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A MODULAR PLANTING CONTAINER FOR STUDYING PLANT ROOT GROWTH

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ABSTRACT

A modular planting container has been developed to study root growth. The container is designed specifically for "split-plant" comparisons of media, fertilizers or other physical factors affecting plant root growth. The modular system allows flexibility to create containers ranging from 3 to 6 cells. The module is easy to construct with readily available materials. The module planting container was used to test anthurium, Anthurium andraeanum Andre. cv. UH-965, root growth in 4 potting media; screened black cinder, peat, rock wool, and orchid bark. Anthuriums grown in peat had the highest number of lateral roots of all media tested. Plants grown in black cinder, rock wool, and orchid bark had similar number of lateral roots. Efficiency of greenhouse bench space utilization and materials between standard pots vs the modular container is also discussed.

KEYWORDS: *Pots, Potting Media, Anthurium andraenum Andre*

INTRODUCTION

Most root growth studies (Bunt, 1976) utilize pots which can accommodate only a single treatment (media or fertilizer rate) for each test plant. This method of comparison fails to eliminate the variability among individual plants that is due to differences in plant vigor, size and maturity. In contrast a split-plant method will reduce this variability. In the split-plant method of analysis, a single plant is used to compare multiple treatments, thereby removing the variability from the "treatment effects" to the "error" term when conducting the analysis of variance (ANOVA; Steel and Torrie, 1960). This increases the accuracy of the experiment to detect statistical differences between treatments effects. In addition to increased ability to detect differences between treatments, the modular planting container also allows the plants' root to "select" by growing towards and proliferating in the cell with the treatment that best suits the needs of the plant. This inherent design characteristic is nonexistent in root growth studies utilizing the standard pot method.

MATERIALS AND METHODS

Three sides of the rectangular module were constructed of 2.3 cm thick exterior grade

plywood with internal dimensions of 8 x 10 x 10 cm (width x length x height). The fourth side of the module was screened with 1 x 1 cm galvanized wire. The screened side is faced toward the center of the container to form the central container where the plant is grown. The screen restricts intermixing of treatments yet allows for root passage. The top and bottom sides of the module were left open to facilitate collection of root data. The modules can be made arranged to form planting containers with 3 to 6 cells (Table 1).

The modular planting container was used in the evaluation of anthurium, *Anthurium andraeanum* Andre. cv. UH-965, root growth in 4 potting media; (1) screened-black cinder (0.75 to 1.5 cm), (2) peat (Sunshine Peat Moss, Canada); (3) rockwool (1:1 (v/v) absorbent : non-absorbent rockwool (Grodan, Denmark) and (4) orchid bark (Sequoia Red Wood, California). Four modules were arranged to form a square central container yielding 4 cells. The container was placed on a standard plastic planting flat (40 cm square x 7.5 cm deep). The planting flat served as the bottom of the container and facilitated the handling of the container during movement. Each module was filled with one of the 4 media and black cinder was used to fill the center cell where a single anthurium plant was planted. All plants used were top cuttings (20 cm tall) of tissue cultured 'UH-965'. The container was placed in a fiberglass covered greenhouse with 80% polypropylene shade. Each module was irrigated with lead weighted drip tubing. The plant was fertilized with 17-6-12 controlled release fertilizer plus minors (Sierra Chemical Co., Milpitas, Calif.) at a rate of 3 gm/module every 8 weeks. Ten replicate containers were used for the experiment.

Eight months after planting, root growth in each media was determined by disassembling the planting container into individual modules containing each respective media. Roots were recovered by severing with a knife along the screened side of the module followed by pushing of the media and roots out through the module bottom.. Roots were manually separated from the media. Root growth was rated on a scale of 0 to 3 (0 = no roots; 1 = 1 to 5 lateral roots; 2 = 6 to 10 lateral roots and 3 = more than 10 lateral roots).

RESULTS AND DISCUSSION

Peat had the greatest number of roots compared to all other media tested (Table. 2). Orchid bark, rock wool and black cinder had similar numbers of lateral roots.

The advantage of this modular container in comparison to standard pots is in saving greenhouse bench space. One container arranged in the square central pattern has 4 cells and therefore can test 4 treatments; this would require 4 pots in the standard pot method. Thus, a four media experiment with ten replicates using the standard pots would have required a total of 40 pots and 40 anthurium plants as compared to 10 pots with 10 anthurium plants using the modular planting container method.

The modular planting container maybe useful in other areas of root growth studies besides media comparisons. Fertility experiments that control the rate of single or multiple nutrients are also possible applications for this container.

LITERATURE CITED

Bunt, A.C. 1976. Modern Potting Composts : A manual on the preparation and use of growing media for pot plants. Penn. State Univ. Press. USA.

Steel, R.G.D. and J.H. Torrie. 1960. Principles and procedures of statistics. McGraw-Hill, New York.

Table 1. Four configurations of modules with number of test cells per treatment.

Configuration of the central planting cell	No. of available test cells excluding the central cell
Triangle	3
Square	4
Pentagon	5
Hexagon	6

Table 2. Visual rating of anthurium roots in 4 media using the modular planting container.

Media[1]	Root growth rating[2] Mean ± SE
Peat	1.67 ± 0.24
Orchid bark	1.11 ± 0.20
Rock wool	1.00 ± 0.17
Black cinder	0.89 ± 0.11

[1]Each treatment consisted of 9 replicate modular containers.
[2]Visual root growth ratings (0 = no roots, 1 = 1 to 5 lateral roots, 2 = 6 to 10 lateral roots and 3 = more than 10 lateral roots).