

Determination of Permanent Wilting Point (PWP) by Sunflower Method

Permanent Wilting Point (P.W.P.) is the moisture content in percentage of a oven dried soil at which nearly all plants wilt and do not recover in a humid dark chamber unless water is added from an outside source. This is the lower limit of available moisture range for plant growth. Below the wilting point, extraction of moisture continue for some time but growth ceases completely. The force with which moisture is held by the soil at this point corresponds to about - 15 atmospheres.

(i) Determination of Wilting Point by Sunflower Method

Materials:

1. Five 600 g capacity cans with lids
2. Sunflower seeds
3. Glass tubing (5 cm x 0.5 cm)
4. Sealing wax
5. Moisture cans
6. Physical balance
7. Drying oven
8. Bell jars or cabinet 25 cm x 50 cm with polythene cover
9. Water trays and
10. Soil sampler

Procedure:

Even though nearly all plants wilt at the same moisture content, some of them show clear signs of wilting while others do not. Dwarf sunflower is selected as an indicator plant in this method as it exhibits symptoms of moisture stress clearly and has a root system which penetrates throughout the soil mass uniformly and rapidly.

Fill uniformly five cans having a drain hole at the bottom with about 500 g of air-dry soil in each. It is necessary to have many replications in this trial as the permanent wilting point is a range of moisture. Sow about four seeds of sunflower in each and allow them to germinate.

After emergence, thin the plants to two, allow them to pass through the two holes in the lid and place the lid. Avoid heating of the cans due to insulation, by placing them in moist sawdust. Grow them for about six weeks, watering them as and when necessary. By this stage, the plants would have developed at least about three pairs of leaves.

Insert a glass tubing in the soil for aeration and plug it with cotton wool. Seal the soil surface with wax. Also close the drainage hole and seal it.

At this stage, water the plants for the last time and plug all the space between the soil surface and the holes in the lid of the can, be plugged with cotton wool to control evaporation. Allow the plants to wilt.

As soon as both the plants show signs of loss of turgor, transfer them to a dark humid chamber. The cans with plants can be kept in a small water tray and covered with a bell jar or a wire cabinet to create a high humidity chamber. The bell jar or the cabinet should be covered with a black polythene piece. The aim is to close the stomata and reduce transpiration.

Leave the plants overnight to gain a favorable water balance by allowing them to extract moisture from the soil. If they gain turgidity, expose them to the atmosphere for a couple of hours and transfer them back to the humid chamber. Repeat the process till the plants do not recover in the dark humid chamber.

At this stage, remove the lid and cut the plants. Take a duplicate soil sample. Remove the roots. Determine the moisture content of the soil samples which will present the value of the wilting point of the soil.

Practical significance

Conclusion

Signature of Faculty In-charge