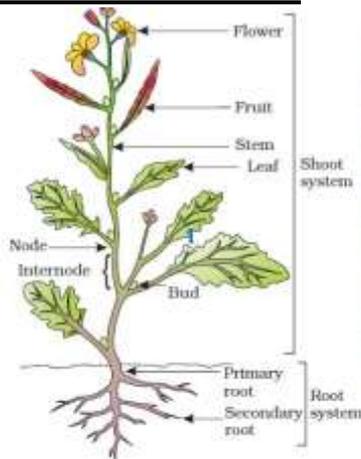


Transportation & Reproduction in Plants

- There are about 3,91,000 types of plants in the world.
- 1. They could be classified according to their size and the nature of their stem into three categories:
 - A). HERBS
 - B) SHRUBS
 - C) TREES

There are also some plants that do not fall under the category of Herbs, Shrubs or Trees. These plants can be grouped as CLIMBERS and CREEPERS

PARTS OF A PLANT-



A plant has 2 important systems:

1. SHOOT -Above the ground --→ the stem, branches, leaves, flowers and fruits.
2. ROOT SYSTEM - Below the ground --→main root and its branching roots.

ROOT SYSTEM- UNDERGROUND PART OF FLOWER

FUNCTIONS OF ROOTS

1.	- The roots help in holding the plant firmly to the soil. They are said to anchor the plant to the soil. This is called Anchorage.
2.	- Roots absorb water and minerals from the soil through tiny hair like structures present on them.
3.	- They also prevent soil erosion.
4.	- Some roots are modified to store food. For e.g. Radish, Carrot and turnip have food stored in them.

SHOOT SYSTEM

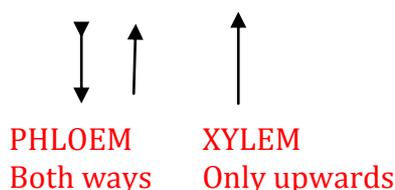
The shoot system → stem, branches, leaves, flowers and fruits.

1. THE STEM

1	Major part of a plant-→ bears branches, leaves, flowers and fruits.
2	The leaves on the stem are arranged in a way -→ exposed to lots of sunlight.
3	The point from where a leaf or a branch arises from the stem is called a node. The part of the stem between any two nodes is called an internode.
5	

Functions of a stem

1	The stem provides support to different parts of the plants and helps it to stand upright.
2	It transports (or conducts) water, minerals and food to all parts of the plant.
3	It carries water and minerals to the aerial parts (stem, flowers, buds, fruits) of the plant through vessels called Xylem Vessels
4	The food made by leaves is also conducted / transported by the stems to different parts of the plant through a set of thin tubes called Phloem
STEM MODIFICATION	Stems of some plants are modified to store food. For e.g. Stems of ginger, onion and potato grow underground and also store food .
	Some stems modify to make food, for e.g. In case of cactus, the green stem of the cactus performs all the functions like a leaf that is, it prepares food and also stores water for a long period.



2. LEAVES

FUNCTIONS OF THE LEAVES

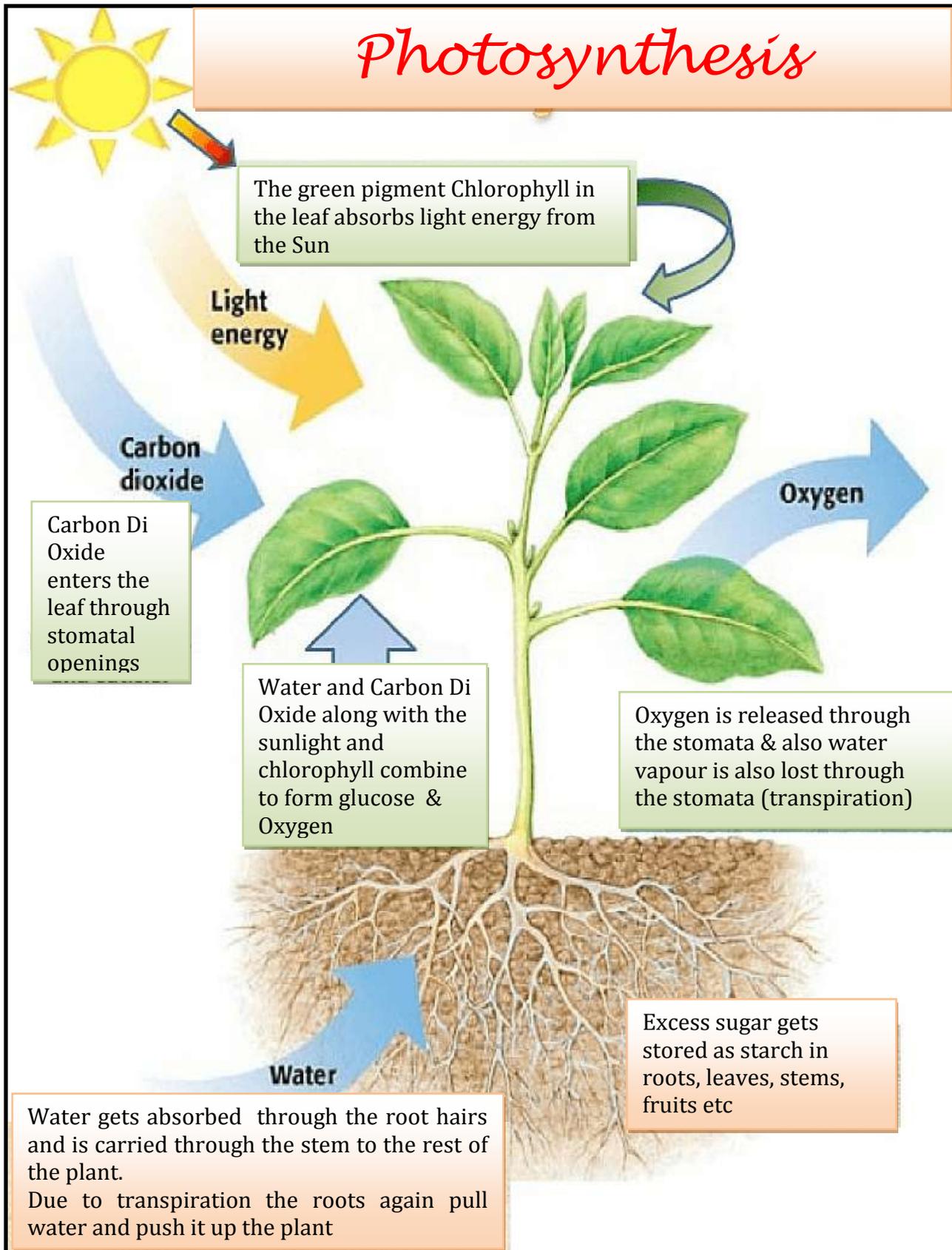
<u>1</u>	Leaves are called the food factories, or the kitchens of the plants, because they can make their own food through Photosynthesis
<u>2.</u>	Leaves also release water in the form of water vapor from their surface called transpiration. This process is similar to sweating in humans and helps to keep the leaves cool. As the water escapes from the leaves the roots pull more water (suction effect) to compensate for this loss. This water brings with it important nutrients required by the plant from the soil.
<u>2</u>	Leaves help in the exchange of gases through small pores present under their surface, these minute pores are called stomata. During photosynthesis, carbon dioxide is taken in from the atmosphere through the stomata and oxygen is released as a waste product.

Photosynthesis (Photo = Light, Synthesis = to make OR to put things together)

- The process by which plants prepare food, by using Carbon dioxide (CO₂) and Water (H₂O) in the presence of sunlight, and chlorophyll is called photosynthesis.
- The food that the leaf prepares during photosynthesis is a kind of sugar called glucose.
- This glucose then gets converted into starch & this starch is stored in different parts of the plants like the roots, stems, leaves etc. Oxygen (O₂) is released during this process

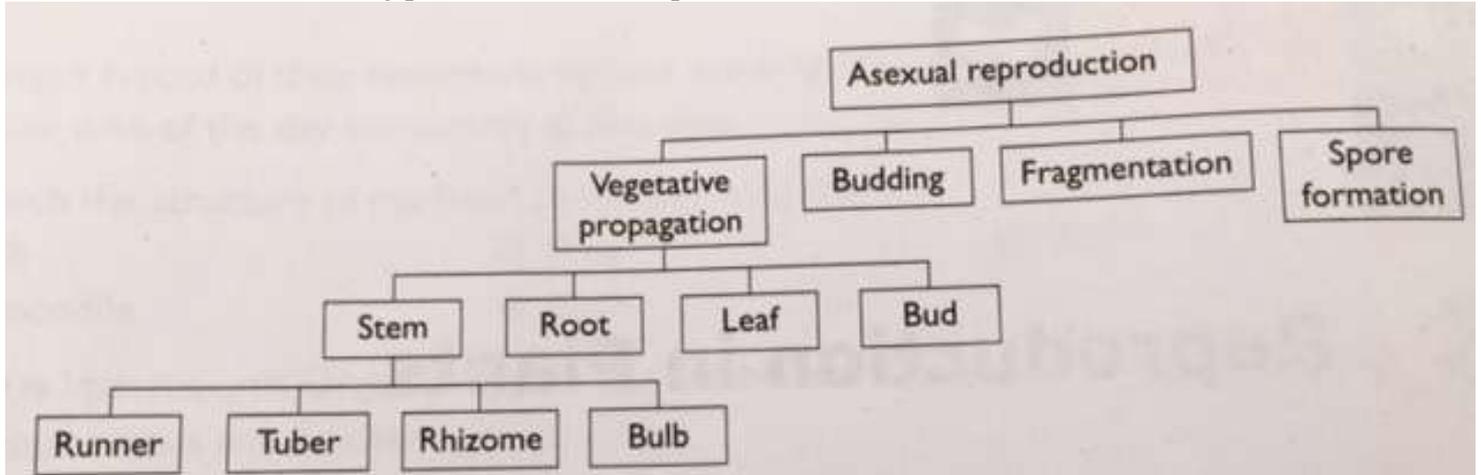
Carbon Dioxide + Water $\xrightarrow{\text{chlorophyll}}$ **Food + Oxygen**

Sunlight (glucose)



ASEXUAL REPRODUCTION

There are different types of asexual reproduction:

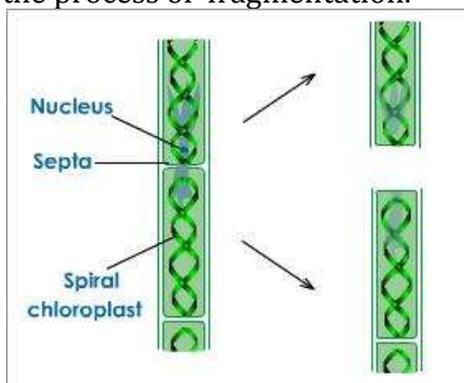


1. Fragmentation

In fragmentation the body of the parents breaks into different pieces, each of which then can produce an offspring.

E.g.

- The slimy green algae (for example: Spirogyra) which grows in stagnant water reproduces by the process of fragmentation.



2. Budding

In budding, a bulb-like projection called bud occurs on the body of the parent organism, This bud grows into an offspring and may eventually break away from the parent.

For e.g.

- Yeast reproduces by budding. A small bud forms on the parent cell. The nucleus of the parent cell then divides and one of the nucleus migrates into the new bud. The bud increases in size and eventually breaks off as a new cell which is an exact copy of the parent cell.
- Sometimes the buds do not detach from the parent and a chain of buds is formed. This is called a colony. In corals and sponges, the buds do not separate but remain attached to the parent organisms and reproduce again and again producing a colony.

3. Spore formation

Plants like ferns, mosses, molds and organisms like mushroom reproduce by spore formation. Spore is a tiny spherical single celled body which is protected by a thick wall. In this method of reproduction, the parent plant produces hundreds of tiny **spores** which can grow into new plants.

When weather conditions are ideal, some ferns, algae, moss and even fungi, release spores into the air which then grow into new moulds. For e.g. we can see moulds growing on moist bread, wood, paper, carpet and in various foods.

4. Vegetative Propagation

Vegetative propagation is another form of asexual reproduction in which the vegetative parts of the mother plant like roots, stems, leaves, buds give rise to new plants

For e.g. Plants like Cacti, Strawberry, Onions etc. reproduce by vegetative reproduction.

Vegetative propagation through Stem:-

Vegetative propagation (or reproduction) can take place through stems. This is seen in various different types of plants. For example -

1. Runner – Grasses produce underground stems. These underground stems grow through the soil and they produce new roots and side shoots at definite intervals above the ground. This leads to the entire land getting green. E.g 2-Strawberry plant.



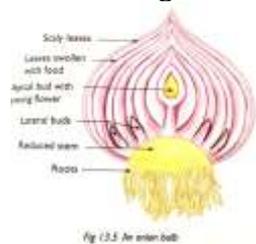
2. Tuber – Potatoes are underground stems called tubers. They are swollen because they store food in them. Just as normal stems have buds, they too have buds called 'eyes' found in depressions on its surface. These depressions are called 'eyes' or 'notches'. These notches are actually the nodes. New potato plants sprout from these eyes or notches. Hence, when a potato is cut into parts and planted in the soil, each part with an 'eye' develops into a new potato plant.



3. Ginger and Onions also are underground stems that further reproduce through vegetative propagation. Ginger has buds which give rise to new plants. Their buds develop into branches which grow upwards into the air and then produce normal green leaves .



Onions are bulbs, which too have buds like ginger that produce new shoots and further grow a new bulb underground which in turn grows into a new onion



4. Cutting –

Many plants such as Rose, Coleus, Sugarcane and Bougainvella are propagated by stem cuttings. Cutting is a artificial way of producing plants. It allows many new plants to be produced from a single plant without waiting for flowers and seeds.

In this method a young healthy stem from the node of a plant is cut off and is planted in a suitable rooting medium that includes moist sand, a mixture of compost and soil.

These buds then give out roots and a new plant grows out of the cutting with new roots and stem.

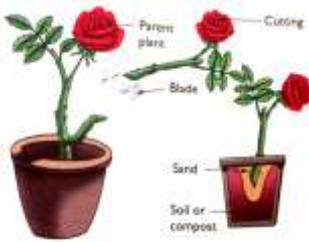


Fig 13.6 Vegetative propagation through rose cuttings

Vegetative propagation through Roots:

Roots help by absorbing water from soil, by providing support to the plant by anchoring it to the soil and besides this some roots also store food. Roots of some plants can also give rise to new plants. In such plants buds develop at the base of the stem. These buds then grow into new plants by taking nutrition from these swollen, modified roots. For e.g. Sweet potato.

It is cut with its buds on its top and sown in the soil . from there, the plant develops new roots that grow into fresh shoots upwards while a new sweet potato swollen root grows underground.

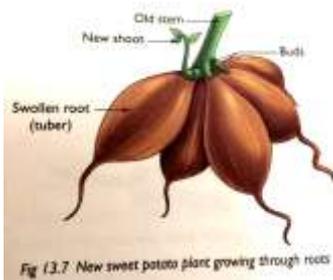


Fig 13.7 New sweet potato plant growing through roots

Vegetative propagation through Leaf:

New plants can also be obtained from leaves. In Plants like Bryophyllum, the margins of the leaves contain buds. Small plants called plantlets arise from these buds. These plantlets fall off and develop into mature plants.



Vegetative propagation through Bud

In some plants like Agave, the floral buds are modified into bulbils. When these bulbils are detached, they come in contact with the soil and develop into new plants.

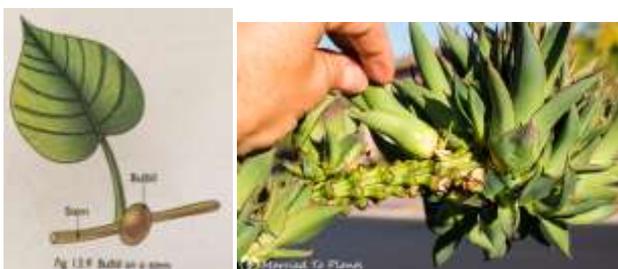


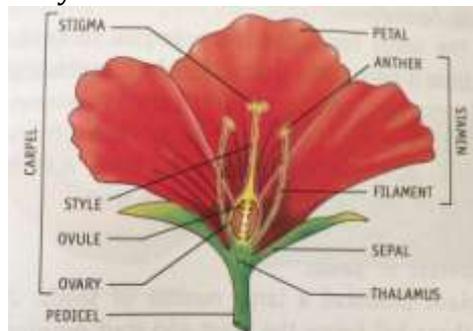
Fig 13.8 Bulbil on a stem

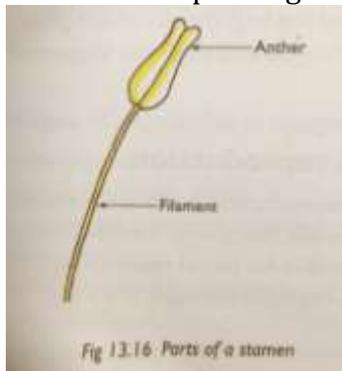
SEXUAL REPRODUCTION IN PLANTS

Sexual Reproduction is reproduction in which both the male and female are involved in the production of the new offspring.

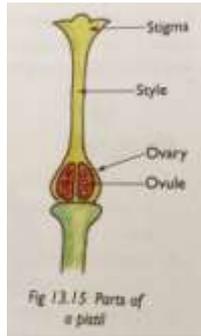
The flower is the reproductive part of a plant i.e., both male and female gametes are produced by flowers. Hence, Sexual reproduction in plants takes place in flowers.

Let us study the structure of a flower to understand how it helps in reproduction:



PARTS		PEDICEL	A flower has a stock called a Pedicel which joins it to the stem
		THALAMUS	The uppermost part of this pedicel is wider and is known as the Thalamus
A flower has four main parts:	1	SEPALS	<ul style="list-style-type: none"> - The outermost, green leaf like structures are called sepals. - The sepals provide protection to the flower when it is in the bud stage.
	2	PETALS	<ul style="list-style-type: none"> - They are generally brightly colored and scented and could be large or small in size.
	3	STAMEN	<ul style="list-style-type: none"> - This is the MALE part of the flower which is visible on removing the petals. - Each stamen consists of a hair like structure called the filament and a lobed bag like structure called anther at the tip of the filament. - The anther contains dust like particles called pollen grains. - These pollen grains take part in reproduction.  <p style="text-align: center;"><i>Fig 13.16: Parts of a stamen</i></p>
	4	PISTIL	<ul style="list-style-type: none"> - It is the female part of the flower. - It is the innermost flask shaped part of the flower. - It consist of a small, sticky, disc-like structure called the Stigma on the top. - The stigma runs into a long tube – like structure called Style and has a swollen base called the Ovary.

- The ovary contains small, bead-like structures called the Ovules.
- The stigma receives pollen grains from the anthers. The ovary and the ovules help in reproduction.

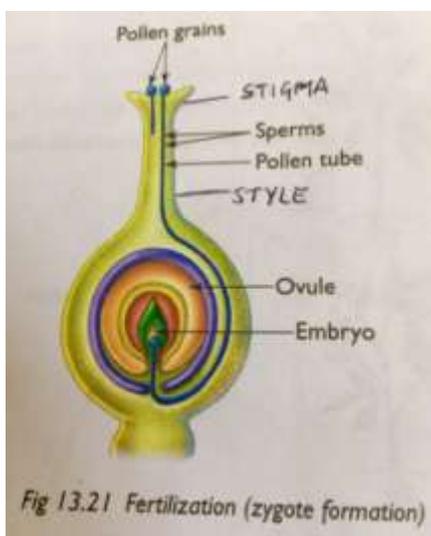


POLLINATION

1. The process of transfer of pollen grains from the anther (male reproductive part) to the stigma (female reproductive part) of the same or another flower is called Pollination.
2. There are 2 types of Pollination:
 - A). Self -Pollination
 - B). Cross- Pollination

SELF- POLLINATION	CROSS- POLLINATION
When the Pollen Grains are transferred from the anther of a flower to the stigma of the same flower or on another flower of the same plant, it is called Self-Pollination	When the Pollen Grains are transferred from the anther of a flower to the stigma of another flower of another plant, but of the same kind, it is called Cross- Pollination. It mostly occurs with the help of wind, water and insects.

FERTILISATION



FERTILIZATION

1. Once the pollen grains land on the stigma of a flower, a pollen tube grows out from the pollen grain.
2. This pollen tube travels through the style and reaches the ovule via the ovary.
3. Two male gametes from the pollen grain then travel down through the pollen tube.
4. After reaching the ovule one male gamete unites with the female gamete and forms the zygote.
5. The process of fusion of the male gamete with the female gamete to form a zygote is called fertilization.
6. The zygote which is single celled then divides many times to form an embryo.

7. The second male gamete fuses with another cell in the ovule to form the endosperm. This endosperm subsequently provides nourishment to the growing embryo.
8. After fertilization the petals drop off and sometimes even the sepals drop off.
9. The ovules in the ovary contain a supply of food, which is provided to the zygote to grow.
10. The walls of the ovules become hard and turn into seeds.
11. The seed contains the embryo enclosed in a seed coat.
12. The seed coat helps to protect the embryo.
13. As the seeds form, the ovary begins to swell and then becomes a fruit.
14. A fruit can have one or more seeds in it.
15. Some fruits like mangoes and apples are sweet and juicy while others like almonds and walnuts are hard.

GERMINATION

Germination is the process by which a seed grows into a seedling and subsequently into a new plant. Upon getting the right amount of air, water and warmth, the process of germination takes place.

1. Water softens the seed coat and changes the food stored in the seed into a soluble form for the baby plant. Air and warmth make the cells of the seed active.
2. The seed grows in size and the seed coat bursts open. A tiny root called radical comes out and grows downwards. A tiny shoot called plumule grows upwards towards the sun. This plumule grows into stem and leaves.
3. During the early stages of germination, the seedling gets the food required for its growth from the cotyledons. After the food stored in the cotyledons has been used up, it gets its food from the soil.
4. The seedling absorbs water and nutrients from the soil with the help of its roots.
5. Air (which is required for germination) also reaches the seed through pores in the soil.
6. It develops leaves and grows into a plant. That is why soil is so important for plant growth.

NOTE: We should not grow too many seeds very close to one another since after they germinate they will be competing with one another for air, water, light, nutrients and space to grow and as a result many of them would die.

SEED DISPERSAL – The process by which the seeds are scattered away or spread away from the mother plant is called seed dispersal.

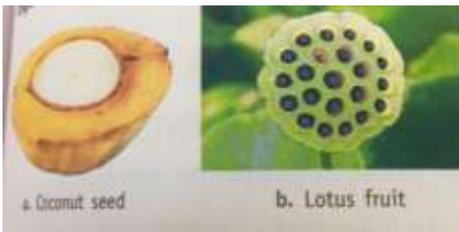
1. If the seeds of a fruit simply fall and grow below the parent plant then they will be overcrowded and will not get enough space, nutrients, water, minerals and sunlight so as to grow into healthy plants.
2. So nature has arranged agents of dispersal, which scatter these seeds over a large area.
3. The process by which seeds are scattered to distant places is known as seed dispersal.
4. Seed dispersal also helps plants in invading new habitats.
5. Seed dispersal is mainly carried out by agents like wind, water and animals.
6. Some seeds are dispersed by explosion.

WIND DISPERSAL



1. Seeds of some plants are light in weight and have wing like structures or hairs called tufts on them. This helps them to float in the air.
2. The seeds then germinate into new plants in that place.
3. Some examples are listed below-
4. Dandelion has hairy growth which act like little parachutes and carry the seeds far away from the parent plant. Cotton also has tiny hair surrounding which helps them to get carried away.
5. Drumstick and maple seeds have wings, which help in dispersal.
6. Madar (aak) and sunflower plants have fruits which are hairy and are blown away to far off places.
7. Poppy fruits sway in the wind. This cause the seeds to fall out.
8. Maple and Sycamore seeds.

WATER DISPERSAL



- Seeds dispersed by water have special structures that help them to stay afloat.
- Fruits like water lily and coconut palm float on water. They form a spongy or fibrous outer coat that helps them to float. Coconuts can travel to thousands of kilometers across seas and oceans. Lotus fruit also disperses seeds through water.
- Mangrove plants in the swamp regions of countries like Thailand are also plants whose seeds spread / get dispersed through water.

ANIMAL DISPERSAL



- Animals and birds also help to disperse seeds.
- At times while eating fruits, only the juicy part gets digested while the seeds are thrown away by mouth or are passed out through excretion. New plants grow from these seeds.
- This can happen far away from the parent plant. Since animals move from one place to another.
- For e.g. Seeds of Cherry and Apple are dispersed in this manner.
- Birds like parrots also disperse seeds to other areas through their droppings.
- The mistletoe plant multiplies through seed dispersal. This is because mistletoe plant has sticky berries which attract the birds.

- The sticky seeds stick to the beak of birds. When they rub their beaks on the bark of trees, the seeds are left on the bark to grow into new mistletoe plants.
- Squirrels collect nuts and bury them as food for winter but they often forget where they have buried them. These seeds then grow into new plants.
- The Xanthium plant has spiny seeds with hooks. These get attached to the body of animals and are carried away from the parent plant.

DISPERSAL BY EXPLOSION

- Some plants have pods that explode when ripe / when they dry up and scatter their seeds.
- This is observed plants like balsam, castor, pea and beans.