Plant Growth Regulator Effects on Canna Lily

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A study in 1998 determined the effects of several rates of B-Nine, Bonzi, Cutless, and Pistill on vegetative growth and flowering in *Canna xgeneralis* 'Florence Vaughn'. Canna lily is often difficult to manage during production due to their top-heavy growth pattern and rapid growth. Controlling the plant's height could potentially lower shipping costs to market and reduce maintenance during the production and retail stages. Vegetative height 30 and 60 days after treatment (DAT), vegetative and inflorescence heights and scape length at first flower, and vegetative height at 30 days after planting (DAP) in the landscape were reduced by increasing rates of Cutless, while days to flower increased 1 to 6 days. With increased rates of Bonzi, vegetative height at 30 DAT, and vegetative and inflorescence heights at first flower were suppressed, but to a lesser degree than with Cutless. B-Nine and Pistill did not significantly affect the plant characteristics measured, with the exception B-Nine delayed flowering 3 to 8 days.

INTRODUCTION

Species and cultivars of canna lily are characterized by heights of up to 1.5 m (5 ft) and 0.6 m (2 ft) long leaves up to 15 cm (6 inches) in width (Still, 1994). Canna lilies bloom in early to mid-summer and continue through frost (Still, 1994). Canna lilies may become difficult to manage during container production due to their rapid and top-heavy growth habit. These characteristics lead to frequent blow-over during production and later at retail facilities, and increased shipping costs, especially when plants are racked during shipment.

Plant growth regulators (PGRs), such as B-Nine, Bonzi, Cutless, and Pistill, are effective in suppressing height in numerous species (Barrett, 1982; Pisarezyk and Splittstoesser, 1979) and may offer benefits in the production, shipping, and marketing of canna lilies. B-Nine, Bonzi, and Pistill are labeled for use in greenhouse and nursery environments, whereas Cutless is labeled for use on turfgrass only. While these PGRs have been effective on numerous horticultural crops, none are labeled for use on canna lily during nursery production. PGRs used in production occasionally have residual effects which carry over into the landscape (Keever and Cox, 1989).Suppressed growth in the landscape may reduce the intended visual effect of treated plants, as well as customer satisfaction. The objective of this study was to determine the effects of several rates of four PGRs on height and flowering of canna lily during container production and in the landscape.

MATERIALS AND METHODS

On 3 April 1998, 3.8-liter (4 qt) containers of gladiolus-flowered canna lilies (*Canna* 'Florence Vaughn') were divided into quarters and repotted into 3.8-liter (4 qt) containers while dormant. The substrate consisted of a 7:1 (v/v) pine bark to sand medium amended with 10.7 kg m^{-3} (18 lb yd^{-3}) Polyon 22-4-14, 0.9 kg m^{-3} (1.5 lb yd^{-3})

Micromax, and 3.0 kg m^{-3} (5 lb yd^{-3}) dolomitic limestone. Plants were placed in full sun under overhead irrigation. On 6 May 1998 plants were blocked by height, initial height measurements taken, and the following PGRs applied as foliar sprays in a volume of 0.2 liters per m^{-2} (2 qt 100 ft^{-2}).

- B-Nine at 2500, 5000, and 7500 parts per million (ppm);
- Bonzi at 33, 66, and 99 ppm;
- Cutless at 50, 100, and 150 ppm;
- Pistill at 125, 250, 500, 750, and 1000 ppm;
- Control.

Ambient temperature and relative humidity at treatment ranged from 30 to 39°C (86 to 102°F) and 71% to 53%, respectively. Treatments were arranged in a completely randomized design with ten single-plant replications.

Data collected included time to first flower, inflorescence height, scape length at first flower, and vegetative heights (from the substrate to the top of the uppermost leaf) at first flower and 30 and 60 days after treatments (DAT). On 20 July 1998, five plants each from the control treatment and all Bonzi and Cutless treatments were planted in the landscape and blocked by replication. Vegetative heights were measured at 30, 60, and 90 DAP. Plants from the B-Nine and Pistill treatments were not transplanted because treatments did not affect inflorescence height at first bloom or vegetative heights 30 or 60 DAT during container production.

RESULTS

The results of our study show that canna lily height can be controlled during production using certain PGRs at the rates tested (Table 1). For example, plants treated with increasing rates of Cutless were shorter compared to untreated plants by 42% to 50% at 30 DAT and 37% to 47% at 60 DAT. Cutless-treatments delayed flowering in canna lilies 1 to 6 days. Though statistically significant, the delay of flowering of 1 to 6 days would not be a major detriment to the commercial grower. The inflorescence height and scape length at first flower were 50% to 68% and 25% to 57% shorter, respectively, for Cutless-treated plants compared to untreated plants. The average inflorescence height of Cutless treated plants was less than that of the foliage. This suppression was least pronounced at the lowest rate applied (50 ppm) with foliage on average 5 cm (2 inches) taller than the inflorescence. A major concern of growers with the use of PGRs is the impact on the plants after purchase by the consumer. With Cutless-treated plants, the vegetative height was reduced 5 to 14% compared to untreated plants at 30 DAP in the landscape (approximately 100 days after PGR treatment), indicating a slight residual effect. However, by 60 DAP vegetative heights were similar among Cutless and control treatments.

With increasing rates of Bonzi, vegetative height of treated plants at 30 DAT was 16% to 29% shorter compared to untreated plants. Days to first flower for Bonzi-treated plants were similar to untreated plants. Vegetative and inflorescence height at first flower were reduced for Bonzi-treated plants by 12% to 26% and up to 20%, respectively. Scape length was not affected by Bonzi treatments. Bonzi-treated plants were similar in height to untreated plants at 60 DAT and 30 and 60 DAP. However, at 90 DAP, Bonzi-treated plants were approximately 12% taller than untreated. B-Nine and Pistill had no effect on any characteristic measured during the study, with the exception B-Nine delayed flowering 3 to 8 days compared to control plants.

Table 1. Vegetative and inflorescence heights, scape lengths, and days to first flower for *Canna* 'Florence Vaughn' treated with Bonzi or Cutless.

Plant growth regulator	First flower					Vegetative height (cm)			
						Container production		Landscape	
	Rate (ppm)	Days to flower	Vegetative Height (cm)	Inflorescence height (cm)	Scape length (cm)	30 DAT[z]	60 DAT	30 DAP[y]	60 DAP
Control	0	42	86.0	93.2	32.4	85.7	86.5	94.6	110.4
Cutless	50	41	52.9	47.3	24.5	50.2	55.1	90.2	109.8
Cutless	100	43	49.1	43.7	21.8	45.9	49.0	78.4	108.8
Cutless	150	48	36.6	30.4	14.0	43.6	46.1	81.2	108.2
Dose response[x]		L*	Q*	Q**	L**	Q***	Q***	L*	NS
Bonzi	33	43	76.5	94.1	35.0	72.8	92.5	99.4	113.2
Bonzi	66	46	78.2	92.3	37.6	68.2	90.5	93.8	117.0
Bonzi	99	43	64.6	74.8	36.3	61.5	83.4	98.0	124.2
Dose response		NS	L**	L*	NS	L***	NS	NSL*	

[x] Nonsignificant (NS), linear (L), or quadratic (Q) response at the 5% (*), 1% (**), or 0.1% (***) level, control included in regression analysis.
[y]Days after planting.
[z]Days to flower.

DISCUSSION

In container production of canna lily, growers can apply Cutless at the rates tested and have a significant suppression in vegetative height for around 60 days. However, average inflorescence height for Cutless-treated plants was less than that of foliage at first flower. In previous research, Cutless decreased inflorescence length and width of *Buddleja davidii* (Keever and Gilliam, 1994). For canna lilies, the inflorescence heigth reduction detracted from the floral display of treated plants which could be detrimental to plant marketability. Following transplanting inflorescence heights among treated and untreated plants appeared similar by 30 DAP. Bonzi applied at the rates tested should suppress vegetative height for 30 days during container production. Shorter plants will reduce blow-over, making shipping easier, and improve the overall plant appearance in the retail market. The noted delay in flowering (1 to 6 days overall) is minor considering the overall production cycle and the lengthened window of marketability. Furthermore, once planted in the landscape, plants treated with Bonzi outgrew control plants. This increase in growth observed with Bonzi treatments is not uncommon (Blanco, 1988; Keever and Gilliam 1994) and relates to how Bonzi controls height. Bonzi suppresses plant height by retarding internode elongation. However, plants continue to produce plant cells following the PGR treatment. After cessation of treatment effects, the plant cells previously produced will rapidly elongate to their normal size. This enhanced post production performance will benefit the consumer and should improve consumer satisfaction. The results presented above represent data collected from one growing season. The test will be repeated in 1999 to obtain additional data from a second growing season.

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