Growth and Flowering Response of Butterfly-bush to Paclobutrazol Formulation and Rate of Application

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Vigorous shoot growth and poor root development are problems associated with container production of butterfly-bush (*Buddleia davidii* Franch. 'Dubonnet'), necessitating multiple prunings during production to produce a marketable plant.

Paclobutrazol [β -[4-chlorophenyl)methyl]- α -(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol] is known to retard growth of woody landscape plants (Keever et al., 1990) and enhance flowering (Bailey et al., 1986; Keever et al., 1990; Wilkinson and Richards, 1991). The purpose of this investigation was to study the effect of paclobutrazol formulation and rate of application on the growth and flowering response of butterfly-bush.

Seventy-two plants were grown in 2.8-biter pots and pruned to a height of 17 cm on

26 June 1991. The potting medium consisted of 4 pine bark : 1 sand (v/v). Liquid fertilizer (10N-1.5P-8.5K) was applied with each irrigation at 100 mg N/liter. Plants were grown in full sun and irrigated as needed at 20 mm/irrigation using overhead sprinklers.

Paclobutrazol [(0, 5, 10, 20, or 40 mg a.i./pot) ICI Americas, Richmond, Calif.] was applied to the surface of the container medium as a granular formulation (2.5% RG) or as a single 100-ml liquid drench (Clipper 2 SC) on 28 June 1991. The experiment was terminated 12 Aug. 1991, because control plants required further pruning to remain marketable. Measurements at the termination of the study included growth index [(height + width1 + width2)/3], height, root dry weight, shoot dry weight, panicle count, panicles with open florets, and panicle length. The design was completely randomized, with eight replicate plants per treatment. Data were evaluated by analysis of variance and regression analysis where appropriate (SAS Institute, Gary, N.C.).

Paclobutrazol formulation influenced all plant characteristics recorded; rate of application influenced all but the number of panicles, but the interaction was significant only for root dry weight (Table 1). Growth index was reduced 50% by granular paclobutrazol at 10 mg a.i./pot; as a liquid drench, 20 mg a.i./pot was required to achieve an equivalent reduction.

Granular and liquid paclobutrazol reduced

shoot dry weight proportional to the rate of application (Table 1). Root dry weight was reduced to the greatest degree at 20 mg a.i./pot for both formulations. The greater response of shoot vs. root dry weight translated into higher root : shoot ratios among paclobutrazol-treated plants. Total plant biomass (averaged across rate) was reduced $\approx$ 40% and 33%, respectively, for the granular and liquid formulations of paclobutrazol compared to the control.

Granular paclobutrazol reduced the panicle count per plant, while the liquid formulation had no effect (Table 1). Panicle length (averaged across rate) was reduced more by the granular formulation (66%) than by the liquid formulation (40%) when compared with the control. Formulation and rate of application had no effect on the number of panicles with open florets (data not presented).

Growth suppression on other woody landscape plants was greater when paclobutrazol was applied as a drench than as a foliar spray (Keever et al., 1990). In this study, granular paclobutrazol reduced growth and flowering to a greater degree than liquid drenches. Granular paclobutrazol at rates >5 mg a.i./pot produced butterfly-bush plants too small to be marketable. A 10-mg a.i./pot drench of liquid paclobutrazol produced a quality, marketable plant. At this rate, liquid paclobutrazol reduced the growth index and plant biomass by $\approx$ 33%. Thus, appropriate application of paclobutrazol could be used successfully to control the growth of butterfly-bush.

Literature Cited

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Table 1. Influence of paclobutrazol formulation (granular or liquid) and rate of application on growth and flowering characteristics of butterfly-bush.

Formulation	Rate (mg a.i./pot)	Growth index ^a	Root dry wt (g)	Shoot dry wt (g)	Root : shoot ratio ^b	Plant biomass ^c	No. panicles	Panicle length (cm)
Control	0	68.6	25.4	42.9	0.6	68.3	42	18.9
Granular	5	51.6	22.7	31.9	0.7	54.6	38	14.2
	10	34.4	20.4	20.9	1.0	41.3	32	9.6
	20	24.9	17.9	14.8	1.2	32.7	39	5.6
	40	22.6	20.6	15.4	1.3	36.0	33	4.3
Liquid	5	51.4	26.8	29.1	0.9	55.8	43	14.4
	10	44.8	21.1	24.8	0.9	45.9	45	12.8
	20	35.0	17.4	19.7	0.9	37.1	42	10.4
	40	30.5	25.7	18.6	1.5	44.2	40	7.4
Significance								
Formulation		**	*	**	**	**	**	**
Rate								
Linear		**	*	**	**	**	NS	**
Quadratic		**	*	**	NS	*	NS	**
Form. $\times$ rate		NS	*	NS	NS	NS	NS	NS

^aGrowth index = [(height + width1 + width2)/3].

^bRoot : shoot ratio = (root dry weight/shoot dry weight).

^cPlant biomass = (root dry weight + shoot dry weight).

**, *, NS Significant (eight replications) at $P \leq 0.01$ or 0.05, or not significant at $P > 0.05$, respectively.