

# Substrate Physical Properties: Pitcher Method

There are two simple methods for measuring the physical properties of your container media. The physical properties of your media, as discussed today, primarily dictate how much air vs. water is available to plant roots when the substrate is fully irrigated (saturated). As you change media types, or switch vendors, this could provide valuable insight on how to modify irrigation practices.

Total porosity of your media should remain stable over time. Total porosity can be partitioned into pores filled with air, and pores filled with water. This ratio of air vs. water is critical to irrigating crops.

## Substrate Preparation

Collect a few liters of loose substrate to be analyzed in a bag or bucket, add water until moist, loosely seal so as not to dry out, and preferably let sit for a 1 to 24 hours to come to equilibrium. Moist substrate should feel as if it has weight and typically look darker in color but should not make your hand wet when handling nor should you be able to easily squeeze water out of the substrate.

## Pitcher method

Use any vessel that clearly shows the volume marked on the side.

1. Fill and pack the vessel, like you would a container, to approximately the same height as the containers in which plants will be grown (height matters!). Record the volume of moist substrate when filled to that height  $S =$  \_\_\_\_\_ mL.
2. Fill the container with a known volume of water slowly until you can see the water level equal with the surface of the media, record the volume needed to fill the container  $W =$  \_\_\_\_\_ mL.
3. Allow several minutes for the water to settle and air bubbles to escape. Add water if needed.
4. Suspend the vessel over like container and allow it to drain, being careful not to tilt the container, record the volume  $D =$  \_\_\_\_\_ mL.

Effective Total Porosity (ETP) =  $W/S =$  \_\_\_\_\_ mL  $\div$  \_\_\_\_\_ mL = \_\_\_\_\_ x 100 = \_\_\_\_\_ % by vol.

Effective Air space (EAS) =  $D/S$  \_\_\_\_\_ mL  $\div$  \_\_\_\_\_ mL = \_\_\_\_\_ x 100 = \_\_\_\_\_ % by vol.

Effective Water holding Capacity = Available Water (EAW) =  $(W - D)/S$

$$= ( \text{_____ mL} - \text{_____ mL} ) \div \text{_____ mL}$$

$$= ( \text{_____ mL} ) \div \text{_____ mL}$$

$$= \text{_____} \times 100$$

$$= \text{_____} \% \text{ by vol.}$$

Notes/ Comments:

# Substrate Physical Properties: Plastic Bag Method

There are two simple methods for measuring the physical properties of your container media. The physical properties of your media, as discussed today, primarily dictate how much air vs. water is available to plant roots when the substrate is fully irrigated (saturated). As you change media types, or switch vendors, this could provide valuable insight on how to modify irrigation practices.

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## Substrate Preparation

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## Plastic bag method

Line your container with a plastic bag that will hold water.

1. Fill and pack the vessel, like you would a container, to the normal filling line. Record the volume of moist substrate when filled to that height  $S = \text{_____ mL}$   
\*can use weight since  $1 \text{ mL} = 1 \text{ g}$ ; therefore, water filled weight – (container weight + bag weight) = container volume .
2. Remove the water and fill the container with media.
3. Fill the container with water slowly until you can see the water level equal with the surface of the media, record the volume needed to fill the container  $W = \text{_____ mL}$ .
4. Allow several minutes for the water to settle and air bubbles to escape. Add water if needed.
5. Suspend the vessel over an empty measuring device, poke holes in plastic bag through drain holes, and allow it to drain being careful not to tilt the container, record the volume  $D = \text{_____ mL}$ .

Effective total porosity (ETP) =  $W/S = \text{_____ mL} \div \text{_____ mL} = \text{_____} \times 100 = \text{_____} \% \text{ by vol.}$

Effective Air space (EAS) =  $D/S \text{ _____ mL} \div \text{_____ mL} = \text{_____} \times 100 = \text{_____} \% \text{ by vol.}$

Effective Water holding capacity = Available water (EAW) =  $(W - D)/S$

$$= ( \text{_____ mL} - \text{_____ mL} ) \div \text{_____ mL}$$

$$= ( \text{_____ mL} ) \div \text{_____ mL}$$

$$= \text{_____} \times 100$$

$$= \text{_____} \% \text{ by vol.}$$

Notes/ Comments: