Controlling Hybrid Lily Plant Height With Ancymidol and XE-1019

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ABSTRACT

Plants of Lilium speciosum hybrids '101' and '298' received one 125 ml soil drench containing 1-3) 0, 0.125, or 0.25 mg a.i. ancymidol per pot; or 4-6) 0.05, 0.10, or 0.15 mg a.i. XE-1019 per pot. Ancymidol treatments were less effective in controlling plant height (11%and 16%reduction of control plant height) than were XE-1019 treatments (18%,26%, and 34%reduction of control plant height). Treatments did not affect days from planting to visible bud; days from planting to anthesis of the first flower per inflorescence; the total number of flowers per inflorescence reaching anthesis; or the number of aborting buds per inflorescence. The treatments investigated allowed for rapid production of plants having a commercially acceptable height without a reduction in flowering quality.

INTRODUCTION

Two unnamed cultivars of Lilium speciosum hybrids, '101' and '298', show promise as flowering potted plants. However, excessive plant height is a major production problem with oriental hybrid lilies. If grown without chemical height control, oriental hybrid lilies far exceed the height for an appropriate aesthetic ratio of 2.6:1 (height from base of pot to top of plant:pot diameter). Currently, ancymidol is recommended for height control of lilies. XE-1019 is an effective chemical growth retardant on other lily species and has the advantage over ancymidol of high activity at very low dosages. The purpose of the present work was to evaluate XE-1019 effectiveness in height control on L. speciosum hybrids '101' and '298' and compare XE-1019 treatments to ancymidol treatments currently employed commercially.

MATERIALS AND METHODS

Lilium hybrids '101' and '298' were received 25 November 1987 and placed immediately into a 4.4° ± 1°C storage cooler for 8 weeks. Bulbs were stored in moist peat moss in the original shipping cases. On 20 January 1988, 60 bulbs of each cultivar were removed from the cooler, potted one per 15 cm diameter plastic container, and placed into a 26°/18° (venting/night) greenhouse under prevailing natural light conditions in southern Arizona.

The growth medium consisted of a 1 soil: 2 sphagnum peat: 2 perlite (by volume) mixture amended with 890 g treble superphosphate, 593 g potassium nitrate, 593 g magnesium sulfate, 4.75 kg ground dolomitic limestone, and 74 g Frit Industries Trace Elements No. 555 (Peters Fertilizer Products, W.R. Grace & Co., Fogelsville, Pa.) per cubic meter.

The plants were fertilized at each watering with 200 mg·liter^{-1} each of N and K supplied from 517 and 367 mg·liter^{-1} of potassium nitrate and ammonium nitrate, respectively. Fertilizer solution was maintained at 6.0 pH by injecting 75% (w/w) technical grade phosphoric acid into the system, supplying 37 mg·liter^{-1} P at every watering. Other cultural practices, including fungicide and insecticide applications were made following common practices.

Ten plants of each cultivar received the following treatments when emerging shoots averaged 2.5 cm in length: 1) control; 2-3) 0.125 or 0.25 mg a.i. ancymidol per pot; and 4-6) 0.05, 0.10, or 0.15 mg a.i. XE-1019 per pot. Chemical treatments were applied as 125 ml soil drenches. Drenches were applied 17 February and 22 February 1988 (27 and 32 days from potting) for '101' and '298' plants, respectively.

Days to visible flower bud and anthesis were calculated from the date the bulbs were potted and placed into the greenhouse. The date of anthesis was recorded for each plant when the first flower per inflorescence opened. Plant height (from the soil surface to the top of the inflorescence) was recorded at anthesis. The number of flowers reaching anthesis, number of aborted buds, number of leaves, stem length, and inflorescence length were recorded for each plant after the last flower per inflorescence had reached anthesis. The stem length was measured from the soil surface to the base of the inflorescence. The inflorescence length was measured from the point of attachment of the most basal flower to the highest point of the inflorescence. All data were subjected to one-way analysis of variance, and single degree of freedom contrasts were utilized, when appropriate. Statistical analysis was carried out using Proc GLM in SAS 6.03 (SAS Institute Inc., Cary, N.C.).

RESULTS AND DISCUSSION

No treatment affected days from planting to appearance of visible bud; buds were visible after (± SD) 33.2 ± 5.3 and 54.9 ± 5.9 days for '101' and '298' plants, respectively. Days from planting to anthesis of the first flower also were not affected by treatment; plants averaged (± SD) 84.5 ± 4.4 and 88.1 ± 11.2 days for '101' and '298', respectively. Although XE-1019 has been reported to delay flowering in other lily hybrids, no delay was observed for '101' and '298'. Plant height at anthesis was affected by treatment for both cultivars (Table 1). Ancymidol effectively controlled height of '101' plants, but was less effective on plants of '298'. The '298' plants within all treatments were extremely variable in height. Plants treated with XE-1019 were shorter than controls for both cultivars. Plants of '101' exhibited a linear response in height to XE-1019, and plants of '298' tended to be shorter with increasing concentration of XE-1019. For both cultivars, XE-1019 treatments were more effective in height control than ancymidol treatments applied (Table 1).

The total number of flowers reaching anthesis and the number of aborted buds per plant were not affected by growth retardant treatments. Plants of '101' averaged (± SD) 6.0 ± 1.7 flowers and 1.6 ± 1.4 aborted buds; '298' plants averaged 6.2 ± 1.6 flowers and 0.2 ± 0.5 aborted buds each. For '101' plants, ancymidol and XE-1019 treatments resulted in shorter stems and inflorescences at final flower anthesis as compared to controls (Table 1). For '101' plants, XE-1019 was more effective in controlling inflorescence length than ancymidol. Stem length was not affected by treatment for '298' plants. Ancymidol did not effectively control inflorescence length for '298', but XE-1019 was effective.

The control of inflorescence elongation achieved with XE-1019 treatments indicates that XE-1019 may have prolonged activity in the plant or soil as compared to ancymidol. In our study, soil drench applications were used and nearly all plant uptake would be expected to occur through the roots. Visual observation of the root systems of the plants used in this study indicated slow root development; few bulbs had developed new roots at the time of treatment application, and plants were nearly to the visible bud

Table 1. Responses of L. speciosum hybrids '101' and '298' to ancymidol and XE-1019.[z]

Drench (mg a.i./pot)	Plant ht at anthesis (cm)[y]		Stem length (cm)[x]		Inflorescence length (cm)[w]	
	101	298	101	298	101	298
Control	45.8	42.1	29.9	27.1	17.3	14.6
0.125 ancymidol	38.6	39.5	25.2	29.0	14.6	14.9
0.250 ancymidol	37.6	36.5	25.2	25.5	14.1	14.1
0.05 XE-1019	36.8	35.3	27.1	26.1	10.9	13.9
0.10 XE-1019	33.0	32.2	24.8	23.7	9.2	11.4
0.15 XE-1019	27.7	30.6	20.6	22.2	8.3	10.2
Treatment effect	***[v]	**	**	NS	***	**
Ancymidol vs control	**	NS	*	--	*	NS
XE-1019 vs control	***	**	**	--	***	*
Ancymidol vs XE-1019	**	*	NS	--	***	**
XE-1019 linear	**	NS	**	--	NS	**

[z]Means based on 10 replicates.

[y]Measured at anthesis of first flower per plant. Measurement taken from the soil surface to the top of the inflorescence.

[x]Measured at anthesis of the last flower per plant. Measurement taken from the soil surface to the base of the inflorescence.

[w]Measured at anthesis of last flower per plant. Measurement taken from the point of attachment of the most basal flower to the highest point of the inflorescence.

[v]Treatment effect or contrast is nonsignificant (NS) or significant at $0.05 \geq \alpha > 0.01$ (*), $0.01 \geq \alpha > 0.001$ (**), or at $\alpha \leq 0.001$ (***).