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Optimum Temperatures for Carnations in Colorado /1

by
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Results from work in the CSU Temperature Research House during the past two years has sharpened our knowledge of optimum temperatures for Sim carnation varieties. The day temperature should vary with the amount of solar energy received by the plants as has been suggested in previous CFGA bulletins. It is now possible to confirm the following temperature recommendations:

DAY TEMPERATURES

1. When solar energy is high (May to August)
   a. Young plants in their first 6 months of growth-- 70°F.
   b. Plants older than 6 months-- 65°F.
2. When solar energy is intermediate-- averaging 250 to 400 gram calories per sq. cm. per day-- September 15 to November 15.
   a. Young plants-- 65°
   b. Older plants-- 60°
3. When solar energy drops below 250 grm cal/sq cm/day-- normally from November 15 to March 1 in Colorado-- 60°.
4. When solar energy drops below 200 grm cal/sq. cm/day, in January, 57° should help considerably in maintaining flower grade, especially on older plants.
5. Raise day temperature to 65° after two weeks of sunny weather in March.

NIGHT TEMPERATURES

1. From September 1 to October 15-- 54°
2. From October 15 to March 15-- 50 to 52°
3. From March 15 to May-- 54°

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The four compartments in the Temperature Research House were maintained as follows during 1958 to 1960:

Compartment A was regulated at 65°F year around except when evaporative cooling allowed 70° and slightly higher during some days of the summers.

Compartment B: 70° first summer to September 15, 65° to December 25, 60° to March 15, 65° second summer, 60° from November 15 to the completion of the experiment at the end of April.

Compartment C: 70° during the first summer, 65° from September 15, lowered to

/1 This is a part of the research work done by Jim Manring in partial fulfillment of the requirements for the Master of Science Degree at CSU. This work was supported by the Colorado Flower Grower's Association, Inc.

60° on November 15, back to 65° from February 10 to March 15, 70° from March 15 through the summer, lowered to 60° on September 30 for the entire second winter.

Compartment D was heated to 60° and cooled at 70° until March 13 of the first year, at which time the cooling thermostat was set at 65° for the second year.

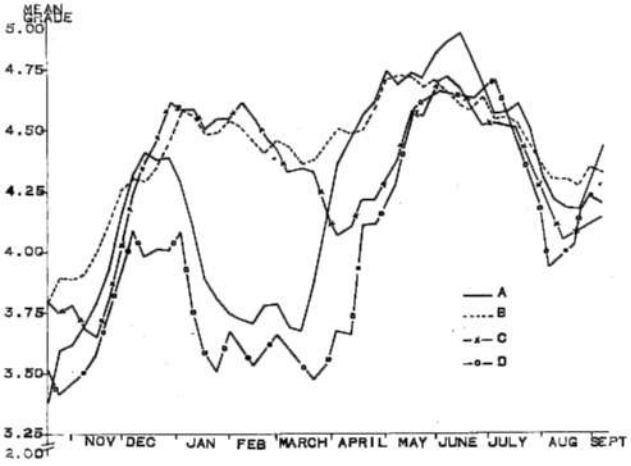

Fig. 1. The mean grade of flowers produced in four different day temperature combinations. Red Gayety carnation in its first year. Total yield: A= 2550, B= 2476, C= 2604, D= 2660.

Results and discussion

All flowers were graded and a weekly mean grade was calculated for each compartment by assigning numerical values of 2 for design, 3 for short, 4 for standard, and 5 for fancy grades. In order to smooth irregularities in resulting graphs, three-week moving means were calculated for the mean grade in each compartment. The graphs of mean grades during the two years are presented in three figures.

Figure 1 shows the mean grade of flowers cut from first-year Red Gayety, 1958-59. A steady day temperature of 65° greatly reduced the mean grade of flowers from December to April 1 (Compt. A). Heating to 60° on cold days and allowing the temperature to rise to 70° on sunny days greatly reduced flower grade from late November to late May (Compt. D). Ten degrees difference in temperature between cold and warm days is too great a spread for quality flowers. This fluctuating temperature decreased fancy grade, and increased standard, short and design grades of flowers. 66 percent of the flowers graded below fancy, with approximately half of these being downgraded because of insufficient weight. The flowers were not split, but hollow centered and small with weak stems.

The average grade was maintained at a reasonably steady level on young plants by reducing the day temperature to 60° either November 15 or December 25. There was little difference in the mean grade of flowers cut from Compartments B and C until mid-March even though the temperature was reduced to 60° in Compartment C on November 15, and not lowered in Compartment B until December 25. The decrease in mean grade in Compartment C after mid-March was largely due to the raising of the day temperature to 65° on February 10, which is too early to raise the temperature in normal years. The mean grade held steadily in Compartment B where the day temperature was not raised until March 15.

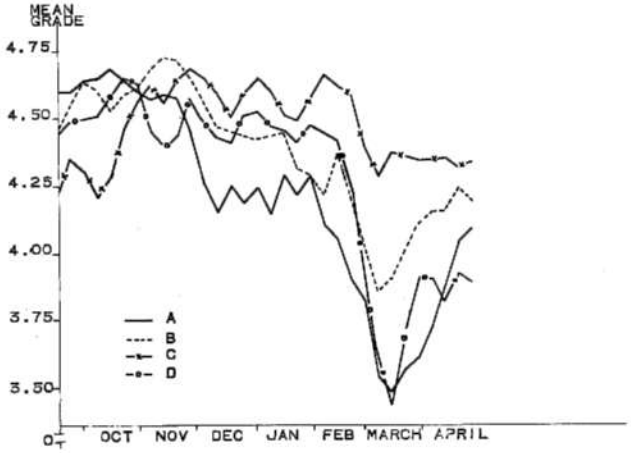

Fig. 2. The mean grade of flowers produced in four day temperatures slightly modified from those used the first year. Red Gayety in its second year. Total yield: A= 1215, B= 1241, C= 1239 and D= 1359.

In figure 2 is shown the mean grade of flowers from the same plants in their second year of production. Temperature for Compartment A was unchanged from the first year. B was controlled at 65° the second summer until November 15 then lowered to 60°. The day temperature for Compartment C was 70° from March to September 25, at which time it was decreased gradually to 60° for the entire winter. Compartment D was heated to 60° on cold days and cooled to 65° on warm days during the second winter, 5 degrees less spread than the previous year.

The average grade of flowers on second-year Red Gayety (Fig. 2) during the

summer and early fall was lowest in Compartment C where a day temperature of 70° was used. Mean grade was essentially the same in Compartments B, C and D from November 1 until February, when the mean grade decreased sharply in B and more sharply in D. Holding the day temperature at 60° from September 30 in Compartment C did not prevent a decrease in mean grade during March and April, but the mean grade held up significantly better than in all other temperature treatments. The steady 65° day temperature in Compartment A caused the mean grade on older plants to start declining in late November, with a further sharp drop in February. Solar energy was the lowest on record for the winter of 1959-60, especially was it below normal in January, February and March.

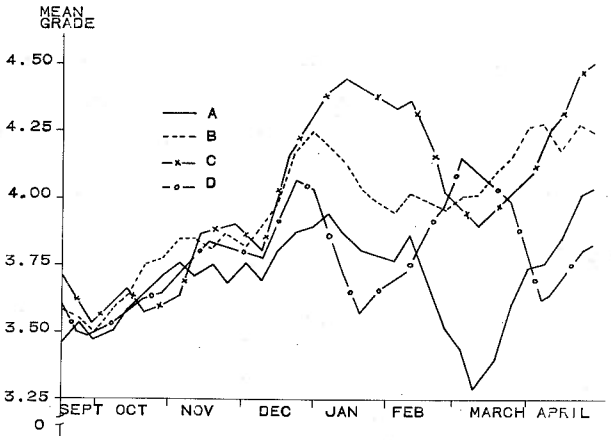

Fig. 3. The mean grade of flowers produced in the same four temperature combinations used in Fig. 2. White Sim in its first year. Total yield: A= 1663, B= 1555, C= 1527 and D= 1774.

Figure 3 covers the same period (winter 1959-60) and the same temperature compartments except that one-year White Sim are the producing plants. The mean grade of flowers from these young plants was essentially the same until December 1. From December through February mean grade was highest in Compartment C (60° from September 30) and second highest in Compartment B, which had 60° day temperature from November 15. Continuous 65° temperature (Compartment A), and the 60-65 fluctuating temperature (Compartment D) reduced mean grade of flowers.

Yield

The small differences in yield between temperature treatments seem to favor the temperature combinations which allowed a net increase in total degrees of temperature. Cooler temperatures used at the right time increased the grade of flowers more than enough to nullify these increases in yield, if they are real differences.

Decreasing temperature

The yield of flowers has been depressed around 15 percent during the three weeks immediately following the reduction in temperature from 65° to 60°. This reduction and the period involved have been relatively consistent. When the temperature was continued at 65° throughout the winter, flower grade decreased severely during the winter. The reduction from 65 to 60° can be delayed until December 25 for young plants without serious effects on flower grade, or it can be made October 15 for older plants, to avoid affecting the yield for the Christmas period.

Raising the temperature in spring

The date of raising the temperature from 60° to 65° should depend on the amount of light available to plants. The increase in yield following a temperature rise of 5 degrees lasts only a few days. However, if temperature is raised before the plants have had at least two weeks of sunny weather, mean grade will be decreased significantly. This was illustrated when Compartment C was raised from 60 to 65 on February 10, 1959 (Fig. 1). March 15 is normally about the right date to raise day temperature in Colorado.

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A Yankee Looks at the