

FUNGICIDES IN POINSETTIA PROPAGATION

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Recently several fungicides including benomyl (Benlate 50W, E. I. DuPont de Nemours Co., Wilmington, DE), chlorothalonil (Daconil 2787 40.4F, ISK-Biotech Corp., Mentor, OH), flutolanil (SN 84364 50W; an experimental fungicide from Nor-Am Chemical Co., Wilmington, DE--not yet available/labeled for poinsettias), iprodione (Chipco 26019 50W, Rhone-Poulenc Ag. Co., Research Triangle Park, NC) and metalaxyl + benomyl (Varsity 42W; an experimental product that is equivalent to a Benlate + Subdue mixture from Ciba-Geigy Agricultural Division, Greensboro, NC) were found to be effective in control of *Rhizoctonia* stem rot of poinsettia caused by *Rhizoctonia solani* Kuhn (Benson, 1990). Both foliar sprays and rooting cube soaks of poinsettias in rooting cubes (Oasis Rootcubes, Smithers-Oasis USA, Kent, OH) were efficacious and prevented

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colonization of rooting cubes by *R. solani*. Rooting cube soaks used less fungicide than sprays and application of soaks resulted in less worker and environmental exposure to the fungicides.

Poinsettia propagators are reluctant to use fungicides in propagation because previous research with fungicides including Benlate showed delayed or suppressed root development in poinsettia (Boodley, 1968; Lee et al., 1983; Peterson, 1981). However, the endemic nature of *Rhizoctonia* stem rot and the potential for significant plant losses in poinsettia suggests a need for fungicides in the pest management strategy for this crop. The research presented in this article was initiated to evaluate the effects of fungicides efficacious for control of *Rhizoctonia* stem rot on rooting of poinsettias in propagation and subsequent growth after potting. In these experiments plants were not inoculated with *Rhizoctonia*, so that the effects of the fungicides on rooting could be assessed independent of their effects on disease control.

Materials and Methods

Rooting cubes (Oasis Rootcubes) were either soaked in water or in a fungicide suspension to saturation. A dry five-cube strip of rooting cubes was allowed to absorb 200 ml of water that contained 24 ml of fungicide suspension made up to the rate given below. 'Gutbier V-14 Glory' cuttings taken from stock plants were then stuck. Fungicides tested and rate of product used were benomyl, (Benlate 50W, 1.2 g/liter), chlorothalonil, (Daconil 2787 40.4F, 1.8 ml/liter), flutolanil, (SN 84364 50 W, 1.2 g/liter), iprodione, (Chipco 26019 50W, 1.2 g/liter), metalaxyl (Subdue 2E, 0.33 ml/liter), and metalaxyl + benomyl (Subdue 2W + Benlate 40W, Varsity 42W, 1.2 g/liter). The rates used were based on label recommendations for application, when available. Fungicides were also applied as foliar sprays after poinsettia cuttings were stuck in the rooting cubes. Poinsettia cuttings were sprayed to run-off (about 60 ml fungicide suspension per five cube strip) with the test fungicide and allowed to dry before strips of cuttings were placed on a

mist bench. Cuttings were misted for 2 minutes every hour from 7 AM to 7 PM initially, then 2 minutes every 3 hours daily thereafter. Daily temperatures during the propagation experiment averaged 71°F; average maximum was 73°, and average minimum was 67°F. The experiment was repeated twice with similar results.

After 14, 21, and 28 days, two replications of each treatment were chosen randomly and rated for rooting and root number. Root rating as an estimate of root elongation was based on a 1 to 7 scale where 1 = no callose formed on cutting, 2 = callose formation, 3 = callose and root initials present, 4 = roots beyond 1 mm in length, 5 = roots through one side of rooting cube, 6 = roots through two sides of rooting cube, and 7 = roots through three sides of rooting cube. Root number was also determined at each sampling date for roots greater than 1 mm in length. Root number represented the effect of fungicides on root initiation. On day 28, two extra replications of each treatment (total 10 cuttings) were transplanted individually to 4-inch-diameter pots containing Metro-Mix 260 (WR Grace, Cambridge, MA) and grown for 8 weeks without pinching. Plants were fertilized weekly with 200 ppm N using 21-7-7. Plant height was measured at 30 and 58 days.

Results and Discussion

No significant difference was found between foliar spray and rooting cube soak application methods of fungicides for root rating or root number on poinsettia cuttings at any sampling date. Therefore, it seems that either method of application would be effective in control of *Rhizoctonia* stem rot.

Differences in root rating and root number among treatments after 14 days of rooting under mist were small. After 21 days of rooting, differences in treatments with flutolanil were not apparent, but root rating for cuttings in cubes soaked with Subdue were significantly higher than for similar cuttings sprayed with Subdue. However, cuttings in cubes soaked with Subdue were not different than those in untreated cubes.

In this experiment, Subdue was used as comparison to the Subdue + Benlate combination product, Varsity 42W. Subdue by itself would not be expected to control *Rhizoctonia* stem rot, but should be effective against *Pythium* root rot. No significant differences were found in root number among treatments at 21 days.

except at the insertion point in the cube and thus, little uptake of fungicide would be expected until rooting occurred. In contrast, cuttings would be expected to take up a much larger amount of fungicide when sprays were applied directly to cuttings.

After rooted cuttings were transplanted and

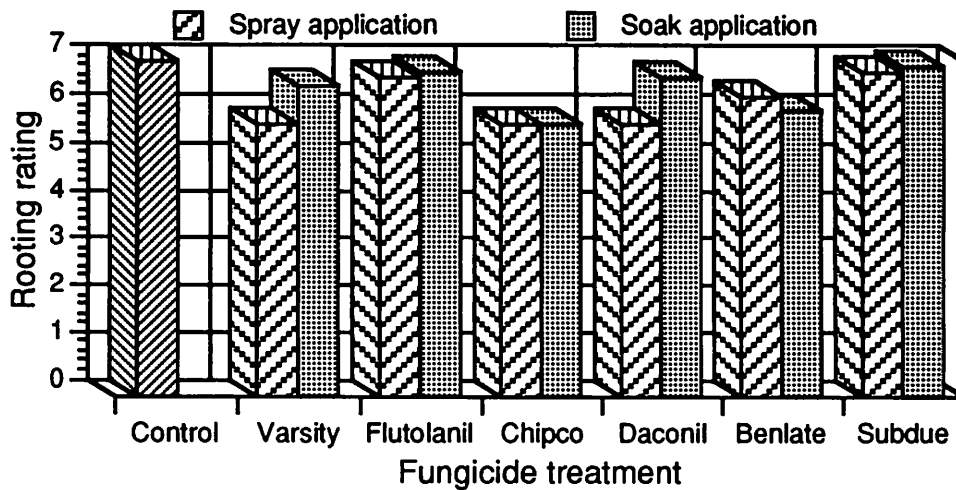


Figure 1. Root rating on day 28 (1 = no callose to 7 = roots through three sides of rooting cube).

grown for 30 days, those treated with sprays of Benlate, Chipco 26019, and Subdue, and with soaks of Daconil were not as tall ($P = 0.05$) as the untreated controls (Table 1). However, at 58 days after transplanting only poinsettias from the Chipco 26019 spray treatment were significantly shorter ($P = 0.05$) than the

After 28 days, there were no differences in root rating among treatments (Figure 1). Root number for cuttings in cubes treated with soaks of Chipco 26019 and Benlate and for cuttings sprayed with Chipco, Daconil 2787, and Benlate was significantly less than for the untreated control ($P = 0.05$; significance indicated by the stars on Figure 2). The greater inhibition of root number for cuttings in fungicide spray treatments compared to those in soak treatments, in general, may be due to the actual amount of uptake of the fungicide by the cutting. In the rooting cube soak the fungicide did not contact the cutting

control plants (Table 1).

Several of the fungicide treatments used in this experiment including the flutolanil, Subdue, and Subdue + Benlate treatments caused no inhibition in root rating or root number when poinsettias were sprayed or rooting cubes were soaked in these fungicides at sticking. Soaks of

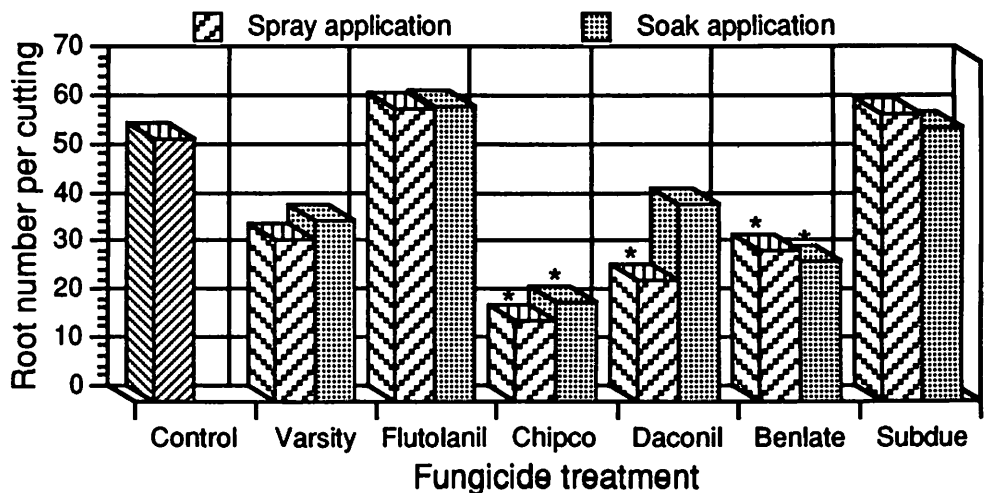


Figure 2. Root number per cutting on day 28. Treatments with a star had significantly fewer roots than the untreated controls.

Table 1. Effect of several fungicides applied as a foliar spray or as a rooting cube soak to poinsettia cuttings 'V-14 Glory' on subsequent plant height 30 and 58 days after transplanting rooted cuttings.

Treatment	Plant height (inches)			
	30 days		58 days	
	Spray	Soak	Spray	Soak
Benlate	4.8 bc	5.2 abc	9.1 abc	8.9 abc
Daconil 2787	5.2 abc	4.8 bc	8.9 abc	8.2 cd
flutolanil	5.7 a	5.8 a	9.3 abc	9.4 ab
Chipco 26019	4.6 c	5.7 a	7.6 d	9.3 abc
Subdue	4.9 bc	5.6 a	8.5 bcd	9.4 ab
Varsity 42W	5.3 ab	5.6 a	8.9 abc	10.0 a
Untreated control	5.7 a		9.1 abc	

Plant heights within a sample date followed by the same letter are not significantly different according to the Waller-Duncan k ratio: $k = 100$, $P = 0.05$. See text for fungicide rates used.

Benlate and Chipco 26019, and sprays of Benlate, Daconil, and Chipco 26019 suppressed the number of roots formed (when compared to controls), but these treatments did not affect the overall root rating. Apparently, root initiation is affected to a greater extent by these fungicides than subsequent root elongation. All inhibitory effects as measured by root rating or root number were overcome by 58 days after transplanting except for poinsettia cuttings sprayed with Chipco 26019. These results suggest that most of the fungicides tested would be safe in propagation of poinsettias when *Rhizoctonia* stem rot threatens the crop.

Significance to the Industry

Several fungicides proved safe in both soak and spray application to 'V-14 Glory' cuttings as rooting and root number were not affected compared to controls. In propagation areas that have had a history of problems with *Rhizoctonia*

stem rot of poinsettia, growers should consider the use of fungicide soaks at sticking. This mode of application used less fungicide per unit treated and avoids the problem of fungicide drift to non-target areas as well as reduces exposure assuming that the styrofoam jackets are used around the cube after treating. Initially, growers should test labelled fungicides, such as Daconil 2787 on only a small percentage of their cuttings

and cultivars to be sure of their safety under local conditions.

Literature Cited

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