

**DETERMINATION OF AIR-FILLED
PORE SPACE FOR
CONTAINER-GROWN NURSERY STOCK**

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Restricted soil aeration in soil mixes for container grown plants can 1) be the greatest limiting factor in the development of an extensive root system, 2) can impair the essential process of respiration of an established root system that retards both water and nutrient absorption, 3) prevent the orderly functioning of essential biological processes associated with good soil fertility, and 4) increase the probability of root disease problems.

The water content in container plant production remains near field capacity under irrigation. The air-filled pore space following drainage to field capacity is an important aspect of soil mixes. It is through air-filled pores that gases are exchanged between the soil mixes and the atmosphere. This pore space is influenced by the amount and type of amendments used in the soil mix. Since we cannot yet predict water and air-filled pore conditions for different mixes, each grower must measure air-filled pore space for his own mix.

A way to determine the air-filled pore space after drainage (at field capacity) is as follows:

1. Slowly immerse the container plant into a larger volume of water until the water begins to appear at the surface of the soil mix in the container. The object of slow wetting is to avoid trapping air in pores. Be careful not to let any water enter from the top of the container.

2. After water has appeared at the surface of the soil mix, quickly remove the container and set it into a bucket or watertight container and record the weight in ounces or grams. Call this weight, W_1 .

3. After weighing the container, remove it from the bucket and allow it to drain for 24 hr away from drafts, direct sun, or high temperature, to avoid excessive evaporation.

4. After 24 hr. reweigh the container in the same bucket or watertight container used in step 2. Call this weight W_2 .

5. It is necessary to determine the volume occupied by the soil mix in the container. Mark the top of the soil line around the inside of the container. Remove the soil mix, clean out residues, line the container with a very thin polyethylene plastic or saran wrap. Refill the container with water to the soil line, mark and weigh. Call this weight W_3 . Empty water from the container and reweigh. Call this weight W_4 . Remember, keep the units of weight for all measurements in either ounces or grams.

6. Compute the percent air-filled pore space at field capacity by dividing the loss in weight ($W_1 - W_2$) by the volume of the soil mix ($W_3 - W_4$), and multiply the quotient by 100.

- Example:
- a) weight of saturated 2 gal/container of rhododendron and bucket = 5100 grams (W_1)
 - b) weight of container and bucket after draining 24 hr = 4300 grams (W_2)
 - c) weight of drained water = 800 grams ($W_1 - W_2$)
 - d) weight of container plus water up to the soil line = 5250 grams (W_3)
 - e) weight of container without water = 600 grams (W_4)
 - f) volume of soil mix = 4650 grams ($W_3 - W_4$)
 - g) divide weight of drained water (800 grams) by volume of soil mix (4650 grams) = 0.17
 - h) multiply by 100 for percent air-filled pore space of 17%.

Values for the best percent air-filled pore space for container growing have not yet been established. However, a good farm soil to produce good corn should be at least 10%. A range of about 15-25% air-filled pore space would be desirable for container-grown ornamentals. Plants susceptible to root rot diseases, for example rhododendron, may grow better at the higher levels of air-filled pore space. This is important along with a good program of disease prevention and sanitation methods.

PRESIDENT TUKEY: Thank you very much Fred. Are there any questions?

CHARLIE PARKERSON: Can we use your method on a medium right out of the mixer or must there be a plant growing in it?

FRED BUSCHER: The method can be used immediately, but the medium should be firmed into the container. Decomposition during the growing season will cause changes but by running some preliminary tests and keeping records you should be able to formulate the mix you want.

H. SINGLETARY: As pore space increases can you give any correlation to moisture retention?

FRED BUSCHER: No, I can not, but I do know that it drains faster and takes more frequent irrigation.

JIM WELLS: As the growing medium deteriorates, must we continually check the pore space and adjust our watering practices accordingly?

FRED BUSCHER: That is exactly what I am suggesting.

PRESIDENT TUKEY: Our next speaker is John Sparmann of Quincy, Florida, who is going to tell us about container stock in his part of the country.