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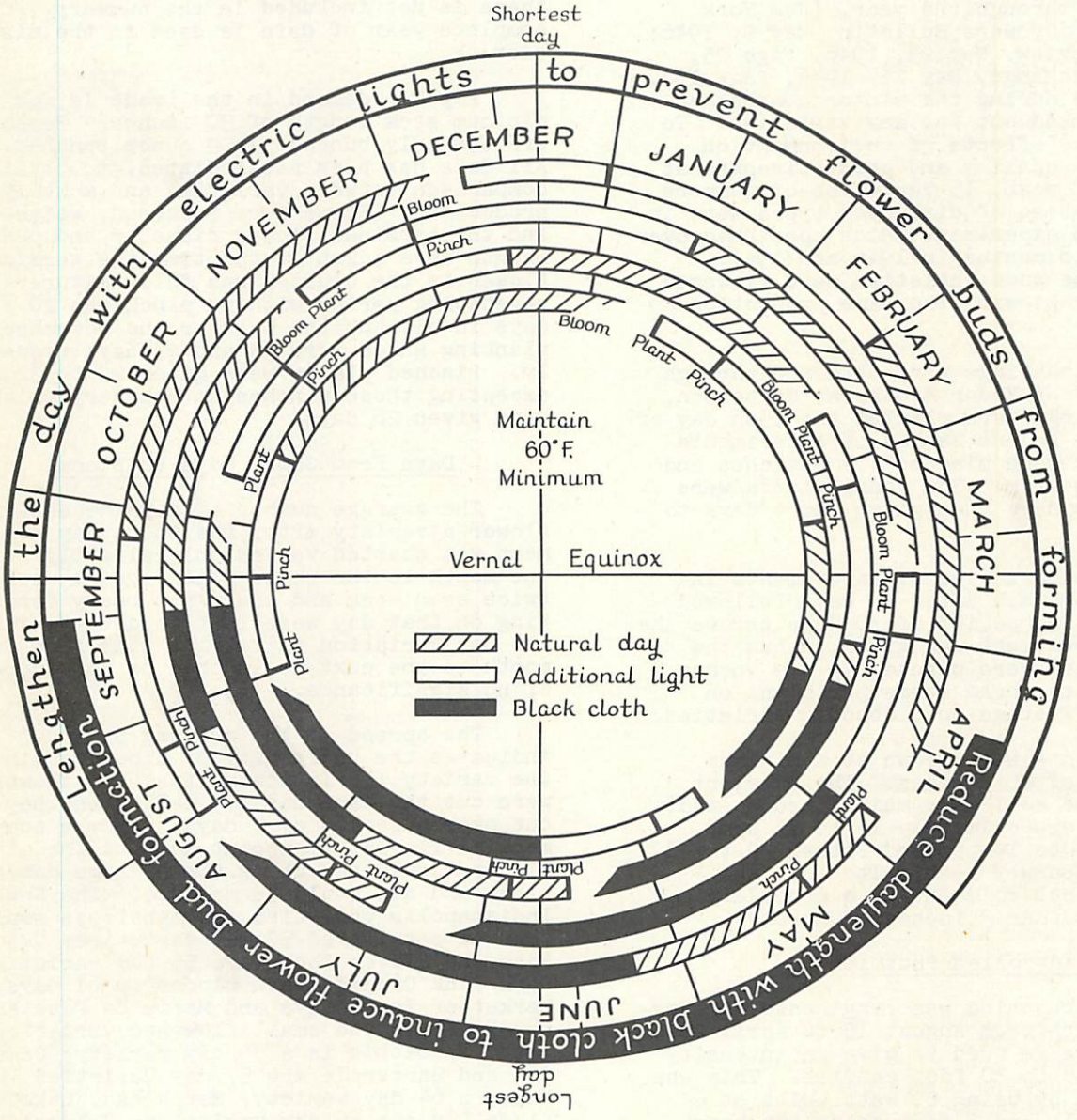
Year Around Flowering of Chrysanthemums



TO LENGTHEN THE DAY:

60 watt bulbs, with reflectors, at 6-foot intervals, 3 feet above the plants. Light - 10:30 to 1:30, August 15 to May 1.

TO SHORTEN THE DAY:

Enclose and cover the plants with black cloth 5 p.m. to 7 a.m., April 10 to September 20.
Be certain there are no light cracks. March 25 to July 15 the cloth must show no pin holes when held to the sun.

THIS REPLACES BULLETIN 9.

Year Around Flowering of Chrysanthemums

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The proposed year around production program previously published was based on spot trials through the year, (New York State Flower Growers Bulletin, May 9, 1946; Florists' Review, May 23, 1946, Page 25; Florists' Exchange, May 25, 1946, Page 15). Growth rates during the winter months had not been worked out for any varieties. To determine the effects of environment on growth rate, quality and productiveness at all times of year, 15 varieties of pompons and 11 varieties of disbudded types were included in an experiment which continued over a total of 18 months in 1946 and 1947. Plants of the same varieties were flowered each month following the same production procedure.

Rooted cuttings were obtained through the courtesy of Yoder Brothers, Barberton, Ohio. Cuttings were planted the 15th day of each month. In one series of experiments the cuttings were planted 4 x 6 inches and grown single stem. The young plants were given 21 long days then given short days to flower.

The second series of experiments included a tip pinch after 15 days followed by a vegetating period of 30 days before the short day treatment was given to bud the plants. These were planted $7\frac{1}{2}$ x 9 inches and limited to three stems per plant on pompons and 2 stems on disbudded varieties.

The plants were grown at a minimum temperature of 60 degrees. The nutrient levels in the soil were maintained so that Nitrate was approximately 15 to 75 ppm, Phosphorus 5 to 10 ppm and Potash 20 to 40 ppm by the Spurway test. The soil was surface watered to maintain a capillary tension less than 3 inches of mercury.

Controlled Photoperiod

The photoperiod was lengthened for vegetative growth from August 15 to April 20. Mazda lamps were used to give an intensity of light of 8 to 30 foot candles. This was accomplished by using 60 watt bulbs at 6 foot intervals and 3 feet above the bench. Four hours of supplementary light was given from 10:00 p.m. to 2:00 a.m. From April 20 to August 15 the photoperiod is long enough at Ithaca to permit vegetative growth.

The photoperiod was reduced for bud formation and flowering starting April 1 and continuing to September 1 (now prefer September 20). From September 1 (now Sept. 20) to April 1 discontinuing the supplementary lighting gave a photoperiod short enough for budding and flowering. The shortened photoperiod was produced by covering and enclosing the plants with black sateen cloth. During most of the treatment 2 and sometimes 3 thicknesses of cloth was used to obtain a zero light reading at the time of covering. Cloth was pulled over the plants at 4:30 to 5:00 p.m. and removed from 8 to 8:30 a.m. each day of treatment. The treatments were based on daylight saving time. Some slight variation in time of planting, pinching and beginning of short day occurred on some treatments. Some varieties could not be allowed to develop fully each time and the data for these is not included in the summary. One complete year of data is used in the discussion.

Popular demand in the trade is for a minimum stem length of 30 inches. Pompons are commonly bunched in 9 ounce bunches. All data has been recalculated, to obtain a comparison between varieties and monthly production. Stems were measured, weighed and the terminal flower diameter and pedicel length were taken at the time the terminal flower in the cluster was fully mature. The vegetating period with no pinch was 20 to 23 days in all but the October and November planting which were 33 and 25 days respectively. Pinched plants were given 29 to 32 days excepting those pinches in February which were given 26 days.

Days From Short Days to Bloom

The average number of days necessary to flower a variety after the short day treatment was started varied only slightly from one month to the next. The flowers were cut twice each week and those not ready for cutting on that day were left to develop further. A 4 day variation in cutting time from one month to the next would then be considered of no significance.

The spread of the cutting period ( ) Table (1) indicates the uniformity of blooming time of the variety (1) indicates that all flowers were cut the same day (7) indicates they were cut over a period of 7 days. From a commercial florist viewpoint most of the flowers could be cut on the average date of bloom and all would be salable. The News, Indianapolis varieties and Albatross would then be considered 57 day varieties; October Rose and Silver Sheen are 55 day varieties; Dark Pink Orchid Queen blooms in 61 days, Marketeer in 63 days and Marie De Petris in 68 days. In the small flowered varieties used, Pinocchio is a 55 day variety, Cassandra and Barcarole are 57 day varieties, White Mensa a 64 day variety, Matchless, Lakme and Linda Lou are 66 day varieties, Goldsmith and Golden Jane 68 day varieties.

A variation of 4 days allowed either side of these dates would include the flower from nearly all the plots for each month of treatment unless the treatment was not completely controlled for photoperiod or temperature.

These data (Table 1 and 1A) show any one variety does not vary in time from short days to bloom each month of the year if grown at a minimum temperature of 60° with controlled photoperiod.

Rate of Vegetative Growth

Stem length of the single stemmed (not pinched) planting was considered from the ground to the top of the flower. Plants pinched after 15 days of growth were cut at the base of the branch and the stem length from this point to the top of the flower was considered. These data have been recalculated to show the expected number of days required to produce a 30 inch stem at the rate of growth obtained in the experiment.

The formula used to calculate these data is:

$$\frac{\text{Number of Long days given}}{\text{Stem length (inches)}} \times 30 = \text{Number of days for 30 inches of growth.}$$

To produce a 30 inch stem from the ground, the large flowered varieties grown single stem required an over all average of 25 to 30 days if planted in February, April, May, June, July, August and September. They required 35 days if planted in March or December and 51 and 50 days planted in October and November respectively.

Large flowered varieties pinched and grown two stems per plant required 28 to 30 days when pinched in May, June, July, August and September; 32 to 37 days pinched in October, February and March and 46 to 52 days when pinched in November, December and January.

A slow growing variety as Silver Sheen required 2 to 12 days longer than average. Dark Pink Orchid Queen required 2 to 12 days less than average and other varieties required about the average number of days to produce 30 inch stems. The variation from the average number of days was greatest with the longest growing period required. An analysis of the data shows a difference of 4.77 days difference in growing period is significant at the 1 per cent level.

Pompons reacted in a similar manner. 32 days for vegetative growth was necessary as an average for the year from the time of planting if no pinch was given. Planted in February, April, May, June, July, August and September, 22 to 29 days were required for vegetative growth and planted in September, December, February and April, 28 to 34 days were required. If planted in October or November they required 45 and 63 days respectively for the production of 30-inch stems.

Pinched plants required 30 days average from pinch to short days to give 30-inch stems. If pinched in March, April, May, June, July, August or September, 22 to 28 days of growth were required for 30-inch stems while October and February required 34 and 35 days and November and December pinches required 47 and 39 days respectively.

Short Varieties

Pinocchio, Cassandra, Barcarole and Goldsmith require 2 to 15 days longer than average. Other varieties fluctuated around the over-all average.

It is obvious from these data that small chrysanthemum plants grow most slowly during November and December and most rapid during February to September. This should be allowed for in the production program permitting an average of 45 days for vegetative growth after a pinch in November, December and January, 35 days in February, March and October and reducing the vegetative period to 28 days for plants pinched in April, May, June, July, August and September.

Plants grown single stem should be given the same vegetative period from the date of planting as pinched plants are given from the date of pinching. Growing plants single stem would reduce the period in the bench by about 15 days. This is the interval allowed from the date of planting to the pinch.

Short varieties such as Silver Sheen, Pinocchio, Goldsmith, Arcadia, Little America (not included), Barcarole and others should be given 57 days to vegetate during October, February and March and 30 days in April to September.

Tall varieties as Vesper, Valencia, Nevada and Orchid Queen should be given 35 days to vegetate in November, December and January, 30 days in February, March and October, and 25 days in April to September.

Most of the short varieties are early flowering requiring 54 to 60 days to bloom after short days start. Four to 6 of these extra days could be removed from the period of short photoperiod to flowering. The remaining additional time should be added to the vegetating period. The tall varieties are often late and the time removed from the period of vegetation should be added to the short photoperiod to flowering plus additional time at this end of the growth cycle.

Production

If stem elongation is at a slower rate in some months than in others the production of plants during this period might also be considerably reduced. All data have been reduced to the number of 9 ounce bunches per square foot of bench area and calculations based on a 30 inch stem. The formula used to compute the data is:

9 ounce bunches with 30 inch stems=

$$\frac{\text{weight per sq. ft. x 30}}{\text{average stem length x 9}}$$

All varieties used throughout the year averaged slightly less than 1 bunch per square foot (Table 3).

Highest production was obtained from the April planting which flowered in August. This was followed by the May, March, June, January, February, July, August, December, November, September and October plantings. Variation from month to month was such that planting dates of September, October, and November gave significantly lower production than April and May plantings. June, July, August, January, February and March plantings were not significantly different in production among themselves.

Highest producing varieties were Barcarole, Vesper, Cassandra, White Mensa, Pinocchio, and Arcadia. The lowest producers were Nevada, Goldsmith, Lakme, Matchless and Brocade.

Varieties produced about half as much weight per square foot of bench area grown 4 x 6 inches and not pinched as when grown 7½ x 9 inches and given one tip pinch with the shoots thinned to 3 per plant. The single stem production as followed here was more expensive and produced less per square foot per month.

Varieties which were good producers during the summer were also the best producers during winter. Flowers on Arcadia, Barcarole and Cassandra were soft during the winter months. Pinocchio consistently was infected with mildew in winter. The late varieties produced superior quality flowered November to February while the earlies were superior in June to September. In the intervening months all varieties were good.

Flower Size

Flower size on disbudded varieties varied much the same as production of pompons per month. Flowered in July, August, September and October gave the largest blooms and January gave the smallest blooms with no significant difference during other months. None of the large flowered, single stemmed varieties were in the test each month and for this reason were not averaged but it is obvious that the plants grown single stem gave smaller flowers than when they were pinched and grown two flowers per plant.

The diameter of the terminal flower on pompon varieties was also measured but the differences in diameter at different times of year was not significant.

Pedicel Length

The length of the pedicel of the flower of pompons determines the spread of the spray. A greater than normal spread is desirable on some varieties and undesirable on others. When continuous short days are given for flowering pedicel length is reduced compared with intermittent short days or when the cloth is not sufficiently opaque.

Pedicel was longest on the July planting which flowered at the normal time and was permitted to bud naturally September 1. The next greatest pedicel length was from the June planting which finished in September with no artificial shortening of the photoperiod after September 1. August, February, March, April and May plantings gave longer pedicels than September to January plantings.

The greater pedicel length in September and October is explainable on the basis of normal photoperiod in September not being short enough for rapid bud development and permitting pedicel elongation. The longer pedicel during the summer months may also be due to this cause or it may be due to more rapid rate of growth at this time of year permitting pedicels to elongate more than in winter.

It might be desirable to force pedicel elongation to improve spray formation during the winter months. This can be accomplished by giving an occasional long day during the developing period of the flower buds. The most effective time for giving these long days is while the buds are first being initiated. Probably after 3 to 8 short days the greater the number of long days in the following three weeks the greater the pedicel length. Probably no more than a total of 10 long days in the 21 day interval would be desirable. These preferably scattered through the period.

Number of Flowers Per Stem

The average number of flowers per stem has previously been found associated with the temperature. It is doubtless associated with carbohydrate supply also. These data show the lowest number of flowers resulted in the crop which flowered in December, January, and February and the greatest production of flowers in August, September and October with other months producing near to an average number of flowers. This correlates closely with the weight of a given variety during the year.

SUMMARY

1. The time interval from beginning of the short photoperiod to bloom in a given variety of chrysanthemum was nearly the same each month when plants were grown at a minimum temperature of 60°F. and the length of day was controlled perfectly. Varieties can be listed as 55, 57, 60, 65, etc., day varieties depending on the interval from the beginning of the short photoperiod to bloom.

2. Artificial short photoperiods produced by covering with black cloth are required to flower varieties from April 10 to September 20.

3. Long photoperiods, produced by lighting a minimum of 3 hours with 8 or more foot candles of light, are necessary from August 15 to May 1 to assure vegetative growth.

4. Growth of young plants was slowest from October to December plantings. These require about 20 days longer from the pinch to the time a short photoperiod is given for a 30-inch stem. An average of 28 to 35 days is required for this growth period at other times of year.

5. Production was more than 9 ounces of pompons per square foot from March, April and May plantings and less than half as much from October and November plantings.

6. Flower size of disbudded varieties correlated with the weight production in pompons.

7. Varieties which were heavy producers in summer were also heavy producers in winter. Varieties which flower normally after November 20 were best quality from November to March and earlier varieties were best in summer. All varieties were good in fall and spring.

8. Spread of the spray was better in summer than in winter and the number of flowers per spray on pompons was greatest in summer.

Table I - Number of Days from Short Days to Bloom (Large Flowered Varieties)

	Date Short Days Started	Good News	Detroit News	October Rose	Ind. Yellow	Ind. Bronze	Ind. White	Alba-tross	Dk. Pink Orchid Queen	Marke-teer	Marie De Petris*	Silver Sheen	Average
	8/1	57(1)	53(5)	50(4)	53(8)	53(6)	52(1)	53(1)	57(4)	57(15)	67*	50(1)	53.5
	9/1	56(7)	60(1)	50(6)	54(8)	55(6)	54(6)	54(2)	59(8)	62(4)	66*	55(4)	55.9
P	10/1	57(5)	57(5)	50(7)	57(7)	58(10)	57(5)	53(14)	57(10)	70(1)	67*	50(2)	56.6
I	11/2	57(7)	57(7)	51(9)	67(7)	58(7)	58(1)	56(6)	63(1)	61(1)	---	51(4)	58.5
N	12/5	57(4)	59(4)	57(4)	59(4)	59(4)	65(4)	62(1)	62(3)	62(3)	64*	59(4)	60.1
C	1/5	54(6)	56(4)	55(3)	63(8)	56(6)	61(3)	55(6)	59(1)	62(3)	---	52(3)	57.3
H	2/2	63(1)	63(1)	63(1)	63(1)	63(1)	63(1)	57(1)	65(3)	60(1)	---	59(1)	61.9
E	3/1	57(6)	58(4)	53(11)	58(1)	54(1)	61(1)	62(1)	63(3)	64(1)	68*	58(1)	58.8
D	4/1	62(5)	62(1)	56(1)	56(4)	57(4)	56(4)	62(5)	62(8)	63(6)	71*	56(1)	59.2
	4/30	57(4)	59(4)	54(5)	56(6)	57(6)	61(1)	54(5)	62(1)	71(1)	71*	53(1)	58.4
	6/2	58(4)	57(1)	57(1)	55(4)	55(1)	60(1)	60(4)	60(4)	72(6)	128*	52(12)	58.6
	7/2	57(5)	58(5)	60(1)	54(5)	54(5)	54(5)	54(5)	61(1)	62(7)	68*	53(1)	56.7
	8/1	60(1)	60(1)	52(1)	61(1)	62(1)	62(1)	56(7)	62(1)	53(1)	---	56(7)	58.4
	Ave.	57.8	58.4	54.9	58.2	57.0	58.8	56.8	60.9	63.0	---	54.7	Grand Ave. 58.0
	6/6	56(18)	57(11)	56(4)	60(5)	60(5)	57(8)	57(8)	60(5)	37(15)		55(10)	57.5
N	7/5	55(10)	59(8)	53(10)	54(10)	55(11)	54(13)	54(9)	56(9)	66(6)		51(6)	54.0
O	8/7	53(13)	55(11)	53(4)	55(11)	55(7)	54(9)	54(8)	61(5)	65(4)		50(4)	54.5
T	9/6	54(7)	------	50(8)	56(6)	56(6)	56(8)	55(5)	60(8)	63(6)		49(20)	55.5
	10/6	58(8)	57(10)	53(9)	57(10)	58(8)	57(8)	54(11)	61(5)	66(2)		53(6)	56.7
P	11/15	60(1)	56(1)	------	56(1)	------	56(1)	59(6)	56(1)	-----		55(1)	57.0
I	12/10	57(6)	59(6)	57(6)	59(6)	59(6)	64(1)	59(6)	64(1)	-----		57(1)	60.0
N	1/6	65(1)	60(5)	57(8)	60(6)	60(6)	65(1)	60(6)	65(1)	66		59(8)	62.3
C	3/8	72(1)	67(1)	59(8)	67(1)	67(1)	66(1)	59(8)	67(1)	-----		59(1)	65.0
H	4/7	59(1)	60(7)	55(5)	60(7)	60(7)	60(1)	56(5)	66(1)	66		55(1)	59.3
E	5/5	68(1)	71(1)	67(1)	69(1)	63(1)	63(5)	58(6)	65(7)	89		61(3)	64.0
D	6/6	62(6)	59(9)	58(1)	63(1)	63(6)	63(6)	63(1)	63(6)	80		54(9)	61.3
	7/6	60(17)	63(5)	56(1)	64(1)	63(1)	63(1)	56(7)	64(15)	64		53(6)	60.0
	Ave.	59.9			60.0		59.8	57.2	62.2			54.7	Grand Ave. 59.0

* Not Included in Calculations.

Table IA - Days from Short Days to Bloom (Pompons)

	Date Short Days Started	Arcad-ia	Nevada *	Sunny-side	Vesper	Match-less	Lakme	Gold-smith	Valen-cia*	Golden Jane*	Cassan-dra	Barcar-ole	Bro-cade	Pinoc-chio	White Mensa	Linda Lou*	Average
	9/1	60	72*	86	67	71	68	72	72*	72*	60	64	68	58	65	67*	67.2
	10/1	56	67*	72	70	71	72	67	69*	68*	55	59	67	55	67	66*	64.6
P	11/2	59	67*	67	66	67	67	66	---	67*	54	61	66	57	63	66*	63.0
I	12/5	62	69*	67	68	69	68	69	---	---	64	64	68	64	68	69*	66.4
N	1/5/47	60	61*	65	64	64	59	63	64*	64*	54	57	64	54	61	62*	60.4
C	2/2	58	---	69	67	66	67	68	67*	66*	57	60	65	57	65	65*	63.5
H	3/1	60	65*	68	67	66	70	69	68*	65*	55	62	66	56	65	67*	64.0
E	4/1	57	65*	70	71	66	63	72	69*	66*	56	56	64	56	63	67*	63.1
D	4/30	57	69*	81	78	66	74	72	69*	73*	57	61	68	54	68	67*	66.9
	5/29	61	73*	72	84	81	87	68	64*	64*	70	69	74	59	73	70*	72.5
	7/2	63	68*	76	68	65	68	75	78*	74*	59	65	67	56	63	---	65.9
	8/1	62	76*	82	63	70	73	75	82*	81*	65	66	72	62	63	62*	68.4
	Ave.	59.6		72.9	69.4	68.5	69.6	69.6			58.8	62.0	67.4	57.3	65.3		Grand Ave. 65.5
	8/7	--	65	77	68	67	67	--	--	--	63	60	68	54	--	66	
N	9/6	56	66	77	67	68	68	68	--	--	59	62	67	52	62	64	Least Signif-
O	10/6	58	67	80	67	67	68	68	68	68	59	63	67	56	65	66	icant Dif-
T	11/15	56	70	--	--	--	--	--	--	--	56	56	--	56	--	--	ference for
	12/10	60	64	--	--	--	--	--	--	--	60	61	--	60	64	64	Months:
P	1/6	60	68	--	65	--	55	65	--	--	62	61	64	59	--	64	5% level = 3.0
I	3/8	60	63	81	67	68	57	--	67	--	60	62	67	58	67	66	1% level = 4.0
N	4/7	52	66	82	67	61	64	67	67	67	52	62	66	58	64	64	
C	5/5	59	66	114	112	76	85	119	109	90	62	70	77	58	70	73	
H	6/6	62	68	100	80	77	77	88	88	83	62	67	66	62	68	79	
E	7/6	63	79	97	80	78	84	85	96	91	68	69	68	61	69	--	
D	Ave.		67.5								60.3	63.0		57.6			

* Not Included in Calculations

Table 2 - Number of Growing Days for 30 Inch Stems.
Large Flowered Varieties

	Date Pinched	Actual No. Long Days	Good News	Detroit News	October Rose	Ind. Yellow	Ind. Bronze	Ind. White	Alba-tross *	Dk. Pink Orchid Queen	Marke-teer	Marie De Petris*	Silver Sheen	Ave.
	8/1	36	27	27	33	26	25	25	29*	25	37	27*	31	28.4
	9/1	36	27	25	29	26	25	27	37*	25	29	26*	39	28.0
	10/4	36	38	38	35	42	40	43	39*	33	41	36*	48	31.8
	11/5	36	51	46	65	51	52	52	---	40	49	49*	62	52.0
	12/4	37	49	57	44	54	52	50	47*	41	44	---	61	50.2
	1/1	36	45	42	41	46	46	48	46*	42	44	44*	56	45.6
	2/3	30	37	37	34	34	36	36	32*	32	39	36*	49	37.1
	3/1	31	33	33	36	34	34	35	31*	29	35	35*	40	34.3
	4/1	29	34	30	32	36	38	38	34*	32	35	33*	40	35.0
	5/1	30	26	25	29	28	30	26	25*	25	31	25*	32	28.4
	6/1	31	29	29	26	29	26	30	30*	27	38	28*	34	29.8
	7/1	31	30	29	25	31	29	32	25*	26	34	29*	33	29.9
	Ave.		35.8	34.9	35.4	36.5	35.9	37.2		31.4	38.0		43.7	Grand Ave. 36.55
	Date Planted													
	7/15	21	26	24	24	28	37	30	26	33	28	--	30	29.4
N	8/15	22	21	--	21	24	26	27	24	19	23	21	31	24.4
O	9/14	22	24	23	23	25	25	28	27	22	27	32	37	27.2
T	10/14	32	51	52	--	58	--	52	--	29	--	--	65	51.0
	11/15	25	47	44	44	61	49	44	43	41	--	--	55	49.6
P	12/16	21	34	35	34	41	35	35	40	30	--	--	36	35.2
I	2/15	21	26	23	31	28	28	27	34	24	--	--	39	28.8
N	3/15	23	35	32	38	37	33	33	37	26	--	34	48	35.8
C	4/15	20	25	27	20	32	31	31	29	22	20	16	35	29.0
H	5/14	23	30	30	27	32	31	31	29	23	29	21	32	29.8
E	6/16	20	24	26	23	26	23	26	23	22	20	22	26	24.8
D	Ave.		31.1			35.7		33.0		26.4			39.4	Grand Ave. 33.18

* Not Included in Calculations.

Table 2A - Number of Days From Pinch to Light Off to Produce 30 Inch Stems (Pompons)

	Date Pinched	Long Days (Actual)	Arcad-ia	Nevada	Sunny-side*	Vesper	Match-less	Lakme	Gold-smith	Valen-cia*	Golden Jane*	Cassan-dra	Barcar-ole	Bro-cade	Pinoc-chio	White Mensa	Linda Lou*	Average
	8/1	31	23	20	---	19	21	17	28	18*	19*	20	25	19	24	22	23*	21.6
	9/1	30	25	23	23*	25	21	19	26	23*	24*	26	27	20	26	23	25*	23.7
	10/4	29	43	27	33*	34	32	29	39	22*	37*	38	37	26	33	30	31*	33.5
	11/5	30	50	38	38*	45	48	39	58	---	---	50	49	32	62	41	47*	46.6
	12/4	32	38	27	30*	37	37	27	40	31*	30*	41	53	31	52	42	43*	38.6
	1/1	32	38	33	30*	34	32	27	34	32*	30*	35	41	30	43	36	35*	34.8
	2/3	26	30	25	25*	27	26	22	28	26*	26*	28	31	21	46	30	31*	28.5
	3/1	31	27	27	25*	26	29	24	30	31*	26*	28	29	22	33	31	31*	27.8
	4/1	29	30	23	23*	25	28	24	24	22*	23*	31	25	25	33	35	28*	27.6
	5/1	31	27	30	---	26	28	25	37	35*	34*	25	29	22	28	30	26*	27.9
	6/1	31	27	25	20*	24	26	23	32	28*	27*	26	29	23	29	30	---	26.7
	7/1	31	23	21	20*	23	27	23	29	26*	22*	27	27	23	28	29	31*	25.5
	Ave.		31.8	26.6		28.7	29.7	24.9	33.7			31.2	33.5	24.5	36.4	31.6		Grand Ave. 30.2
	Date Planted																	
N	7/16	22	--	19	--	18	18	19	--	--	--	23	29	19	27	--	25	26.3
O	8/15	22	20	18	19	19	16	19	20	--	--	22	22	17	23	20	24	22.3
T	9/14	22	25	23	25	29	22	20	30	27	27	28	30	19	26	22	24	28.0
	10/14	32	50	--	--	--	--	--	--	--	--	63	68	--	59	--	--	63.3
P	11/15	25	38	30	--	--	--	--	--	--	--	37	48	--	52	38	44	45.7
I	12/16	21	38	38	--	25	--	23	--	--	--	23	34	23	37	--	30	31.3
N	2/15	21	33	38	--	26	30	25	--	28	--	22	30	23	28	25	26	26.7
C	3/15	23	30	23	--	20	30	26	--	24	26	29	33	22	39	35	32	33.7
H	4/15	20	25	25	14	15	24	20	13	15	15	25	25	17	26	24	24	25.3
E	5/14	23	25	23	19	28	26	24	26	20	22	30	28	20	29	29	--	29.0
D	6/16	20	20	19	19	18	19	18	23	22	17	20	22	16	23	20	22	21.7
	Ave.											29.3	33.5		33.5			Grand Ave. 32.1

Least Significant Difference for Months: 5% level = 2.9, 1% level = 3.8

* Not Included In Calculations.

Table 3 - 9 Ounce Bunches Per Sq. Ft. with 30 Inch Stems (Pompons)

	Planted	Arcadia	Nevada	Sunnyside*	Vesper	Matchless	Lakme	Goldsmith	Valencia*	Golden Jane*	Cassandra	Barcarole	Brocade	Pinocchio	White Mensa	Linda Lou*	Average
	7/16	1.1	0.6	----	0.9	0.9	0.9	0.9	0.2*	----	0.9	1.1	1.0	1.0	0.6	1.2*	0.90
	8/15	0.9	0.6	0.8*	0.8	0.7	0.9	0.6	0.6*	0.7*	0.9	1.3	0.8	0.9	0.7	1.0*	0.83
P	9/14	0.6	0.1	0.7*	0.7	0.7	0.6	0.5	----	0.4*	0.6	0.8	0.6	0.6	0.6	0.7*	0.58
I	10/15	0.6	0.4	0.5*	0.6	0.4	0.6	0.3	----	----	0.5	0.8	0.5	0.5	0.5	0.6*	0.51
N	11/15	0.8	0.5	0.6*	0.8	0.6	0.6	0.7	----	0.7*	0.8	0.8	0.6	0.7	0.8	0.5*	0.70
C	12/16	0.9	0.8	0.9*	1.0	1.0	0.6	0.7	0.6*	0.8*	1.0	1.2	0.6	0.8	1.0	0.9*	0.87
H	1/14	0.8	0.6	0.7*	1.1	0.9	0.8	1.3	0.6*	1.0*	0.8	1.2	1.1	0.8	1.0	1.6*	0.95
E	2/15	0.9	0.7	1.1*	1.2	1.1	0.9	1.0	0.4*	0.4*	0.8	1.0	0.8	0.5	1.2	0.9*	0.92
D	3/15	1.1	0.9	1.2*	1.3	1.2	1.2	0.7	0.3*	1.2*	1.2	1.1	1.0	1.0	1.0	1.3*	1.06
	4/15	1.4	0.9	1.8*	1.6	1.4	1.1	1.4	1.3*	1.3*	1.8	1.6	1.6	1.4	1.7	1.3*	1.44
	5/14	1.0	0.7	1.1*	1.1	0.9	1.1	1.0	1.0*	1.2*	1.2	1.1	1.0	2.1	1.2	----	1.13
	6/16	1.1	1.2	1.0*	0.9	0.8	1.0	0.9	0.9*	0.8*	1.0	1.0	0.9	0.9	1.0	0.6*	0.97
	Ave.	0.93	0.67		0.99	0.88	0.86	0.83			0.96	1.08	0.87	0.93	0.94		Grand Ave. 0.91
	7/16	---	0.7	----	0.3	0.3	0.4				0.5	0.7		0.4			
N	8/15	0.4	0.1	----	0.5	0.4	0.4				0.4	0.5		0.6			Least Significant Difference for Months: 5% level = 0.50 1% level = 0.66
O	9/14	0.4	0.2	0.4	0.4	0.3	0.3				0.3	0.5		0.5			
T	10/14	0.3	---	----	---	---	---				0.2	0.4		0.2			
	11/15	0.4	0.1	----	---	---	---				0.3	0.3		0.3			
P	12/16	0.4	0.3	----	0.4	---	0.3				0.4	0.4		0.3			
I	2/15	0.5	0.3	----	0.3	0.4	0.4				0.6	0.5		0.9			
N	3/15	0.5	0.3	----	---	0.5	0.4				0.5	0.5		0.7			
C	4/15	0.6	0.4	0.5	0.7	0.6	0.5				0.4	0.6		0.7			
H	5/14	0.5	0.4	0.5	0.6	0.4	0.3				0.6	0.5		0.5			
E	6/16	0.5	0.5	0.7	0.5	0.4	0.6				0.3	0.3		0.6			
D	Ave.										0.40	0.47		0.51			

* Not Included in Calculations.

Table 4 - Av. Flower Diameter Inches. Large Flowered Varieties

	Month of Bloom	Good News	Detroit News	October Rose	Ind. Yellow	Ind. Bronze	Ind. White	Albatross*	Dk. Pink Orchid Queen	Marketeer	Marie De Petris*	Silver Sheen	Average
	Sept.	5.17	4.82	4.88	4.53	5.09	5.14	5.03*	5.06	4.32	5.19*	4.48	4.83
	Oct.	4.75	4.42	5.19	4.54	4.89	4.87	4.91*	5.49	4.42	5.40*	4.68	4.81
P	Nov.	4.33	4.46	4.65	4.19	4.42	4.42	-----	4.98	4.38	4.79*	4.12	4.44
I	Dec.	4.63	4.45	5.03	4.06	4.56	4.42	4.30*	4.76	3.58	-----	4.37	4.43
N	Jan.	4.32	4.05	3.82	3.92	4.25	4.20	-----	4.46	3.45	-----	3.65	4.01
C	Feb.	4.47	3.94	5.22	4.26	4.40	4.45	4.56*	4.68	4.08	-----	4.46	4.44
H	March	3.97	4.27	5.13	4.11	4.20	4.23	4.08*	4.53	4.58	-----	4.22	4.36
E	April	4.47	4.54	4.76	4.47	4.58	4.56	4.49*	4.51	4.08	4.05*	4.29	4.47
D	May	4.54	4.69	4.72	4.27	4.26	4.29	4.91*	4.96	3.70	4.31*	4.34	4.42
	June	4.25	4.72	4.97	4.54	4.65	4.62	4.53*	5.11	3.99	4.22*	4.16	4.56
	July	4.43	5.15	4.87	4.61	5.25	4.71	5.07*	5.70	4.26	5.28*	4.55	4.84
	Aug.	4.53	4.56	5.23	4.65	4.84	4.70	4.94*	5.58	4.28	4.89*	4.50	4.76
	Ave.	4.49	4.51	4.87	4.35	4.62	4.55		4.99	4.09		4.32	Grand Ave.: 4.53
	Sept.	4.91	4.85	4.68	4.83	4.78	5.30	4.54	5.28	4.15	5.40	4.50	
N	Oct.	4.91	4.91	5.26	4.98	5.51	4.61	-----	5.33	4.30	-----	4.25	Least Significant Difference for Months: 5% level=.1994 1% level=.2648
O	Nov.	4.62	----	4.64	4.42	4.93	4.47	-----	5.48	4.12	4.87	4.09	
T	Dec.	4.15	4.32	4.50	4.04	4.25	3.87	-----	4.72	3.62	-----	3.54	
	Jan.	3.50	3.81	----	----	----	3.89	-----	----	----	-----	3.47	
P	Feb.	3.74	3.80	3.86	3.66	3.71	3.90	3.66	3.88	----	-----	4.35	
I	March	3.88	3.99	4.76	3.87	4.53	----	4.23	4.36	----	-----	----	
N	May	4.03	4.84	5.24	4.54	4.82	4.78	4.66	4.84	----	-----	4.34	
C	June	4.62	4.66	4.68	4.42	4.67	4.44	4.61	5.03	----	5.00	4.29	
H	July	5.34	4.30	4.50	4.93	4.72	4.79	4.79	5.10	3.78	4.58	4.50	
E	Aug.	4.56	4.29	4.78	4.89	4.89	4.92	4.59	5.08	----	-----	4.46	
D	Ave.	4.39											

* Not Included in Calculations.

Table 5. Pedicel Length (Pompons)

	Planted	Arcadia	Nevada	Sunnyside*	Vesper	Matchless	Lakme	Goldsmith	Valencia*	Golden Jane*	Cassandra	Barcarole	Brocade	Pinocchio	White Mensa	Linda Lou*	Average
	7/16	5.02	7.12	-----	6.52	5.63	9.76	7.54	8.20*	9.25*	7.54	6.22	8.77	2.39	5.63	6.08*	6.56
	8/15	1.99	3.38	4.82*	2.37	2.92	4.44	3.67	4.27*	4.89*	4.91	4.40	5.01	2.85	3.66	4.04*	3.60
P	9/14	0.78	2.51	2.95*	2.67	2.75	2.12	3.44	-----	4.18*	1.66	1.45	4.06	0.64	3.05	1.14*	2.28
I	10/15	0.93	2.73	2.54*	2.35	2.90	1.31	3.17	-----	-----	1.00	1.64	3.98	0.42	2.68	1.00*	2.10
N	11/15	1.30	3.09	3.31*	4.14	2.40	1.80	3.85	3.12*	4.97*	2.15	1.79	4.39	0.48	3.11	1.09*	2.59
C	12/16	1.21	2.31	3.31*	3.73	2.13	2.05	4.67	4.33*	5.13*	2.70	2.14	4.38	0.26	2.93	0.98*	2.59
H	1/14	1.02	1.67	2.86*	3.01	1.53	1.25	3.69	3.11*	3.31*	2.01	1.82	3.98	0.25	2.39	0.67*	2.06
E	2/15	0.97	2.57	3.16*	3.21	1.58	2.10	3.76	3.83*	4.33*	4.31	3.06	4.61	4.42	2.90	0.96*	3.04
D	3/15	1.25	1.94	3.73*	4.17	1.44	2.48	5.21	5.56*	2.55*	5.36	2.32	4.14	0.66	1.71	1.05*	2.79
	4/15	3.55	4.37	3.06*	4.25	4.29	3.85	3.90	3.95*	4.33*	5.82	4.88	5.79	2.02	3.98	2.57*	4.25
	5/14	1.92	4.60	3.95*	4.61	4.26	3.95	4.89	5.41*	6.67*	6.06	2.93	5.34	1.13	3.36	-----	3.91
	6/16	4.07	6.00	5.89*	6.49	5.23	5.73	5.33	7.06*	7.33*	5.50	5.07	7.01	1.99	4.52	2.49*	5.18
	Ave.	2.00	3.52		3.96	3.09	3.40	4.43			4.08	3.14	5.12	1.46	3.33		Grand Ave. 3.41
	7/16	----	7.31	-----	7.23	6.04	7.78	----	-----	-----	5.07	3.78	5.63	1.87	----	3.53	
N	8/15	2.70	6.00	5.17	4.11	4.35	4.95	6.63	-----	-----	3.81	5.91	5.05	1.48	5.21	3.43	
O	9/14	1.34	4.31	-----	3.14	2.89	4.12	4.06	-----	4.25	2.34	4.14	4.28	0.93	3.60	3.36	Least Significant Difference for Months: 5% level = 0.71 1% level = 0.95
T	10/14	1.73	----	-----	----	----	----	----	-----	-----	1.38	1.28	----	0.70	----	----	
	11/15	1.96	2.90	-----	----	----	----	----	-----	-----	1.68	1.84	----	0.47	2.95	1.40	
P	12/16	1.61	3.10	-----	4.27	----	2.87	----	-----	-----	3.63	1.83	4.50	1.20	----	1.78	
I	2/15	1.21	2.21	-----	2.62	1.78	1.89	----	3.25	-----	2.30	2.06	2.93	0.53	2.83	1.57	
N	3/15	1.24	4.26	-----	3.57	1.77	2.78	----	5.32	4.57	3.16	2.54	4.01	0.72	2.89	0.96	
C	4/15	1.66	4.20	5.87	5.84	2.65	4.24	6.23	6.79	8.72	3.55	4.52	5.25	1.30	3.72	1.93	
H	5/14	2.37	4.67	5.92	3.67	2.67	3.88	6.02	6.59	6.13	4.53	3.82	5.50	1.20	4.27	----	
E	6/16	3.10	4.50	5.97	5.61	3.83	5.48	5.68	6.15	8.47	5.39	3.97	6.38	1.72	4.47	4.08	
D	Ave.										3.35	3.24		1.10			

* Not Included in Calculations.

Table 6 - Flowers Per Stem (Pompons)

	Planted	Arcadia	Nevada	Sunnyside*	Vesper	Matchless	Lakme	Goldsmith	Valencia*	Golden Jane*	Cassandra	Barcarole	Brocade	Pinocchio	White Mensa	Linda Lou*	Average
	7/16	17.22	5.80	-----	7.90	11.88	16.56	7.80	11.20*	10.00*	13.95	13.80	11.10	39.98	7.66	26.96*	13.97
	8/15	11.66	6.41	14.50*	10.09	9.98	15.34	6.17	7.74*	5.85*	11.51	14.00	14.12	18.88	9.15	22.11*	11.57
P	9/14	8.16	3.18	7.11*	5.68	6.53	5.17	4.12	-----	4.44*	4.90	7.31	3.76	12.55	3.81	8.00*	5.92
I	10/15	6.38	3.33	8.36*	6.02	5.53	6.15	3.43	-----	-----	4.72	5.85	5.14	6.65	3.95	7.77*	5.20
N	11/15	12.15	5.33	10.07*	8.17	7.04	9.63	5.50	5.30*	5.39*	7.90	7.58	6.44	11.06	6.58	8.90*	7.94
C	12/16	12.76	10.14	12.77*	9.33	9.08	9.12	6.26	4.79*	5.88*	10.38	11.60	6.17	16.26	8.56	12.67*	9.97
H	1/14	11.75	6.33	11.34*	10.54	10.50	11.45	5.98	6.14*	7.14*	11.17	11.77	7.55	15.69	10.07	14.09*	10.25
E	2/15	14.75	6.77	22.43*	12.66	11.54	11.34	7.36	4.85*	5.73*	13.61	12.95	7.90	16.83	8.18	10.90*	11.25
D	3/15	14.71	6.91	16.40*	10.14	15.35	14.07	6.47	5.62*	5.39*	18.43	13.80	9.02	20.98	13.90	6.49*	13.07
	4/15	21.04	7.89	20.38*	14.70	17.85	17.63	9.09	6.07*	5.93*	21.95	25.33	21.50	32.79	8.55	20.44*	18.03
	5/14	11.89	5.29	15.46*	10.97	11.80	16.01	6.55	5.23*	5.91*	16.45	12.87	12.28	28.73	10.56	-----	13.04
	6/16	12.05	6.34	12.66*	8.02	10.19	14.68	6.53	4.33*	3.91*	12.80	15.19	11.71	20.19	6.23	9.04*	11.27
	Ave.	12.88	6.14	-----	9.52	10.61	12.26	6.27	----	----	12.31	12.66	9.72	20.05	8.02	-----	Grand Ave. 10.95
	7/16	-----	5.52	-----	12.26	10.50	11.08	----	----	----	11.92	12.65	9.04	22.52	----	21.37	
S	8/15	15.85	6.47	11.67	12.91	11.09	12.19	7.70	----	----	10.37	20.34	14.57	4.90	11.58	15.66	
I	9/14	14.59	5.12	-----	8.34	8.39	10.31	6.44	----	6.00	10.23	14.28	6.94	17.97	7.19	19.70	Least Significant Difference for Months: 5% level = 2.66 1% level = 3.51
N	10/14	8.65	----	-----	-----	-----	-----	----	----	----	5.32	6.29	-----	8.77	-----	-----	
G	11/15	9.85	4.16	-----	-----	-----	-----	----	----	----	7.80	8.49	----	12.87	5.40	9.42	
L	12/16	9.45	6.45	-----	6.18	-----	7.40	----	----	----	12.36	9.20	4.58	13.00	-----	9.66	
E	2/15	13.81	5.97	-----	10.10	7.61	9.70	----	5.16	----	14.26	12.13	5.91	19.57	8.26	13.23	
	3/15	12.24	7.46	-----	11.19	10.82	7.79	----	7.43	5.57	12.09	12.00	7.68	19.47	10.47	12.93	
S	4/15	12.45	6.89	29.47	27.86	11.87	13.54	19.95	10.64	8.69	14.11	17.65	17.08	12.60	12.40	11.68	
T	5/14	18.82	9.64	29.98	10.86	11.77	13.55	7.30	10.66	8.62	17.57	18.18	11.76	32.13	12.47	--0--	
E	6/16	19.36	10.50	38.72	12.53	12.04	22.03	8.90	6.71	7.16	15.80	15.96	13.17	34.80	11.63	28.69	
M	Ave.										19.84	13.38		18.05			

* Not Included in Calculations.