Evaluating Improved Potting Mixes for Camellia Production

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Nature of Work:

Camellia plants are highly susceptible to many production problems caused by poor substrate drainage. Improved aeration and drainage of the mix could improve plant health and reduce losses. Many nurseries have reduced the number of plants being produced and may eliminate them from their inventory all together because of the production problems.

Small *Camellia japonica* 'Pink Frost' rooted liners in 2 1/4" pots were potted into trade gallons on March 27, 2001 and into three gallons on April 4, 2001. The potting substrates were amended with 14# Osmocote Plus 15-9-12 (Southern Formula) with minors, and 4# dolomitic lime. The substrate treatments were 1) 100% pine bark, 2) 6:1 pine bark:sand, 3) 6:1 pine bark:well point sand, 4) 10:1 pine bark:sand and 5) 1:1 aged bark:mini nuggets. Fifteen single plant replicates were used for each treatment.

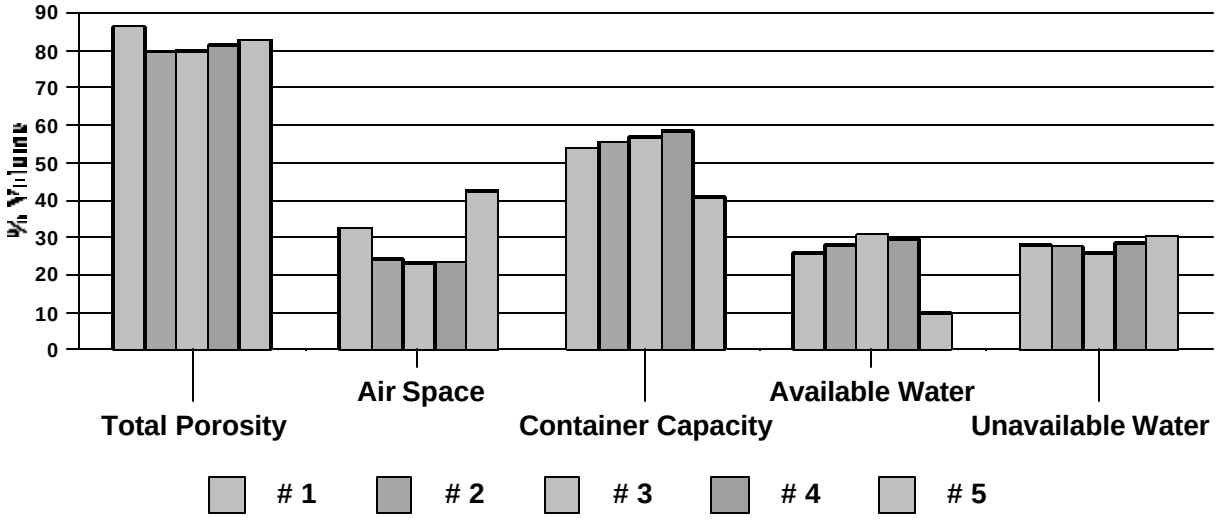
The plants were grown under normal nursery conditions and were harvested in October 25, 2001 to determine top and root growth. Samples of the five substrates were taken on March 27, 2001 for analyses. Physical properties were done at the NCSU Substrate Laboratory under the direction of Dr. Bilderback. Growth and physical properties were compared at the termination of the study.

Results and Discussion:

The suggested range of physical properties for a container medium are total porosity (50-85%), air space (10-30%), container capacity (45-65%), available water (25-34%) and unavailable water (25-35%).

Air space and available water volume have the most significant effect on plant growth. The resulting substrates in the study had as much as 19% difference in air space volumes and 20% difference in available water volume. The 6:1 v/v pine bark:well point sand substrate compared to the 1:1 pine bark:mini nugget substrate provided the greatest contrast in air space and available water volume. The pine bark:mini nugget substrate would be considered excessively well drained with too limited available moisture retention for production of many crops. However, these major differences in physical properties provide an opportunity to assess the affect of air and water relationships on Camellia production.

Figure 1. Physical Properties of Camellia Potting Mixes



The particle size analyses (Table 1) provide additional evidence of the major physical property differences of the substrates selected for this study. Generally, for easiest irrigation management, one component substrates should have between 20% to 30% particles less than 0.5mm (by weight) and multiple component substrates should not exceed 50% fine particles. All of the test substrates were within these guidelines for fine particles less than 0.5 mm. However the greatest differences in fine particles were 22.6 % for the 6:1 (v/v) pine bark:well point sand substrate compared to 44 % fine particles in the 6:1 v/v pine bark:sand substrate. These two substrates had rather similar physical properties with only approximately 3% greater volume of available water held by the pine bark well point sand substrate.

Table 1. Particle Size Distribution of Camellia Substrates

Sieve Size	# 1	# 2	# 3	# 4	# 5
6.3 mm	18.3 %	7.3 %	5.7 %	9.5 %	21.4 %
2 mm	30.8 %	21.1 %	45.8 %	23.9 %	34.4 %
0.71 mm	21.1 %	27.4 %	25.9 %	25.6 %	17.9 %
0.5 mm	7.6 %	14.2 %	6.9 %	12.7 %	5.8 %
0.25 mm	11.6 %	21.0 %	9.2 %	18.9 %	8.9 %
0.106 mm	7.7 %	7.3 %	4.7 %	7.4 %	7.5 %
0 mm	2.9 %	1.6 %	1.9 %	2.0 %	4.2 %

An additional observation was bulk density which ranged from 0.19 g/cc to 0.39 g/cc with the 6:1 v/v pine bark:well point sand substrate having the greatest bulk density.

The analysis of the top and root dry weights for the one gallon camellias showed no differences in the top growth dry weight. The amount of top growth produced in these trade gallons was acceptable by industry standards. There were significant differences in the root dry weights (Table 2). The most roots were produced by the 1:1 bark:mini nugget substrate which was the most aerated and held the least available water. However, it was not significantly different from the 10:1 bark sand substrate which was the least aerated and held the most available water.

Table 2. Root Dry Weights of One Gallon *Camellia japonica* 'Pink Frost'

Treatments	Mean Dry Weight (grams)	Non-significant Ranges
#2 - 6:1 Bark:Sand	6.56	a
#1 - 100% Pine Bark	7.01	a
#3 - 6:1 Bark:Well Point Sand	8.45	ab
#4 - 10:1 Bark:Sand	10.19	bc
#5 - 1:1 Bark:Mini Nuggets	12.29	c

The analysis of the top and root dry weights for the three gallon camellias showed no differences in top and root dry weights. There were no detectable differences in the growth of these three gallon treatments. There was no significant increase of top growth with this cultivar in the three gallons over the one gallons as one might expect with the greater volume of soil and improved drainage.

Significance to the Industry:

The potting mixes used by the nursery industry represent a wide range of physical characteristics that affect plant growth. Although all the substrates tested had roughly the same total porosity, there was great variation in the air space, container capacity and available water. Specific substrates can be selected to give maximum air space for great drainage and aeration or to maximize the amount of available water for plant use. Camellia production is difficult due to the loss of plants thought to be caused by poorly drained substrates. The cultivar used in this trail did not suffer great losses or reduced top growth due to high water holding capacity or reduced air space.

There is a need to evaluate other cultivars that are more susceptible to production problems with improved substrates.