EVALUATION OF VARIOUS POTTING MEDIA FOR GROWTH OF FOLIAGE PLANTS

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Abstract. **Five experiments were conducted to evaluate various potting media for best growth of foliage plants. Two experiments were conducted utilizing Brassaia actinophylla and Monstera deliciosa as test plants to evaluate Alive, an organic compost obtained by mixing city refuse with primary sludge, as an ingredient for soil mixes. Mixes with Alive had high salts and sometimes produced smaller plants than those without Alive. In the third experiment, growth of Philodendron oxycardium was evaluated in various mixes with and without rice hulls. Some mixes containing rice hulls performed as well as the more common mixes. The remaining 2 experiments were initiated to compare growth of P. oxycardium and B. actinophylla in 20 media at 2 fertilizer levels. Plants were graded visually and measured for height at the termination of the experiment. Plants that grew in the higher fertilizer level were slightly larger and had a better grade. No mix was clearly the best mix for both measurements and both species. A peat-shavings or peat-bark mix appeared best for P. oxycardium and peat-bark appeared best for B. actinophylla. Very little growth differences resulted between plants grown in various sources of peat. P. oxycardium grew poorly in mixes containing bark and no peat. B. actinophylla grew poorly in mixes with sand.**

Many ornamentals, flowers, woody and foliage, are grown in containers, and large volumes of material are required to fill these containers. Because physical characteristics of most native soils are not desirable for container growing, amendments are added to improve growth of plants. Plants are frequently grown in mixes entirely free of native soil. Although peat is the most commonly used amendment, the list is long and diverse.

Much research has been conducted to determine the best container mix. Several states Agricultural Experiment Stations have recommended specific components. The John Innes Soil Mix suggests 7 parts loam, 3 parts peat moss and 2 parts clean sand (3). The University of California Soil Mix C has a formulation of 1 part fine sand and 1 part peat moss (2). Cornell University suggests 2 parts sphagnum peat moss, 1 part vermiculite and 1 part perlite for foliage plants (1). The University of Hawaii potting mix is composed of 1 part tree fern and 2 parts volcanite (8). Auburn University has also conducted many experiments with a variety of plants and a large number of combinations of potting materials (5). However, researchers at Auburn did not find one medium superior but found that excellent plants could be grown in a large variety of media if these media had proper characteristics.

Even though some commercial growers use mixes suggested by the various states, mixes employed by the commercial industry are almost as numerous as the list of commercial growers. The reasons for this are many, but some of the most prominent are: (1) growers customs, (2) availability, (3) cost of material, (4) growers watering and fertilizer practices and (5) inherent plant characteristics.

The major objectives of this study were: (1) to evaluate several new materials not commonly used as mixes for foliage plants and (2) to evaluate various combinations of several materials easily available to the foliage industry.

Materials and Methods

Five experiments were conducted over a 2 year period to evaluate various media ingredients and combinations of ingredients on several foliage species.

Experiment 1. Seedlings of *B. actinophylla* were potted July 2, 1969, in various mixes listed in Table 1. Soluble salts were determined at the initiation of the experiment from a solution obtained by mixing 1 volume of the medium with 2 volumes of water as outlined by Waters et al. (6, 7). Plants were watered 3 times weekly and fertilized with 2 lbs of 25-5-30 liquid fertilizer per 400 sq. ft. weekly. Height of plants was measured September 25, 1969.

Experiment 2. Unrooted cuttings of *M. deliciosa* were potted in 6 inch plastic pots in various mixes (Table 2) October 15, 1969. Cuttings were kept under mist for 1 month then watered and fertilized as in Experiment 1. Length of stem and

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Table 1. Experiment 1. Effect of various mixtures (1:1:1) on growth (cm) of Brassaia actinophylla in 6 inch pots. 1969.

Media	Soluble[x] salts (ppm)	Height[y]
Alive : GP : Shav[z]	2870	14.0a
Alive : Sand : Shav	3626	15.3ab
Alive : GP : Sand	3640	16.1abc
Alive : ZP : Sand	4228	18.2abcd
ZP : Sand : Shav	896	20.2bcd
Alive : ZP : Shav	3822	20.8cd
GP : Sand : Shav	714	23.2d

[x]Determined by 1:2 volume method (7).

[y]Numbers followed by a common letter are not significantly different at the 5% level.

[z]GP = German Peat, ZP = Zellwood Peat, Shav = Shavings.

length and width of largest new leaf were measured December 12, 1969.

Experiment 3. Rooted cuttings of *P. oxycardium* were placed in 4 inch plastic pots (Table 3) April 17, 1970. Plants were fertilized with 7 g of Osmocote 18-9-9 (approx. 1.5 tsp.) per pot. On June 18, shoot length was determined.

Experiments 4 and 5. These experiments compared 20 media (Table 4) and 2 rates of fertilizer in which either *B. actinophylla* seeds or double eye unrooted cuttings of *P. oxycardium* were used. Eight double eye cuttings of *P. oxycardium* were placed in a 6 inch pot which contained 2 24 inch cypress slabs and placed in the slat shed under 80% shade May 18, 1970. *P. oxycardium* was watered daily for the first 6 weeks to stimulate rooting. *B. actinophylla* seeds were placed 3 seeds per hole, 6 holes per 6 inch pot May 20, 1970. Each mix contained 4 lbs. dolomite, 2 lbs. of single superphosphate and 1.5 lbs. of Perk, a minor element mixture, per cubic yard. *P. oxycardium* pots contained either 10 or 15 g of 14-14-14 Osmocote fertilizer and the pots with *B. actinophylla* contained either 10 or 20 g per pot. Height of the longest 2 vines of *P. oxycardium* and height to base of highest leaf of *B. actinophylla* was determined. *P. oxycardium* were given growth ratings September 9 and *B. actinophylla* November 3. The rating scale employed was 1 = poor, 2 = medium, 3 = good and 4 = excellent plant growth.

The Florida peats, Zellwood and Oxford, were steam sterilized before using. All other materials were used in the condition they were obtained. Sand utilized in the experiment was coarse builder's sand. Bark was obtained from North Florida and composed almost exclusively of pine.

Table 3. Experiment 3. Effect of various mixtures (1:1:1 or 1:1) on shoot length of Philodendron oxycardium grown in 4 inch pots. 1970.

Media	Shoot[y] Length (cm)
Rice H : Sand : Sorb[z]	28.8a
OP : Sand : Sorb	29.9ab
Bark : Sand : Sorb	31.4abc
CP : Rice H	35.3abcd
Rice H : Sand : Bark	36.1abcd
Rice H : Sand : Perl	36.5bcd
OP : Sand : Perl	37.3bcd
CP : Sand : Sorb	37.6bcd
CP : Bark	38.0bcd
CP : Shav	39.5cd
CP : Sand : Perl	39.6cd
Bark : Sand : Perl	41.3d

[y]Numbers followed by a common letter are not significantly different at the 5% level.

[z]CP = Canadian Peat, Perl = Perlite, Sorb = Sorbolite, Rice H = Rice Hulls, Shav = Shavings, OP = Oxford Peat.

Table 2. Experiment 2. Effect of various mixtures (1:1:1) on growth (cm) of Monstera deliciosa in 6 inch pots. 1969.

Media	pH	Soluble[z] salts (ppm)	Stem Length	Leaf Length	Leaf Width
Alive : GP : Perl[y]	5.8	2072	33.6	18.2	17.4
Alive : GP : Bark	5.5	2562	29.4	17.6	16.6
Alive : GP : Sand	5.5	2618	35.2	16.4	16.0
Alive : Perl : Bark	6.4	3262	33.8	16.8	17.0
Alive : Perl : Sand	6.4	2898	34.0	17.0	16.6
Alive : Bark : Sand	6.4	2898	33.2	21.0	17.2
GP : Perl : Sand	6.5	266	37.2	17.0	17.6
GP : Perl : Sorb	6.8	196	38.2	17.8	17.2
			NS	NS	NS

[y]GP = German Peat, Perl = Perlite and Sorb = Sorbolite.

[z]Determined by the 1:2 volume method (7).

Table 4. Experiments 4 & 5. Effect of various mixtures (1:1:1 or 1:1) on growth of Philodendron oxycardium in 4 inch pots and Brassaia actinophylla in 6 inch pots. 1970.

Media	P. oxycardium		B. actinophylla	
	Growth Rating[x]	Vine Length (cm)	Growth Rating[x]	Height (cm)
GP : Shav[y]	3.5e[z]	44.8f	2.2ab	31.7abc
LP : Shav	2.8bcde	37.5bcdef	2.5abc	30.8ab
OP : Shav	3.4de	43.0ef	2.6abc	32.7bc
GP : Sand	3.0cde	39.8def	2.0ab	27.8ab
LP : Sand	2.8bcde	35.1bcd	2.3ab	31.3ab
OP : Sand	2.8bcde	31.9abc	1.6a	23.8a
GP : Bark	3.1cde	36.9bcde	3.1bc	35.8bc
LP : Bark	3.3de	43.5ef	3.4c	39.7c
OP : Bark	2.8bcde	37.6bcdef	2.4abc	32.0abc
GP : Sand : Perl	3.2cde	38.8cdef	2.7abc	32.5abc
LP : Sand : Perl	2.9cde	36.6bcde	2.2ab	28.8ab
OP : Sand : Perl	3.0cde	38.3bcdef	2.3ab	29.3ab
GP : Sorb : Perl	2.9cde	38.8cdef	2.8bc	30.8ab
LP : Bark : Sand	2.7bcd	34.8bcd	2.6abc	30.0ab
OP : Bark : Sand	2.7bcd	34.5abcd	2.4abc	29.2ab
LP : Bark : Shav	2.8bcde	37.9bcdef	2.6abc	31.7abc
OP : Bark : Shav	3.0cde	37.7bcdef	3.0bc	31.3ab
Bark : Sorb : Sand	1.6a	28.0a	2.3ab	29.7ab
Bark : Verm : Sand	2.5bc	31.3ab	2.2ab	29.5ab
Bark : Verm : Shav	2.2ab	32.8abcd	2.6abc	32.2abc

[x]1 = poor, 2 = medium, 3 = good, 4 = excellent.

[y]GP = German Peat, Shav = Shavings, LP = Louisiana Peat, OP = Oxford Peat, Sorb = Sorbolite, Perl = Perlite, Verm = Vermiculite.

[z]Numbers followed by a common letter are not significantly different at the 5% level.

Results and Discussion

Experiment 1. B. actinophylla growing in mixes containing Alive did not grow as tall as plants growing in mixes without Alive except for the mixture of Alive, Zellwood peat and Shavings (Table 1). Mixes containing Alive had much higher soluble salts than mixes without Alive. Zellwood peat when mixed with Alive and either sand or shavings appeared to be slightly better than German peat, but this difference was not apparent when Alive was not included in the mix. Soluble salts of 3,000-4,000 ppm which were found in Alive mixtures are extremely high for growth of foliage plants (7).

Experiment 2. M. deliciosa grew equally well in a variety of mixes, some contained Alive, and some did not (Table 2), even though there was a large variation in soluble salts. Since the plants were initially kept under mist, the high humidity and moisture content of the soil probably alleviated the problem of excess salts. This is reflected in lower soluble salts readings than were contained in Experiment 1.

Experiment 3. P. oxycardium also grew equally well in a variety of mixes (Table 3). Peat, Canadian or Oxford, and bark with sand and perlite were possibly slightly better than the other mixes. Once again, there did not appear to be much difference in sources of peat. Plants grew very well in mixes containing rice hulls with the exception of sand and sorbolite, indicating that rice hulls may be used as an inexpensive filler in potting soils. Mixes containing bark as a replacement for peat also produced plants with very good growth.

Experiments 4 and 5. Results of these experi-

ments also indicate that a wide variety of mixes will produce good growth of *P. oxycardium* and *B. actinophylla* (Table 4). A peat-shavings mix appears slightly better for growth of *P. oxycardium* but peat-sand and peat-sand-perlite also produced very good growth. *B. actinophylla* growing in peat-bark mixtures were slightly larger than plants in other mixes, but plants in peat-shavings mixes and mixes containing bark and shavings also grew very well. *P. oxycardium* growing in mixes containing bark with no peat grew poorly and peat-sand mixes apparently produced the smallest *B. actinophylla.*

Plants that grew in the higher fertilizer level were slightly larger and had a better grade than plants grown in the lower fertilizer level.

Results from the above experiments indicate that a wide range of mixes will produce good growth of foliage plants. These results also indicate that a mix which may be best for one plant may not be best for another plant.

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IDENTIFICATION AND CORRECTION OF COPPER DEFICIENCY OF RHODODENDRON SIMSI 'GEORGE LINDLEY TABER' CUTTINGS

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Abstract. **A nutritional disorder of rooted cuttings of 'George Lindley Taber' azalea, similar in appearance to previously identified Cu deficiency of 'Formosa' and 'Fielder's White' azaleas, was observed in a Florida nursery in June, 1971. Some of these affected cuttings were brought to Gainesville, and potted on June 10, in Florida Florahome peat, in 6-inch Lerio metal cans. Treatments given these plants were: an untreated check, copper sulfate ($CuSO_4.5H_2O$) at rates of 10, 25, and 50 lb./A, and the commercial nutrient mixture "Perk" at rates of 1 and 4 lb./yd.^{3} of medium. All plants receiving copper sulfate and "Perk" grew normally, while the untreated plants continued to show characteristic Cu deficiency symptoms, and 42 percent of the untreated plants died. There was no difference in size and quality of plants produced by any of the copper sulfate or "Perk" treatments.**

A nutritional disorder of 'George Lindley Taber' azalea cuttings developed during rooting, which was similar in appearance to the previously identified Cu deficiency of 'Formosa' and 'Fielder's White' azaleas, was observed in a Florida nursery in June, 1971. Cu deficiency has been experimentally developed and corrected by Dickey (1, 2, 3, 4) on contained grown *Camellia japonica* L. cultivars 'Elegans,' 'Tricolor' and 'Lady Clare,' *Rhododendron simsi* Planch, cultivars 'Formosa' and 'Fielder's White,' *Jasminum multiflorum* Andr., *J. nitidum* Skan., *Ligustrum japonicum* Thunb., *Pittosporum tobira* Ait., and *Viburnum suspensum* Lindl. Cu deficiency has also been observed on these species growing in containers in Florida nurseries, but had not been seen previously on cuttings in rooting medium before they had been transplanted to containers.

This experiment deals with identification, description, and correction of this nutritional disorder on rooted 'George Lindley Taber' azalea cuttings which had developed while they were rooting.

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