New Application Methods for Growth Retardants to Media for Production of *Clerodendrum*

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Southern bleeding heart (*Clerodendrum thomsoniae* Balf.) is a potted florist crop requiring growth regulators for the production of an acceptable product (Hildrum, 1972). Foliar sprays and media drenches are used on this crop, depending on the growth retardant used, timing, cost, and phytotoxicity. Generally, media-applied retardants are more effective than sprays, but are more labor- and time-consuming to apply (Cathey, 1975) and their effectiveness can be greatly reduced when the medium contains pine bark (Larson and Kimmins, 1972). Murray (1982) found that drenches, the conventional method, resulted in concentration of much of the retardant in the upper few centimeters of the medium or in loss through drainage. Various attempts to improve the efficiency of media-applied retardants have been made (Wilfret et al., 1978; Read et al., 1974; Witte and Tjia, 1976; Einert, 1976; Holcomb and White, 1978; Sanderson et al., 1984). Based on the effectiveness of ancymidol, chlormequat, flurprimidol, and paclobutrazol as growth retardants on Southern bleeding heart in preliminary tests, we compared their relative effectiveness when applied to the medium as a drench, injected gel, or tablet.

Rooted cuttings of Southern bleeding heart were transplanted on 15 Nov. 1985 into 1.5-liter pots containing a 1 soil : 1 sphagnum peat : 1 perlite (by volume) medium amended with 3.0 kg dolomitic limestone and 1.2 kg superphosphate/m³. Plants were fertilized each week with a fertilizer solution containing 2 g of 20.0N-8.8P-16.6K per liter. Plants were grown in a greenhouse at a night minimum of 17°C and daily radiation of ≈ 990 to 1500 $\mu\text{mol}\cdot\text{s}^{-1}\cdot\text{m}^{-2}$ (PAR). On 17 Dec., the plants were pinched (1.25 to 2.5 cm of plant apex removed). A single pot containing two plants served as an experimental unit in a 4

$\times 3$ factorial arrangement in a randomized complete-block design with four replications. Treatments applied on 10 Jan. 1986 consisted of ancymidol, flurprimidol, and paclobutrazol drenches, gels, and tablets at 0.5 mg a.i./pot plus a control (no treatment). Chlormequat drenches and gels were applied at the rate of 360 mg a.i./pot. For drenches, 120 ml of solution was applied per pot to the medium surface. A 5 $\times$ 2.5-cm hole was punched into the center of the medium to facilitate insertion of gels and tablets. Gels were made by mixing the retardant concentrate and water with a hydrogel (Viterra Planta-gel, potassium propenoate-propenamide copolymers, Nepera Chemical Co., Harriman, N.Y.). A large hypodermic syringe was used to inject the gel into the pre-punched hole. Tablets were cast from mixtures of water, retardant, and plaster of paris using a mini ice cube tray to produce a tapered 2.5-cm² tablet. Data taken at flowering, 20 Feb. to 17 Mar., included height of the plants in the pot and number of racemes per pot (two plants).

No phytotoxicity was noted on any of the Southern bleeding heart plants from any of the treatments. Generally, drenches, gels, and tablets were equally effective in reducing final plant height. Ancymidol drenches produced the shortest plants, confirming previous research on ancymidol's effectiveness on *Clerodendrum* (Sanderson and Martin, 1976); however, all methods used for ancymidol, flurprimidol, and paclobutrazol similarly retarded Southern bleeding heart plant height (Table 1). Chlormequat was least effective,

but much higher rates have been suggested for it on *Clerodendrum* (Hildrum, 1972). Plants receiving flurprimidol and paclobutrazol drenches, ancymidol gels, and flurprimidol tablets had fewer racemes than control plants (Table 1), even though ancymidol drenches have been reported to increase raceme number (Sanderson and Martin, 1976). Chlormequat had little effect on raceme number.

This experiment introduces gels as a method for applying growth retardants to media. In all cases, gels and tablets were as effective as the conventional drench method; however, both are more convenient and accurate than a drench.

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Table 1. Height and number of racemes of Southern bleeding heart plants receiving various growth retardants applied as drenches, gels, or tablets.^a

Form	Retardant				Mean
	Ancymidol	Chlormequat	Flurprimidol	Paclobutrazol	
<i>Height (cm)</i>					
Drench	12.8 a	34.8 a	15.0 a	16.7 a	20.4 a
Gel	13.5 a	22.2 b	16.5 a	15.8 a	17.5 a
Tablet	19.2 a	---	17.3 a	17.7 a	18.2 a
Mean ^y	15.5 b	28.5 a	16.3 b	16.6 b	---
Control mean 36.3	Dunnett d = 12.6				
<i>No. racemes</i>					
Drench	17.0 a	23.5 a	7.3 a	4.7 c	14.1 a
Gel	14.0 a	20.5 a	15.5 a	28.0 a	20.3 a
Tablet	20.2 a	---	11.3 a	16.7 b	16.5 a
Mean ^y	17.7 ab	22.0 a	11.8 b	17.6 ab	---
Control mean 25.0	Dunnett d = 10.2				

^aMeans for growth parameter in columns with same letter are not different ($\alpha = 0.05$).

^bMeans for growth parameter in rows with same letter are not different ($\alpha = 0.05$).

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