Ch-9-Soil

Soil Teeming with Life

Soil Profile

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Soil Teeming with Life

Soil is the source for plants to get nutrients with the help of their roots which go down and anchor the plants. Soil is made up of minerals, organic matter, liquids (water) and gasses (such as CO_2).

Functions of Soil

- Soil is a vital component of nutrient cycling. It can take in nutrients in forms, which other organisms cannot use and processes them into usable forms.
- Soil helps to manage water by holding moisture, controlling the flow and drainage.
- Soil is like a sponge soaking up water and when plants need it, the water is squeezed out.

Top soil

- Soil provides homes for many different organisms and plants.
- Organisms living in the soil range from microscopic bacteria to small animals such grasshoppers.
- Soil helps to filter pollutants from the water and air to keep the quality of our air and water.

The soil is formed by the breaking down of rocks by the action of wind, water and climate. This process is called **weathering**.

Soil Profile

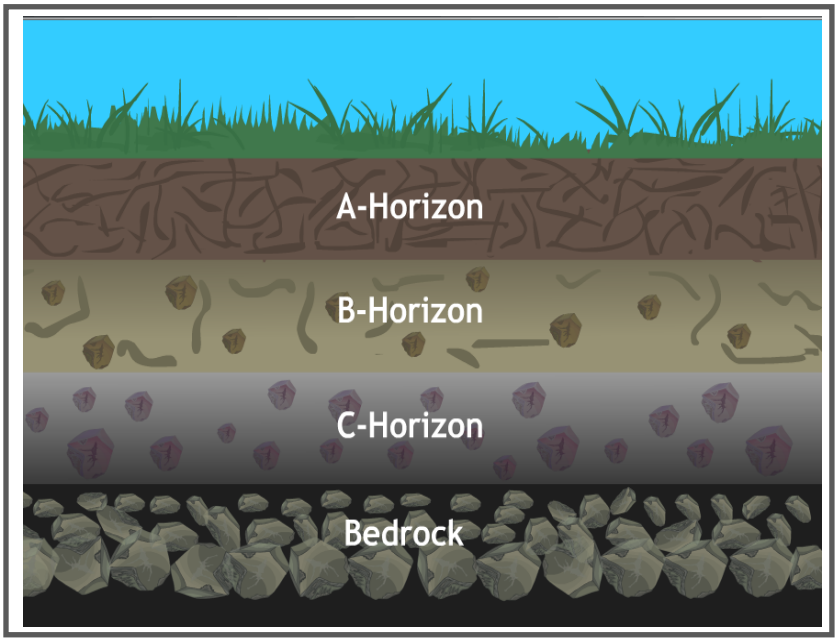
A vertical section through different layers of the soil is called the soil profile. Each layer differs in texture, colour, depth and chemical composition.

The top layer is the **A-Horizon** or often called topsoil as it supports the greatest amount of root activity and therefore is the most productive as it provides shelter for many living organisms such as worms, rodents, moles and beetles. The roots of small plants are embedded entirely in the topsoil.

Horizon B is harder and compact zone vital for the filtration of nutrients and minerals. It contains less of humus and more of minerals.

C-Horizon produces the soil as it breaks down the parent material of the soil. It is composed of small lumps of rocks with cracks and crevices.

The **bed rock** provides stability and parent material for the soil. It is hard and difficult to dig with a spade.



Soil profile

Types of Soil

The mixture of rock particles and humus is called the soil. The soil is classified on the basis of the proportion of particles of various sizes.

Sandy soil

This soil type has the biggest particles with better aeration and drainage of the soil. Sand particles are quite large. They cannot fit closely together, so there are large spaces between them filled with air. The soil is granular and comprises of small rock and mineral particles. The texture of this soil is gritty.

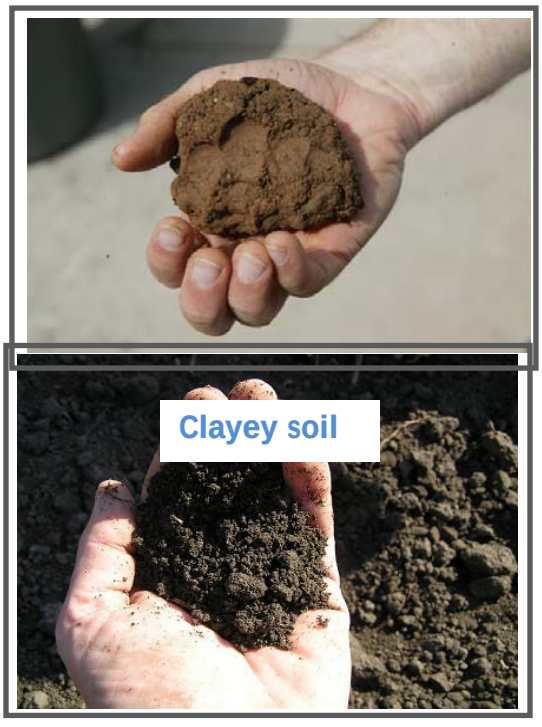
Sandy soil

Clayey soil

Clayey soil is very fine and has very less air spaces and hence drainage in this soil is low. Water can be held in the tiny gaps between the particles of clay. The proportion of fine particles is relatively higher in clayey soil.

Loamy soil

Loamy soil is a mixture of sand, clay and another type of soil particle known as silt. Loamy soil has same amount of large and fine particles and is basically formed by the accumulation of dead and decaying organic matter. It has the right water holding capacity for the growth of plants.



Loamy soil

Properties of Soil

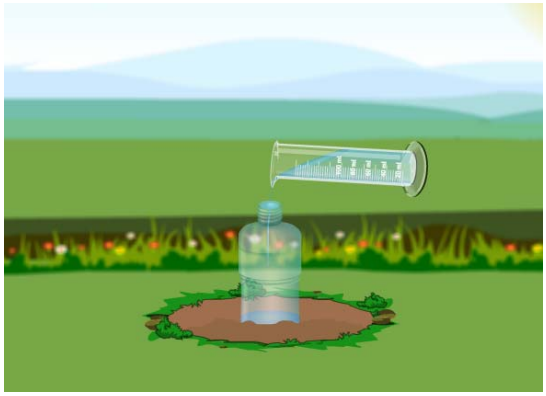
Percolation rate of water in soil

Water percolation rate of the soil refers to the rate of the movement of water through the soil as it passes through the small holes or spaces between the particles of the soil.

Percolation depends up on:

- **Climate:** If the rainfall is more than evaporation, then there will be appreciable amount of percolation. In dry region, percolation is almost negligible.
- **Nature of soil:** Sandy soils permit more percolation as these occupy large number of macro-pores. The macro-pores serve as the main channels of the gravitational flow. However, clayey soil permits less water to percolate.

Activity



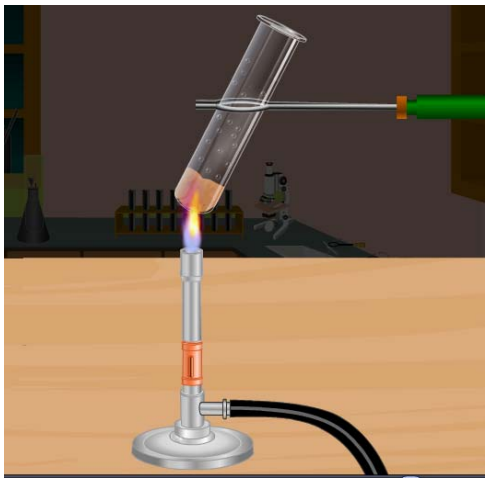
Let us understand the percolation rate of the soil this with the help of an activity. Dig 50 by 50 centimeter deep hole in soil. Cut the bottom portion of an empty plastic the bottle. Place the bottle in the hole. Fill the bottle with 100 ml of water. Note the time when all the water has percolated leaving the bottle empty. Percolation rate = Amount of water (milliliter)/Percolation time (minutes), putting the value and simplifying them, we can get percolation of soil.

Moisture in Soil

Soil also contains moisture. The amount of moisture present in a particular soil can be measured with the help of an activity.

Activity

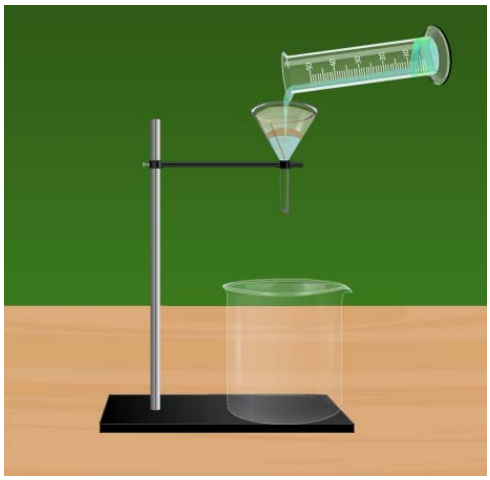
Take an empty boiling tube. Weight it on a digital balance. Note the reading. Put some soil sample in it. Weigh again and note the reading. Heat it on a flame and observe it. What do you observe? You will see water droplets are formed on the inner walls of the upper part of the boiling tube. Now, again weigh the boiling tube on balance. You will be surprised to know that the weight of the soil decreases. On heating, water in the soil evaporates, moves up and condenses on the cooler inner walls of the upper part of the boiling tube.



Absorption of Water by Soil

When determining water absorption, two factors are considered: permeability, or how easily the soil is penetrated with water, and retention, or how well it holds water. Since sandy soils have very loose particles, they have high water permeability, but they do not retain water for very long. Clay soils, on the other hand, have low permeability and high water retention. Loam soils have medium permeability and absorption.

Activity



Take a paper and weigh it on a balance and note the reading. Now, add 50 grams of soil sample and weigh again and note the reading again. Take 10 ml of water and fix the funnel on an iron stand. Take a filter paper, fold it and place it on the funnel. Put the soil into the funnel and pour the measured 10 ml of water drop by drop on the soil. Finally, measure the amount of water collected in the beaker. This will give the absorption percentage. We can calculate the water absorption percent of soil by using the following formula. We get, % of water absorbed = (U-V)/ 50 X 100, where U represents initial volume of water in the container and V represents final volume of water dip out from the container.

Soil and Crops

Different crops need different soil type for its proper growth. Soil is affected by wind, rainfall, temperature, light and humidity. The following table gives the soil type suitable for particular crop.

Crop	Soil type
Wheat and gram	Clayey and Loamy
Paddy	Clayey
Lentils (masoor) and other pulses	Loamy
Cotton	Sandy-loam or loam

Soil erosion

The removal of land surface by water, wind or ice is known as erosion. Plant roots firmly bind the soil. In the absence of plants, soil becomes loose. So it can be moved by wind and flowing water.

Causes

Soil erosion potential is increased if the soil has no or very little vegetative cover of plants and/or crop residues. Plant and residue cover protects the soil from raindrop impact and splash, tends to slow down the movement of surface runoff and allows excess surface water to infiltrate.

Soil erosion

Prevention

Soil erosion can be reduced by building terraces on hillsides, irrigation schemes to overcome droughts, planting more trees to bind the soil together and make wind breaks, and using fertilizers in overpopulated areas to make the soil more fertile. It is very important that the farming techniques used do not damage the structure of the soil, as this makes it easily eroded.