Height Control Of Mid-Century Hybrid Lilies

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Potted hybrid garden lilies with their multicolored flowers have good commercial potential as potted plants, if height can be controlled. Tall potted lilies have marked internode elongation, can become top heavy and may have short basal leaves which make them unsightly. The use of growth retardants can result in short hybrid lilies and should offer attractive potted plants which may ultimately be transplanted into gardens.

The objectives of this research were: (1) to compare various application methods of ancymidol (A-Rest) (a growth retardant) on mid-century hybrid lilies for their height control, and (2) to determine the most effective concentrations of ancymidol for each application method.

Materials and Methods

A. Plant Materials. This experiment was conducted twice at the Southern Illinois University, Horticulture Research Center Greenhouse, starting Feb. 1 until approximately mid-May, in 1981 and 1982. Four cultivars of mid-century hybrid lilies were used in each experiment, with two of them being common in each experiment (see **Table 1**).

Table 1. Cultivars of mid-century hybrid lilies studied in 1981 and 1982.

	Experiment I (bulbs 13-15 cm)	Experiment II (bulbs 15-17 cm)
1.	'Connecticut Lemon Glow'	'Connecticut Lemon Glow'
2.	'Sunkissed'	'Sunkissed'
3.	'Charisma'	'LoveSong'
4.	'Enchantment'	'Sunray'

The pre-cooled bulbs were shipped by Geo. J. Ball Seed Co., and were stored at 43°F (±2°) for 2-3 weeks prior to treatment.

B. Chemicals and Treatments.

EXPERIMENT I. The growth regulator used was ancymidol[1] (A-Rest) at the following 5 concentrations: 0 (control), 5, 10, 50, and 100 ppm. It was applied to the plants by the following methods:

1. *Regular Bulb Soak* (BS) involved immersion of the bulbs in the chemical for 1 hour (BS-1 h) or 12 hours (BS-12 h). The bulbs were placed in beakers. The chemical solution containing 1 of the 5 levels of ancymidol was then poured into the beaker surrounding all surface areas of the bulbs, and they were immediately timed for proper duration.

2. *Vacuum Bulb Soak* (VS) involved immersion of the bulbs in the chemical solution containing 1 of the 5 levels of ancymidol for 30 minutes (VS-30 m) or 60 minutes (VS-60 m), while under vacuum of less than 1

mm mercury tension. The bulbs receiving this treatment were also treated in the same manner as the Regular Bulb Soak method, except that they were placed under vacuum immediately. A Vertis Freeze-drier held at room temperature was used to create the vacuum around the beakers. The bulbs were timed exactly at the moment the vacuum pump was started. When the bulbs had received the proper treatment, they were removed for planting.

3. *Foliar Spray* (FS). This treatment was applied at a later stage of development when plants were approximately 4-6 in. tall. It included coverage of plants with ancymidol at 1 of the 5 concentrations until run-off. For each plant being sprayed, a piece of plastic was wrapped around the pot and the stem, covering the soil surface so the excess chemical run-off would not drain into the pot and the growing medium.

4. *Soil Drench* (SD). This treatment was also applied at a later stage of development when plants were 4-6 in. tall. For this method, 50 ml of the chemical solution at 1 of the 5 levels of ancymidol was poured into the growing medium.

EXPERIMENT II. The presoaking treatments of the bulbs took place in the same laboratories as in Experiment I, on Jan. 31, 1982. The growth retardant used was also the same as in Experiment I at the following 4 concentrations: 0 (control), 10, 25, and 50 ppm. It was applied to the bulbs by the following methods:

1. *Regular Bulb Soak* (BS) as mentioned in Experiment I for 1/2 hour (BS-30 m), 1 hour (BS-1 h), and 12 hours (BS-12 h).

2. *Vacuum Bulb Soak* (VS) as mentioned in Experiment I for 1 minute (VS-1 m), 10 minutes (VS-10 m), 30 minutes (VS-30 m), and 60 minutes (VS-60 m).

All laboratory procedures and applications were performed in the same manner as in Experiment I. There were also 3 replications in this experiment which did not receive any soaking or vacuum soaking treatments. They were just planted to observe any possible differences between them and the bulbs which received the treatments in water (0 ppm).

C. Culture. One bulb was planted per container, although many of the bulbs had more than 1 growing point. Four-inch standard plastic pots were used in Experiment I, whereas in Experiment II 5-inch standard plastic pots were used. Except for the pot size, all cultural practices in both experiments were identical.

The growing medium used was Pro-Mix BX[2]. Plants were forced and grown under natural photoperiods at a night temperature of 59-65°F, with day temperatures 10 to 15 degrees higher. The benches were oriented east to west.

Plants were watered 2 to 3 times weekly, according to the dryness of the soil surface. They were also fertilized weekly with 200 ppm N from Peter's [3]20-20-20 (N, P_2O_5,K_2O). Twenty-four hours after planting, the bulbs received 100 ml per pot of Dexon 35% WP at 0.6 g l^{-1}, and terraclor 75% WP at 1.2-1.8 g l^{-1} for disease prevention.

Results and Discussion

The results from 2 consecutive years of experiments showed that mid-century hybrid lilies were promising for their adaptation to pot culture. Ancymidol has been an effective growth retardant in reducing lily height. Using these soaking methods, A-Rest can be used more efficiently and results in more uniformity within the cultivars than foliar sprays or soil drenches. The optimal rates of ancymidol in these experiments (25 and 50 ppm) applied by the BS-30 m and VS-1 m methods to the cultivars resulted in plants that were shorter (attained a height of 12-14 in.) than the non-treated ones (attained a height of 19-21 in.) with potentially better marketability. Foliar sprays and soil drenches were not nearly as effective as the soaking treatments.

In general, the soaking methods that involved the longest exposure to ancymidol, especially at higher concentrations, were the ones that caused the most adverse effects; e.g., the BS-12 h method significantly delayed emergence of 'Charisma' and 'LoveSong' up to 2 days, delayed flowering of 'LoveSong' up to 4 days, and caused a significant reduction in the number of flowers of 'Sunkissed'. No such effects were caused by the VS-1 m method. Higher concentrations of ancymidol such as 50 ppm, applied by some of the BS or VS methods, caused the following effects: (1) delayed emergence of 'Connecticut Lemon Glow', 'Sunkissed' and 'Sunray' 5 to 8 days; and (2) delayed flowering up to 7 days in 'Enchantment' and 'Sunkissed', 5 days in 'Sunray', and 3 days in 'Connecticut Lemon Glow'. However, 50 and 100 ppm in Experiment I, and 50 ppm ancymidol in Experiment II, resulted in the greatest height reduction (miniature plants which were 2-5 in. tall). Vacuum soaks and bulb soaks generally resulted in similar height reductions, except the BS-12 h method, which caused plants to be significantly shorter than other application methods. Experimental data indicated no evidence for delayed emergence or flowering, or reduction of flower number in cultivars when ancymidol was applied by the short exposures of VS-1 m or BS-30 m.

The results from these experiments are encouraging in that they indicate height control of mid-century hybrid lilies can be achieved by soaking the bulbs in aqueous solutions of 25-50 ppm ancymidol for 30 minutes, or for 1 minute while under vacuum. Using the vacuum soak method requires a vacuum pump which probably would have to be purchased by the grower. Those commercial producers who ship the pre-cooled lily bulbs to growers every year may consider trying this new rapid method and pre-treat their bulbs prior to shipment, but perhaps may need to increase the price of their "treated" bulbs.

In general, cultivars reacted somewhat differently to ancymidol concentrations. The time of emergence, number of days to flowering, number of flowers, height and most other measured parameters have been variable in different cultivars, sometimes even within the same cultivar, from year to year, under different cultural and climatic conditions. Therefore, growers should be careful in selecting cultivars or planting dates for timing emergence and flowering. The final flowering and sales dates may be manipulated by the growers in programming and based on the Easter lily program for forcing. Variability in maturity by 1 week would probably be acceptable.

There could be more than one expected sale date for mid-century hybrid lilies as pot plants as opposed to just Easter Sunday for Easter lilies. Because of the attractiveness of these hybrid lilies, they may be sold for any holiday or any other special occasions such as Mother's Day.

Conclusions

Although heights vary among cultivars, in general, we feel that the optimum heights for marketing them as pot plants should be 6-8 in. when grown in 4-inch pots, and 10-14 in. when grown in 5-inch pots which can be achieved when 25 or 50 ppm ancymidol is applied to the bulbs by soaking them in aqueous solutions of the chemical for 30 minutes, or 1 minute while under vacuum. These methods may provide the following advantages compared to soil drenches or foliar sprays: (1) they are time and labor saving; (2) better insurance of uniform chemical uptake is attained; (3) a large number of bulbs can quickly be treated and packed at once; (4) there is less waste of the chemical solution; (5) no further chemical treatments would be necessary by the grower; and (6) it is possible to reuse the excess chemical which is left in the container after the treatment.

(EDITOR'S NOTE: The research reported in this ar-

[1] Manufactured by Elanco Products Co., a division of Eli Lilly & Co., Indianapolis, IN 46206.

[2] Manufactured by Premier Brands, Inc., New Rochelle, NY.

[3] W.R. Grace & Co., Cambridge, MA

ticle was supported, in part, by funds from the I.S.F.A. Research Fund. As many of you know, Dr. G.D. Coorts, one of the authors, is now a dean in agriculture at Tennessee Technical Univ., Cookeville, TN.)