

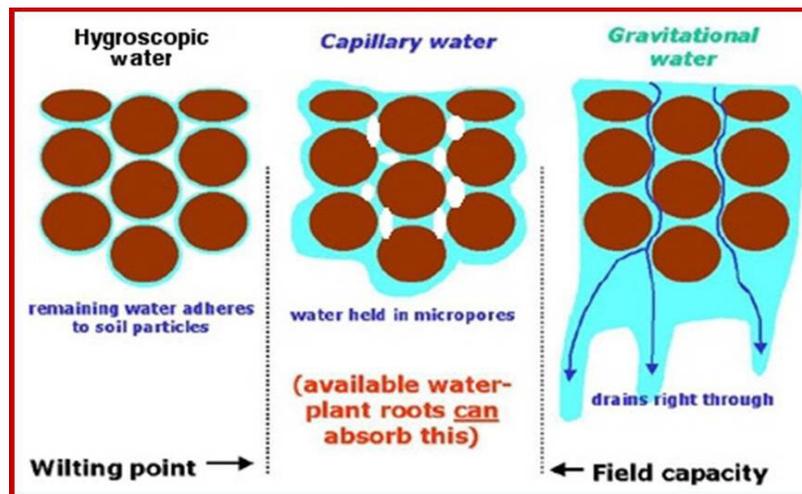
Types of Soil Water

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Soil Water

Soils can process and hold considerable amount of water. They can take in water, and will keep doing so until they are full, or until the rate at which they can transmit water into and through the pores is exceeded. Some of this water will steadily drain through the soil (via gravity) and end up in the waterways and streams, but much of it will be retained, despite the influence of gravity. Much of this retained water can be used by plants and other organisms, thus contributing to land productivity and soil health.

The water that remain in Soil consider as Soil Water.



There are five types of soil water

1. Hygroscopic water
2. Capillary water
3. Gravity water
4. Run-off water
5. Combined water

1. Hygroscopic water

Hygroscopic water Water absorbed from the atmosphere and held very tightly by the soil particles, so that it is unavailable to plants in amounts sufficient for them to survive.

Found as a microscopic film of water (3-4 molecular layers)- adsorbed water. Bound to soil particles by adhesive forces 10,000 bar (Recall that the atmospheric pressure is 1 bar). They cannot be removed from natural forces.

It is the water held tightly to the surface of soil particles by adsorption forces. Hygroscopic water is held tightly in thin films of 4 – 5 milli microns thickness. It is essentially non-liquid and moves primarily in the vapour form. This water is unavailable to the plants as huge pressure force would be needed to extract it.

2.Capillary water

Trees 'drink' from capillary water. Their instrument to drink from the capillary water is the primary root. On the picture below, you can see the primary roots going downwards to the dark soil. This soil is dark because of the water content in the capillary channels.

In soil, there are millions of vertical channels - pipes - these are called "capillary tubes". Whenever there is a downpour, excess water runs underground through these capillary tubes. When it is dry, these same tubes transport water to the surface. Trees have their roots in these capillary tubes - which also contain threads of fungi which are hygroscopic (attracting water); and with their lateral roots, they soak up capillary water when it is hot and dry. This is how a tree survives heat and drought. Even in rocks, minuscule and invisible fissures function as capillary tubes.

It held by cohesive forces between the films of hydroscopic water. Pressure of capillary water is much less than of hygroscopic water. Can be removed by drying(heating) or plant root absorption. Can not be removed by gravity. Plants absorbs this water through their roots until the soil capillary force – Extractive force of the plant root. At this point the plant can't extract water through root and hence the plant wilts this is called the wilting point of the plant.

WILTING POINT

As roots with their numerous branches and millions of root hairs deplete water from capillary spaces, water from the other regions move into the depleted spaces; sometimes the water moves upwards from the water table and fills up the capillary spaces, but the refilling or replenishment process takes its own time. Thus plants experience deficiency of water for a short duration time, which is referred to a temporary wilting point. In some cases, the depleted water is not replaced for a long time, under such conditions, plants die, and such a state is called permanent wilting point.

3. Gravity water

Gravitational water is soil water moving through the soil as influenced by gravitation. It is not plant available.

Moves through the soil by the force of gravity. The amount of water held by the soil after excess water has drained is called the FIELD CAPACITY OF SOIL (FC). Fine grained soil have higher FC's than those of coarser grained soils.

That moves downward freely under the influence of gravity to the water table is termed as gravitational water. It is also referred to as free water. Gravitational water is of no use to plants as it drains out due to gravity. It reduces aeration in the soil and hence, its removal from soil is necessary for optimum plant growth.

FIELD CAPACITY OF THE SOIL

The amount of water found within the soil as capillary water that is available for the root system is often referred to as useful water content of the soil. Hence the capacity of soil to hold maximum amount of utilizable or useful water is known as 'Field capacity of the soil', this again depends upon the nature of soil. Sandy and rocky soils are poor soils in terms of water holding potential. While

clay soils have great water retention capacity but they have the worst aeration. However loam soil is the best for it retains good amount of water and also it has good aeration. However, the field capacity of the soil can be determined by finding out the difference between the weight of completely wet soil and that of the dry soil of a known quantity.

4.Run-off water

Does not enter the soil (when saturated with water) and gets drained away from the soil Surface. Run-off occurs when there is more water than land can absorb. The excess liquid flows across the surface of the land and into nearby creeks, streams, or ponds. Runoff can come from both natural processes and human activity



5.Combined water

Some water is present in the Hydrated form.

e.g;- $\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}$

Write a comprehensive note on “different types of water present in soil”

Soil water can define the present in soil. Soil water can be divided into main 5 categories according to their manner of present in soil. The categories are

- 1) Hygroscopic water
- 2) Capillary water
- 3) Gravity water
- 4) Run-Off water
- 5) Combined water

Hygroscopic water, found as a microscopic film of water (3-4 molecular layers). It is adsorbed water. Tightly binds to soil particles. Bonds to the soil particles by adhesive forces, 10,000 bar. They cannot be removed from natural forces. The capillary water, it is present in tiny tubes in soil. Capillary forces between the films of hygroscopic water. Pressure of capillary water is much less than of hygroscopic water. It can be removed by drying (heating) or plant root absorption. Cannot be removed by gravity. Plants absorb this water through their roots until the soil capillary force - Extractive force of the plant root. At one point the plants can't extract water through roots and hence the plant wilts; this is called the wilting point of the plant. The Gravity water moves through the soil by the force of gravity. The amount of water held by the soil after excess water has drained is called the FIELD CAPACITY OF SOIL (FC). Fine grained soils have higher FC's than those of coarser grained soils. Other two types of soil water are Run-off water and Combined water. The Run-off water does not enter the soil (when saturated with water) and gets drained away from the soil surface. And combined water, some water is present in the Hydrated form. Ex: $\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}$