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Daylength Control for Easter Lilies

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In the New York State Flower Growers Bulletin 192 (November 1961), we showed the effect of various constant photoperiods on the Easter Lily. The greatest effect was on height. The longer the photoperiod, the taller the lily with only a slight effect on flower number and timing. We also discussed the effect of interrupted night and cyclic or flashing light. This work will report the two-year study made to determine when the lily was most responsive to daylength.

The methods used were similar to that of our temperature study (New York State Flower Growers Bulletin 236). The 1960-61 work periods were divided into four stages:

1. Planting to emergence
2. Emergence to flower differentiation
3. Flower differentiation to visible bud
4. Visible bud to first flower

The plants were grown under normal daylength conditions then placed in either a 9 or 15 hour daylength for the Ace or 9 or 18-hour daylength for the Croft during these four indicated stages. The growing temperature was 60° at night and 70° during the day.

In the second year's work (1961-62) the periods were divided by a different and more accurate method. For the Ace variety, four 20-day periods were used:

1. January 19 to February 28, or 36 to 56 days after planting
2. February 8 to February 28, or 56 to 76 days after planting
3. February 28 to March 20, or 76 to 96 days after planting
4. March 20 to April 9, or 96 to 116 days after planting

For the Croft variety, four periods of 18 days were used:

1. January 13 to January 31, or 30 to 48 days after planting
2. January 31 to February 18, or 48 to 66 days after planting
3. February 18 to March 8, or 66 to 84 days after planting
4. March 8 to March 26, or 84 to 102 days after planting

To help remove the variation caused by the natural daylengths used in the first year's study, the plants were grown under 9 or 18-hour daylengths, then placed in the opposite daylength condition during the selected period and then back to the original daylength.

Table 1. The effect of 9 and 15 hour daylengths for 4 stages on the growth and flowering of Ace. Treatments began December 14, 1960.

Stage	*Daylength (Hrs)*	*Treatment Time (Days)*	*Days to First Flower*	*Number of Flowers*	*Height (In)*
1. Planting to emergence	9	14	111	4.6	14.4
	15	14	104	4.7	13.8
2. Emergence to flower differentiation	9	17	106	4.7	12.8
	15	16	101	4.5	14.8
3. Flower differentiation to visible bud	9	26	104	5.5	10.8
	15	23	99	5.1	17.2
4. Visible bud to first flower	9	39	106	5.0	11.2
	15	36	107	3.8	15.2
CONTROL	Natural	—	109	4.6	12.8

Table 2. The effect of 9 and 18 hour daylengths for 4 stages on the growth and flowering of Croft. Treatments began December 14, 1960.

Stage	*Daylength (Hrs)*	*Treatment Time (Days)*	*Days to First Flower*	*Number of Flowers*	*Height (In)*
1. Planting to emergence	9	14	102	4.2	16.4
	18	14	102	4.0	14.8
2. Emergence to flower differentiation	9	17	103	3.4	14.8
	18	16	100	3.5	15.6
3. Flower differentiation to visible bud	9	26	102	3.9	13.6
	18	23	99	3.5	22.0
4. Visible bud to first flower	9	39	96	3.7	13.2
	18	36	93	3.8	19.8
CONTROL	Natural	—	100	3.6	13.2

RESULTS

1960-61

The results for the first year's work is shown in Table 1 for the Ace variety and Table 2 for the Croft variety. Each recorded data will be discussed, the Ace variety first followed by Croft.

Treatment Time *Ace* The treatment time was very similar at each stage. The 15-hour daylength being slightly shorter.

Croft The same pattern was seen for the Croft variety.

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Daylength Control

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Days to first flower *Ace* The control treatment took 109 days to flower. The variation among the treatment was 99 to 111 days; however, no consistent trend or pattern was observed.

Croft The control plants required 100 days to flower, and the variation among the treatment was 96 to 103 with no trend.

There would appear to be little of any effect of daylength on the number of days to flower.

Number of flowers *Ace* The control plant had an average of 4.6 flowers per plant. The range of variation on the other treatments was 3.8 to 5.5 and no trend was indicated.

Croft The control plants had an average of 3.6 flowers per plant. The range of variation among the other treatments were 3.4 to 4.2 and no trend was indicated.

There would appear to be little effect of daylength on the number of flowers.

Height *Ace* The control was 12.8 inches tall. That is the height from the rim of the pot to the point of the stem where the first flower branched out. In actual fact, the plants would be higher than indicated by this data, but this was considered to be a consistent point of measure and one that would not change.

The short day effect was not very great. It was completely ineffective during the first stage. This was to be expected except the plant should have been the same size as the control. The other treatments were the same as the control or shorter (2 inches in stage 3).

The long days effect (ignoring the first stage) appeared to indicate a real effect. The plants were 2 inches taller than the controls in stage 2, 4.4 inches taller in stage 3, and 2.4 inches taller in stage 4.

Croft The control plants averaged 13.2 inches tall. The short-day treatment in this situation had no apparent effect on the height for the other treatments were as tall or taller than the control.

The long-day treatment, however, did have an apparent effect. The plants were 2.4 inches taller than the controls when exposed to 18 hours during stage 2, 8.8 inches taller during stage 3, and 6.6. inches taller during stage 4.

The short daylength was not as effective in shortening the lily as compared to the control or as the long-day was in making lilies taller. It appeared the plants were most receptive or the greatest effectiveness was achieved when the plants were exposed to either daylength during the third stage.

1961-62

The results for the second year's work is shown in Table 3 for the Ace variety and Table 4 for the Croft variety. To attempt to more clearly define the most receptive time, the stages were determined by periods of days. In the case of the Ace variety, four 20-day periods were used; and in the case of the Croft variety, four 18-day periods were used. A problem in the first year's work was the variation caused by the control or natural day treatments. To overcome this problem, the plants were grown under control daylength treatment all the time. Therefore, to interpret this data, it must be compared to the proper control treatments. All of the 9-hour treatments should be compared with the 18-hour control, and the 18-hour treatment with the 9-hour control. The first stage, with a 9 hour daylength, for example, was grown for the first 36 days under an 18-hour daylength, then placed under a 9-hour daylength for 20 days and then placed back under the 18-hour daylength until flowered.

Table 3. The effect of daylength during 4 specific periods on the growth and flowering of Ace. Treatments started December 6, 1961.

Stage	*Daylength (Hrs)*	*Treatment Time (Days)*	*Days to First Flower*	*Number of Flowers*	*Height (In)*
(1) 36 to 56 days after planting	9	20	106	8.1	22.4
	18	20	111	8.6	22.0
(2) 56 to 76 days after planting	9	20	105	8.0	21.5
	18	20	117	7.1	22.4
(3) 76 to 96 days after planting	9	20	105	8.4	22.0
	18	20	116	6.3	17.2
(4) 96 to 116 days after planting	9	20	103	8.0	27.6
	18	20	116	6.7	17.2
CONTROL	9	—	126	6.5	14.8
	18	—	103	7.9	25.2

Table 4. The effect of daylength during 4 specific periods on the growth and flowering of Croft. Treatments started December 6, 1961.

Stage	*Daylength (Hrs)*	*Treatment Time (Days)*	*Days to First Flower*	*Number of Flowers*	*Height (In)*
(1) 30 to 48 days after planting	9	20	93	4.1	22.8
	18	20	96	3.8	17.6
(2) 48 to 66 days after planting	9	20	98	4.6	22.8
	18	20	109	4.3	20.8
(3) 66 to 84 days after planting	9	20	95	4.1	25.2
	18	20	102	4.2	18.4
(4) 84 to 102 days after planting	9	20	95	3.8	24.4
	18	20	102	4.0	17.6
CONTROL	9	—	101	4.0	17.6
	18	—	92	3.9	25.2

Days to flower *Ace* The 9-hour treatments all took about the same number of days to flower as the 18-hour control (103 days). The 18-hour treatments all required about the same time to flower (111 to 117 days); however, this was about ten days sooner than the 9-hour control (126 days).

Croft The 9-hour treatments all took about the same number of days to flower (93 to 98 days), and this was within the range of the 18-hour control (92 days). The 18-hour treatments had a little greater variation (96 to 109 days) with the control following 101 days.

There would appear to be a slight trend with the short days requiring a few more days to flower than the long-day treatments. This effect was greatest with the Ace variety and was about equally effective during the last three periods.

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Daylength Control

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Number of flowers *Ace* There was no apparent difference in the number of flowers produced by any of these treatments. Neither the long or the short days had an effect.

Croft This variety also indicated very little effect by either short or long days. The range in variation of flower number was 3.8 to 4.6 less than one flower.

Height *Ace* The special manipulation did show both long and short days would control the height of the lily. To see these effects, we must compare the 9-hour treatments with the 18-hour controls and the 18-hour treatment to the 9-hour controls.

The 9-hour treatment plants were shorter than the 18-hour controls when exposed during the first, second, and third stages, but not the fourth stage. The 18-hour treated plants were taller than the 9-hour controls by 7 inches when exposed during stage 1 and 2 and two inches when exposed during stages 3 and 4.

Croft The 9-hour treated plants were shorter than the 18-hour controls when exposed during stages 1 and 2. The 18-hour treated plants were taller than the 9-hour controls during stage 2 and slightly taller during stage 3.

The effect of the daylength is real as can be seen by comparing the two control treatments. The difference between the 18 and 9-hour control plants for Ace was 10.4 inches, and 7.6 inches for Croft. These same differ-

ences can be obtained by exposing the plants to the proper daylength for just short periods of time.

SUMMARY

This study has indicated the lily does have a certain period during its forcing life when it is most responsive to daylength. During the first year's work, the whole forcing life is divided into four parts. From those results, the second year's study was able to more clearly define the period of time and also the general effects. Both varieties responded in a similar way, the Ace variety generally indicating larger differerences. The effects of long days were:

1. Somewhat faster flowering
2. No apparent effect on flower number
3. Increase in height
4. The lily was found to be most responsive 36 to 76 days after planting in the case of the Ace variety and 48 to 84 days after planting in the case of the Croft variety.

The effects of the short days were:

1. Somewhat slower flowering
2. No apparent effect on flower number
3. Decrease in plant height
4. Lilies most responsive 36 to 96 days after planting in the case of Ace and 30 to 66 days after planting in the case of the Croft.
5. The short day response generally was not as great as the long day