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FURTHER STUDIES ON ROSE PLANT RENEWAL

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If a rose plant is grown so that food reserves are sufficiently high, low temperatures at night will cause cane renewal. While this year's results were not suitable from the standpoint of commercial application, we believe that further study will show that one or two nights of low temperature, instead of 4 weeks, will be sufficient to rejuvenate, without interfering drastically with the cropping period. The important factor in determining success of renewal of old bushes is whether or not a grower is able to produce a healthy, vigorously growing plant through the winter period. We are not sure what controls accumulation of food reserves, but we think that stimulation of adventitious buds at the base of a rose bush, or the growth of dormant buds, is dependent upon a sufficient food reserve which can be mobilized by these buds either by fulfilling a cold requirement, or loss of apical dominance.

Methods and Materials

Four, 15×18-foot, fiberglass-covered greenhouses were utilized. 'Samantha' were planted in the ground on July 5, 1978, in the south beds. 'Cara Mia', which had been planted on June 5, 1975, in the north beds, were cut back to 18-inches on June 3, 1978. Each bed was divided into 3 plots of 12 plants each with a density of one plant per sq. ft. All plants were pinched twice during the summer, and then pinched once more in September to time for the Christmas market.

All four houses were heated to 75°F, with ventilation at 86°F during the day. CO_2 was injected, with plants watered on demand with the rose solution devised by Sadisiaviah and Holley. With the exception of the low temperature treatments, all houses were maintained at 62°F nights. The treatments were:

Control: Night temperature 62°F.
I: 32°F night from Sept. 30, 1978, to Oct. 30, 1978.
II: 32°F night from Dec. 23, 1978, to Jan. 8, 1979.
III: 32°F night from Feb. 22, 1979, to Mar. 23, 1979.

The number of degree-days below 62°F for each treatment was 283, 246, and 402 for I, II and III respectively.

Production records were kept from Oct. 1, 1978, through June 9, 1979, at which time 5 cropping cycles were completed in the control house. Flowers were cut daily, and weekly records were kept on total flowers and the stem length from each plot. To assess quality, a number was assigned to each stem length, beginning with 1 for malformed, with 8 for 27-inch and longer stems. The number of flowers cut in each grade was multiplied by the appropriate number and added for all grades to obtain a weighted figure for flower quality.

Bottom breaks, or renewal canes, were defined as any new shoots, ¼-inch diameter, rising from within 12-inches above the graft union.

Stem and leaf samples were taken for carbohydrate analyses on Sept. 30, before any cold treatments had been given, on the day each of the cold treatments ended, and on May 10, 1979. All tissue was from flowering stems, from 3 plants per plot, and combined to make one leaf and one stem sample. Sugar and starch analyses were run, and then combined to provide a figure for "total nonstructural carbohydrates" (TNC).

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Results

Weekly 'Cara Mia' yield throughout the year was typical of lower yield and quality found for both cultivars in all cold treatments (Fig. 1). Production peaks were essentially the same as the control up until the cold treatment began. Thereafter, they were lower, broader, with some delay, spreading the production out more evenly throughout the winter. The major demand periods were often missed. Both average yield and stem grade for the entire year (Table 1) were lower than the control.

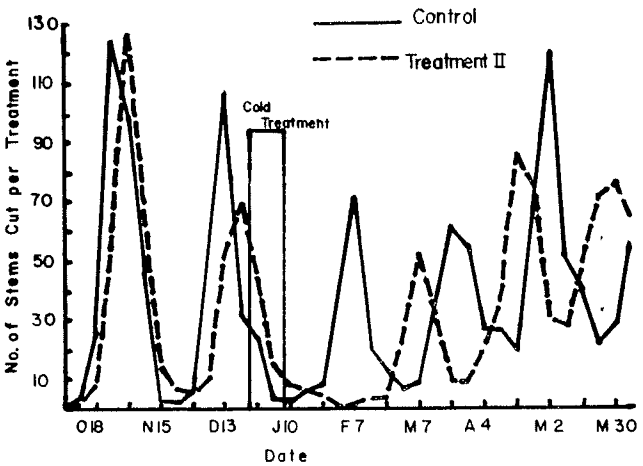

Figure 1: Typical example of the effect of a 32°F night temperature on yield of 'Cara Mia' rose plants. With the exception of the cold treatment between Dec and Jan, both treatments maintained at 62°F night, heated to 72°F during the day and ventilated at 86°F.

Table 1: Effect of 32°F night temperatures on average yield and stem grade per cropping period per plot of 'Samantha' and 'Cara Mia' rose plants (12 plants per plot).

	'Samantha'		'Cara Mia'	
Dates of cold treatment	Yield	Stem grade	Yield	Stem grade
Control	92	518	87	465
I. Oct	78[z]	479	68	383
II. Dec-Jan	76	395	78	437
III. Feb-Mar	92	531	70	355

Note: Total period for records from Oct. 1, 1978 through June 6, 1979.
[z]Figures underlined are significantly different from the Control.

Cold treated plants produced a greater proportion of their yield and stem length in the spring after cold treatment than did the control (Table 2). For example, 'Cara Mia', in Treatment III (Feb-Mar), produced 41 percent of its total flowers, and 43 percent of its total stem grade, in the period between March and June. This followed the results obtained last year, during the temperature splitting work (CFGA Bul. 337). Some rejuvenation had taken place. The number of bottom breaks was increased by the Dec-Feb and Feb-Mar treatments (No.'s II and III), but there was no reaction by plants subjected to the Sept-Oct treatment (No. I) (Table 3).

The difference between Treatments I and II and III were found in the carbohydrate analyses. Leaves and stems of both cultivars exhibited patterns of carbohydrate fluctuation similar to each other throughout the winter. Total sugar was fairly constant except when treated to nights at 32°F. There was a definite seasonal trend in starch in all treatments. No relationship between cold treatment and starch was observed. But, when the total nonstructural carbohydrates (sugar plus starch) were added together, bottom breaks were found to occur when the level in leaves was above 20% and the level in the stems above 9%.

Table 2: Percent of the year's total yield and stem grade produced in the final cropping period, Apr. 22 to June 9, of 'Samantha' and 'Cara Mia' rose plants, after being subjected to 32°C nights. Total record period from Oct. 1, 1978, to June 9, 1979.

	'Samantha'		'Cara Mia'		Combined	
Cold treatment	Yield	Stem grade	Yield	Stem grade	Yield	Stem grade
Control	22	25	30	30	26	27
I. Oct	25	30	34	37	29	33
II. Dec-Jan	29	37	34	36	31	36
III. Feb-Mar	34	38	41	43	37	40

Table 3: Effect of 32°F night temperature on average bottom break production per plot for 'Samantha' and 'Cara Mia' rose plants (12 plants per plot).

Dates of cold treatment	'Samantha'	'Cara Mia'	Combined
Oct 1 to Dec 1			
Control	2.3	0	1.2
I. Oct	1.7	0.3	1.0
II. Dec-Jan	2.0	0	1.3
III. Feb-Mar	3.7	0	1.8
Feb 15 to Apr 2			
Control	2.3	0	1.3
I. Oct	0	0.3	0.3
II. Dec-Jan	8.7[z]	4.3	6.5
III. Feb-Mar	0.3	0	0.3
Apr 3 to May 26			
Control	0	0	0
I. Oct	0	1.0	0.5
II. Dec-Jan	0.7	0.3	0.5
III. Feb-Mar	3.7	6.7	5.2

[z]Values underlined are significantly different from the control treatment.

Discussion

On the basis of this work, we think that shorter periods of cold treatment would be just as effective as the long treatments we gave in this case. The long, early winter treatment (No. II, Dec-Jan) suffered from a total lack of a Valentine's crop. Treatment III (Feb-Mar) gave more nearly normal holiday production. The lack of renewal and rejuvenation in Treatment I (Oct) was attributed to low total food supply. There were reduced starch levels in the plants at this time. This suggests to us that food accumulation in the rose may be partially influenced by temperature, although this is mostly conjecture at this time. However, we are reasonably sure that renewal canes require adequate food supply before any treatment, whether it is cold treatment, growth regulators, etc., will cause them to grow. These tentative conclusions imply that attempts to rejuvenate weak, poorly grown or diseased plants will not be very successful.