

2

Getting to Know Plants



“Plants are the major producers in an ecosystem, and they include trees, herbs, bushes, grasses, vines, ferns, mosses, and green algae”

Introduction

Plants are alive, just like people and animals. How do we know this? Living things all do certain things:

They grow and die, need energy, nutrients, air and water, produce young ones. They are made up of cells. They react to what's around them. Life is not possible without plants. We find plants everywhere around us. Some are small while others are big. Some are found in water and other are present on land in roadside, house, school and farmhouse.

Plants on the basis of size and the nature of their stem can be classified into three categories :-

(i) Small plants/herbs (ii) Medium plants/shrubs (iii) Big plants/trees

There is another type of plants that can differ from herbs, shrubs and trees. These are plants with weak stems and cannot stand upright. Some of these spread out on the ground and are called creepers. For example pumpkins, watermelon.

Other climb up with the help of the support, for example grapevine, money plant, beanstalk and gourd. They are called climbers.



Creeper



Climber



Active

Biology

1

Look closely at the stem and branches of:

1. Plants much smaller than you.
2. Plants that are about your size, and
3. Plants which are much taller than you.

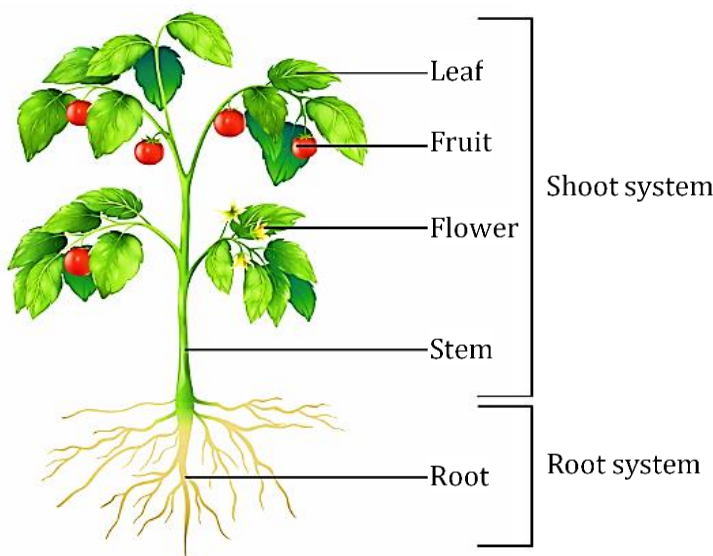
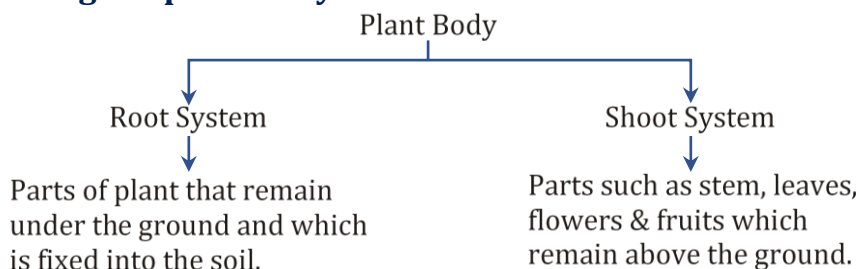
Feel their stem and try to bend them gently to see if they are tender or hard.

A banana tree has a green, soft stem. It is actually a herb-It is the biggest herb.

SPOT LIGHT

Plant Name	Column-1 Height	Column-2 stem				Column-3 Where do the branches appear		Column-4
		Green	Tender	Thick	Hard	At the base of the stem	Higher up on the stem	Category of plant
Tomato	Shorter than me	Yes	Yes					Herb
Mango	Much taller than me			Yes	Yes		Yes	Tree
Lemon	Slightly taller than me				Yes	Yes		Shrub

Design of plant body






Design of a plant body

In crop fields, lawns or in pots, often some unwanted plants start growing called weeds.

SPOT LIGHT

Comparison of plants on the basis of size and nature of their stem :

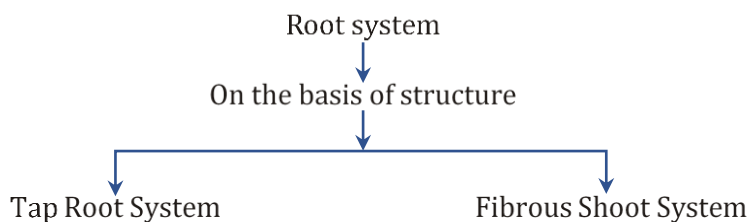
PARAMETER	HERBS	SHRUBS	TREES
Size	Very small, usually less than 1 m high	Medium sized, usually 1-3 m high	Tall, generally more than 3 m high
Nature of stem	Green, tender stem, few branches	Hard stem but not very thick, branches arise near the base of stem	Hard, brown thick stem, branches on upper part of the stem
Example	Grass, tomato wheat, mint, coriander 	Lemon, rose, pomegranate, bougainvillea, China rose, henna. 	<i>Gulmohar</i> , neem, Peepal, mango 

Root system

The structure emerging from the base of stem which act like straws absorbing water and minerals from the soil are roots. Tiny root hairs emerge out of the root helping in the absorption. Roots help to anchor the plant in the soil so it does not fall over. Roots also store extra food for future use like in carrot, sweet potato.



Structure:



(i) Tap root system

In this system, a single root (primary root) comes out from the seed after germination. Many branches and sub-branches come out from this main root called “Lateral roots” and spread out into the soil. It is found in most of the dicot plants.

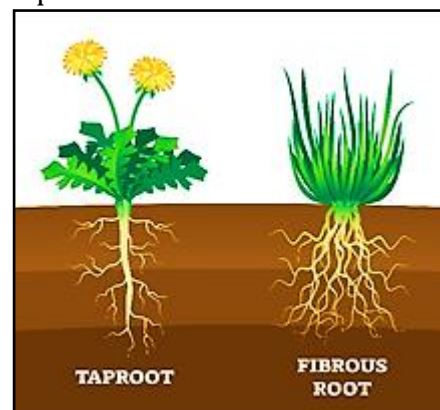
e.g. Mango, neem, pine, sheesham, pea, carrot, radish, turnip and beetroot.

Primary Root + Lateral Roots = Tap root system (main root)

(ii) Fibrous Root System

Many plants do not have a main root. Instead they have a cluster of fine roots which come out from the base of stem. These roots does not go down as deep into the soil as tap roots. It is found in most of the monocot plants.

e.g. Grasses, cereals (like maize, rice and wheat) bamboo, sugarcane and onion.



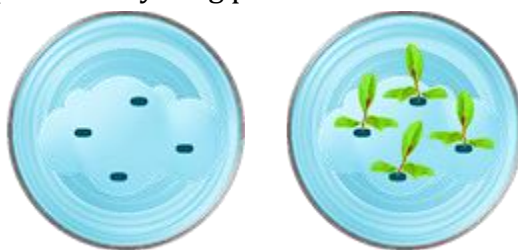
Tap Root and Fibrous Root

**Aim**

To show that roots anchor the plant in to the soil.

Method

- (i) We would require seeds of maize, cotton wool, katori and some water.
- (ii) Take a katori. Place some wet cotton wool in them.
- (iii) Put 3 or 4 seeds of maize on the cotton wool.
- (iv) Keep the cotton wet by sprinkling water every day, until the sprouts have grown into young plants.
- (v) After a week try to separate the young plants from the cotton wool.



Young plants grown on cotton wool

Observations and conclusions

We could not easily pull out the plants from the cotton. This is because roots hold the plant. This conclude that roots help in holding the plant firmly in the soil. They are said to anchor the plant to the soil.



- Sprinkling of water should be done properly because moisture is required for germination of seed.

**Aim**

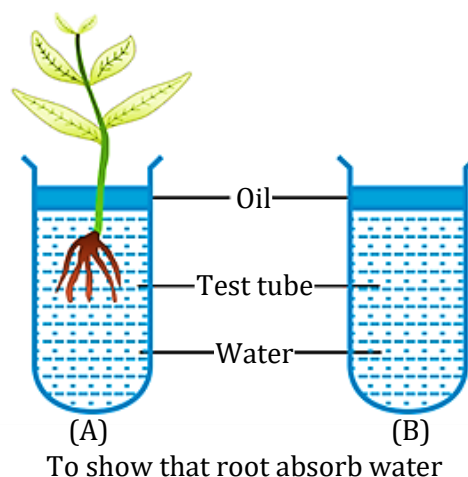
To show that roots absorb water.

Method

Take two test tubes and label them A and B.

In tube A, take some water and insert a young plant in it. Only the roots of this plant must be dipping in water. Pour some oil to cover the surface of water. The oil on the surface of water will not allow evaporation of water.

In tube B, take water and pour oil exactly in the same way as in tube-A.



To show that root absorb water

What is the difference in tubes A and B?

Tube A has the plant, but tube B does not have one.

Mark the water level in the two tubes and place both the tubes in a warm, dry place.

Observation

After a day or so it will be observed that the level of water in tube A has fallen. There is no decrease in the water level in tube B.

Conclusion

Absence of the plant in tube B tells us that the presence of plant in tube A has caused the loss of water as roots absorb water and send it to upper parts of plant.

Functions of root

- (i) Anchoring the plant: Roots help to anchor (fix) the plant firmly into the ground.
- (ii) Absorption of water and nutrients from the soil.
- (iii) Preventing soil erosion: Roots help to bind the soil particles together, thereby preventing them from being carried away by water and wind.



1. Name the two main systems found in plants.
2. Give two examples of plants where tap roots and fibrous roots are present.
3. Name the vegetative parts of plants.

Shoot system

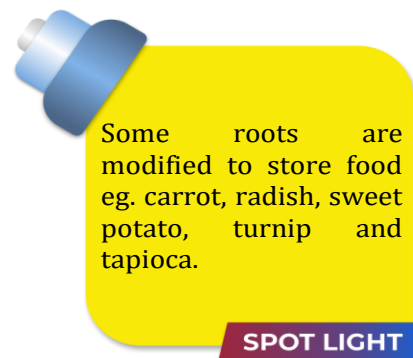
The part of a plant above the ground consisting of stem, branches, leaves, flowers and fruits is called the shoot system.

Stem

Main supporting part of plant. Stem bears leaves, branches, buds, flowers and fruits.

Functions of stem

- (i) Stems keep the plant upright or they support the plant.
- (ii) They act like the plant's plumbing system, conducting water and nutrients from the roots and food from the leaves to other plant parts. A set of thin tubes from the root are connected to thin tubes in the stem, water and minerals pass through these tubes to leaves, flowers, buds and fruits.





Why stem is called street with two way traffic?

Explanation

Stem is like a street with two-way traffic because in stem, water and minerals move in upward direction from roots to the leaves, while food transports in upward and downward direction from leaves to the other parts of the plant.



Aim

To study the transport of water through stems.

Method

Place a plant in a beaker half filled with water. Put a drop of red fountain-pen ink in the water and stir. Let the plant stay in beaker for a day.

Observation

Next day take a cross section of stem and examine it. We will find red colour in the section of the stem.

Conclusion

It indicates that coloured water moved up with the help of tubes present inside the stem.

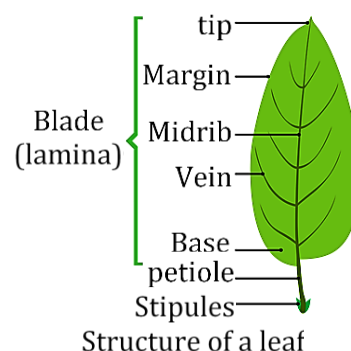
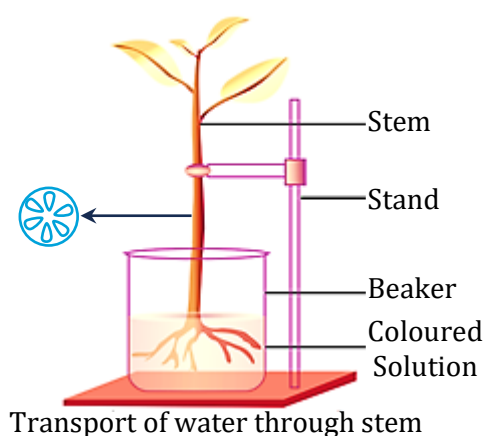
Leaves

The leaf is flat green outgrowth of the stem. The wide flat green portion of the leaf is called lamina or leaf blade.

The thin portion of leaf by which it is joined to stem is called stalk or petiole. The petiole extends into the leaf as the midribs and joins the stems at the leaf base. The thin lines arise from the petiole and midribs and spreading across the leaf are called veins. The veins branch into veinlets. The veins provide support to leaf and carry water, minerals and food. The arrangement of veins on a leaf is called venation.

Venation is of two types –

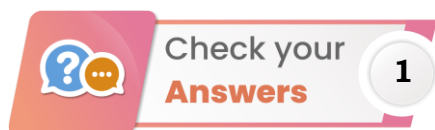
- Parallel venation
- Reticulate venation



	Parallel venation	Reticulate venation
1.	If veins run parallel to one another from the base to the tip of leaf.	Veins arranged in the net like pattern on both sides of midrib.
2.	Plants whose leaves have parallel venation have fibrous root.	Plants whose leaves have reticulated venation have tap root.
3.	They are mainly found in monocot plants.	They are mainly found in dicot plants.
4.	Example maize, grass and wheat.	Example Tulsi, coriander and China rose.



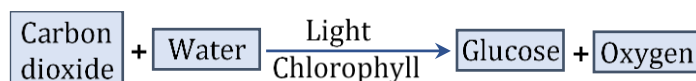
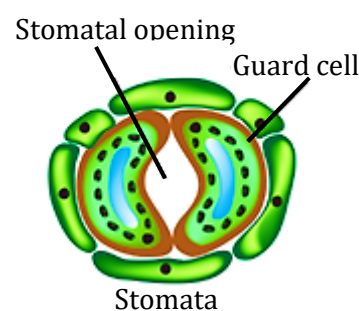
Leaves with parallel and reticulate venation



1. Root system and shoot system
2. Tap root-carrot and rose, fibrous root-maize and grass.
3. Roots, stems and leaves.

Functions of the leaf

- (i) The leaves on their surfaces have tiny pores called stomata. Through these pores, plants take in gases for respiration and photosynthesis. The gases produced during these processes are also given out through stomata.
- (ii) The process by which plants throw out excess water is called transpiration.
- (iii) Leaves manufacture food for the plant body. The process of manufacturing food by the leaves is called photosynthesis. Leaves require water, carbon dioxide, sunlight and chlorophyll for making food.



- (iv) In some plants, leaves bear buds in the marginal notches from which new plants grow and develop. e.g., *Bryophyllum*.

**Aim**

To demonstrate that water is given off during transpiration.

Method

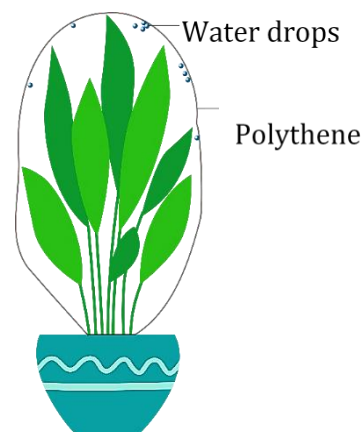
- (i) Take a small-sized well-watered potted plant.
- (ii) Cover the plant as shown in the figure with a transparent plastic bag. Tie the bag at the base of the stem.
- (iii) Leave the plant in sunlight for a few hours and then observe.

Observation

We will find drops of water on the inside of the bag.

Conclusion

Water vapours transpired by the plant condense as water droplets.



Process of transpiration

**Aim**

Leaf is essential for photosynthesis.

Method

Take a leaf in a test tube and pour spirit to completely immerse the leaf. Now, place the test tube in a beaker half filled with water. Heat the beaker till all the green colour from the leaf comes out into the spirit in the test tube. Take out the leaf carefully and wash it in water. Place it on a watch glass and pour some iodine solution over it.

Observation

The leaf turns blue-black.

Conclusion

Leaf prepares food in the form of glucose which is later converted into starch and so it turned blue-black in presence of iodine solution. This shows that leaf performs photosynthesis means leaf is essential for photosynthesis.



**Be Alert !**

- We need to boil the leaf in alcohol or spirit to remove the chlorophyll from leaf.

**Active****Biology**

7

Aim

To demonstrate that sunlight is essential for photosynthesis.

Method

- (1) Destarch the plant by placing it in a dark corner for 3 days.
- (2) Pick any leaf from the destarched plant and test it for starch to confirm whether it is fully starch-free.
- (3) Cover a part of a leaf using strips of black paper or Ganong's light screen.
- (4) Now place the plant in strong sunlight for at least 6 hours.
- (5) Pick the leaf covered by the strip of black paper, remove the strip and test the leaf for starch.

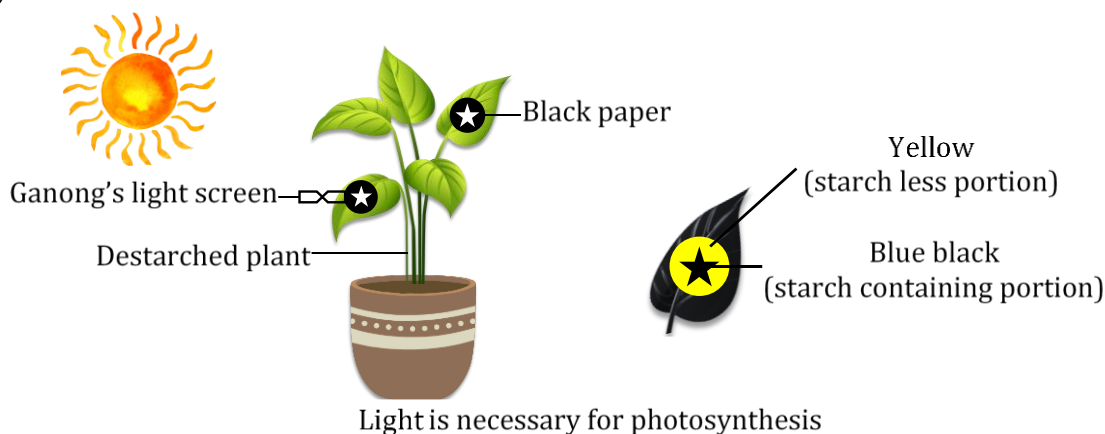
Note: Ganong's light screen is a small metallic box with a spring handle, ventilating holes and a lid having a design cut in the centre.

Observation

The covered portion of the leaf does not turn blue-black.

Conclusion

There was no starch formation in the covered part of the leaf because it did not get sunlight, so no photosynthesis occurs and it did not turn blue-black. This shows that light is necessary for photosynthesis.

**Building****Concepts**

2

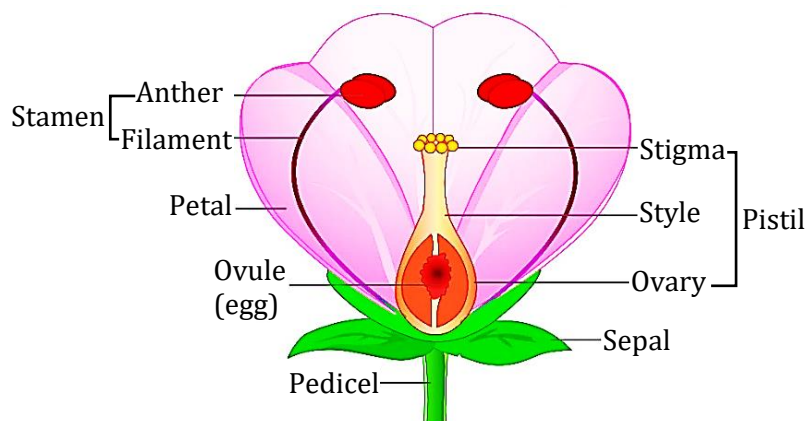
Is it possible for you to tell the type of venation in leaves without seeing them? How?

Explanation

Yes, We can tell the type of venation in leaves without seeing them. We can look for the type of roots of the plant and identify the type of leaf. If the plant has fibrous roots, then its leaves have parallel venation, and if the plant has tap roots, then its leaves have reticulate venation.

Flowers, Fruits and Seeds

A flower is the reproductive organ of a plant. A typical flower has a stalk called a pedicel which joins it to stem. The upper most part of pedicel is wider and is known as thalamus. On the base of the thalamus, the different parts of the flower are arranged in concentric rings and whorls.



Flower and its different parts

The prominent part of an open flower is petals and the prominent part in a closed bud is sepals.

SPOT LIGHT

(i) Sepals :

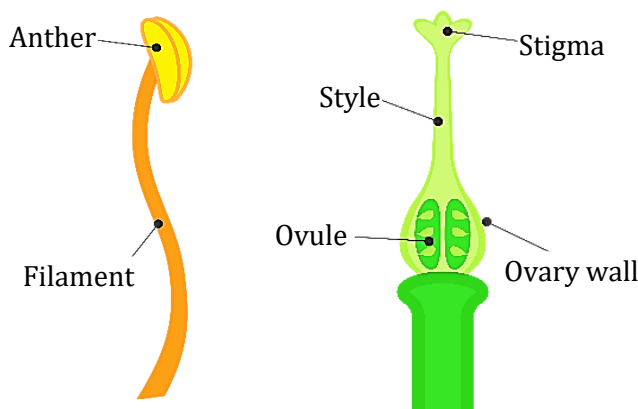
The outermost whorl of the flower consists of sepals. These are the green, leaf like structures at the base of flower. Sepals protect flower during its development and support the flower when flower blooms.

(ii) Petals :

The second whorl consists of petals. These are colourful structures that surround the inner parts of flower. Its function is to attract the pollinators.

(iii) Stamen :

The third whorl of flower consists of stamen. These are male reproductive parts of flower. Each stamen has two parts, a thin stalk called filament and a knob like structure called anther. Anther produces a powdery substance called pollen.



Parts of Stamen and Pistil

In some flowers both sepals and petals are coloured and cannot be distinguished from each other then their whorl is known as perianth, e.g. Lily, Tulip.

SPOT LIGHT

(iv) Carpel : It is a single elongated structure in the centre of the flower. It is broader below and tapers at the top and is also known as pistil. It is the female reproductive part of a flower. It has three parts, a sticky top portion called stigma, an enlarged base called ovary and a stalk called style that connects these two. The ovary contains tiny bulb like structures called ovules (can be one or more) which later become seeds.

- A flower having all the whorls i.e. sepals, petals, stamens and pistils is known as a complete flower e.g. hibiscus, rose, tulips.
- A flower lacking one or more of such structures, is known as an incomplete flower e.g. sweet corn, grass.
- Sunflower, rose, hibiscus have both stamen and carpel. They are bisexual flowers, but some have only stamen or carpel, such flowers are unisexual flowers like papaya, cucumber, maize etc.



SPOT LIGHT

What does the word “pollination” mean?

Explanation

Pollination is the transfer of pollen from a stamen to a pistil. Pollination starts the production of seeds.



1. What is pedicel?
2. Define photosynthesis.
3. What is transpiration?

Sometimes to see the inner parts of the flower clearly, we have to cut it open, if its petals are joined. For example, in datura and other bell shape flowers, the petals have to be cut lengthwise and spread out so that the inner parts can be seen clearly.

Functions of flower

- (i) It is an organ of sexual reproduction and result in the formation of fruits and seeds. Seeds on germination give rise to new plants.
- (ii) It is source of food for many insects e.g. Bees
- (iii) They beautify the surrounding and provide aesthetic value.



SPOT LIGHT

**Do You Remember ?**

- Seeds can't fly but they can travel by sticking on to the fur of animals or on the clothes of human.

**Check your Answers****2**

1. Pedicel is a stalk which joins flower to the stem.
2. The process of manufacturing food by the leaves is called photosynthesis. Leaves require water, carbon dioxide, sunlight and chlorophyll for making food.
3. The process by which plants throw out excess water is called transpiration.

**Active****Biology****8****Aim**

To study the structure of ovary.

Method

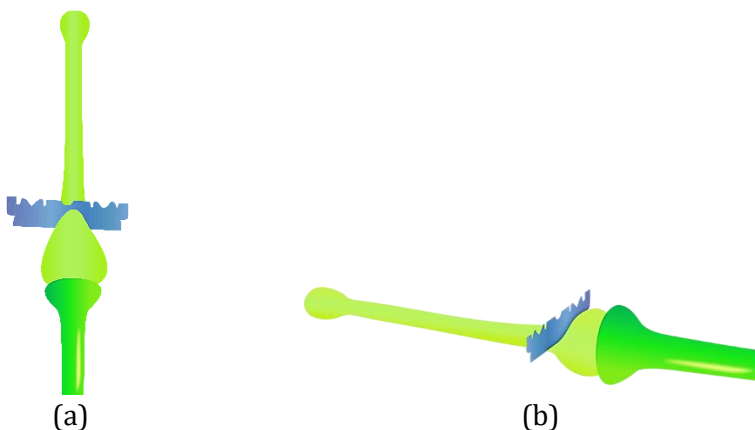
Take a flower and cut the ovary in two different ways. To prevent them from drying, put a drop of water on each of the two pieces of the ovary, you have cut.

Observation

We can see some small bead like structures inside the ovary.

Conclusion

Ovary contains some bead like structures, these structures are called ovules.

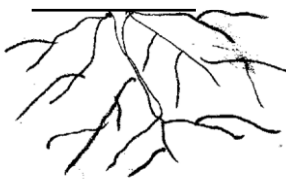


Cutting an ovary (a) longitudinal cut and (b) transverse cut

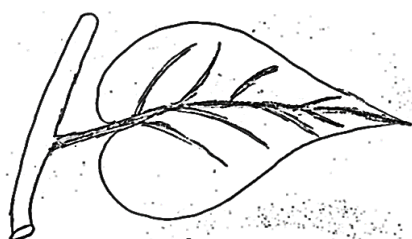
Biology Diagrams made Easy



Tap root



Fibrous root

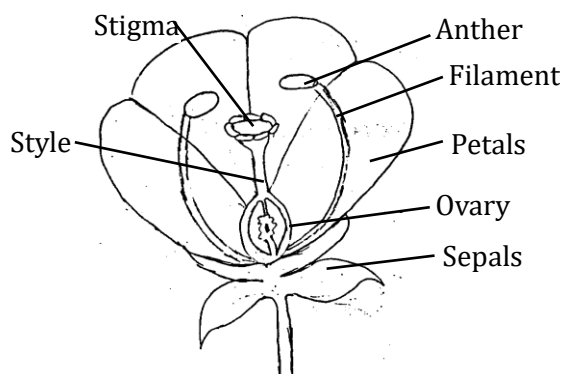


Reticulate venation

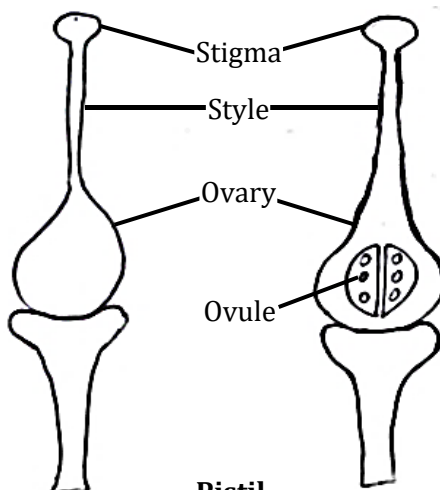


Parallel venation

Types of venation

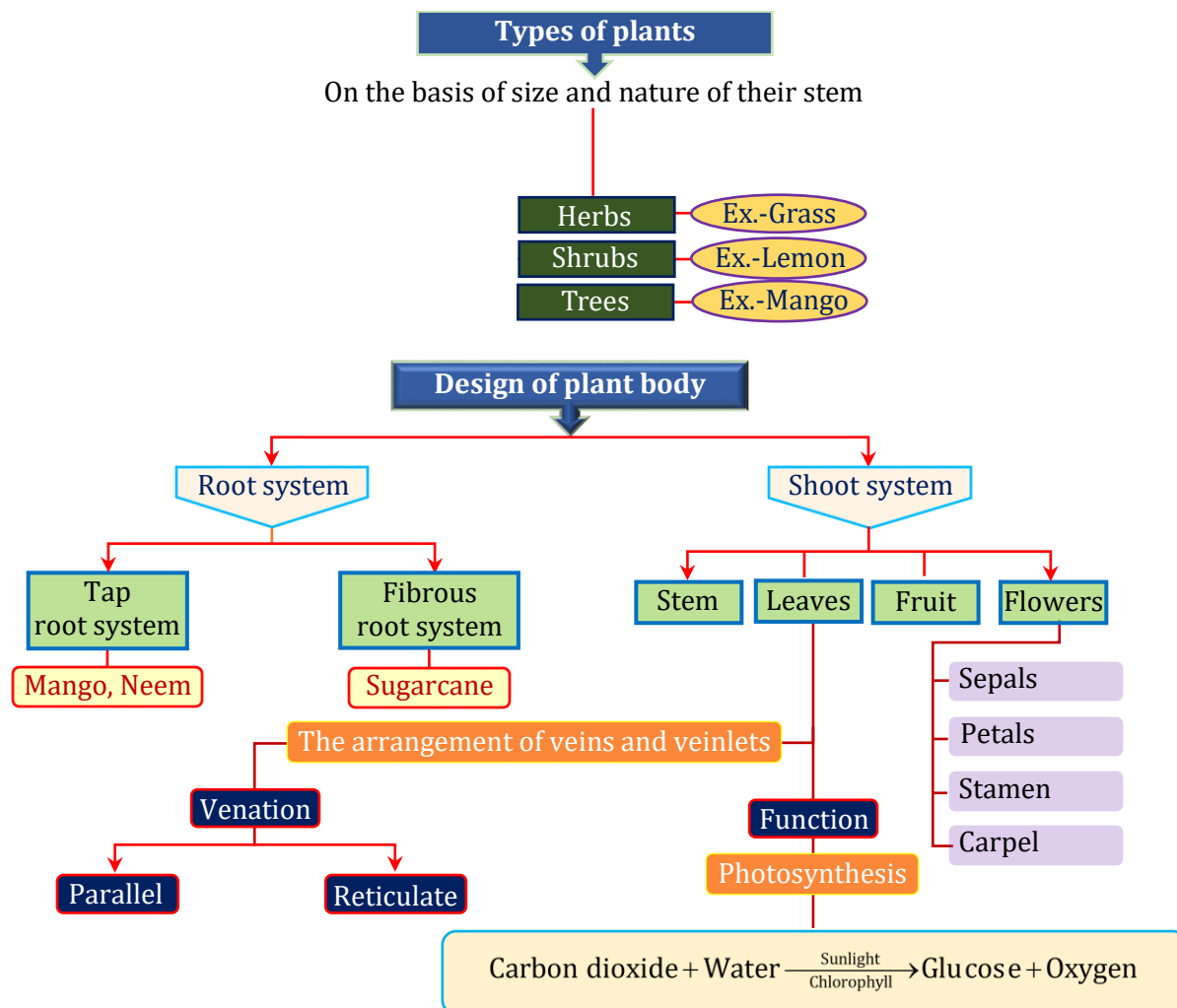


Structure of flower



Pistil

Chapter At a Glance



SOME BASIC TERMS

1. **Petiole** : Thin portion of leaf by which leaf is joined to stem.
2. **Absorption** : Socking up something.
3. **Germination** : The process by which plant grows from a seed.
4. **Lateral** : Connected with the side of something.
5. **Extend** : To make something longer or larger.
6. **Manufacture** : To make something.
7. **Evaporation** : The process of a substance in a liquid state changing to a gaseous state.
8. **Parallel** : Two lines that never intersect.
9. **Reticulate** : Something in such a way as to resemble a net or network.
10. **Prominent** : Noticeable (easy to see).