

**Humidity**

## **Humidity**

The amount of water vapour that is present in atmosphere is known as atmospheric moisture or humidity.

### **Absolute humidity**

The actual mass of water vapour present in a given volume of moist air. It is expressed as grams of water vapour per cubic meter or cubic feet.

### **Specific humidity**

Weight of water vapour per unit weight of moist air. It is expressed as grams of water vapour per kilogram of air (g/kg).

### **Mixing ratio**

The ratio of the mass of water vapour contained in a sample of moist air to the mass of dry air. It is expressed as gram of water vapour per kilogram dry air.

### **Relative Humidity**

The ratio between the amount of water vapour present in a given volume of air and the amount of water vapour required for saturation under fixed temperature and pressure. There are no units and this is expressed as percentage. In other terms it is the ratio of the air's water vapour content to its maximum water vapour capacity at a given temperature expressed in percentage. The relative humidity gives only the degree of saturation of air. The relative humidity of saturated air is 100 per cent

## **Dew Point temperature**

The temperature to which a given parcel of air must be cooled in order to become saturation at constant pressure and water vapour content. In this case, the invisible water vapour begins to condense into visible form like water droplets.

## **Vapour Pressure deficit**

The difference between the saturated vapour pressure (SVP) and actual vapour pressure (AVP) at a given temperature. This is another measure of moisture in the atmosphere which is useful in crop growth studies. When air contains all the moisture that it can hold to its maximum limit, it is called as saturated air, otherwise it is unsaturated air, at that temperature. The vapour pressure created at this temperature under saturated conditions is vapour pressure or saturated vapour pressure (SVP).

## **Effects of humidity on crops**

Humidity is an important factor in crop production and it is not an independent factor but closely related to rainfall and temperature. It plays significant role in weather and climate. The dampness of air is called humidity.

- a. Humidity is the invisible vapour content of the air and is of great importance in determining the vegetation of a region.
- b. it affects the internal water potential of plants.
- c. Humidity is a major determinant of potential evapotranspiration. So, it determines the water requirement of crops.
- d. It influences certain physiological phenomena including transpiration.
- e. Change in relative humidity can produce various morphological and anatomical changes in the plants. For example, orchids grow abundantly in humid forests as epiphytes depend for their moisture supply on the atmosphere by developing certain morphological and anatomical characteristics that are not found in other plants (hydroscopic aerial roots).
- f. Xerophytes in desert region where relative humidity is low show certain adaptations to conserve water.
- g. High relative humidity can prolong the survival of crops under moisture stress.
- h. Relative humidity plays a significant role in the outbreak of disease and pest epidemics. High humidity promotes the growth of some saprophytic and parasitic fungi and bacteria which cause various plant diseases.
- i. Very high or very low relative humidity is not conducive for higher yields.

# condensation

## Condensation

- ◆ Condensation is defined as “The process in which the water vapour is converted into its liquid”.
- ◆ This process is inverse of evaporation process. In condensation 600 calories of heat is released by each gram of water which was taken in the evaporation process.
- ◆ Thus the evaporation of water produces cooling effect and condensation gives warming effect.
- ◆ The visible forms of condensed moisture in the atmosphere are known as “Hydrometeors”.

condensation occurrence of in the atmosphere.

**a) Presence of sufficient water vapour**

- ◆ An adequate amount of water vapour is necessary to bring about saturation of air.
- ◆ Dew point shall be reached through this water vapour to begin condensation.

**b) Presence of condensation nuclei**

- ◆ Sodium chloride injected into the atmosphere by sea-spray; Sulphur dioxide, nitrous oxide etc., released from industries as combustion products; dust present in the atmosphere act as nuclei of condensation.
- ◆ Water vapour can only deposit and condense on them as these are hygroscopic in nature (affinity to water).
- ◆ As these particles are microscopic or sub-microscopic in size (0.1 to 1 micron) these are called either hygroscopic nuclei or condensation nuclei.
- ◆ In the absence of hygroscopic nuclei condensation can not trigger even if air is supersaturated and its temperature being below freezing level.

**c) Cooling of air**

Cooling of air upto and below dew point is necessary for saturation of atmospheric air with water vapour.

## **Forms of condensation**

**Condensation near the ground – dew, fog, haze or smog, frost**

**Condensation in higher altitude - clouds**

### **Dew**

The deposition of water vapour in the form of tiny droplets on the colder bodies by condensation is known as dew. The temperature at which water vapour condenses is known as dew point temperature. When the objects on the surface of the earth get cooled in the night below dew temperature the water vapour is condensed on these surfaces. Dew forms when condensation takes place above freezing point. These surfaces should be good radiators and bad conductors of heat (Plant leaves; window glasses, pieces of paper etc. The conditions for the formation of dew are:

- a. Clear sky
- b. Absence of wind

With particularly favourable conditions, dew deposition may commence before sunset and continued till after sunrise. Deposition trends to be reduced under very calm conditions (wind speed range of 1-3 m/sec). Dew is an important secondary source of moisture for crops during the non-rainy season and plays vital role in plant growth. Dew occurrences benefit the plants in many ways.

- **Significance of dew**
- 1 The dew deposited on the leaf surface in the morning delays the rise in leaf temperature and thus reduces the rate of evapotranspiration.
- 2 Dew provides water for direct plant use. The amount of dew deposition varies from 0.25 to 0.40 mm per night in semi-arid tropics (Usually, from September to April dew amounts are measured in these areas).
- 3 Under suitable conditions, in semi-arid areas, it may exceed even 25-30 mm per annum.
- **2 Frost**
- When the temperature of atmospheric air falls below 0°C before the dew point is reached, the water vapour is directly converted into crystals of ice called as “Frost”.
- This is a form of sublimation, because, water vapour is directly converted into ice.
- Frost is injurious to agricultural and horticultural crops.



### 3. Fog

“Low cloud” near the ground surface. Extremely small water droplets suspended in the atmosphere reducing the horizontal visibility is known as ‘Fog’. Fog reduces the visibility. The conditions for the formation of fog are

- ◆ Calm wind
- ◆ Atleast upto 75 % relative humidity

Fog is also called as “Cloud on and near the ground”. There is no particular form, shape or structure to fog. The following are types of fog.

- **Radiation fog**

This results from rapid loss of night time radiation either from the ground or lower air. This radiation produces cooling.

- **Inversion fog: This is another type of radiation fog. This results from** condensation of water vapour in a mass of warm moist air lying over a layer of cold air and near the ground.

These two fogs occur during night or cold morning. They disappear due to desaturation of air with vapours after the rise of sun in the morning.

- **Advection fog**

This fog occurs when warm moist air rides in over a cold surface of either land or water. These fogs occur at any time of the day.

**4 Smog:** The combined effect of smoke and fog droplets which reduce visibility is called “Smog”. Some solid particles like dust, smoke from fires and industry restricts the visibility further when these are added to smog which is known as ‘Haze’. On some occasions toxic materials present in fog, smog and haze and these are harmful. All these processes cause difficulty in rail, road, aviation and shipping traffics.

**5 Rime:** This is “Freezing fog” and is formed when wet fog has super cooled droplets immediately freeze on striking objects having temperatures below freezing point. White ice is formed on windward freezing point (telegraph post).

**6 Mist:** Mist is less dense fog. The suspended water droplets in the atmosphere in the atmosphere restrict the visibility between 1100 to 2200 yards or number 4 on the coded scale (IMD). The relative humidity is 75 per cent when mist occurs. Mist disappears with rising sun.