Colorado Flower Growers Association, Inc.

IN COOPERATION WITH COLORADO STATE UNIVERSITY

Doris Fleischer, Executive Secretary

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Continuous Culture of Carnations

by Gordon Koon

Before we had greenhouse cooling, the practice of keeping carnation plants in production more than one year was of questionable value. "Carry-over" benches produced heavily in late May and June when the market was overloaded. The flowers were cut low into the plant, or the plants cut back, to keep the height down low enough to carry a second year. Summer heat hardened the plants severely. Very little useful production was realized from these plants until the following spring when light conditions improved. Therefore, total production was often less than from newly planted benches.

Air conditioning came in and the way was open to develop a successful method of keeping plants from one year to another. However, the old cropping pattern of carry-over benches had to be changed. The key to the timing of old plants came from a crop planted April 1, 1955 - the summer prior to air conditioning. The plants were pinched once and produced the first crop in late July and August. Flowers were cut high, taking standard-grade length (17-20 inches) and leaving most of the side breaks. These breaks returned a heavy second crop in November and December. The November-December crop was again cut high leaving breaks that returned for Easter and Mother's Day. Production for this year (July 1-June 30) was 44 flowers per sq. ft. of bench area.

In June of 1956 about half the benches were replanted due to disease, variety requirements, etc. Air conditioning was in use by this time, and a series of tagged cuts was begun. The objective was to find out when to expect cuts to return so that a system of timing could be worked out. Production for this year was lower than the previous year with 41 flowers per sq. ft. of bench.

In June of 1957 only two benches were replanted, or about 3 per cent of the area. The remaining plants were carried into their second and third years of continuous production. A record high yield of 53 flowers/sq. ft. was attained. By applying the information from the tagged cuts the previous year, we had peak production for Christmas and the Easter-Mother's Day period.

On July 1, 1958 about 8 per cent of the area was replanted with the remainder carried into the second, third and fourth years of continuous production.

We anticipate replanting the entire range in 1959 to get a fresh start. Disease has taken its toll in some benches. Others have flowers touching the glass, and many are getting too high to cut conveniently (most benches have eight sets of support wires). However, about 50 per cent of the benches could still go another year or two. Plants are about 6 to 7 feet tall. All walks are built up with lumber to the height of the benches.

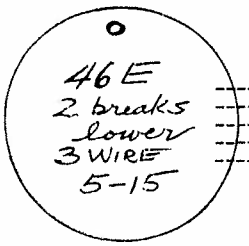
Stem quality has been excellent, but flower quality has varied with temperature. The three and four year benches had poor flowers during late summer and early winter. It appears that this winter condition can be corrected by lowering the temperature on sunny days not to exceed 65 degrees F.

Methods of tagging

Cuts are either made to existing side breaks or to a blind node. Periodically, tags were placed on the stub left from a blind cut, or on breaks that were left. Cutters were given a pocket full of tags with the date on them, and told to hang them on cuts made along the outer rows of the benches. Tags hung in the middle of benches were usually not recovered because they were hidden in the plant growth. Timing information is based largely on the results of this tagging and is for Sim varieties only.

Blind cuts

When breaks from blind cuts were long enough to tag above the point where they would be cut, the original tag was removed and all breaks resulting from the cut were tagged. Typical information appearing on the tags with an explanation follows:



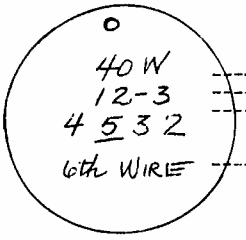
-------- bench no. 46- East side of bench
-------- two breaks resulted from the cut
-------- this tag on lower of the two breaks
-------- out made at 3rd support wire from bottom on May 15

As the breaks developed into flowers and were brought into the grading room, tags were removed and dated. Many blind cuts did not break, especially those in hard wood or those heavily shaded by plant growth.

Cuts to breaks

Tagging was done in a similar fashion with the cutters hanging one tag on the main stem as it was cut. The date cut, estimated length of breaks in inches, and location of break both on the stem and height above the bench were recorded. For instance 5,3,1 on a tag meant that there were three breaks left, the upper being 5 inches, the middle 3 inches, and the lower 1 inch in length.

Later, when the breaks were longer, each individual break was tagged above the level where it would be cut when mature. The original lengths of all the breaks from the cut were recorded on each tag, with the length of the one being tagged underlined. An example of the tagging system for breaks follows:



---------bench no. 40 - West side
--------- breaks left December third
--------- four breaks left - 4,5,3,1,inches long from upper to lower. This tag on second break (underlined)
--------- breaks left near 6th wire above bench

Compiling the data

Tags that came in on flowers were sorted periodically and the information organized by dates and types of cut. Typical information obtained by grouping all the breaks from a given cut follows:

Bench	Variety	Date left	No. of breaks	Position of break	Date cut
Blind cuts					
18-E	Red Sim	Oct 9	2	upper	June 2
				lower	June 23
28-E	Gayety	Oct 9	1	-----	June 19
27-E	White Sim	May 15	3	upper	Dec 3
				middle	Dec 12
				lower	Jan 4
			Length & Position	Height	
Cuts to breaks					
53-E	Pink Sim	Oct 11	7	5 wire	Dec 17
47-W	Red Sim	Oct 10	4, 4	5 wire	March 3
			4, 4		March 14
50-E	White Sim	Nov 13	2,2,2,½	5 wire	Apr 11
			2,2,2,½		Apr 14
			2,2,2,½		May 21
			2,2,2,½		June 23
27-W	White Sim	Dec 3	1,4,3,4	5½wire	May 19
			1,4,3,4		Apr 25
			1,4,3,4		May 1
			1,4,3,4		May 1

Array of return flowers from May blind Cuts

May appeared to be an important month for blind cuts, so a large number of tags were hung on blind cuts made May 15. The month in which flowers returned from these cuts is shown graphically in figure 1. Although the spread in this crop was 9 months, most of the flowers were cut in November, December and January.

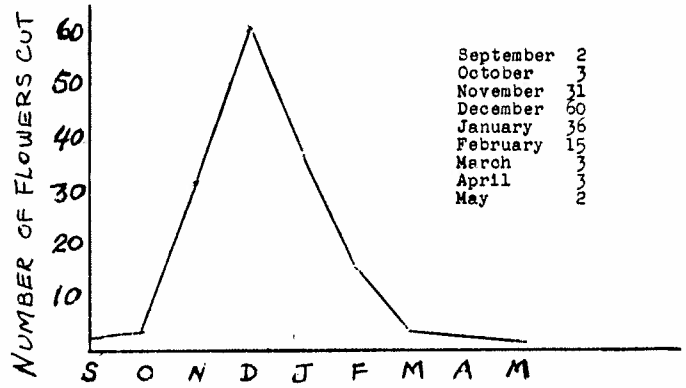


Fig. 1. The return crop from blind cuts made May 15.

Blind cuts made in January produced a similar curve for the return crop, with peak production in August. With the results compiled in this manner, table 1 was prepared as a guide for cutting and timing year around.

Table 1. Carnation Timing from Breaks and Blind Cuts

To flower in ____	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Leave 3-5 Inch Breaks ____	Sept. Oct.	Oct. Nov.	Oct. Nov.	Nov. Dec.	Dec. Jan.	Jan. Feb.	Mar. Apr.	Apr. May	May June	June July	July	Aug
Cut Blind ____ (soft wood, good light)	May June	June July	July Aug	Aug Sept.	Sept Oct.	Oct. Nov.	Dec. Jan.	Feb. Mar.	Mar. Apr.	Mar. Apr.	Apr. May	May June

Several factors were found to affect the time required for a return crop such as size of break left, location with regards fans and evaporative pads, as well as time of the year a flower was cut. On the pad end of a greenhouse there were an average of 1.75 breaks from those cuts which resumed growth and these required an average of 7 1/3 months to flower. On the fan end of houses the number of breaks was 2.3 and the time 6 2/3 months. It should be understood that many cuts did not break again. To give a general picture of the influence of size of break left on time of flowering, table 2 has been compiled.

Table 2. The effect of size of break left below a cut on time of flowering.

Breaks left	Length in inches	Flowering time
May 15	4 to 5	August
	1 to 3	September
Aug. 23	3 to 4	January
	2 to 3	February
Sept. 5	3 to 4	January
	1 to 2	February
Oct. 10	6 to 7	Dec.-Jan.
	4 to 5	Jan.-Feb.
	3 to 4	March
Nov. 8	5 to 6	February
	4 to 5	March
	2 to 3	Apr.-May
	1	May-June
Dec. 3	7	March
	4 to 6	April
	2 to 3	Apr.-May
Jan. 23	5	May-June

CONTINUOUS CULTURE CALENDAR FOR HOLIDAY TIMING AND QUALITY PRODUCTION

Month	Procedure	Explanation
January	Leave only extra large breaks.	Most breaks left in January flower after Mother's Day.
	Make blind cuts deep into plant. Undercut where possible, especially along sides.	Flowers from Jan. blind cuts flower in mid-summer. Cutting hard should prevent breaking or at least delay to better market.

Month	Procedure	Explanation
February	Eliminate all breaks	Breaks flower in June - poor market.
	Blind cuts deep or undercut same as January.	Delay returns from blind cuts so they will flower when demand is better. Benches produce heavily in summer even with light plant load.
March	Eliminate all breaks.	Breaks flower in July. Poor market.
	Blind cuts deep or undercut.	Blind cuts return in late summer or fall.
April	Eliminate all breaks.	Breaks flower in August.
	Establish a new blind cut level in good wood. (One-half wire above last level should be adequate.)	April blind cuts very important for October-November production.
May	Eliminate breaks.	Breaks flower August-September.
	Blind cuts to level established in April.	May blind cuts are source of Christmas flowers, along with breaks left in July and August.
June	Eliminate breaks.	Breaks flower in September-October.
	Blind cuts to origin or undercut.	June blind cuts not encouraged since they flower January-February when reduced plant load desirable due to poor light conditions.
July	Leave breaks, especially medium and small. (Flowers from high breaks require only one wire support).	Medium and small breaks left in July flower November-December.
	Set new blind cut level ½ wire above level set in April.	Blind cuts in July flower February-March and start building crop for Easter and Mother's Day.
	Leave breaks as high as one wire above this new blind cut level.	
August	Leave breaks, especially large and medium size.	Large and medium breaks flower in November-December.
	Blind cuts at new level set in July.	August blind cuts produce Easter flowers.

Month	Procedure	Explanation
September	Eliminate breaks.	September breaks flower in January when light is poor. Reduce tail-out problems following Christmas crop with light plant load in January.
	Blind cuts at level set in July.	September blind cuts flower for Mother's Day, along with breaks left in November-December.
	Time to start running new set of wires to take care of winter stretch.	
October	Leave breaks, especially medium and small size.	Medium and small breaks flower early spring.
	Blind cuts to origin or undercut where possible.	Flowers from October blind cuts flower after Mother's Day when market usually loaded and benches produce heavily even with light plant load.
November	Leave all breaks. Take Standard length if necessary to leave breaks. Inspect flowers before cutting to leave all possible.	November breaks produce Easter and Mother's Day flowers.
	Blind cuts to origin or undercut wherever possible.	Help reduce June production.
December	Leave breaks, especially large and medium.	Large and medium breaks left in December produce Mother's Day flowers, along with breaks from blind cuts made in September.
	Blind cuts deep or undercut.	Discourage return from blind cuts in December to hold down July production.

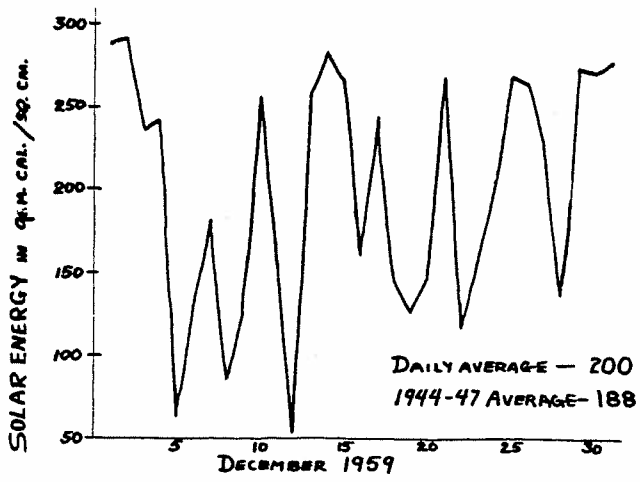
Breaks require 2 to 5 months to flower depending upon size, time of the year, location in the bench and on the plant, etc. They are often high on the stem causing the sacrifice of stem length, if they are to be left. Breaks left too high on the plant often develop into short-jointed stems with hollow flowers. A better concentration of a crop can be attained from breaks than from blind cuts. Leaving breaks causes a greater loss in cutting level. An average of three flowers develop following cuts to breaks, however, breaks smaller than one inch in length often fail to develop.

Blind cuts take about twice as long to develop the next crop of flowers -- 4 to 10 months. Blind cuts allow taking a long stem, return the crop over a long period, but tend to concentrate the main part of the crop. The breaks resulting from blind cuts are often thin and weak until they are tall enough to receive good light. Blind cuts will break as long as the wood is succulent and of good diameter, and there is adequate light to the cut stems. Plant height or cutting level is much easier to control with blind cuts. An average of about two flowers was obtained from the blind cuts which were tagged.

We wish to thank Gordon Koon, Manager of the Frank Kirschner Greenhouses, Denver, Colorado, for this fine and original contribution to carnation culture.

Pre-Christmas Light

Light in northern Colorado was below normal in November and until the 12th of December. After this date, we received normal or above normal light the rest of the month. The total solar energy received in December was 36 per cent of that received the previous August.



your editor,
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