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Forcing Temperatures for Easter Lilies

R. W. Langhans and D. R. Smith
Department of Floriculture
Cornell University

As was shown in New York State Flower Growers Bulletin 179, November 1960, the temperature at which the bulb was forced had a great effect on the time required for flowering. High temperature speeded flowering, whereas, cool temperatures slowed flowering. Under the extreme conditions, however, there was a reduction in bud count and little effect on height. In the New York State Flower Growers Bulletin 192, November 1961, we suggested more control of timing could be obtained by using temperature at specific stages without a loss in bud count. To state this in another way, there appeared to be certain stages in the growth of the lily bulb when it was very responsive to temperature and other stages when the response was very slight.

This article will report two year's work, 1960-61 and 1961-62. In the first year's work, the forcing life of the lily was divided into four stages:

1) planting until shoot emergence
2) shoot emergence until flower differentiation
3) flower differentiation until visible flower bud
4) visible flower bud until first flower.

The standard temperature was 60N-70D (60° night temperature and 70° day temperature). A low temperature of 50N-50D and a high temperature of 80N-80D was used. At the beginning of each of the 4 stages, ten plants were placed at the high and ten plants at the low temperature. When the plants had completed the stage; i.e., for example, in stage 1 the bulbs were planted and placed at the low or high temperatures and when shoots had emerged were returned to the 60N-70D greenhouse and remained at that temperature until flowering. The same was true for each of the other stages.

In the 1962 study, the stages were more carefully designated and a more practical determination of stage was selected. In this year's study, the two varieties were given different stage designations. In the case of the Ace variety, 4 periods of 20 days were used:

1) January 19 to February 8, 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, 4 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.

Results

1960-61

The results of the first year's work are 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 the Croft.

Table 1. The effect of forcing temperature on the growth and flowering of the Ace Lily. Treatment started December 14, 1960.

Stage	*Temperature (°F)*	*Treatment Time (Days)*	*Days to First Flower*	*Number of Flowers*	*Height (In)*
1. Planting to Emergence	50	38	132	5.0	12.2
	80	16	122	5.5	12.2
2. Emergence to Floral Differentiation	50	36	143	5.4	10.4
	80	15	103	5.1	11.2
3. Floral Differentiation to Visible Bud	50	56	144	6.2	8.6
	80	14	100	5.5	12.8
4. Visible Bud to First Flower	50	71	142	4.7	10.0
	80	25	99	4.7	11.6
CONTROL	60/70	—	125	5.3	12.8

Table 2. The effect of forcing temperature on the growth and flowering of the Croft Lily. Treatment started December 14, 1960.

Stage	*Temperature (°F)*	*Treatment Time (Days)*	*Days to First Flower*	*Number of Flowers*	*Height (In)*
1. Planting to Emergence	50	29	117	2.6	10.2
	80	16	113	3.2	8.8
2. Emergence to Floral Differentiation	50	40	136	3.5	10.0
	80	15	105	2.9	10.2
3. Floral Differentiation to Visible Bud	50	55	139	2.6	6.8
	80	18	93	2.9	10.2
4. Visible Bud to First Flower	50	69	131	3.2	7.6
	80	26	88	3.2	11.2
CONTROL	60/70	—	110	3.0	9.6

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Forcing Temperatures

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Treatment Time Each of the stages was carefully determined. Emergence, visible bud, and first flower were relatively easy, however, flower differentiation was more difficult to determine. Random samples of plants were disected and when more than 50% of the sample had flower buds starting to form as determined by microscopic examination, the plants were transferred to the next stage.

Ace The treatment time indicated clearly there was an immediate slowing or speeding when placed at the 50° or 80° temperature.

Croft The same relationship of time was seen with Croft as was reported for the Ace. There was an immediate slowing or speeding of growth when placed at either the high or low temperature. The Croft variety appeared to grow faster than the Ace variety.

Days to first flower *Ace* The control bulbs required 125 days to flower. If the plants were exposed to 50° during any of the stages, more days were required to flower than the control. The difference was 7 days delay when exposed to 50° during the plant to emergence and a 17 to 19 day delay for the other three stages. Exposure to 80° during any of the stages caused an apparent speeding of flowering. This was very slight during stage 1 (planting to emergence—3 days). The other stages were more effective, 17 days earlier for stage 2, 25 days earlier for stage 3, and 26 days earlier for stage 4.

Croft The flowering of the Croft variety was speeded or retarded by exposure to either low or high temperatures during the various growth stages. Exposure to 50° had a slight retarding effect during stage 1 (planting to emergence—7 days). There was a 26-day delay for stage 2, 29 for stage 3, and 21 for stage 4. The effect of high temperature on speeding was negative during the planting to emergence, stage 1. However, it was effective in the other three stages. There was a speeding of 5 days during stage 2, 17 days for stage 3, 22 days for stage 4.

Both varieties responded in a similar manner. There appeared to be only a slight effect during the first stage, slightly more during the second stage, and a very apparent effect during the third and fourth stages.

Flower Number *Ace* The control produced 5.3 flowers. The lowest number of flowers produced was by plants exposed either to 50° or 80° during stage 4, and they produced 4.7 flowers. The highest flower count was 6.2 produced by plants exposed to 50° temperature during stage 3.

Croft The control produced 3.0 plants. The lowest number of flowers was produced by plants exposed to 50° during stage 1 (2.6) and the highest (3.5) produced by plants exposed to 50° during stage 2.

There was no apparent trend and the differences were slight. Exposure of the plants to extreme temperatures during these periods of time had no apparent effect on flower number.

Height Exposure of either Ace or Croft lilies to extreme temperatures during any of these four stages had no apparent effect on plant height.

1961-62

In the second year's work the stages were more clearly defined by selecting definite periods of time, in the case of the Ace variety 20-day periods and in the case of the Croft variety 18-day periods. Since the previous work had shown the stage from planting until emergence was least responsive, it was not included in this work. The results for the Ace variety are shown in Table 3 and the Croft variety in Table 4.

Table 3. The effect of forcing temperature during 4 specific periods on the growth and flowering of Ace Lily. Treatment started December 6, 1961.

Stage	*Temperature (°F)*	*Treatment Time (Days)*	*Days to First Flower*	*Number of Flowers*	*Height (In)*
1. 36 to 56 days after planting	50	20	138	8.8	18.4
	80	20	112	6.7	19.2
2. 56 to 76 days after planting	50	20	137	6.3	15.2
	80	20	114	6.2	16.0
3. 76 to 96 days after planting	50	20	136	6.6	13.2
	80	20	114	6.0	12.8
4. 96 to 116 days after planting	50	20	138	6.8	14.0
	80	20	121	6.2	14.0
CONTROL	60/70	—	128	7.6	17.6

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

Stage	*Temperature (°F)*	*Treatment Time (Days)*	*Days to First Flower*	*Number of Flowers*	*Height (In)*
1. 30 to 48 days after planting	50	18	115	4.1	17.6
	80	18	97	4.3	16.0
2. 48 to 66 days after planting	50	18	117	3.7	13.6
	80	18	94	3.5	15.2
3. 66 to 84 days after planting	50	18	113	3.7	15.6
	80	18	94	4.3	19.2
4. 84 to 102 days after planting	50	18	111	3.6	18.2
	80	18	101	4.2	18.2
CONTROL	60/70	—	105	3.9	18.0

Days to first flower *Ace* The control plants required 128 days to flower. These particular data were statistically analyzed. For these differences to be real (at the 1% level), the number of days difference must be 7 or greater. This means, all of the differences shown were real. The effect of the 50° during the four 20-day periods was almost equal, and there was greater than 1 week's delay. The effect of the 80° during the four 20-day periods was effective causing a two-week's speeding except during the last period where there was just 1-week's speeding.

Croft The control plants required 105 days to flower. For a delay or speeding to be real, the difference must be 8 days or more (at the 1% level). There was a definite delay of about 10 days when the plants were exposed to 50° during the first 3 18-day periods. There was, however, no significant delay during the fourth

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period. There was a speeding of approximately 10 days when the plants were exposed to 80° during the first 3 18-day periods, but there was no significant speeding during the last 18-day period.

The results were similar for both varieties. Either variety can be speeded or retarded by exposure of high or low temperature. In this case, the last or fourth period was least receptive.

Flower number There was no apparent trend in flower number. In each variety exposure to either high or low temperature for relatively short periods of time had no effect on flower number.

Height There was no apparent trend in height. In either variety it was apparent, exposure of the plants to either high or low temperatures for relatively short periods had no effect on height.

SUMMARY

Early work has shown prolonged exposure to either high or low temperatures would greatly speed or retard flowering, but would also reduce the flower number. This work has shown plants can be exposed to either high or low temperatures for relatively short periods of time without decreasing the flower number or having any effect on height and still exhibit the speeding or retarding effect.

The period of most effective use of temperature to control the flowering time would be for Ace 36 to 96 days after planting, and for Croft 30 to 84 days after planting.