

Soil – Class 7th

Soil is the uppermost layer of the earth.

- It supports plants which provide food to all the living things of the planet.
- It also supports many micro organisms like bacteria and worms.
- All life on earth depends on soil.

The formation of soil takes place over a very long period of time as it is a slow process. A layer of soil of as little as 1 cm thickness can take 500 years or more to be formed.

Soil is formed by the weathering of rocks and minerals

Weathering is the process of breaking down of rocks into smaller pieces. There are three different types of weathering – physical, chemical and biological.

PHYSICAL WEATHERING

- In physical weathering, rocks break down into finer particles over a period of time under the influence of processes such as **freezing and thawing, wetting and drying, and shrinking and swelling.**
- **Physical weathering does not change the chemical composition of the rock.**
- Freezing and thawing takes place in cold or mountainous areas.
- When it rains, water enters the cracks in the rocks.
- In winter, the water freezes and expands putting pressure on the rocks.
- The ice melts during the summer.
- The repeated freeze-thaw cycles crack the rock from inside and eventually break it down.

The weathering process continues in smaller rock pieces until they break into very fine particles.

CHEMICAL WEATHERING

- **Chemical weathering is the decomposition of rocks through a series of chemical processes.**
- It is more common in warmer areas with lots of water.
- Brings change in chemical composition and makes soil different from the original rock.
- The chemical changes make the rocks softer that helps in breaking bigger pieces into smaller particles.

BIOLOGICAL WEATHERING

- **Biological weathering is caused by living organisms, mostly plants and some microorganisms.**
- The roots of plants grow deep into rock cracks in search of water and nutrients.
- In the process, they widen and extend the cracks resulting in breakdown of rocks.
- Also, lichens (combination of algae and fungi) growing on the surface of rocks very slowly decompose the rocks by secreting certain acids.

SOIL PROFILE: Soil is made up of distinct horizontal layers called ***horizons***.

O Horizon

- **It is the top *organic* layer of the soil, made mostly of leaf litter and partially decomposed organic matter.**
- **It is the most prominent layer in** forests where there is accumulation of debris fallen from trees.

A Horizon

- **This dark coloured layer is called *topsoil*.**
- It is rich in decomposed organic matter called *humus*.
- Humus is formed by the decomposition of plant parts like leaves and dead and decayed animal remains.
- It is mixed with soil and gives the soil a loose texture that holds water and allows air to diffuse through it.
- It makes soil more fertile.
- Many organisms like earthworms, fungi, and bacteria are present in this layer.
- The soil particles in this layer are smallest and finest as compared to the lower horizons of the soil.
- In this layer, seeds germinate and plant roots grow.

B Horizon

- **This layer is called the *subsoil*.**
- It contains higher mineral content than the top soil.
- It is reddish or brownish due to the presence of oxides of iron and clay.

C Horizon

- **This layer is called *regolith*.**
- It consists of slightly broken-up bedrock.
- Roots of plants do not penetrate in to this layer.
- Very little organic material is found in this layer.

R Horizon

- **It consists of the unbroken solid rock, called *bedrock*.**
- It present beneath all the other layers.

COMPOSITION OF SOIL

Soils contain four basic things:

- Soil particles
- Water
- Air
- Organic Matter (This consists of Humus, Roots, Different types of living organisms)

HUMUS

When living things die, their bodies decay. This decayed matter is called humus. It mixes in the soil, making it rich in minerals. Plants grow well in soil that have lots of humus, this kind of soil is called fertile.

EARTHWORMS

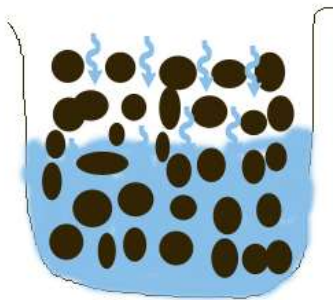
No Eyes / no legs / no teeth

Has strong mouth muscles.

Dig soil, leaves which enter from its mouth and move through its digestive system. The things that they excrete from their body are called Castings. These castings makes the soil fertile.

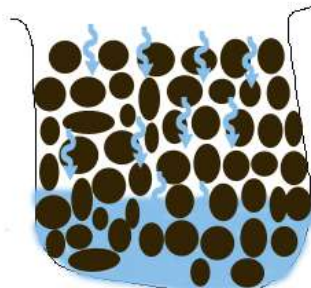
KINDS OF SOIL

There are different kinds of soil. The difference in there texture, affects the water and air holding capacity of soil and hence decides the ease or difficulty in growing plants on it.



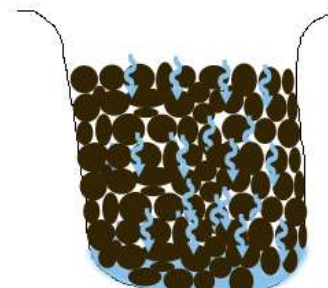
Sandy Soil

- cannot hold air & water



Silt Soil

- Can hold more H₂O than Sandy Soil, Fertile but gets blown away.



Clayey Soil

- Brown, less space, less air but most water, water logged & Sticky



There are different kinds of soil :-

1. SANDY SOIL

- The particles in this soil are big in size, are rough and have lots of space between them.
- Hence this type of soil allows air into the soil but it is not able to hold water and nutrients.
- The roots of the plants also cannot hold on to this soil.
- This sandy soil is found on beaches near the sea and in the desert.
- However some plants are able to grow into this sandy top layer because they put their roots deep into the subsoil below. For e.g. Cactus.

2. SILT

- This soil is light and its particles are finer than sand.
- It is commonly found in flood plains.
- This soil is blown away in the storms and carried downstream in flood.
- It is fertile but erodes easily.

3. CLAYEY SOIL

- Clay is a sticky grey brown soil, which is heavy and dense.
- It consists of very fine particles. The spaces between the particles is very less due to which the roots of the plants cannot push through it and also no air can get into it from the surface.
- Hence this soil is not good for growing plants.
- However since it has the capacity of holding water and is sticky it is used by potters to make clay objects.
- Rice is a common plant that grows well in clayey water – logged fields.

4. LOAM = SAND + SILT + LITTLE CLAY

- This soil is the perfect soil for plants.
- It has a combination of sand and silt along with very little clay.
- It has enough large and small spaces for air and water to flow through it and has the right amount of clay which also allow the particles to stick together.
- It also holds humus on its surface due to which plants can grow well in it.
- Gardeners and farmers also add natural manure and fertilizers to this soil.

SOIL COLOUR

- Soils vary in colour depending on the area where they are found and depending upon their composition.
- They could be red or yellow due to presence of iron and aluminium.
- Presence of humus makes the soil black.
- They could be greenish / grey blue.

ANIMALS IN THE SOIL

Soil is the home for many animals.

- On rainy days earthworms that live under the ground come up. This is because their underground tunnels get filled with water and the amount of air becomes less. The earthworms dig up the soil, drag leaves into their tunnels and also excrete in these tunnels. These all things decay and form humus. This makes the soil fertile and that is why earthworms are called the “farmer’s friend”. (The excreta of earthworm are called casts. The earthworms take in soil and organic matter and excrete out casts.)
- Soil can also contain germs like tetanus bacteria that can get into our body through cuts and wounds.
- Vegetables specially those which are eaten raw should be washed since their surface might have tiny worms or their eggs which would make us ill.

SOIL EROSION

Soil erosion is the process of removal of the topmost layer of the soil due to - wind, rain, running water or by human activity like deforestation, over grazing, construction works etc.

- As a result of soil erosion the topmost layer which is otherwise fertile is lost and hence land loses its fertility.
- Heavy rains cause floods, running water, strong winds, deforestation, overgrazing of cattle etc result in removal of top soil.

SOIL CONSERVATION

The process of prevention and protection of soil from getting eroded is called soil conservation.

Soil erosion can be prevented in many ways: -

1. Afforestation – Afforestation means planting more and more trees so that the roots of the trees / plants hold on to the soil firmly.
2. Terrace farming – Terrace farming consist of building a series of steps like benches in hilly areas. Each step slows down the flow of water in the hills. Terraces hold the water since they are flat and hence reduce the amount of soil washed away.
3. Building of Bund / Embankment on the sides of the river. This will prevent the water from overflowing on the land on the both the sides of the river. This will prevent floods and also soil erosion.
4. The land on which the farmers grow crops is prevented from soil erosion by planting cover crops like grass and creepers. The roots of plants of these cover crops hold the soil particles together and prevent them being blown away. Trees and bushes are also grown along the boundary of the fields as it also acts as a protection against strong winds.
5. We should also not put harmful chemical substances / garbage / plastics as they can pollute the soil and make it less fertile.

Percolation rate of water in Soil

The rate at which water moves through soil is called the percolation rate of water in the soil.

For observing this, we need to pour equal amount of water in 4 different types of soil samples. Then we will need to pour same amount of water in all the 4 soils. Then we carefully observe the soil samples.

Note down the initial time when you started pouring water in the three samples.

Also, note down the time for each sample when there is no water left over the soil in each sample.

To calculate the percolation rate of water, use the following formula:-

$$\text{Percolation rate (ml/min)} = \text{Amount of water (ml)} / \text{Percolation time (min)}$$

You will notice that sandy soil absorbs water but has high percolation rate. It thus drains quickly and retains very little amount of water.

Clay, on the other hand, holds water for a very long time but has very low percolation rate, i.e., it does not drain well.

In the loamy soil, water is uniformly distributed. It also drains well. For its ability to retain water and drain well, loamy soil is best suited for growing crops.

Some of the common crops and their soil requirements are described below:

Paddy: paddy can be grown in all types of soils, except sandy soil. However, due to its high water-holding capacity, soil rich in clay is best suited for rice cultivation.

Wheat: Loamy soil and clayey loam are considered good for growing wheat.

Lentils: Lentils and pulses require soil with good water drainage. Thus, loamy soils are best suited for these crops.

Cotton: Cotton needs soil that drains well and can hold air. Sandy soil meets this requirement.

Sugarcane: Sugarcane can grow in different types of soils ranging from sandy soils to clayey loams.