Why Use 60°F Night Temperature

Henry M. Cathey
Department of Floriculture
Cornell University

Temperature conditions played a great role in the time required for chrysanthemums to flower. In New York State Flower Growers Bulletin 104, the following classification of temperature requirements of varieties was given. (1) Thermozero varieties flowered in a wide range in temperature. (2) Thermopositive varieties flowered when the minimum night temperature was 60°F or above. (3) Thermonegative varieties flowered when the maximum night temperature was 60°F. This study was made to determine the effect of temperature in different phases of growth on the flowering of chrysanthemums.

The varieties were selected for a known response to temperature.

Variety	Classification	Weeks to Flower
Shasta	Thermozero	10
Encore	Thermopositive	10
Defiance	Thermonegative	13

The cuttings obtained were used as stock plants. Stock was grown at 50, 60, and 80°F with an interruption of the dark period from 10 p. m. to 2 a. m. At the time of potting, again at the start of the long dark period, and again when the buds were visible ten plants were moved from each of the stock temperatures to 50, 60°F. The experiments were started December 28, 1951 and January 5, 1953.

The following important dates were recorded when long dark periods were started, when buds could be seen in the expanding growing point, when the bud showed color, when the flowers were open. Bud initiation was considered from the start of long dark periods to visible buds. Bud development was from the date the buds showed until flowers were cut. Flowering time was from the start of long nights to full bloom.

I - Thermozero variety Shasta

Shasta has a wide temperature tolerance. It flowers in the minimum time at 60°F. Flowering was delayed about the same at 50 or 80°F, but the 80°F night temperature compared with 50°F doubled the number of flowers per spray. Low temperature (50°) during vegetation had little effect on the flowering time. Continued low temperature during bud initiation followed by 60° for bud development delayed flowering to almost the same extent as if low temperature had continued to flowering. Any shift from 60° to 50° delayed flowering and reduced the number of flowers.

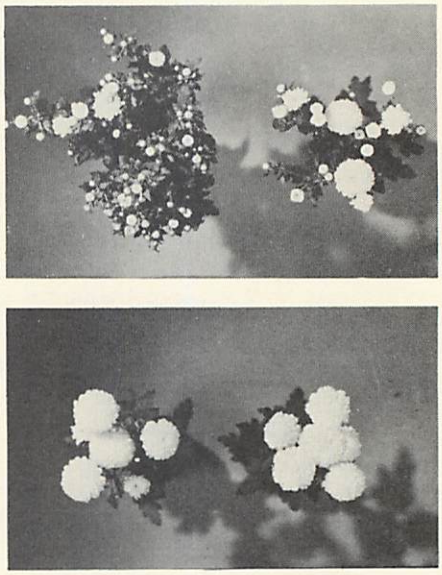
Effect of temperature on time to flower and number of flowers on thermozero variety Shasta

Treatment	Total # days to flower	# flowers per stem	Stem length in inches
Continuous 50°	92	5.1	26.7
Continuous 60°	71	7.9	27.9
Continuous 80°	92	10.2	26.8
50° Stock, 60° to Fls.	73	5.7	25.9
50° to LN, 60° to Fls.	78	7.9	27.4
50° to bud, 60° to Fls.	97	8.6	28.3
60° stock, 50° to Fls.	92	4.1	21.6
60° to LN, 50° to Fls.	87	4.4	15.7
60° to bud, 50° to Fls.	78	5.4	25.0

II - Thermopositive variety Encore

The variety Encore flowered if the temperature was maintained at a minimum of 60°F. The minimum flowering time was at 60°F. Continuous low temperature (50°) prevented the buds from developing into open flowers. Continuous high temperature (80°) delayed flowering by 7 days compared with plants grown at 60°F but had little effect on the number of flowers produced on each spray.

Plants shifted from 50 to 60°F were delayed or completely inhibited in flowering; this delay occurred due to the low temperature on the stock plants. The earlier the plants were shifted from 60 to 50°F, the greater the delay. Low temperature (50°) in all cases increased the number of flowers due to the formation of crowned sprays with elongated laterals. Buds initiated at 50°F were crown buds but no florets were initiated on the capitulums. Temperature had its primary effect on the initiation of flowers. Once flowers were initiated, development occurred over a wide range in temperature.



Effect of stock temperature variety Encore. Left to right, top to bottom 50, 55, 60, 80. 60°F subsequently until open flowers.

Effect of temperature on time to flower and number of flowers on thermopositive variety Encore

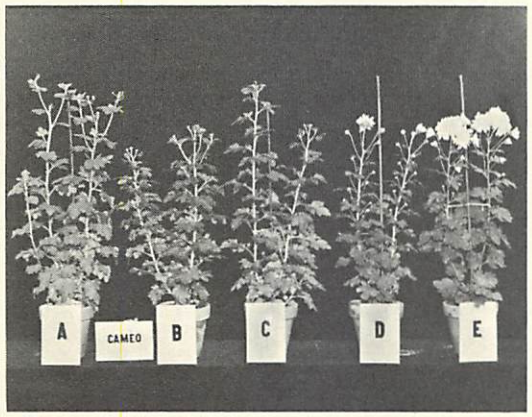
Treatment	Total # days to flower	# flowers per stem	Stem length in inches
Continuous 50°	NF	----	----
Continuous 60°	71	9.1	20.9
Continuous 80°	78	9.7	17.7
50° stock, 60° to Fls.	84	13.5	24.8
50° to LN, 60° to Fls.	101	17.4	26.4
50° to bud, 60° to Fls.	NF	----	----
60° stock, 50° to Fls.	118	15.7	20.3
60° to LN 50° to Fls.	87	8.6	17.2
60° to bud, 50° to Fls.	78	8.6	21.4

Thermopositive variety:

A. 50° stock, 60° to flower; B. 60° stock, 60° to flower; C. 80° stock, 60° to flower; D. 50° to LN, 60° to flower; E. 80° to LN, 60° to flower.

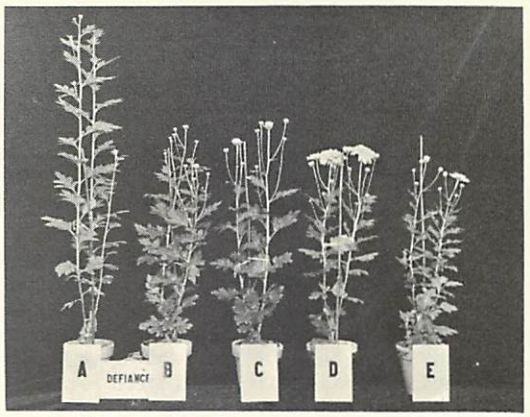
Thermonegative variety:

A. 50° stock, 60° to flower; B. 60° stock, 60° to flower; C. 80° stock, 60° to flower; D. 50° to LN, 60° to flower; E. 80° to LN, 60° to flower.



Thermopositive variety:

A. 50° stock, 50° to flower; B. 60° stock, 50° to flower; C. 80° stock, 50° to flower; D. 60° to LN, 50° to flower; E. 80° to LN, 50° to flower.



Thermonegative variety:

A. 50° stock, 50° to flower; B. 60° stock, 50° to flower; C. 80° stock, 50° to flower; D. 60° to LN, 50° to flower; E. 80° to LN, 50° to flower.

III - Thermonegative variety Defiance

Defiance did not flower if the temperature was above 60°F. The minimum flowering time was at 60°F. Continuous low temperature (50°) delayed flowering and reduced the number of flowers per spray by half. Shifting from 60° to 50° or 50° to 60° at the various developmental stages had little effect on flowering time.

In all cases, flowers were initiated. At temperatures of 60° or below, florets were initiated but developed slowly. At a temperature above 60°, florets were initiated but they did not develop. Temperature had its primary effect on the development of the flower.

Effect of temperature on time to flower and number of flowers on thermonegative variety Defiance

Treatment	Total # days to flower	# flowers per stem	Stem length in inches
Continuous 50°	125	4.7	26.4
Continuous 60°	92	8.5	25.5
Continuous 80°	NF	---	----
50° stock, 60° to Fls.	97	7.7	26.2
50° to LN, 60° to Fls.	101	11.2	25.8
50° to bud, 60° to Fls.	93	13.0	22.0
60° stock 50° to Fls.	104	5.0	23.8
60° to LN, 50° to Fls.	104	7.1	19.8
60° to bud, 50° to Fls.	97	6.3	25.9

What Can We Learn From This?

1. High temperature (80°F) delayed flowering in all varieties, and inhibited flowering of the thermonegative varieties. The plants grown from the 80°F stock flowered with much shorter stems than plants grown from stock at 50 or 60°F. The same number of days for vegetative growth in early summer and late summer do not produce the same length of stems because the high summer temperature on the stock reduces growth of the late summer planting.

2. Minimum flowering time was obtained with all varieties when 60°F was continued throughout the life of the plant.

3. High temperature (80°F) increased the number of buds per spray but at the expense of delay or inhibition of flowering.

4. Low temperature (50°F) delayed the flowering slightly in the thermonegative variety. If a grower cannot accurately control his temperature, thermonegative varieties would be less difficult to flower for fall and winter than thermopositive varieties.

5. Low temperature (50°F) inhibited the flowering of thermopositive varieties. The temperature must be accurately controlled at a minimum of 60°F before flowering can be obtained.

6. Continuous low temperature (50°F) reduced the number of flowers per spray on thermozero and thermonegative varieties. Thermopositive varieties did not flower at continuous 50°F.

7. Thermopositive varieties had more flowers per spray when they were shifted from 50 to 60°F at the time of propagation or at the start of long dark periods

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than plants grown continually at 60°F. This increase was due to the formation of compound sprays on plants at low temperature in the stock (50°F).

8. The thermozero variety Shasta flowered in the range 50 to 80°F. There was an equal delay at 50 to 80°F in the flowering when compared with the minimum flowering time at 60°F.