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Method of Application Affects Response of Hollyhock to Paclobutrazol

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Our objective was to determine the efficacy of a given dosage of β-[(4-chlorophenyl)methyl]-α-(1,1-dimethylethyl)-1*H*-1,2,4-triazole-1-ethanol [paclobutrazol (paclo)] applied using differing volumes and application methods [i.e., compressed air, air-assisted electrostatic spraying (Law et al., 1992), fog spray, drench, and a spike] on hollyhock (*Alcea rosea* L.).

'Powderpuff Mix' hollyhock plants, established in 580-cm^3 pots from plugs, were purchased on 14 Sept. 1993. Paclo (Bonzi, Uniroyal Chem. Co., Middlebury, Conn.) was applied to actively growing plant material on 24 Sept. 1993. At the time of treatment, plants were in a rosette form with five leaves and a maximum height of ≈15 cm (measured from pot rim). Greenhouse air averaged 26C day/17C night with a mean photosynthetic photon flux of 14.1 mol·m^{-2}·day^{-1}. Plants were watered overhead as necessary to prevent visible stress and were fertilized weekly with 200 mg N/liter using 20N–4.4P–16.6K (Peter's General Purpose 20–10–20; Grace-Sierra, Cambridge, Mass.).

Treatments were designed to apply an active ingredient dose equivalent to a 50-mg·liter^{-1} paclo spray at the label-recommended volume of 210 ml·m^{-2}. Medium surfaces were not covered. Treatments resulted in 10 mg paclo/m^2 or ≈0.10 mg/pot, except the spike, which provided ≈0.125 mg/pot. Application methods included spray applications with a hand-held compressed-air sprayer (210 ml·m^{-2}; Gilmour 201P at 30 psi, Gilmour, Somerset, Pa.), a hand-held electrostatic sprayer (23 ml·m^{-2}; model EPS-5; Electrostatic Spraying Systems, Watkinsville, Ga.), or a fixed-position fog sprayer (10 ml·m^{-2}; LVM-400 sprayer; Ball Seed Co., East Chicago, Ill.); a drench of 50 ml/pot of a 2-mg paclo/liter solution; and a paclo spike (Barrett et al., 1994). Each spike (0.25 mg paclo) was cut into four equal lengths, and two pieces were placed 2 cm below the medium surface on opposite sides of the plant.

Although treatments were applied at 1600 to 1900 HR, air was still ≈31C with ≈50% relative humidity. The fog treatment was applied in the evening with cooling fans turned off. Paclo solution was distributed (with horizontal flow fans) over 30 min to deliver ≈10 mg paclo/m^2 of greenhouse floor space. The greenhouse was vented 8 h after the treatment.

After treatment, plants were arranged in a randomized complete-block design with two plants per experimental unit and five replications. At time of treatment, the most recent fully expanded leaf on each plant was marked with a black dot. Plant elongation was defined as height of new growth measured from the pot rim to the top of leaves developed since treatment. At 2, 4, and 6 weeks after treatment (WAT), plant height and total number of hollyhock leaves were measured. Data were subjected to the general linear model procedure of SAS (SAS Institute, Cary, N.C.), and mean separation was by protected least significant difference at $P \leq 0.05$.

Hollyhock was responsive to paclo with some significant reductions in height at 2 WAT (Table 1). At 4 WAT, nontreated plants apparently reached maximum height. At 6 WAT, the compressed-air spray resulted in a 36% reduction in plant height. However, plants treated with the compressed-air sprayer had nearly twice as many leaves as the controls. The electrostatic and fog sprays did not significantly reduce plant elongation or increase number of leaves formed. At 6 WAT, drench and spike treatments resulted in 40% and 54% reductions in plant height, respectively. The higher dose in the spike presumably accounts for the greater reduction in plant height. At 6 WAT, both treatments also increased the number of leaves. Signs of phytotoxicity (leaf burn or excessive stunting) were absent. All the treated plants were darker green than the controls, and the shorter ones were attractive.

Paclo applied to marigold (*Tagetes erecta* L.) plants with an electrostatic sprayer reduced height 20% vs. 11% using a compressed-air sprayer (Gilbertz and Oetting, 1993). Our study suggests that electrostatic and fog sprays are not always efficacious for paclo application. Both these methods result in applying small droplets. The growth habit of hollyhock may have presented insufficient absorption sites for paclo absorption under the low-volume applications. However, all spray applications deposited the same amount of paclo per square meter of floor space. At a given (*E*)-1-(*p*-chlorophenyl)-4,4-dimethyl-2-(1,2,4-triazol-1-yl)-1-penten-3-ol (uniconazole) dose, spray volumes from 102 to 408 ml·m^{-2} had no differential effects on chrysanthemum [*Dendranthema ×grandiflorum* (Ramat.) Kitamura] height (Bailey, 1989). The effect of volume may be related to how much chemical penetrates the canopy of the plants and lands on the soil surface. The paclo landing on the medium surface may have been bound to medium particles near the surface and, therefore, not leached into the root zone during watering.

Drench and spike applications were equally effective in height control with other floricultural crops (Barrett et al., 1994). We cannot recommend the alternative methods for reduced-volume paclo application. These data confirm the comparable response of hollyhock to comparable dosages of paclo applied by the compressed-air sprayer (recommended volume), drench, or spikes.

Literature Cited

Bailey, D.A. 1989. Uniconazole efficacy on chrysanthemum and poinsettia is not affected by spray carrier volume. HortScience 24:964–966.

Barrett, J.E., C.A. Bartuska, and T.A. Nell. 1994. Comparison of paclobutrazol drench and spike applications for height control of potted floriculture crops. HortScience 29:180–182.

Gilbertz, D.A. and R.D. Oetting. 1993. Comparison of technologies for growth regulator application to annuals. HortScience 28:547. (Abstr.)

Law, S.E., S.C. Cooper, and R.D. Oetting. 1992. Advances in air-assisted electrostatic crop spraying of conductive pesticides. Proc. Amer. Soc. Agr. Eng. Paper 92-1062, Charlotte, N.C.

Table 1. Effect of paclobutrazol (paclo) on plant height and number of leaves developed on hollyhock at 2, 4, or 6 weeks after treatment. All application techniques were designed to deliver 0.10 mg paclo/10-cm pot, except the spike, which applied 0.125 mg/pot.

	Weeks after treatment					
	2		4		6	
Application method	Plant ht (cm)	No. leaves	Plant ht (cm)	No. leaves	Plant ht (cm)	No. leaves
Nontreated	4.6 a[z]	8.5 a	21.8 a	17.6 c	20.2 a	15.2 b
Compressed air	3.4 bc	8.3 a	10.0 c	22.3 a	13.0 b	29.0 a
Electrostatic	4.4 ab	9.1 a	19.8 a	18.1 bc	21.1 a	19.9 b
Fog spray	4.4 ab	9.0 a	16.4 b	17.9 c	18.7 a	17.6 b
Drench	3.4 bc	7.3 a	8.8 c	20.0 a–c	12.0 bc	27.1 a
Spike	3.1 c	10.2 a	7.6 c	21.3 ab	9.2 c	30.5 a

[z]Mean separation by protected least significant difference at $P \leq 0.05$.

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