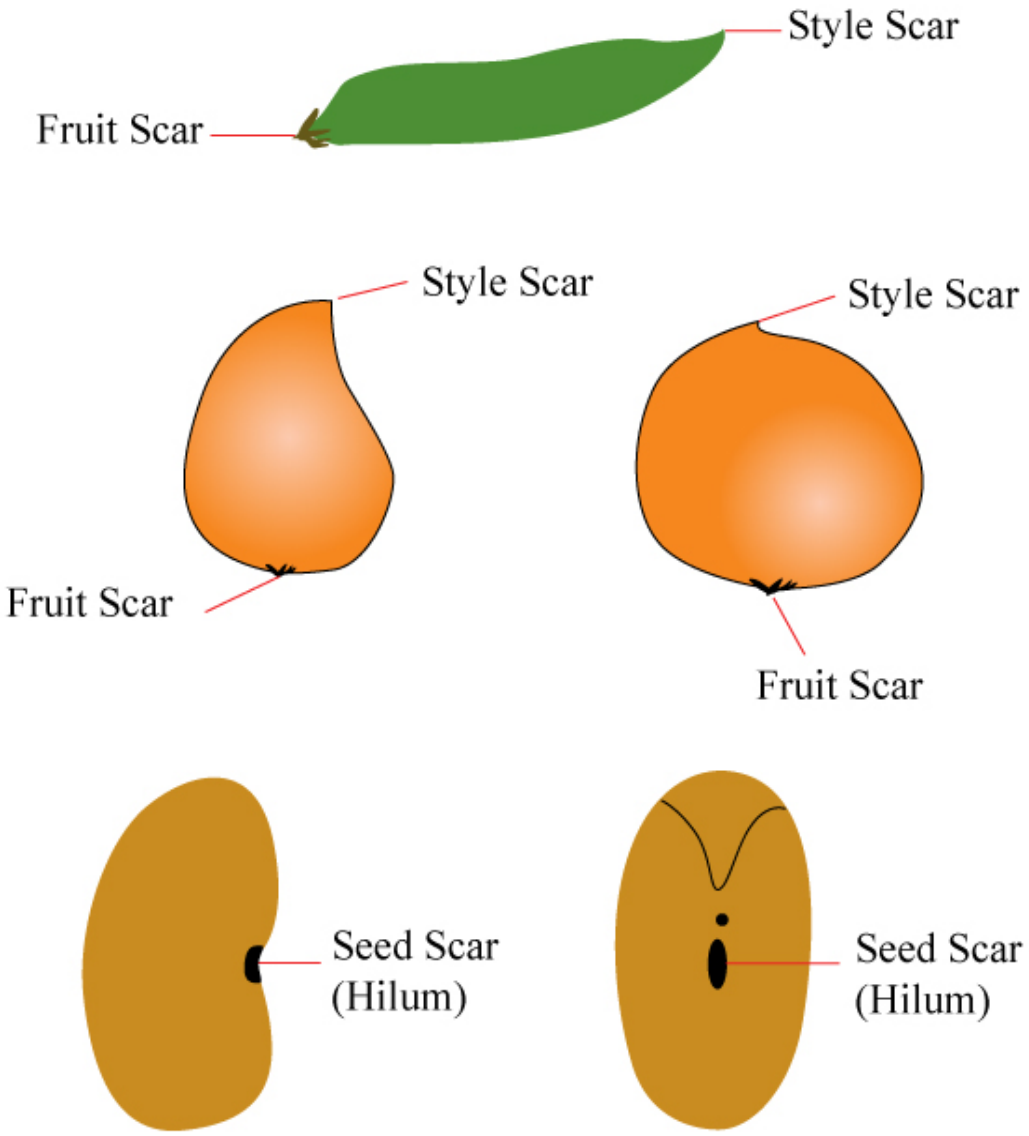
***Plumule*:** Grows into a shoot

***Microphyle*:** It is a tiny hole that allows air and water to enter into the seed during germination.

Scar/Hilumo: Is the part at which the seed was attached to the ovary.

***Cotyledon*:** Stores food that is used during germination.

Cotyledon is also called seed leaf.



N.B. Flowering plants with one cotyledon are called monocotyledons e..g maize, wheat, rice, millet, sorghum etc.

Flowering plants with two cotyledons are called Dicotyledons e.g. beans, peas, soya beans, green grams, etc.

Differences

Monocotyledons	Dicotyledons
• Seeds have one cotyledon • Food is stored in the endosperm • Leaves have parallel veins • Plants have a fibrous root system 	• Seeds have two cotyledons. • Food stored in the cotyledon in the seed • Leaves have branched or a network of veins • Plants have a tap root system. 

GERMINATION

Germination is the process in which a seed develops into a young plant.

A young plant is called a seedling.

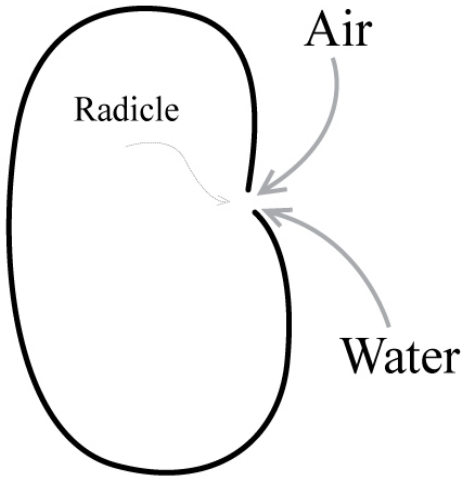
STEPS OF SEED GERMINATION

1. The seed absorbs water and oxygen 9air) through the tiny hole called microphylle.
2. The water makes the seed swell up.
3. The seed coat bursts and splits open.
4. The radical comes out through the microphylle to form a tiny roof that grows into the soil.
5. Shortly after,the plumule forms with tiny leaves.
6. A new plant is formed (seedling)

N.B. During the initial stages of germination the seed used the food stored in the cotyledon or endosperm before leaves develop to carry out photosynthesis.

Conditions necessary for germination

- Water/moisture
- Air (oxygen)
- Warmth



What is the difference between a fruit and a seed?

- Fruit have two scars while seeds have only one scar.

The new plant is the seedling. During germination, the growing embryo feeds from the cotyledon.

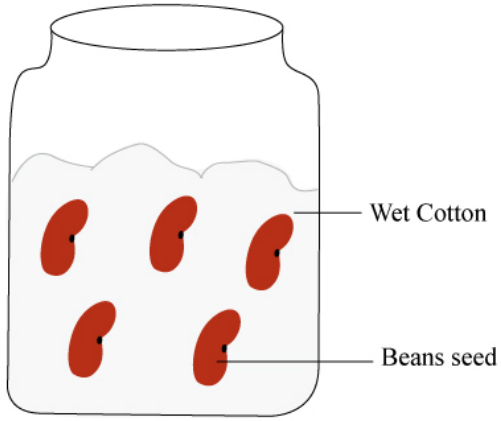
After germination, cotyledons turn green and start making food before the tiny leaves develop.

Experiments

Activity 1

What is necessary for germination?

- Air;
- Water;
- Warmth.

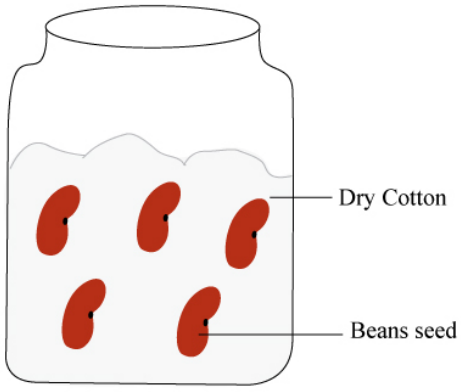


Seeds will germinate since oxygen, water and warmth is available.

Activity 2

What is present?

- Air
- Warmth.



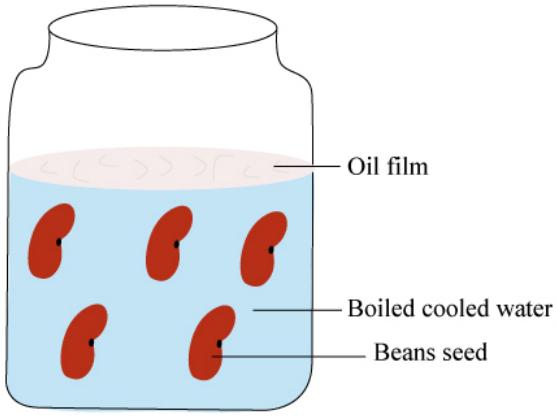
Dry cotton wool indicates water/moisture is lacking, hence seeds will not germinate.

Activity 3

What is present?

-Water,

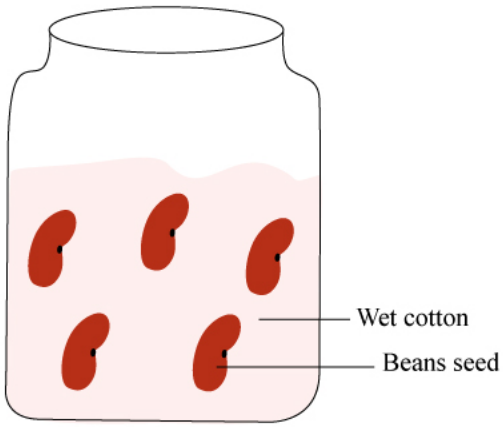
- Warmth.



Water is boiled and then cooled to remove the oxygen.
The layer of oil prevents the oxygen from dissolving into the water.
Seeds will NOT germinate since there is no oxygen.

Activity 4

Place the set up in a freezer or refrigerator.



Ice cubes make the temperatures very low, hence there is no warmth.
Seeds will not germinate because there is no warmth.

INTERDEPENDENCE IN PLANTS

Interdependence is a situation whereby living things depend on each other.

All living things depend upon each other in many ways.

TYPES OF INTERDEPENDENCE

i) Interdependence between plants
ii) Interdependence between plants and animals
iii) Interdependence between animals.

1. Interdependence between plants and other plants

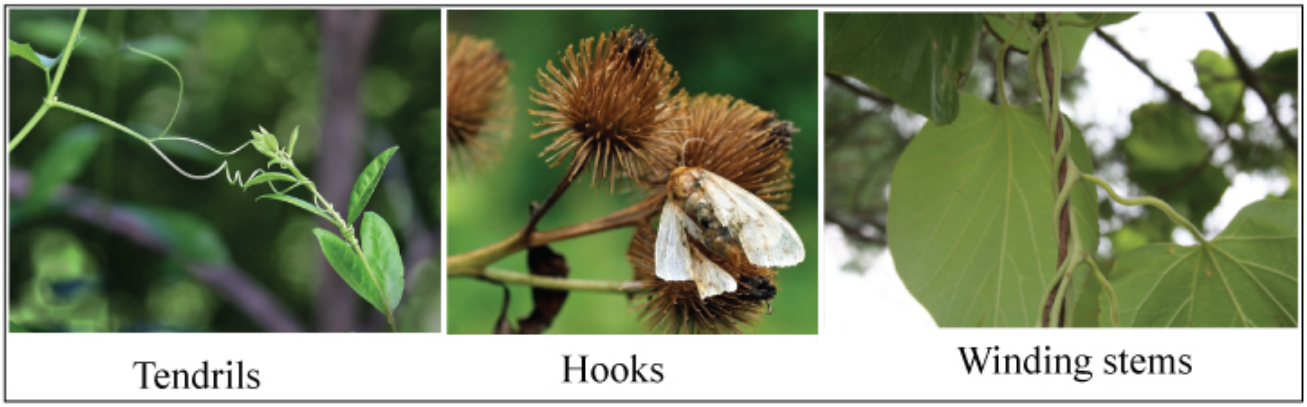
i) Shade
ii) Support
iii) Habitat

Shade

1. Plants that cannot grow in direct sunlight grow under bigger plants such as trees.
2. An example of a plant that grows under a shade is the fern plant.

Support

1. Plants with weak and soft stems which cannot stand firmly by themselves depend on other plants for support. They are called climbing plants.
2. They have special features to climb on other plants e.g.the passion plant has tendrils to climb on other plants while the bougainvillea has hooks to climb.
3. Others like the garden pea twine around other plants.



Habitat

1. A habitat is the natural place where a plant grows or an animal lives.
2. Some plants grow on other plants e.g. lichen.
3. Others live and feed directly from the host. They are called parasitic plants e.g. dodder plant

Others feed on dead and decaying plants. They are known as saprophytes e.g. mushroom and toadstool.

2. Interdependence between plants and animals

Plants and animals depend on each other in the following ways:

1. For oxygen
2. For carbon dioxide
3. For food
4. For medicine
5. For pollination
6. For shelter
7. For nutrients
8. Animal wastes

9. Decomposition on death

Food

1. Herbivorous animals feed on plants directly. Carnivores feed on them.
2. Animals produce carbon dioxide which is used by plants during photosynthesis to make food.

Oxygen

1. During photosynthesis, plants produce oxygen which is used by animals during respiration.

Carbon dioxide

1. During respiration, animals give out carbon dioxide which is used by plants to make their own food.

Medicines

1. Many plants are a source of medicine e.g. Aloe vera, Mwarubaini (neem tree), ginger, garlic.
2. Penicillin and quinine are modern medicines extracted from plants.

Pollination

1. Most plants depend on animals such as bees, butterflies and birds like the sunbird for pollination.
2. Pollination allows reproduction in plants.

Animal waste

1. Animal droppings and dung add nutrients to the soil.
2. The nutrients are absorbed by the plants through the roots.

Shelter

1. Some animals depend on trees for shelter and protection from rain, wind, heat and cold.
2. Birds build nests on trees, monkeys live on trees and termites build their shelters on trees.

Nutrients

1. Animals get nutrients by eating. Insectivorous plants trap insects and feed on them.
2. Plants get nutrients from dead and decaying animal waste.

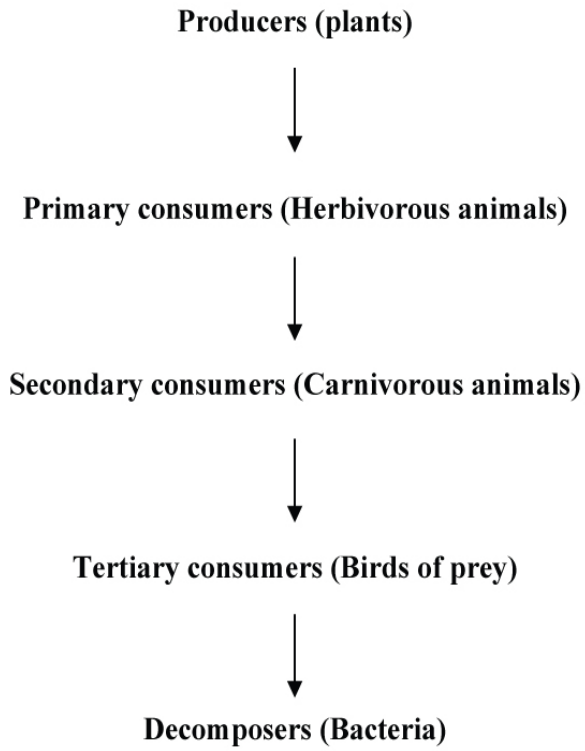
Decomposition

1. Living things die, decay and rot. The process of rotting and decaying is known as decomposition.
2. After decomposition, nutrients are released to the soil and then used by plants.

FOOD CHAIN

1. A food chain is a feeding relationship among living things.
2. The producers in a food chain are plants.
3. Herbivorous animals feed on plants and are called primary consumers.
4. Carnivorous animals feed on herbivores and are called secondary consumers.
5. Animals that feed on secondary consumers are called tertiary consumers.
6. Finally, in a food chain we have decomposers who bring about decomposition.

Living things in a food chain



Examples of food chains

1. Plants → Insects → Frogs → Snake
2. Plants → Gazelles → Leopards → Vultures
3. Grass → Locust → Lizard → Hawk
4. Algae → Small fish → Big fish → King fish

CROP PESTS

1. A pest is a harmful thing, person or animal.
2. Pests are grouped into two: - Field pests
   - Storage pests

FIELD PESTS

They attack crops when they are in the field.

They include: - Weaver birds
- Army worms
-Cut worms
-Stalk borers
- Aphids

- Locusts

	Crop pest	Crops attacked	Part attacked
1.	Locust	All growing crops	Leaves
2.	Aphids	Beans, cabbage, groundnuts. peas, sorghum, carrot, tobacco	Stem and leaves
3.	Army worms	Cereals, cassava, grass	Leaves
4.	Stalk borer	Sugarcane, maize, rice, sorghum, millet	Stem
5.	Cut worms	Cabbages, tomatoes, potatoes, maize, wheat, rice	Stems of young plants
6.	Weaver birds	Rice, maize, wheat, millet, sorghum	Eat the grains

STORAGE PESTS

They attack and destroy stored crop produce. They include:

- Rodents like rats, mice and squirrels
- Weevils
- White ants (termites)

Weevils

They bore holes in grains and eat them reducing their quality.

Rodents

They attack and destroy grains.

White ants

They eat stored grains and root tubers e.g. yams.

EFFECTS OF CROP PESTS ON CROPS

1. Lower yields: The quantity of the harvest is reduced.
2. Reduced quality of produce: The produce is not attractive to the buyer. This leads to a loss for the farmer.
3. Transmission of diseases to crops: Some plants transmit diseases to crops e.g. aphids.
4. Transmission to consumers: Crops attacked by pests may cause diseases to consumers

CONTROL MEASURES FOR CROP PESTS

Pests are reduced or eliminated by the following methods:

1. Scaring
2. Trapping
3. Hand-picking
4. Weeding
5. Spraying
6. Pruning
7. Biological method

Scaring: Birds and monkeys can be kept away by scaring, using scarecrows or metals that make unpleasant noise.

Trapping: Traps are put where pests are commonly found.

Hand picking: Some pests can be hand-picked. Hand-picking is best used in small pieces of land.

Weeding: This is the removal of unwanted plants. Some weeds host pests.

Spraying: Pesticides are sprayed on crops to control pests.

Pruning: Remove the affected parts of a plant and destroy them.

Biological method: This is the use of other animals to feed on pests e.g. Ladybirds feed on aphids which affect crops.

ADAPTATION OF PLANTS TO THEIR ENVIRONMENT

Adaptation is the ability/or a mechanism of a plant to survive in a particular environment or habitat.

PLANTS ADAPTED TO DIFFERENT ENVIRONMENTS

Xerophytes - Plants that grow and survive in dry areas.

Mesophytes - Plants that grow and survive under normal conditions

Hydrophytes -Plants that grow and survive in watery areas.

Halophytes - Plants that grow in salty areas.

Adaptation of plants to survive in dry areas (Desert – Arid and Semi-Arid)

- These plants suffer water shortage
- They are called Xerophytes
- They conserve water either by their structure or through their behaviour.
- Examples include:
- Cactus
- Acacia
- Euphorbia
- Baobab tree
- Sisal
- Marram grass
- Prickly pear
- Blue gum tree

Cactus plant in desert

Adaptation of Xerophytes

1.Some plants shed their leaves during dry season to reduce the rate of transpiration. Plants that shed (lose) their leaves are called deciduous plants.
They do not carry out photosynthesis during dry season hence they become dormant i.e. inactive.

2. They have needle-like leaves. The surface area of the leaves is small, hence it reduces the rate of transpiration.

3.They have sharp spines. This protects the plant from being eaten by desert animals and also reduces water loss.

4.Some plants roll/fold or curl their leaves. This reduces the rate of transpiration. They also trap moist air and make it available for the plant.

5. Some have normal or silvery (shiny) hairs. Normal hairs trap water vapour for the plant. Shiny hair reflects sunlight and heat the leaves, hence reduce
temperatures on the plant's surface.This reduces the rate of evapotranspiration.

6. Other plants have leaves covered by a thick waxy cuticle. The wax reduces the amount of water loss through evaporation.

7.Some plants have fleshy, thick green stems instead of leaves for photosynthesis. The thick stem does not allow much water to be lost e.g. cacti plant.

8.Others have fleshy stems that store large amounts of water in their tissues. Plants with fleshy stems are called succulents.

9.Some close the stomata during the day when the rate of evaporation is high and open during the night.

10. Some have fewer or sunken stomata to reduce water loss.

11. Some are deep-rooted to obtain underground water e.g. acacia.

Adaptation of plants to survive in water (wet areas)

These plants are called Hydrophytes

They face a big problem obtaining energy oxygen

Examples of hydrophytes are water lily, buttercup, water lettuce, duckweed, aquatic ferns.

Water lily

Adaptation of Hydrophytes

1. They have thin cuticles since they do not have to reduce the amount of water loss.
2. They have an increased number of stomata.
   Most of the stomata are on the upper surface of the leaf and remain open most of the time to allow absorption of gases from air.
3. They have flexible stems that sway or bend with the currents so that they are not broken.
4. They have large flat leaves to enable the plant float on water e.g. water lily.

5. The leaves have air sacs that enable the plant to float in water.
6. Some have hairs on the stems and leaves to prevent water from standing and soaking into the plant.
7. Some have a waxy layer on the stem and leaves to prevent water from entering into the plant.
8. Their roots are shallow and small to reduce the amount of water absorption.
9. They have floating flowers above the water to facilitate pollination.

NB: Mesophytes grow under normal soils and water conditions. They require an average amount of water e.g. beans, maize, bananas, potatoes.

SIGNS OF UNHEALTHY CROPS (ILL-HEALTH)

a) Stunted growth – also known as retarded growth. Plants develop at a slower rate than expected.

b) Discolouration of plant parts. Other than the normal colour of the parts,they gain a different colour e.g leaves turn yellow ,hence the photosynthesis process is affected.

c) Curled/folded leaves.

d) Wilting. Plants may wither and die i.e. appear weak.

e) Presence of spots, streaks, dots or patches. (Streaks are thin lines)

f) Distortion or malformation – Abnormal shapes

EFFECTS OF CROP DISEASES

- Reduced yields – The quantity of harvest is less than expected.
- Reduced quality of the produce i.e. the produce is not up to the expected standards e.g. small maize grains, fruits or kales.
- Leads to high production cost. More expenses are incurred when controlling the diseases.