**Course: Water Management in Horticultural Crops 2(1+1),**

**Class: 1st year, 2nd semester**

**Topic: Different Water Potential & Water Properties**

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**Different Water Potential & Water Properties**

**Different Types of Water Potential:**

1. **Free Energy or Gibbs Free Energy:** The free energy of saturated soil is zero but in unsaturated soil is zero but in unsaturated soil, it is less than 0, hence it’s value is ngative.
2. **Metric Potential:** The portion of total water potential that is attributable to the solid colloidal matrix of the soil system. It is negative pressure potential which results from the capillary and adsorptive forces emanating from the soil matrix.
3. **Capillary Potential:** Buckingham (1907) introduced the concept of ‘capillary potential’ to define the energy with which water is held by soil.
4. **Gravitational Potential:** It is the portion of total water potential which is due to the gravitational force of earth.

**Properties of Water:**

1. Water molecule contains two hydrogen ions and one oxygen ion.
2. The space occupied by each water molecule is mainly due to oxygen ion while two hydrogen ions do not occupy practically any space.
3. The shape of the water molecule is a sphere.
4. The position of two hydrogen ions is at the corners of a tetrahydron that exists within a sphere.

The positive valencies of hydrogen ions are partially neutralized by the negative valency of oxygen ion. Thus one end of water molecule has positive charge and another end negative charge. This makes water molecule a dipole.

**EFFECT OF SOIL MOISTURE STRESS**

Some of the adverse effects of deficit soil moisture stress on plant growth, development and yield are:

1. The first obvious effect of water stress is wilting because turgor pressure, which inflates plant cells and keeps them erect, is lost. As wilting increases, plant cells fully deflate, causing their deaths.
2. Loss of turgidity leading to cell enlargement and stunted growth.
3. Decrease in photosynthesis due to decreased diffusion of CO2 with the closure of stomata to conserve water and reduced leaf area.
4. Plant growth and productivity are adversely affected by water stress.
5. If there is not enough water for a plant, the nutrients it needs cannot travel through the plant.
6. Under sufficient soil moisture condition, plant roots get sufficient oxygen and become healthy. A plant cannot grow if it doesn't have healthy roots.
7. Water stress causing a closure in stomata as to reduce the amount of carbon dioxide assimilation.
8. Plant stress refers to any unfavorable condition or substance that affects a plant's metabolism, reproduction, root development or growth.
9. In the absence of water, nutrients can not translocated from soil to plants.
10. Under acute moisture stress condition, different physical, chemical and biological activities of plants are not possible.
11. Without water life of macro and micro fauna of the soil is not possible.
12. Soil operations like land preparation, ploughing, leveling, sowing, hoeing etc. conveniently possible only under sufficient soil moisture condition.