

Determining the Aeration Porosity of Container Media

WHY –Aeration porosity (or air pore space) in the root zone can have a major effect on root growth and overall plant health. As container substrates are handled, watered and used as a substrate, organic matter is broken down and finer particle sizes result. These fine particle sizes can interfere with drainage and aeration by plugging up pore spaces in the media. Reduced aeration and drainage results in higher levels of soil moisture and less available oxygen. The anaerobic conditions and rising populations of water moulds mean disease and death for the fine, feeder roots of affected plants. This results in reduced water and nutrient uptake by the growing plant that looks like wilting and nutrient deficiency.

WHEN – When considering a new media ingredient or source, evaluate the aeration porosity of that new container media. It's also a good idea to understand how your media can change over the course of a season due to compaction and degradation of the media. It is important to know the aeration porosity of your media at the time of potting, especially if the plants are to be grown in the same media for more than a few months. Total porosity should be measured again, half way through the production cycle (of that potted mix).

WHERE – Determining the total porosity can be done indoors on a clean, level surface.

HOW – Follow the simple steps below to determine the total porosity of container media.

List of materials required:

- Container to measure volume of water –a graduated cylinder, beaker, or measuring cup
- Container with only one central base hole, plugged tightly with a cork or rubber plug
- Media sample – enough to fill container to the top, packed to the same density you would do during potting (can contain fertilizer if you incorporate it)
- Pie plate or tray (heat-proof if using oven to dry media)
- Large collection saucer – for example a clear plastic tray with a lip or raised sides
- Device to support the pot while it drains, example a metal ring, wooden blocks, or a pail that will hold the pot upright without interfering with the drainage hole

Method:

Step 1. Pre-moisten the media 12-24 hours prior to testing. Wet the media as uniformly as possible to the point where a few drops of water can just barely be squeezed out with your hands. Put the media in a sealed bag for the night to ensure consistent moisture levels. This step is critical to prevent inconsistent results from shrinking/swelling that can happen during the porosity test.



Step 2. Determine the volume of the container. Fill the empty pot (hole plugged or lined with a waterproof bag) with water right to the top. Measure the volume. Record this volume on Line A of the worksheet below. *You can use any pot that is at least 1 L in volume. Just drill a hole in the base and plug with a cork or rubber stopper.*



Step 3. Using the same container (empty), fill it with the pre-moistened media. Pack the container to the top, with the same level of firmness normally used when potting up plants. Use a ruler or stick to scrape the top of the container to ensure it is exactly to the top. This level of accuracy is particularly important when repeating tests, or comparing different media as very minor differences can affect the end result.



Step 4. Saturate the media with water. Add water slowly and evenly to the pot, over an hour, if possible. Fill until you can see a thin layer of free water “glistening” at the top of the media. Tap the sides of the container gently to get rid of air bubbles.



Step 5. Capture the drain water. Carefully remove the plug or plastic liner from the container bottom. DO NOT tilt the container, and try to hold it level. Place the container on a ring or other device and put the container and device on the collection saucer to collect all the drainage water. Allow at least 15 minutes for the water to drain. Measure the volume of water and record the number on Line B of the worksheet below. *The volume of water that drains from the container is equivalent to the volume of air, or air space, in the container.*



Step 6. Determine the wet/dry mass of the media. Dump the entire contents of the drained container into a pie plate. Weigh the pan plus the media and record the mass on Line C of the worksheet below. Place the pan on a counter in a warm, clean area for several days or in an oven at 105°C (or 220°F) for 12 hours. Dry the media until completely dry. Reweigh the pan with the dry media and record the value on Line D of the worksheet below.



WORKSHEET

Note – record all measurements in units of millilitres (mL) or grams (g).

- A. Volume of the container _____ mL
- B. Volume of water drained from the container _____ mL
- C. Mass of the media/pan prior to placing in oven _____ g
- D. Mass of the media/pan after removing from oven _____ g

$$\% \text{ Air Pore Space} = [B / A] \times 100$$

$$\% \text{ Water Holding Capacity} = [(C-D) / A] \times 100$$

$$\text{Total \% Porosity} = \text{Air Space} + \text{Water Holding Capacity}$$

Root dieback and disease may result when Air Pore Space is less than 15-20%.

Desirable % Air Pore Space for container nursery production is 20-30%.