ORNAMENTALS NORTHWEST ARCHIVES

June 1976
Volume 1, Issue 8
Pages 11-12

George Gessert
Graduate Assistant, Hort. Department
Oregon State University

MEASURING A MEDIUM'S AIRSPACE AND WATER HOLDING CAPACITY

A good potting medium must provide plants not only with anchorage and nutrients, but also with adequate water and air. Different plants have different water and air requirements. Examples of root aeration requirements of some common pot plants are given in table 1. Roots not getting adequate air will grow poorly, or die, no matter how good other factors may be.

Table 1. Approximate root aeration requirements of selected ornamentals (Adapted from: "Criteria for Selection of Growing Media for Greenhouse Crops," .J. W. White, Penn. Ag. Exp. St. Journal Series No. 4574).

Air Space after drainage of total container volume	Very High 20%+	High 10-20%	Intermediate 5-10%	Low 2-5%
	Azalea	African Violet	Camellia	Carnation
	Fern	Begonia	Chrysanthemum	Conifer
	Epiphytic Orchids	Foliage Plants	Gladiolus	Geranium
		Gardenia	Hydrangea	Ivy
		Gloxinia	Lily	Palm
		Heather	Poinsettia	Rose
		Terrestrial Orchids		Stocks
		Rhododendron		
		Snapdragon		

There are many published lists available to growers which give the water holding capacities and air space as well as other physical properties of various growing media. These charts are useful; however, there are many situations that they do not, and cannot, cover. The grower who experiments with his own special medium, or who uses field soil as a component in a medium needs to be able to check water holding capacity and aeration for himself. Further, due to the significant effect of the container (i.e. depth, total volume, configuration) these determinations should be made in the specific container(s) in which the grower is planning to use the proposed medium. There is a procedure for doing this that is simple and costs nothing except the grower's time.

The materials needed are a measuring cup, masking tape, a pencil, the container to be used, a bucket or pan, and a few containers for water.

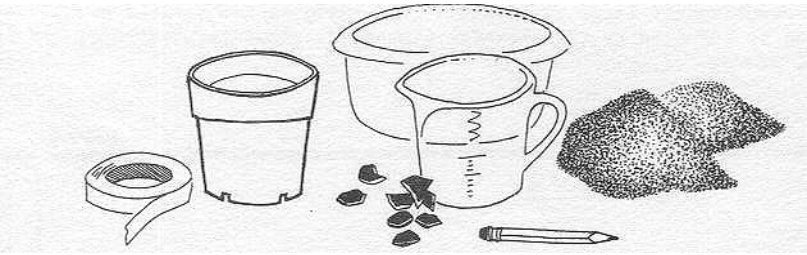

Figure 1. Materials needed to perform the evaluation

Once Materials have been gathered, proceed as follows:

1) Measure the volume of the pot. Do this by securely taping the holes at the bottom (place the tape on the outside of the pot - see Figure 2). Fill the pot with water to within about ½ inch of the brim (or wherever the soil line would be). Mark this line with a pencil. Carefully pour the water from the pot into the measuring cup (see Figure 3). The number of cups of water that the pot held is the "total volume" of the pot.

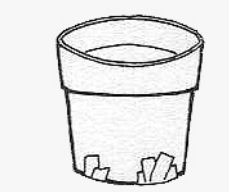

Figure 2. Securely tape drain holes.

Figure 3. Determination of total volume of pot.

2) Next, dry the inside of the pot. Do not remove the tape. Place crockery over the taped hole(s) if this is part of your potting procedure. Fill the pot with dry medium. Pack it as you would when potting a plant.

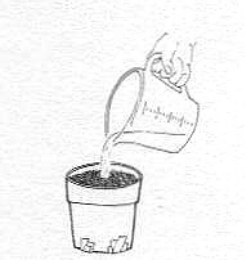

Figure 4. Saturating the medium.

3) Using the measuring cup, wet the medium (Figure 4). 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 - that is, when the medium is water-saturated - stop!

Some media are more difficult to wet than others: dry peats may take a long time to saturate (water absorption can be hastened by applying hot water). Add water to the medium a very little at a time, always being sure to keep track of how much water has been added. Try not to add water too quickly, or the media will float and spill over. It may be necessary to wait several hours while the medium absorbs water. If a wait is necessary, cover the pot with saran wrap or foil to minimize surface evaporation.

The total amount of water added tells you the "total porosity" - that is, what percent of your medium consists of spaces between and within particles. These pore spaces can be occupied by water or air.

$$\text{Percent Porosity} = \frac{\text{cups of water required to saturate the medium}}{\text{“total volume” of the pot (cups)}}$$

4) Once the medium has been thoroughly saturated, elevate the pot above the bottom of the bucket or pan receptacle and remove the tape from the holes. Water will drain from the pot (see Figure 5); allow the pot to drain until no more water comes out. Measure the amount of water that has collected in the receptacle. This volume of "drained water" is equivalent to the air space in the drained medium.

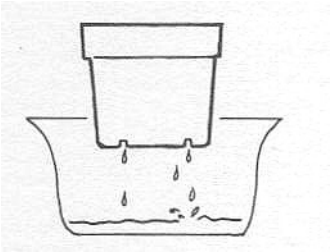

Fig. 5. Drain water from saturated medium

Percent Air Space (Percent of the total volume of the drained medium that is occupied by air) = $\frac{\text{cups of "drained water"}}{\text{"total volume" of the pot (cups)}}$

Note: Not as much water drained from the medium as was applied to saturate the medium. The difference between the amount applied and the amount drained is the "water holding capacity" of the medium.

Water Holding Capacity (percent of total drained medium occupied by water) = Percent Porosity - Percent Air Space

With these figures, a mix can be evaluated to determine percent air space and water holding capacity; and, if necessary, adjustments can be made. For example, media with predominantly small pores (media comprised primarily of small particles) tends to retain more water, and consequently less air, than a medium having large pores (medium comprised of large particles). The ratio of the various media components (particle sizes and shapes) must be adjusted to the specific container, plant requirements, and irrigation practices of the individual grower.
