

SOIL AERATION — DON'T GUESS

Allen C. Botacchi

Cooperative Extension Horticulture Agent

Personal observations by the author over the past 15 years have indicated that at least 3/4 of the greenhouse problems are related to the soil or other growth medium. These problems generally fall into two overall categories: 1) Nutrient levels or balance and pH, and 2) Medium pore space (air to medium ratio).

Soil testing can and will answer questions and problems related to nutrient levels, balance, and pH. The nominal charge made for soil testing is insignificant when compared to the total costs of producing the crop--any crop. Of greater importance is the economic loss which can be experienced due to excessive or deficient nutrient levels, nutrient imbalances or undesirable pH values. A detailed explanation of the above subjects is covered in "Nutrition of Greenhouse Crops" (1).

Medium pore space, although not normally tested at soils laboratories, can be easily determined by the grower. The following procedure for determining air space and water holding capacity was outlined by George Gessert (2).

Materials needed are a measuring cup, masking tape, a pencil, the pot (at least 5") or container to be used, a bucket or pan, water, and the medium to be tested.

1. Measure the volume of the pot. Tape the holes outside securely at the bottom of the pot. Fill the pot with water to about 1/2 inch of the lip or at the normal soil line. Mark this line with the pencil. Carefully pour the water from the pot into the measuring cup and count the number of cups of water held by the pot. This is the total volume of the pot.

2. Dry the inside of the pot, but do not remove the tape. Fill the pot with your potting mix and pack it as you would when potting a plant.

3. Using the measuring cup, carefully wet the medium. Keep track of the number of cups of water it takes to thoroughly saturate the medium. When a thin film of free water appears at the soil line, the medium is water saturated. Stop.

Since dry peats are difficult to wet, add water a little at a time. If the medium tends to float, seal the top of the pot with saran or foil to reduce surface evaporation, as several hours may be required to wet the medium.

The total amount of water added is the total porosity--the pore space of the medium which can be occupied by water or air.

$$\% \text{ Porosity} = \frac{\text{Cups of water required to saturate the medium}}{\text{Total volume of the pot in cups}}$$

4. After the medium is thoroughly saturated, elevate the pot over the bucket or pan and remove the tape from the holes. Water will drain from the pot. Allow the pot to drain until no more water comes out. Measure the amount of water collected in the receptacle. This amount of drained water is equivalent to the air space in the drained medium.

$$\% \text{ Air Space} = \frac{\text{Cups of drained water}}{\text{Total volume of the pot in cups}}$$

This is the percentage of the total volume of the drained media that is occupied by air. It should be noted that not as much water drained from the medium as was applied to saturate it. The difference between the amount applied and the amount drained is the water holding capacity of the medium.

$$\% \text{ Water Holding Capacity} = \% \text{ Porosity} - \% \text{ Air Space} \\ \text{(Percent of total drained medium occupied by water)}$$

The percent air space and water holding capacity determinations are valuable tools for the grower. For example, a fine medium with predominantly small pores tends to retain more water (and consequently less air) than a coarse medium having large pores. The ratio of the various medium components (particle size and shape) must be adjusted to specific containers, plant requirements, and irrigation practices of the individual grower.

Research has shown that the majority of greenhouse crops require a percent air space of 10-20%.

During this past season several cases of poor plant growth were directly attributed to very low levels of air space. Take the time to determine the percent air space of your medium before planting. Many potting media have been observed that contain too fine a particle size caused by the use of fine sands or excessive shredding (mixing) of the components.

To insure more profit from your crops, *Don't Guess--Soil Test* and conduct your own percent air space tests.

LITERATURE CITED

1. Koths, J. et al. 1980. *Nutrition of Greenhouse Crops*. University of Connecticut Bulletin NE 220, 20 p.
2. Gessert, G. 1976. *Measuring a medium's air space and water holding capacity*. *Ornamentals Northwest--Extension Notes* 1(8):11-12.