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Fact sheet

FS881

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Fundamentals of Container Media Management, Part 2

Measuring Physical Properties

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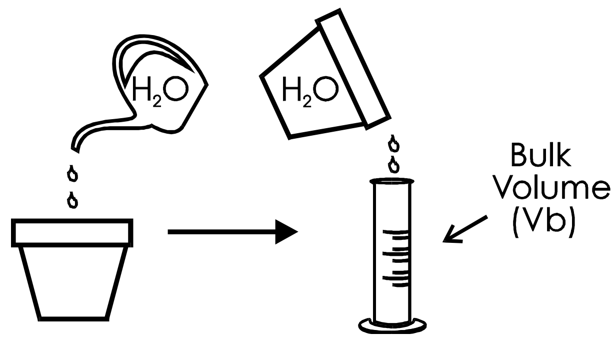
The physical properties of a growing medium should be known before a crop is established. In cases of problems due to inadequate physical properties, like poor aeration or reduced water holding capacity, the presence of a plant does not allow for adjustments of the medium's physical composition. It is therefore extremely important to know the physical characteristics of the medium beforehand to allow for appropriate adjustments before planting the crop. Unfortunately, it is common to find out that neither the physical nor the chemical characteristics of media are evaluated routinely by growers. Such analyses are most likely conducted only after problems arise with the crop, and very often too late to be resolved.

There are, however, some relatively simple procedures that allow growers to determine rapidly some of the most critical physical properties in a medium. The only equipment and material required are: the containers of interest, stoppers (or corks or tape) to cover the drainage holes in the containers, graduated cylinders to measure volumes, and a scale. It is important to conduct the measurements using the container size of interest, as physical properties of a growing medium change as a function of the volume used and container height. Use the information and tables provided in the companion RCE fact sheet FS812 (Part 1) for interpretation of results obtained with the procedures described here.

Bulk Volume (Vb)

- Cover the drainage holes of the pot or container using tape, corks, or stoppers.
- Fill the container with water up to the level or height that corresponds to the volume of medium in the container. Take into account that the volume of fresh medium initially added to a container settles and gets reduced after the first irrigations.
- Determine the volume of water in the container, using a graduated cylinder. This can also be accomplished gravimetrically, by weighing the container with water and subtracting the weight of the container. In this case, it is assumed that the density of water is 1 gram per milliliter.



Air Porosity (Ea)

- Fill the container with growing medium and irrigate thoroughly several times, letting it drain and settle to a constant height or level.
- Proceed to wet the medium to the point of saturation. This occurs when all the pore space in the medium is occupied by water, without accumulating (i.e. "free water") on the surface. There are two ways to accomplish this. One is to cover the drainage holes and slowly add water to the medium until reaching the point of saturation. The other is to submerge the medium-filled pot in a larger container with water. The water outside should be at the level of the medium inside. Wait until the growing medium is thoroughly saturated, and then cover or plug the drainage holes.

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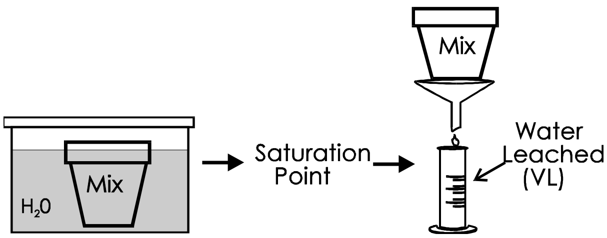
- Unplug the drainage holes and allow the growing medium to drain. Collect the volume of water leached (*VL*). The point at which the medium quits draining is called "container capacity" (*CC*). Container capacity is used as the standard reference point at which all physical properties are measured, allowing for comparisons among different growing media.
- Calculate the value of air porosity with the following equation:

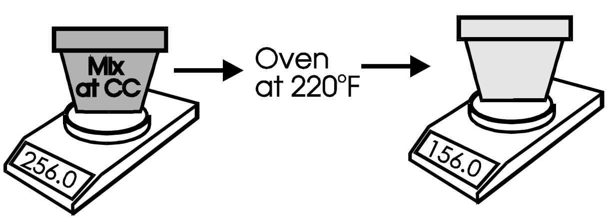
Ea (%) = (VL / Vb) x 100



Water Holding Capacity (Pv)

- Once the growing medium stops draining determine its fresh weight (*FW*), and put it in an oven to dry. At a temperature of 200–220°F it should take at least 24 hours to dry completely.
- Determine the dry weight (*DW*) of the growing medium.
- Using the value of *Vb* previously calculated, use the following equation to calculate the medium's water holding capacity:

Pv (%) = [(FW – DW) / Vb] x 100

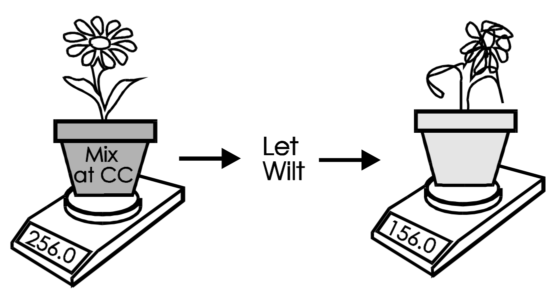


Plant Available Water (Pva)

- This important measurement can be determined only after the crop of interest has been established in the growing medium. Select a number of representative plants, and estimate the bulk volume (*Vb*) of their growing medium.
- Irrigate the plants thoroughly, ensuring that the medium is fully wetted. Let it drain until it reaches container capacity (*CC*). Determine the total weight (*TW1*) of the container at *CC*. This includes the weight of the medium, the water held by it, the container and the plant.
- Put plants back in the production area and do not irrigate them. Weigh them again once they start to wilt (*TW2*).
- Using the value of *Vb* previously determined, calculate the value of plant available water using the following equation:

Pva (%) = [(TW1 – TW2) / Vb] x 100

- *Pva* denotes the maximum volume of water that a plant can extract from a growing medium, and it is very useful for determining irrigation intervals. For example, a plant growing in 1 gallon of medium with a *Pva* of 25% will start to wilt when 1 quart of water is lost to evapotranspiration. Thus, irrigations should be scheduled to occur before this volume of water is lost.
- Take into account that the ability of plants to extract water from a growing medium varies with the species, and thus *Pva* should be determined with representative species (for example, plants with heavy, moderate, and low water requirements).



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