Production of *Fuchsia* and *Tibouchina* Standards Using Paclobutrazol or Chlormequat

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Abstract. Paclobutrazol treatments of 0, 0.125, 0.250, and 0.500 mg/plant improved the form of *Tibouchina urvilleana* (DC.) standards and eliminated the need for pruning during the display season. Paclobutrazol did not improve the form of *Fuchsia* x *hybrida* Hort. ex Vilm. Paclobutrazol inhibited trunk caliper development in both species. Paclobutrazol at 0.125 mg/plant slightly increased *Tibouchina* flower size. Chlormequat at 0, 1000, or 2000 mg/plant did not hasten flowering of *Tibouchina*. Chemical names used: β -[4-(4-chlorophenyl) methyl]- α -(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol (paclobutrazol); α -chloro-N,N,N-trimethylethanammonium chloride (chlormequat).

The ornamental value of plants grown as standards depends on their having a strong, straight trunk and a dense crown. Prolific, early flowering is also desirable. Normally, the standard form is achieved by pruning, although it is often unsightly during the display season and is labor-intensive and delays flowering. The use of growth regulators has improved the quality of some container-grown ornamental (Hentig, 1985; Wainwright and Irwin, 1987).

Paclobutrazol suppresses vegetative growth of *Tibouchina* (Roberts and Eaton, 1988; Shanks, 1980) and *Fuchsia* (Shanks, 1980). It can either delay (Goulston and Shearing, 1985; Wainwright and Irwin, 1987) or hasten (Goulston and Shearing, 1985; Roberts and Eaton, 1988) flowering. Paclobutrazol can reduce flower size (McDaniel, 1986), increase the number of flowers (Shanks, 1980; Wilkinson and Richards, 1987) or inflorescences (Kristensen and Adriansen, 1988), and decrease that of panicles per plant (Roberts and Eaton, 1988). Chlormequat also retards vegetative growth of *Tibouchina* (Roberts and Eaton, 1988) and stimulates production of lateral shoots in some ornamental plants (Hamza and Helaly, 1983). Chlormequat was previously shown to accelerate flowering (Armitage, 1986; Roberts and Eaton, 1988). The present experiment attempted to hasten production and to improve the form and flowering characteristics of *Fuchsia* and *Tibouchina* standards by use of paclobutrazol or chlormequat.

Fuchsia and *Tibouchina* were propagated from 15-cm tip cuttings under mist and pot-

ted in 3.2-liter containers on 11 May 1987. The potting medium (pH 6.6) was sterilized sandy loam containing 10% peatmoss by volume. Osmocote (14N-6.2P-11.6K) was added at 20 g/pot. A 20N-8.7P-16.6K water-soluble fertilizer (W.R. Grace & Co., Fongelsville, Pa.) was applied at the rate of 2.4 g-liter⁻¹ every second week during routine watering. The temperature range in the greenhouse was from 20 to 30C.

In the first year, plants were staked and trained to a single leader and sorted by size into seven randomized complete blocks of *Fuchsia* and 12 blocks of *Tibouchina*. In each species, there were four treatments per block. At the time of treatment, *Fuchsia* were 46 to 68 cm high and *Tibouchina* 37 to 93 cm. The height of each plant was marked and laterals arising below the mark were removed. Subsequent growth formed the crown. Paclobutrazol was applied on 13 May as an aqueous soil drench at rates of 0, 0.125, 0.250, or 0.500 mg a.i. in 200 ml of water per pot. Plant height was recorded every other week from 19 May through 6 Aug. The number of *Fuchsia* flowers per plant and their average weight and petal length were recorded and removed weekly from 4 June to 6 Aug. Petal length and days to anthesis were recorded for the first *Tibouchina* flowers, and the panicles on each plant were counted 11 Aug.

Plants were repotted into 7.3-liter containers on 31 Aug., and each crown was pruned to a 15-cm radius. A second soil drench of paclobutrazol was applied at the same rates as before. Plants were harvested 3 Nov., and trunk caliper was measured 2.5 cm above the soil. In *Fuchsia*, the number of primary and secondary branches and the total length of primary growth were recorded. In *Tibouchina*, the number of secondary and tertiary branches and the total length of secondary growth were recorded. Crown density was computed in *Tibouchina* as the number of tertiary laterals per meter of secondary branch and in *Fuchsia* as the number of secondary laterals per meter of primary branch.

In the second year, the untreated *Tibouchina* standards from the previous experiment had attained trunk heights of 50 to 93 cm and were repotted into 19.5-liter containers on 29 Feb. 1988. The plants were sorted by size into seven new randomized complete blocks with three treatments per block. The crowns were pruned to a 20- to 25-cm radius on 17 Mar. We refer to the secondary new growth, which arose on these crowns after pruning, as branches and the further tertiary shoots as laterals. Treatments of 0, 1000, or 2000 mg a.i. chlormequat in 360 ml of water per plant were applied as a soil drench on 22 Mar. Data recorded in mid-July included height, caliper 5 cm above the soil, petal length, total length and number of branches, the total number of laterals, and the number of days from treatment to anthesis.

Application of paclobutrazol retarded growth of both *Tibouchina* and *Fuchsia* (Table 1). A significant linear effect ($P = 0.01$) was first detected 5 weeks after treatment in both species. Paclobutrazol application increased crown density of *Tibouchina*, but not that of *Fuchsia* (Table 2). Caliper affects both appearance and strength of a standard and is a criterion of marketability. Paclobutrazol reduced caliper of both species (Table 2), resulting in an undesirable lengthening of the production period. Treatment should be delayed until the caliper is satisfactory. Chlormequat retarded growth of *Tibouchina* standards and increased crown density, but had no significant effect on caliper or number of laterals (Table 3).

Unlike in a previous study (Roberts and Eaton, 1988), the number of days between treatment and flowering was not affected by paclobutrazol or chlormequat in *Tibouchina*

Table 1. Effect of one soil drench application (13 May 1987) of paclobutrazol on height of *Tibouchina* and *Fuchsia* standards.

Paclobutrazol (mg/pot)	Weeks after treatment			
	5		11	
	<i>Tibouchina</i>	<i>Fuchsia</i>	<i>Tibouchina</i>	<i>Fuchsia</i>
	Height (cm)			
0.000	79	90	87	105
0.125	79	92	83	104
0.250	75	89	76	95
0.500	72	79	73	83
Significance ^a	L	L	L	L

^aL, linear term significant at $P = 0.01$.

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Table 2. Effect of two soil drench applications (13 May, 31 Aug. 1987) of paclobutrazol on crown density, leader caliper, and flower size of *Tibouchina* and *Fuchsia* standards.

Paclobutrazol (mg/pot)	Branch length (cm)		No. laterals		Crown density ^y		Leader caliper (cm)		Length (mm)	
	T2 ^z	F1 ^z	T3	F2	T	F	T	F	Petal	Sepal
									T	F
0.000	20	12	36	22	11	28	1.03	0.97	41	38
0.125	19	12	33	29	12	28	0.93	1.06	49	38
0.250	16	11	47	20	20	27	1.00	0.90	43	37
0.500	11	11	31	14	34	17	0.89	0.86	43	36
Significance ^x	L	NS	NS	L	L	NS	L	L	Q	NS

^zT = *Tibouchina*, F = *Fuchsia*; 1, 2, 3 = primary, secondary, and tertiary branches, respectively.

^y*Tibouchina*: number of tertiary laterals per meter of secondary branch; *Fuchsia*: number of secondary laterals per meter of primary branch.

^xNS, not significant; L, linear term significant at $P = 0.01$; Q, quadratic term significant at $P = 0.05$.

Table 3. Effect of one soil drench application (22 Mar. 1988) of chlormequat on *Tibouchina* height, branch length, number of laterals, crown density, and stem caliper.

Chlormequat (mg/pot)	Plant ht (cm)	Branch length (cm)	No. laterals	Crown density ^z	Caliper (cm)
0	139	66	8.3	0.13	1.79
1000	124	53	9.5	0.19	1.75
2000	119	43	8.1	0.23	1.74
Significance ^x	*	**	NS	*	NS

^zNumber of tertiary laterals per meter of secondary branch.

NS,*,**Linear term not significant at $P = 0.05$ or significant at $P = 0.05$ or 0.01 , respectively.

or by paclobutrazol in *Fuchsia*. Paclobutrazol did not affect the weight, number, or sepal size of *Fuchsia* flowers. The number of panicles in *Tibouchina* was not affected, although petals were longer at 0.125 mg/pot than at higher rates or in the controls (Table 2).

The ability to produce *Tibouchina* standards with well-shaped crowns through the use of growth regulators may be appealing to parks and conservatories. There was less

promise for the treatment of *Fuchsia*.

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