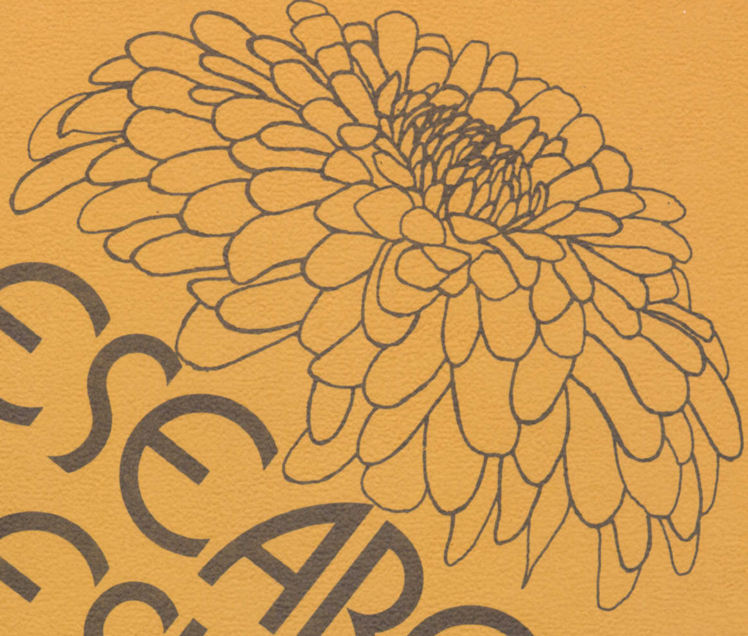
RESEARCH RESULTS FOR ORNAMENTAL HORTICULTURISTS



January 1976
Horticulture Series No. 22
Auburn University
Agricultural Experiment Station
R. Dennis Rouse, Director Auburn, Alabama

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Nursery Crops

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CONTENTS

Effects of Growth Regulator Mixtures on the Rooting of Softwood Cuttings

Kenneth C. Sanderson

Nature of Work: Previous studies indicated that Bayer 102612, a morphactin; Nia 10637, a growth inhibitor; and ancymidol (A-Rest™), a growth retardant might influence the rooting of cuttings. The objective of this experiment was to study the effects of these 3 growth regulators alone and in combination with other growth regulators on rooting cuttings of 5 woody species. The mixtures and concentrations used are shown in Table 1.

Softwood cuttings, 12.5 cm to 15 cm, of Cornus florida, Ilex latifolia, Juniperus conferta, Mahonia bealei and Rhododendron hybrida cv. Kingfisher were collected on June 28, 1972. Ten cuttings of each species were dipped per treatment for 10 seconds prior to placing in a rooting medium of 1:1, v/v, horticultural grade vermiculite and pasteurized builders sand. The cuttings were propagated under mist (2.5 seconds out of every 100 seconds) with bottom heat of 70° F. A ferbam drench, 1 tablespoon per gal., was applied to the cuttings 4 weeks after sticking. On October 5, the cuttings were graded by species according to the following system: 0 = dead; 1 = alive; not rooted; 2 = callused; 3 = light rooting; 4 = medium rooting; and 5 = heavy rooting.

Results and Discussion: A mixture of 5 ppm Bayer plus 250 ppm ancymidol averaged the best rooting score for the cuttings of the 5 species (Table 1). Cuttings treated with 1,000 ppm Nia 10637 plus 500 ppm KGA and 1,000 ppm NAA gave the poorest average score. Cornus florida cuttings rooted best when treated with 5 ppm Bayer plus 500 ppm KGA plus 1,000 ppm NAA. Generally, Ilex latfolia cuttings did not root well, however a mixture of 5 ppm Bayer, 125 ppm IBA and 1,000 ppm NAA yielded the highest rooting score and 80% rooting. Juniperus conferta cuttings had the highest rooting score when treated with 5 ppm Bayer plus 250 ppm ancymidol. Best rooting occurred with Mahonia bealei when the cuttings were treated with 5 ppm Bayer, 250 ppm ancymidol plus 1,000 ppm NAA and 250 ppm ancymidol plus 125 ppm IBA and 1,000 ppm NAA. Kingfisher azaleas had the best rooting score when the cuttings were dipped in mixtures of 1,000 ppm Nia 10637 plus 2,500 ppm B-Nine, 1,000 ppm Nia 10637 plus 500 ppm KGA and 250 ppm ancymidol plus 2,500 ppm B-Nine.

Publications: None

Comparison of Several Commercial Root-Inducing Compounds and Three Experimental Chemicals on the Rooting of Woody Ornamental Cuttings

Kenneth C. Sanderson

Nature of Work: Six commercial root inducing compounds and 4 experimental chemicals (Table 2) were applied to the base of cuttings of 8 woody ornamental species on October 11, 1973. Ten terminal cuttings, 12.5 cm to 15.0 cm, of the following species were used in each treatment: Gardenia jasminoides, Ilex cornuta 'Burfordii', Ilex cornuta 'Dwarf Burfordii', Juniperus conferta, Osmanthus ilicifolius, Pittosporum tobira and Rhododendron hybrida. Rosa hybrida were treated similar to the other species except single-eye cuttings were used. Liquid treatments were applied by immersing the bottom 2.5 cm of the cuttings in the solution for 15 seconds.

Following treatment the cuttings were stuck in a medium of 1:1, v/v, sand and sphagnum peat moss. Cuttings were misted during the day and bottom heat (70° F.) was used. Rooting was scored on November 29, 1973 as follows: 0 = dead; 1 = alive, not rooted; 2 = callused; 3 = light rooting; 4 = medium rooting and 5 = heavy rooting.

Results: Generally, commercial root inducing substances yielded better results than the experimental chemicals tested. Hormodin No. 2 treated cuttings averaged the best rooting for all species (Table 2). Differential response to root inducing chemical was observed. *Gardenia jasminoides* and *Ilex cornuta* 'Burfordii' cuttings rooted best when treated with a mixture of 1,000 ppm Nia 10637 and 5,000 ppm NAA. *Ilex cornuta* 'Dwarf Burfordii' had the highest rooting scores when the cuttings were treated with Hormodin No. 2, Jiffy-Grow No. 2 or Rootone No. 10. Cuttings of *Juniperus conferta* rooted best following treatment with Jiffy Grow No. 2, 1,000 ppm Nia 10637 or 5,000 ppm SADH. Jiffy Grow No. 2 treatment gave the best rooting in *Pittosporum tobira*. *Osmanthus illicifolius* and *Rhododendron hybrida* had the highest scores when cuttings were treated with Hormodin No. 2. The best rooting of *Rosa hybrida* cuttings occurred with 2,000 ppm CEPA.

A Comparison of Ethephon and Jiffy Grow as Root Inducing Agents for Woody Ornamental Cuttings

Kenneth C. Sanderson

Nature of Work: Ethephon (CEPA or Ethrel™) has been reported to both stimulate and retard the rooting of cuttings. Little information is available on its value as a root inducing agent for woody ornamentals. Preliminary research has indicated that ethephon stimulated adventitious root production in certain ornamentals, however recent tests showed that the value of ethephon as a root inducing substance for woody ornamentals is questionable. Jiffy Grow™, a combination of indole butryic acid and napthalene acetic acid, has been found to be an excellent root inducing substance in previous Auburn tests. A factorial experiment was designed to compare ethephon and Jiffy Grow™ alone and in combination, as root inducing substances for cuttings of *Camellia sasanqua*, *Ilex cornuta* 'Burfordii', *Juniperus conferta*, *Pittosporum tobira* *Rhododendrun* cv.'Kingfisher'and *Thuja occidentalis*. Cuttings were propagated under mist in a sand:peat medium on February 3, 1973. A glasshouse with a minimum night temperature of 70° F. was used. The base of the cuttings were dipped for 15-seconds in the following treatments: none, 500 ppm ethephon, 1,000 ppm ethephon, 1:1 Jiffy Grow™ No. 2 and water, 1:4 Jiffy Grow™ and 500 ppm ethephon, 1:1 Jiffy Grow™ and 1,000 ppm ethephon, 1:4 Jiffy Grow™ and water, 1:1 Jiffy Grow and 500 ppm ethephon, 1:4 Jiffy Grow™ and 1,000 ppm ethephon and 2,000 ppm ethephon. Rooting scores were recorded on April 5, 1973 (Table 3).

Results and Discussion: A factorial analysis of the data revealed that ethephon did not influence the rooting scores of the species tested. Cuttings treated with 1:1 Jiffy Grow™ (3.6a) or 1:4 Jiffy Grow™ (3.6a) yielded higher rooting scores than untreated cuttings (3.2b). Species differed in rooting scores. In an analysis which ignored the factorial design and included a 2,000 ppm ethephon treatment, no differences were observed in rooting scores for treatments of ethephon and Jiffy Grow™ used alone or in combination (Table 3).

Publications: Sanderson, K.C. 1975. An Evaluation of Ethephon as a Root Inducing Substance for Woody Ornamentals. *HortScience* 10:315 (Abstract).

Table 1. Rooting scores of cuttings of 5 softwood species treated with various growth regulator combinations

Treatment	Species					Mean
	Cornus florida	Ilex latifolia	Juniperus conferta	Mahonia bealei	Rhododendron cv. Kingfisher	
5 ppm Bayer	3.5	2.0	1.4	5.0	4.1	3.2
5 ppm Bayer plus 1000 ppm NAA	4.4	2.9	1.4	4.2	2.5	3.0
5 ppm Bayer plus 125 ppm IBA plus 1000 ppm NAA	3.9	4.4	2.4	3.8	3.9	3.6
5 ppm Bayer plus 1000 ppm Ethephon	3.4	2.0	3.2	4.0	4.0	3.3
5 ppm Bayer plus 250 ppm Ancymidol	3.4	2.0	3.4	4.8	4.9	3.7
5 ppm Bayer plus 1000 ppm Nia 10637	4.1	2.0	2.2	4.4	4.7	3.4
5 ppm Bayer plus 1:12 Jiffy Grow	3.6	2.0	2.4	4.4	4.7	3.4
5 ppm Bayer plus 2500 ppm B-Nine	2.1	1.9	2.8	4.8	3.8	3.0
5 ppm Bayer plus 500 ppm KGA	2.6	2.1	1.6	4.0	4.8	3.0
5 ppm Bayer plus 500 ppm KGA plus 1000 ppm NAA	4.8	2.2	1.8	3.6	4.4	3.3
1000 ppm Nia 10637	4.0	2.2	2.2	4.8	4.6	3.5
1000 ppm Nia 10637 plus 1000 ppm NAA	3.5	2.3	2.0	4.8	4.2	3.3
1000 ppm Nia 10637 plus 125 ppm IBA plus 1000 ppm NAA	3.4	3.4	1.9	4.0	4.6	3.4
1000 ppm Nia 10637 plus 1000 ppm Ethephon	4.3	2.0	2.0	4.2	4.8	3.4
1000 ppm Nia 10637 plus 250 ppm A-Rest	4.5	2.0	2.8	3.8	4.1	3.4
1000 ppm Nia 10637 plus 1:12 Jiffy-Grow	3.3	2.0	2.9	4.2	4.9	3.4
1000 ppm Nia 10637 plus 2500 ppm B-Nine	2.9	2.0	2.6	4.5	5.0	3.4
1000 ppm Nia 10637 plus 500 ppm KGA	3.0	2.1	1.1	4.0	5.0	3.0
1000 ppm Nia 10637 plus 500 ppm KGA + 1000 ppm NAA	3.6	2.1	1.0	4.2	3.8	2.9
250 ppm Ancymidol	3.8	2.0	2.0	4.6	4.3	3.3
250 ppm Ancymidol plus 1000 ppm NAA	4.0	2.6	2.2	5.0	3.9	3.5
250 ppm Ancymidol plus 125 ppm IBA + 1000 ppm NAA	3.8	2.4	2.7	5.0	2.9	3.3
250 ppm Ancymidol plus 1000 ppm Ethephon	3.8	2.0	1.6	4.0	4.3	3.1
250 ppm Ancymidol plus 1000 ppm Nia 10637	4.4	2.0	2.5	4.4	4.4	3.5
250 ppm Ancymidol plus 1:12 Jiffy Grow	3.3	2.1	2.0	4.2	4.7	3.2
250 ppm Ancymidol plus 2500 ppm B-Nine	3.7	1.8	2.7	4.2	5.0	3.4
250 ppm Ancymidol plus 500 ppm KGA	3.2	1.5	2.0	4.8	4.1	3.1
1:12 Jiffy-Grow	3.7	1.8	2.7	4.6	3.5	3.2
1000 ppm NAA	4.2	2.7	2.8	2.8	3.7	3.2
2500 ppm B-Nine	3.8	2.0	2.5	4.4	4.3	3.4
Mean	3.3	2.2	2.2	4.3	4.2	

Table 2. Rooting scores of six ornamentals treated with commercial root-inducing compounds and experimental chemicals

Treatment[z]	Species[y]								Mean
	Gardenia jasminoides	Ilex Cornuta 'Burfordii'	Ilex Cornuta 'Dwarf Burfordii'	Juniperus conferta	Pittosporum tobira	Osmanthus ilicifolus	Rhododendron hybrida	Rosa hybrida	
Check	1.9	3.5	2.3	2.7	2.0	2.5	2.0	2.4	2.4
Hormodin No. 2 TM	4.0	3.5	4.3	1.8	2.6	3.8	3.1	2.2	3.1
Hormodin No. 3 TM	1.8	3.6	3.9	1.6	1.7	4.2	2.0	1.3	2.5
Cutstart XX TM	2.5	3.2	3.8	3.1	2.1	3.9	2.2	1.5	2.7
Rootone TM	1.2	3.5	2.1	1.5	2.9	3.6	2.1	1.9	2.3
Rootone No. 10 TM	2.0	3.2	4.3	2.6	2.1	2.3	2.1	2.6	2.6
Jiffy Grow TM	0.9	3.9	4.3	3.6	3.4	3.7	2.6	1.8	3.0
1000 ppm Nia 10637	0.8	4.0	4.0	3.6	2.4	2.8	2.1	2.5	2.7
500 ppm CEPA	4.2	3.5	3.4	3.0	3.2	1.9	2.1	2.2	2.9
1000 ppm CEPA	4.3	3.6	2.9	3.3	2.0	3.4	1.9	2.4	2.9
2000 ppm CEPA	3.1	3.7	2.9	3.1	2.9	2.7	2.0	3.2	2.9
1000 ppm Nia 10637 plus 5000 ppm NAA	4.8	4.2	4.0	2.0	2.6	2.5	1.9	1.5	2.9
5000 ppm SADH	3.2	3.7	3.2	3.6	2.3	2.6	2.1	1.6	2.7
Mean	2.6	3.6	3.4	2.7	2.4	3.0	2.1	2.0	

[z] Hormodin No. 2 and No. 3 are various strengths of indole butyric acid manufactured by Merck and Co., Rahway, N. J. Rootone and Rootone No. 10 are various strengths of a combination of 3-indole butyric acid, 1-naphthalene acetimide and 2-methyl naphthalene acetimide manufactured by Amchem Products Ambler, Pa. Cutstart XX is a unidentified rooting substance manufactured by Vitamin Institute, North Hollywood, CA.

Jiffy Grow No. 2 is a combination of 2-napthalene acetic acid, 3-indole butyric acid, a fungicide and boron manufactured by G and W Products, Estacada, OR. Nia 10637 is Magra Chemical Company's, Middleport, N.Y. experimental chemical, ethyl hydrogen 1-propylphosphonate CEPA or Ethrel TM is (2-chlorethyl) phosphonic acid manufactured by Amchem Products Co., Ambler, PA.

SADH or B-Nine TM is succinamic acid 2,2-dimethyl hydrazide manufactured by Uniroyal, Bethany, CT.

[y] Scoring: 0 = dead, 1 = alive, 2 = callused, 3 = light rooting, 4 = medium rooting, 5 = heavy rooting.

Table 3. Comparison of rooting scores of six ornamental cuttings treated with 2,000 ppm ethephon and various combinations of ethephon and Jiffy Grow

Treatment[z]	Rooting scores[y]
None	3.2 a
500 ppm ethephon	3.2 a
1,000 ethephon	3.1 a
1:1 Jiffy Grow No. 2	3.5 a
1:1 Jiffy Grow and 500 ppm ethephon	3.6 a
1:1 Jiffy Grow and 1,000 ppm ethephon	3.8 a
1:4 Jiffy Grow	3.4 a
1:4 Jiffy Grow 500 ppm ethephon	3.6 a
1:4 Jiffy Grow 1,000 ppm ethephon	3.9 a
2,000 ppm ethephon	3.5 a

[z]Ethephon (CEPA or Ethrel) is (2-chlorethyl) phosphonic acid manufactured by Amchem Products, Ambler, PA.

Jiffy Grow No. 2 is a combination of 2-napthalene acetic acid, 3-indole butyric acid, a fungicide and boron manufactured by G and W Products, Estacada, OR.

[y]Scoring: 0 = dead, 1 = alive, 2 = callused, 3 = light rooting, 4 = medium rooting, 5 = heavy rooting.

Means followed by the same letters are not significantly different at the 5% level according to Duncan's multiple range test.

Further Studies on PBA as a Branching Agent on Ornamentals

Kenneth C. Sanderson and Willis C. Martin, Jr.

Nature of Work: PBA (Shell Chemical Company's synthetic cytokinin called Accel) has been found to influence branching in certain plants. Two experiments were conducted to test PBA as a branching agent on azalea cv. 'Kingfisher', Burfordii holly and garden chrysanthemums. Rooted cuttings of the woody ornamentals were planted in 3-in. pots on May 21, treated on June 24, and pinched (sheared) on July 3, 1974. Treatments were 0, 200, 400, 800, 1,200 ppm PBA. Dupont's surfactant B955 was added (4 ml per liter) to all sprays which were then applied to runoff. Plants were grown in a lightly shaded greenhouse under normal cultural practices for liners. Total number of shoots per plant were determined on October 17, 1974.

Branching is important in garden chrysanthemums for adequate flower yield and display. Cultivar selection, pinching methods and culture influence the number of branches per plant. If these methods fail, the grower's only recourse has been to increase the number of plants per container, thus increasing production costs. PBA was applied as a spray to three garden chrysanthemum cultivars ('Festive Cushion', 'Jackpot' and 'White Grandchild') at the rate of 0, 100, and 200 ppm in a randomized block designed experiment. All sprays were applied until runoff 1 week (January 31) prior to pinching (Feb. 6, 1973). Plants were grown in 4-in. pots (2 rooted cuttings per pot on January 11), in a greenhouse using standard cultural procedures for garden chrysanthemum production. Plants received supplementary light from 10 p.m. to 2 a.m. each night from January 11 to February 13 and short day treatment with black cloth from February 13 to flowering.

Results and Discussion: Sprays of PBA did not increase the number of shoots per plant in 'Kingfisher' azaleas and 'Burfordii' holly (Table 4). At a concentration of 1,200 ppm PBA reduced the number of shoots on 'Burfordii' holly. Garden chrysanmum plants sprayed with 200 ppm PBA produced more shoots per plant than untreated plants. The number of shoots on plants sprayed with 100 ppm and 200 ppm PBA did not differ. Cultivars differed from each other in shoot number as follows: 'Festive Cushion', 4.1; 'Stardom', 3.6; 'White Grandchild', 3.9; and 'Jackpot', 3.1. Our results agree with other investigators who found PBA to be an effective agent for increasing shoot number in chrysanthemums. Commercial use of PBA on chrysanthemums will probably depend on economic factors.

Publications:

Sanderson, K. C. and W. C. Martin, Jr., 1974. Effect of DPX 1840, PBA and Glyphosine on Shoot Growth in Garden Chrysanthemums. Proc. Fla. State Hort. Soc.87:558-560.

Table 4. Total number of shoots per plant on Burfordii holly 'Kingisher' azalea and garden chrysanthemum plants treated with PBA sprays

PBA spray concentration (ppm)	'Burfordii' holly	'Kingfisher' azalea	Garden chrysanthemum
0	3.6 ab[z]	9.7 a	3.6 b
100	-----	-----	3.8 ab
200	3.4 ab	9.5 a	4.0 a
400	3.9 ab	10.0 a	-----
800	4.0 a	9.7 a	-----
1200	2.9 b	9.3 a	-----

[z]Mean separation by Duncan's multiple range test at 5% levels. Means, in columns, followed by the same letter(s) do not differ.

Growth of Rhododendron cv. 'Evensong' in Sphagnum Peat Moss Amended with Various Inorganic and Organic Materials

Kenneth C. Sanderson and Willis C. Martin, Jr.

Nature of Work: Liners of the azalea cultivar 'Evensong' were sheared to 13 cm height prior to use in one experiment using inorganic amended media and a second experiment using organic amended media. Various amounts of perlite, calcined clay (Turface™), vermiculite and sand were added to imported sphagnum peat moss in the first experiment (Table 5). Municipal compost (Mobile Aid™) and bagasse (Bet-R-Growth™) were the organic amendments used in the second experiment (Table 3). All media received 2 oz. of limestone and 2 oz. of gypsum per bu. Plants were fertilized every month with 2½ lb. of 21-7-7 water soluble fertilizer per 100 gallons of water. Experiments were established outside under normal container plant culture on April 1, 1971. Plant height and spread data were recorded on May 2, 1972.

Results and Discussion: Many shoots of plants grown in sand and sphagnum peat moss media died. Total plant death in inorganic amended media was greatest in those containing calcined clay amended with (13%) and least in vermiculite (9%). Plant losses in media amended with sand and perlite were 8% and 3%, respectively. Shoot and plant death may have been due to deficiencies, winter injury, overwatering, or a combination of causes. The greatest plant height and spread was produced by plants grown in 8:3 sphagnum peat moss and perlite media (Table 5). Sphagnum peat moss media yielded plants with greater height and spread than plants grown in peat moss amended with various inorganic materials (Table 6).

Plants grown in all-organic amended media grew well. The tallest plants were produced in 9:1 sphagnum peat moss and Mobile Aid (Table 7). Plants grown in sphagnum peat moss alone had the widest spread. Generally, plants grown in sphagnum peat moss alone were equal or superior to plants grown in sphagnum peat moss amended with Mobile Aid or Bagasse.

It is concluded that sphagnum peat moss alone is a better media than sphagnum peat moss amended with various inorganic and organic amendments for the growth of azaleas. Further investigations on minor element additions should be considered since there are some indications that benefits of certain amendments may be due to minor elements.

Table 5. Growth of Rhododendron cv. 'Evensong' in Media of Sphagnum Peat Moss and Various Inorganic Amendments

Media (by volume)	Height (cm)	Spread (cm)
Sphagnum peat moss	36.0	39.3
1:1 peat moss and perlite	34.8	38.3
6:4 peat moss and perlite	33.5	41.6
7:3 peat moss and perlite	30.6	34.0
8:2 peat moss and perlite	42.9	46.7
9:1 peat moss and perlite	34.1	33.8
1:1 peat moss and calcined clay (Turface™)	32.6	31.3
6:4 peat moss and calcined clay (Turface™)	26.6	24.4
7:3 peat moss and calcined clay	22.6	22.3
8:2 peat moss and calcined clay	30.3	32.8
9:1 peat moss and calcined clay	29.1	32.2
1:1 peat moss:vermiculite	32.9	33.9
6:4 peat moss:vermiculite	25.9	33.3
7:3 peat moss:vermiculite	34.0	36.7
8:2 peat moss:vermiculite	30.3	36.4
9:1 peat moss:vermiculite	35.1	36.2
1:1 peat moss and sand	24.1	29.1
6:4 peat moss and sand	24.1	29.1
6:4 peat moss and sand	30.0	31.6
7:3 peat moss and sanc	24.5	28.9
8:2 peat moss and sand	26.8	32.8
9:1 peat moss and sand	35.0	36.6
Mean	31.0	33.9

Table 6. Growth of Rhododendron cv. 'Evensong' in Sphagnum Peat Moss Amended with Various Inorganic Materials

Amendment	Height (cm)	Spread (cm)
Perlite	35.2	38.9
Calcined clay	28.2	28.6
Vermiculite	31.6	35.3
Sand	28.1	31.8
None	36.0	39.3
Mean	31.8	34.8

Table 7. Growth of Rhododendron cv. 'Evensong' in Media of Sphagnum Peat Moss and Various Organic Amendments

Media (by volume)	Height (cm)	Spread (cm)
1:1 Sphagnum peat moss and Mobile aid	48.0	31.6
6:4 Sphagnum peat moss and Mobile aid	54.0	32.9
7:3 Sphagnum peat moss and Mobile aid	55.1	37.5
8:2 Sphagnum peat moss and Mobile aid	52.7	37.2
9:1 Sphagnum peat moss and Mobile aid	55.8	36.6
Sphagnum peat moss	52.8	40.2
1:1 Sphagnum peat moss and bagasse	42.5	31.0
6:4 Sphagnum peat moss and bagasse	39.8	35.5
7:3 Sphagnum peat moss and bagasse	38.7	34.0
8:2 Sphagnum peat moss and bagasse	42.3	38.8
9:1 Sphagnum peat moss and bagasse	33.8	34.3
Mean	46.9	35.4

Table 8. Growth of Rhododendron cv.'Evensong' in Sphagnum Peat Moss Amended with Various Organic Materials

Amendment	Height (cm)	Spread (cm)
Municipal Compost (Mobileaid™)	53.1	35.2
Bagasse	39.4	34.7
None	52.8	40.2
Mean	48.4	36.7

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