RESEARCH RESULTS FOR ORNAMENTAL HORTICULTURISTS

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Horticulture Series No. 29
Auburn University
Agricultural Experiment Station
Gale A. Buchanan, Dean and Director
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Kenneth C. Sanderson, Editor

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November Through May Propagation of *Photinia x fraseri* Tip Cuttings with IBA and NAA

Fred B. Perry, Jr.

Nature of Work: Terminal cuttings 5 in. (12.7 cm) long from *Photinia x fraseri* plants were made November 18, 1981, December 18, 1981, January 18, 1982 and March 18, 1982. Leaves from the basal 1/3 of each cutting were removed and a light wound 0.5 cm wide was made on the lower 2.5 cm of the stem. Treatments consisted of dipping the base of the cuttings in talc preparations of NAA or IBA containing 5% Benlate®. The talc preparations were: NAA at .25%, .50%, .75%, and 1.00% + 5% Benlate; IBA at 0.5%, 1.0%, 1.5%, and 2.0% + 5% Benlate; and a control of talc +5% Benlate.

Cuttings were then inserted into an open bench 6 in. (15.24 cm) deep containing a moist medium of sand and peat (1:1 v/v). The medium pH was adjusted to 5.5 using dolomitic limestone. Intermittent mist was scheduled to be on 2.5 seconds every 5 min. during the daylight hours. A randomized complete block design was used with 40 cuttings per treatment per cutting date and 4 replications. A minimum bottom heat temperature of 70° F was maintained.

Cuttings were allowed to remain in the propagation bench only two months after which time they were removed and evaluated for rooting percent and quality of roots (roots score). Cuttings were then heeled into the bench after evaluation.

Results and Discussion: The effect of cutting date from November 18 to March 18 did not significantly alter rooting percentages although overall rooting dropped from November to December by 50% and increased to slightly above the November level by March.

There was a highly significant rooting response to the addition of rooting hormones. No non-treated cuttings rooted in November or December with 2% and 5.6% rooting in January and March respectively. However, rooting averages of 42% and 57% were obtained for NAA and IBA respectively over this time with a monthly high of 83.6% for 1% NAA and 75.8% for 2% IBA in November.

Cuttings replaced in the propagation bench eventually rooted in large percentages by June. This indicates that cuttings taken this time of year would best be treated with 2% IBA and allowed to remain undisturbed in the propagation bench under mist at least three months or more.

Postmergence Control of Grass Weeds in Field Grown Ornamentals

C. H. Gilliam, C. T. Pounders, and T. Whitwell

Nature of Work: The control of broadleaf and grass weeds is a major problem in the production of field grown ornamentals, even though preemergence applied herbicides are usually used. Preemergence applied herbicides often fail to control weeds adequately because of improper timing and rate of application, weather conditions, and volatilization. Currently, nurserymen utilize hand labor to hoe weeds that preemergence applied herbicides do not control.

In 1980, preliminary tests by Auburn University with BASF 9052 (Poast®), a postemergence applied herbicide, showed this material to be safe on a number of ornamentals when applied over the top of the plant. Three postemergent herbicides were compared in 1981 by the Alabama Agricultural Experiment Station for control of grasses and plant phytotoxicity. The three herbicides tested were Poast (BASD Wynadotte Corporation, Parsippany, N.J.); Fusilade (ICI Americas Inc., Goldsboro, N.C.); and RO-8895 (MAAG Agrochemicals, Vero Beach, FL.). Each herbicide was applied at three rates; 0.25, 0.50, and 1.0 lb./A ai on June 15, 1981 and 10 days later. In the first study plants tested included *Juniperus chinensis* 'Nick's Compact', *Ilex crenata* 'Rotundifolia', and *Taxus cuspidata* grown in local nurseries at Crossville, Alabama. The junipers had been in the field 3-4 years and were heavily infested with coastal bermudagrass (*Cynodon dactylon*). 'Rotundifolia' holly liners had been planted in the spring, and were infested with common bermudagrass (*Cynodon dactylon*). Taxus had been grown 2-3 years in the field and was infested with yellow nutsedge (*Cyperus rotundus*). None of the herbicides tested controlled nutsedge. When the first application was applied, the bermudagrass was about the height of the junipers (2'-3'). At the second application date, only a few live sprigs of bermudagrass were observed.

Results and Discussion: All three herbicides resulted in excellent control of bermudagrass (coastal or common) regardless of the application rate,(Table 1),(data not shown for common bermudagrass). With the exception of Poast at the 0.25 lb./A ai rate, all treatments provide greater than 90 percent control through the middle of October. No further evaluations were made after that time.

There were little or no phytotoxicity on plants tested. Phytotoxicity only occurred on the junipers growing in the coastal bermudagrass. The chlorosis that occurred after the herbicide treatments may have been the result of sunscald, since the interior portions of the plant where the chlorosis was most evident had been heavily shaded before the grass died. At the 60-day evaluation most plants no longer exhibited chlorotic symptoms.

A second study evaluated the effectiveness of one application of these three herbicides at the same rates on *Juniperus horizontalis* 'Plumosa' (Andorra juniper) and *J. chinensis* 'Nick's Compact'. Treatments were applied on July 1, 1981 and evaluated 14 and 60 days later for percent grass control and phytotoxicity. There was no phytotoxicity on either of the species tested.

All treatments except RO 13-8895 at the 0.25 lb./A ai rate resulted in 90 percent control of common bermudagrass after 14 days,(Table 2). At 60 days only Fusilade and RO 13-8895 provided 90 percent grass control at the 1.0 lb./A ai rate when one application was made. Additional research is being conducted to determine minimum rates necessary for season-long control, and to further screen these materials for phytotoxicity to woody ornamentals. It appears that a second application applied when the grass is 2-6" tall at the quarter to half pound rate when regrowth occurs may provide adequate season-long control with minimum chemical usage.

Table 1. Effects of 2 applications of post-emergent herbicides on percent control of coastal bermudagrass and phytotoxicity in field grown junipers[z]

Rates lb./A ai	Percent control of bermudagrass								
	Poast			Fusilade			RO 13-8895		
	Days after application			Days after application			Days after application		
	14	30	60	14	30	60	14	30	60
0.0	0	0	0	0	0	0	0	0	0
0.25	96	100	74	100	100	96	100	99	100
0.50	100	100	91	95	98	100	100	100	100
1.00	100	99	100	96	100	100	100	100	100
				Phytotoxicity					
0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
0.25	1.3[y]	1.0	1.0	2.0	2.3	1.0	1.3	1.5	1.0
0.50	2.3	2.0	1.0	3.0	2.3	2.0	2.0	2.3	1.5
1.00	2.3	2.0	1.5	4.3	3.3	2.0	4.3	3.0	1.8

[z]Applications were made at ten day intervals, and evaluations made 14, 30, and 60 days from the second application.

[y]Rating scale used to evaluate phytotoxicity was as follows: 1 = no damage, 2 = slight chlorosis, 3 = chlorosis, 4 = foliar burn, 5 = 25% defoliation.

Table 2. Effects of 1 application of post-emergent herbicides on percent control of bermudagrass in field grown juniper[z]

Rates lb./A ai	Poast		Fusilade		RO 13-8895	
	Days after application		Days after application		Days after application	
	14	60	14	60	14	60
.25	90	53	91	79	68	29
.50	94	74	94	87	93	85
1.00	94	85	98	97	100	93

[z]There was no phytotoxicity on any of the plants.

Fungicide Evaluation for Azalea Petal Blight Control 1981

A. Hagan and C. Gilliam

Nature of Work: Registered and experimental fungicides were evaluated for the control of petal blight caused by *Botrytis cinerea* on 'Hexe' azaleas under greenhouse conditions (Table 1). The plants were potted in a 1:1 peat and Bagasse soil mixture with a pH of 5.3. Approximately two weeks before the fungicides were applied, the azaleas were removed from cold storage and placed in a greenhouse in order to force the plants to flower. Plants were arranged on benches in a randomized complete block of 3 replications with 3 plants per replicate under a polyethylene tent. Fungicides were applied to the foliage to run-off with a Root-Lowell 3 gallon sprayer. Shortly after the fungicides had dried, a suspension of 85,000 *B. cinerea* per ml was applied to the foliage with an ASL air flow pump-up sprayer. The incidence of petal blight and fungicide phytotoxicity was rated after 10 days.

Results and Discussion: Control of azalea petal blight by RP26019 25E and Chipco 26019 50W generally was superior to that provided by the other fungicide treatments (Table 2). However, all fungicides evaluated significantly reduced the incidence of azalea petal blight. Symptoms of phytotoxicity on azalea blossoms ranged from necrotic flecks on Manzate® 200 80W and Benelate® 50W treated blossoms to ringspots and marginal necrosis on Bayleton® 50W, RP26019 25E, Chipco 26019 50W, and Daconil® 75W treated blossoms. Damage to blossoms was heaviest on plants treated with Bayleton 50W and RP26019 25E. No symptoms of phytotoxicity were observed on the leaves. Chipco 26019 50W provided the best combination of petal blight control and low phytotoxicity.

Table 1. Name, source and composition of products evaluated for control of petal blight on 'Hexe' azalea

Product	Source	Composition
Bayleton 50W	Mobay Chemical Corporation Kansas City, Missouri 64120	50% 1-(4-chlorophenoxy)-3 3-dimethyl-1(1-N-1,2, 4-triazol-1-yl)-2-butanone
RP26019 25E	Rhone-Poulenc Chemical Co. St. Joseph, Missouri 64504	25% 3-(3,5-dichlorophenyl) -N-(1-methylethyl)-2,4-dioxo-1-imidazolidine-carboxamide
Chipco 26019 50W	Rhone-Poulenc Chemical Co. St. Joseph, Missouri 64504	3-(3,5 dichlorophenyl)-N-(methylethyl)-2,4-dioxo-1-imidazolidine carboxamide
Benlate 50W	E. E. duPont de Nemours and Co., Wilmington, Delaware 19898	(methyl-1-butyl-carbamoyl -2-benzimidazole
Daconil 2787 75W	Diamond Shamrock Croporation Agricultural Chemicals Division, Cleveland, Ohio 44114	Tetrachloroiso-phthalonitrile
Manzate 200 80W	E. I. duPont de Nemours and Co., Wilmington, Delaware 19898	Maganous ethylene bisdithiocarbamate

Table 2. Disease incidence and phytotoxicity of 'Hexe' azalea flowers treated with various fungicides.

Treatment and rate/100 gal.	Disease incidence % blighted flowers	Phytotoxicity % flowers damaged
Check	31 c[z]	0 a
Chipco 26019 50W 1.0 lb. . . .	11 b	5 abc
Chipco 26019 50W 2.0 lb. . . .	4 ab	7abc
RP26019 25E 1 qt.	4 ab	14 c
RP26019 25E 2qt.	1 a	29 d
Benlate 50W 2.0 lb.	12 b	9 abc
Manzate 200 80W 1.3 lb. . . .	10 b	2 ab
Daconil 2787 75W 2.0 lb. . . .	10 b	11 bc
Bayleton 50W 2.0 lb.	7 ab	28 d

[z]Values followed by the same letter are not statistically different from one another at the 5% level according to Duncan's multiple range test.

Fungicide Evaluation for Botrytis Petal Blight of Geranium 1981

A. Hagen, R. Shumack and C. Gilliam

Nature of Work: Registered and experimental fungicides were evaluated for the control of petal blight caused by *Botrytis cinerea* on 'Springer Scarlett' geraniums under greenhouse conditions (Table 1). The plants were grown in a Vergro soil mix consisting of peat moss, vermiculite, perlite and calcined clay at a pH of 7.0. All flower clusters were removed several weeks before fungicide application to insure nearly uniform and simultaneous flowering on all plants. The geraniums were arranged on benches in a randomized complete block of 3 replications with 4 plants per replicate. Fungicides were applied to the plants to run-off with a Root-Lowell pump-up 3 gallon sprayer. The blossoms on most flower cluster had just begun to open at the time the first fungicide application. All treatments were sprayed a second time 7 days after the first fungicide application. The incidence of petal blight and phytotoxicity was rated 7 days after the second fungicide application.

Results and Discussion: All fungicide treatments significantly reduced the incidence of Botrytis petal blight on geraniums. The level of control provided by Chipco® 26019 50W and RP26019 25E was superior to that of Benlate® 50W. One fungicide, RP26019 25E proved to be moderately phytotoxic to geranium blossoms.

Table 1. Name, source, and composition of products evaluated for control of petal blight of geraniums

Product	Source	Composition
RP26019 25E	Rhone-Poulenc Chemical Co. St. Joseph, Missouri 64504	25% 3-(3,5-dichlorophenyl)-N-(1-methylethyl)-2,4-diozo-1-imidazolidine-carboxamide.
Chipco 26019 50W . . .	Rhone-Poulenc Chemical Co. St. Joseph, Missouri 64504	3-(3,5-dichlorophenyl)-N-(1-methylethyl)-2,4-dioxo-1-imidazolidine-carboxamide
Benlate 50W	E.I. duPont de Nemours and Co., Wilmington, Delaware 19898	(methyl-1-(butylcarbamoy)-2-benzimidazole

Table 2. Disease incidence and phytotoxicity of 'Springer Scarlett' geranium flowers treated with various fungicides

Treatment and rate/110 gal.	Disease Incidence % blighted flowers	Phytotoxicity % flowers damaged
Chipco 26019 50W 1.0 lb.	10.0 c[z]	1.4 d
Chipco 26019 50W 2.0 lb.	11.5 c	3.3 cd
RP26019 25E 1.0 qt.	10.7 c	10.8 b
RP26019 25E 2.0 qt.	8.1 c	22.0 a
Benlate 50W 2.0 lb.	17.4 b	6.2 c
Check -	40.4 a	0 d

[z]Values followed by the same letter are not statistically different from one another at the 5% level according to Duncan's multiple range test.

Effect of Growth Regulators on Clerodendrum thomsonia Balf.

K. C. Sanderson and W. C. Martin, Jr.

Nature of Work: Clerodendrum thomsoniae Balf. plants were tested for their response to 1-allyl-1-(3,7-dimethyloctyl)-piperidinium bromide (piproctanylium bromide), butanedioic acid mono (2,2-dimethylhydrazide0 (daminozide), 2-chloroethylphosphonic acid (ethephon), 2-chloroethyltrimethyl ammonium chloride (chlormequat chloride, CCC), 2,3-dihydro-5,6-diphenyl-1,4-oxathiin (oxathiin, UBI-P293), sodium salt of 2,3:4, 6 bis-0-(1-emthylethylidene) = 0-1-xylo-2-hexulofuranosonic acid (dikegulac), 6-(benzylamino)-9-(tetrahydropyranyl)-9H-purine (PBA), 2,4-dichlorobenzyltributylphosphonium chloride (CBBP), n-undecanol plus isomeric alcohols (TD 6773),α-cyclopropyl-α-(p-methoxyphenyl)-5-primidine methanol (ancymidol), and methyl-2-chloro-9-hydroxyfluorene-9-carboxylate(chloroflurenol.

Results and Discussion: Of the chemicals tested ancymidol drenches, granules, or sprays were the most effective in retarding plant growth without distortion. Chlormequat, chloroflurenol, dikegulac, ethephon, oxathiin, and n-undecanol were less effective in restricting growth. Generally, piproctanylium bromide and CBBP were ineffective in retarding Clerodendrum growth. Ancymidol increased the number of flower stalks per plant, whereas ethephon reduced flower stalk number. Chlorflurenol completely inhibited flower stalk development.

Effect of Fungicides Applied to Polyurethane Propagation Blocks on Rooting of Poinsettia Cuttings

Leland W. Lee, Kenneth C. Sanderson
and John C. Williams

Nature of Work: Work by Peterson (6) has indicated that drenches of fungicides on phenol formaldehyde rooting cubes prior to rooting of poinsettia, *Euphorbia pulcherrima* Willd., caused rooting inhibition. Other workers using different propagation media have found no inhibition of rooting due to the use of fungicidal drenches at the start of propagation (5,6,8). Even stimulation of rooting is found in the literature (2,3,7). Since studies on the effect of fungicides on poinsettia rooting often have been devoid of statistical analysis further work was suggested.

Polyurethane propagation blocks (Choice Rootwell manufactured by Jiffy Pots of America, West Chicago, IL) were employed as a rooting medium. Blocks were dipped into a fungicide suspension for 5 sec and drained. The base of the cuttings were treated with a 0.1% indolebutryic acid (IBA) in talc powder (Hormodin #1) from Merck, Rahway, NJ) and then inserted into the blocks. Cuttings were taken from stock plants of 'Annette Hegg Lady' grown outdoors. They were sprayed with a 1:18 (v/v) dilution of 5.25% sodium hypochlorite in water prior to harvest. Steam pasteurization of benches and disinfestation of tools with 1:9 (v/v) 5.25% sodium hypochlorite and water were employed to assure that experimentation was done under "sterile" conditions. The root cubes were placed on a bench that had hardward cloth covering a gravel bottom and misted for 3 sec each minute from 8:30 a.m. to 5:30 p.m.

Treatments consisted of 599 mg/liter each of fenaminosulf 35 WP, ethazol (5-ethoxy-3-trichloro-methyl-1,2,4-thidiaxole) 30 WP, PCNB 75 WP, benomyl 50 WP and ferbam 76 WP; 75 mg/liter of metalaxyl 25 WP; 37 mg + 300 mg/liter, respectively, of metalaxyl 25 WP + benomyl 50 WP, metalaxyl 25 WP + PCNB 75 WP, metalaxyl 25 WP + ferbam 76 WP; 300 mg + 300 mg/liter, respectively of fenaminosulf 35 WP + PCNB 76 WP, fenaminosulf 35 WP + Benomyl 50 WP, ethazol 30 WP + benomyl 50 WP; and 599 mg + 599 mg/liter of ethazol 30 WP + PCNB 75 WP. A water dip was used as a control. Concentrations of fungicides were selected on the basis of manufacturer's recommendations and preliminary studies.

Cuttings were stuck on Sept 2 and root was measured on Sept 30. Rooting was measured by counting the number of roots that came out of the bottom of each root cube. This method was found to be superior to slicing the root cube to count the roots.

Results and Discussion: The control (no fungicide dip) produce significantly greater root counts than all fungicide treatments. The metalazyl plus ferbam, ferbam and benomyl dips were among the better treatments (Table 1). Treatments containing fenaminosulf produced notably lower root counts.

The observation that all fungicidal dips inhibited rooting agrees with the work of Peterson (6) but not with that of Tayama et al. (8). These differing conclusions could be due to differences in media sterility, fungicide retention in the media, or quantities of fungicide applied. Tayama et al. (8) never mentioned the amount or mode of the fungicide application nor did they report experimental variability encountered so that differences could be evaluated.

Fenaminosulf and PCNB were notable for producing poor rooting in this experiment (Table 1). This disagrees with other results (5,8) but agrees in part with the work of Boodley (1) and Lee (4).

These results indicate that the application of fungicidal suspensions to polyurethane root cubes at the time of cutting propagation is deterimental to poinsettia. Rates used in the present study would provide disease control. Lower reates of fungicide should be investigated for disease control and root inhibition.

Fungicide[z]	Rate (mg/liter or mg + mg/liter)	Roots per rootcube
Control	---	27.05a[y]
Metalaxyl 25WP + Ferbam 76WP	37 + 300	20.45b
Ferbam 76WP	599	18.20bc
Benomyl 50 WP	599	17.42bc
Ethazol 30WP + PCNB 75WP	300 + 300	16.47bc
Ethazol 30WP + PCNB 75WP	300 + 300	16.35c
Ethazol 30WP	599	16.22bc
Ethazol 30WP + Benomyl 50WP	300 + 300	15.94bc
Metalaxyl 25WP + Benomyl 50WP	37 + 300	15.70bc
Metalaxyl 25WP + PCNB 75WP	37 + 300	15.44bcd
Metalaxyl 25WP	75	14.42bcd
PCNB 75WP	599	12.65cd
Fenaminosulf 35WP + Benomyl 50WP	300 + 300	11.06cd
Fenaminosulf 35WP	599	10.19cd
Fenaminosulf 35WP + PCNB 75WP	300 + 300	8.05d

[z]Control treatment consisted of a 5 sec. dip in water. Other treatments consisted of 5 sec. dips in water-fungicide suspension. Commercial names: metalaxyl = Subdue, Ferbam = Fermate, Benomyl = Benlate, Ethazol = Truban, PCNB = Terrachlor and Fenaminosulf = Dexon.

[y]Means in columns followed by the same letter(s) are not significant at 5% according to Duncan's multiple range test.

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Rooting of Poinsettia Cuttings Treated with Various Fungicides in an IBA-Talc Powder

Leland W. Lee, Kenneth C. Sanderson
and John W. Williams

Nature of Work: The poinsettia, *Euphorbia pulcherrima* Willd., is prone to fungal disease infections during propagation (3). Thus, Ecke and Matkin (3) have recommended the addition of a fungicide in the rooting powder.

Fungicides such as benomyl (methyl 1-(butyl-carbomoyl)-2-benyimidazole-carbamate) and ferbam (ferric dimethyldithiocarbamate) can stimulate (16, 19), or inhibit (6,7,11,18) rooting. Fenaminosulf (sodium-p-dimethylamino) benzediazo sulfonate), ethazol (5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole) and PCNB (penta chloronitrobenze) have been implicated in inhibition of rooting (1,11,14.17) although other studies indicate otherwise (8,12,20). Since the effects of fungicides on poinsettia rooting are not well known, the influence of various fungicides and various fungicide concentrations on root initiation and development of poinsettia cuttings was studied.

Cuttings were taken from field grown stock plant of 'Annette Hegg Brillant' and propagated on September 1. Cuttings were stuck in 27 x 54 x 6-cm plastic flats containing coarse perlite. Flats were placed in a shaded greenhouse (21.1 klux or less) with natural ventilation. Treatments consisted of dipping the basal 1.25 cm of the 5 - 7.5 cm cutting in 0.1% IBA, talc, and various percentages of fungicide by weight. Treatments included IBA-talc plus 5, 20, and 67% of fenaminosulf 35 WP, metalaxyl (N-(2,6-dimethylphenyl)-N-methoxacetyl-alamine methyl ester) 25 WP, benomyl 50 WP, ethazol 30 WP, ferbam 76 WP, PCNB 76 WP, and 10% ethazol 30 WP + 10% PCNB 75 WP. The control was 0.1% IBA and talc. There were 2 treatments with 3 replications of 7 cuttings each in a completely randomized block design. Mist, 3 sec per 60 sec, was used from 8:30 a.m. to 5:30 p.m. during propagation. Four weeks after propagation the rooting was evaluated by visual grading (scores) and root dry wt. Visual grading (scoring) of rooting was done on a 7 point scale with 1 = no roots or callus, 2 = callused, 3 = poor rooting, 4 = poor to moderate rooting, 5 = moderate rooting, 6 = moderate to heavy rooting, and 7 = heavy rooting. For root dry weight measurements, medium was removed from the roots prior to severing from the shoots and drying at 75°C. for 24 h.

Results and Discussion:

The control, all 5% fungicide treatments except the funaminosulf treatment, and the 20% metalaxyl treatment produced cuttings with similar rooting scores and root dry weight (Table 1). Rooting scores and root dry weight of all other treatments were significantly reduced compared to the control supporting Synder's (19) observation that higher concentrations of fungicide inhibited rooting. Inhibitory results reported in other research work (6,7) may have been due to excessive amount of fungicide applied. Ferbam was notable for not causing great decreases in rooting even at the 67% concentration. Other researchers have found similar results with ferbam (6,19). Fenaminosulf was noted to cause reduced rooting even at low concentrations. This result agrees with earlier work by Boodley (1) and other work by Lee (13). No stimulation of rooting was observed in the present study. Work by Hare (5) has suggested that even 5% concentrations can produce inhibition that can cancel out any physiological stimulation of rooting produced by the fungicide. Root "stimulation" reported in other studies (16, 19) may have been due to the fungicidal activity of the material and not to any physiological effect of the fungicide on the plant.

It is concluded from the results of the present study that fungicide application as a powder at the time of cutting propagation is not recommended if the medium is initially disease free and later contamination can be prevented. In certain disease situations, low concentrations of fungicide could be incorporated into a poinsettia rooting pwoder providing the causal pathogen and the disease control specificity of the fungicide are recognized. For example, ferbam (9,10,12) would only provide control of Rhizoctonia solani Kuehn. whereas benomyl (15) is effective against Rhizoctonia, Botrytis cineria Kopf. Also, metalaxyl (2), ethazol (21) and fenaminosulf (21) are effective against Phytium spp., however metalaxyl (2) is a more reliable control for Phytophthora parasitica Dast. than ethazol or fenaminosulf (9,10,21). Further research on combinations of these fungicides and others or on a broader spectrum fungicide is needed for complete fungicide protection against pathogens during poinsettia propagation.

Table 1. Rooting indexes and dry weight of poinsettia roots after treatment with fungicide powders prior to rooting.

Fungicide[z]	Commercial name	Rate (%)	Rooting[y] index	Root dry wt. (g)
Control		---	6.28a[x]	1.08a[x]
Benomyl 50WP	Benlate®	5	5.90abc	0.90abc
		20	4.62d-h	0.50d-g
		67	2.95i	0.21g
Ethazol 30WP	Truban®	5	5.38a-f	0.73a-e
		20	4.76c-g	0.60b-f
		67	4.33e-h	0.48d-g
Ethazol 30WP	+ PCNB 75WP	10+10	5.24a-g	0.64b-f
		5	4.75c-g	0.58c-f
		20	5.00b-g	0.64b-f
		67	3.47hi	0.36fg
Ferbam 76WP	Fermate®	5	6.24ab	0.95ab
		20	5.86a-d	0.88abc
		67	5.57a-e	0.77a-e
Metalaxyl 25WP	Subdue®	5	5.63a-e	0.83a-d
		20	5.33a-f	0.69b-f
		67	4.00hi	0.41efg
PCNB 75WP	Terrachlor®	5	5.38a-f	0.73a-e
		20	4.14gh	0.48d-g
		67	4.81c-g	0.63b-f

z Control treatment consisted of 0.1% in a talc base with no fungicide. Other treatments had various percentages of fungicides and 0.1% IBA in a talc base.

y Rooting scores were 1 = no roots or callus, 2 = callused, 3 = poor rooting, 4 = poor to moderate rooting, 5 = moderate rooting, 6 = moderate to heavy rooting and 7 = heavy rooting.

x Means in columns followed by the same letter(s) are not significantly different according to Duncan's multiple range test at 5% level.

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