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## Influence of Day Temperatures on Carnations

by Joe J. Hanan

Yield of carnations was not influenced within the range of 60 to 75°F day temperatures other than to hasten or delay flowering. However, within this range, small changes can markedly influence quality, especially if care is not used in setting the proper day temperatures according to light intensity and age of the plant.

The following is a partial summary of the results of the day temperature investigations carried out during 1957 and 1958. Some preliminary information was presented earlier in Colorado Flower Growers Association Bul. 96.

Carnations were grown at day temperatures of 60, 65, 70, and 75°F. The night temperature in all treatments was set at 52°F. These settings were maintained approximately nine months of the year. During the summer (July through September), no attempt was made to control night temperature. The summer day temperatures during 1957 seldom exceeded 75°F, while in 1958 the minimum day temperature maintained with any consistency through the same period was 70°F.

Experiment 1 consisted of Red Gayety rooted cuttings benched on May 21, 1957, and pinched June 15. Experiment 2 was

White Sim benched in a nursery bed August 21, 1957, pinched September 12, and transplanted to the different temperature compartments on October 18.

Measurements were made on the length and strength of stems, color and size of flowers, leaf width, internode length, keeping life, fresh weight and per cent dry matter in stems in addition to yield and average grade.

Experiment 3 consisted of carnation plants grown for 12 weeks in each compartment, harvesting the plants and determining the increase in dry weight during that period. Sufficient room was available to allow a new crop of ten plants started, and ten plants harvested, every three weeks. In all, 11 consecutive crops were harvested from August 21, 1957, to June 11, 1958. Day temperatures did not cause significant differences in dry matter production in this experiment. Since dry matter did follow solar energy, regardless of the temperature, the dry matter increase in one temperature treatment is plotted against the average solar energy received in this area (Fig. 5).

## Other Results

The effect of different day temperatures on mean grade in Experiment 1 is illustrated in Figure 1. It appears that steady day temperatures, at least nine months of the year, may result in marked fluctuations in quality. A summary of production is given in Table 1.

Figures 2 and 3 indicate what happened to the time of peak production. The information for these graphs came from Experiment 2, and a summary of production is given in Table 2.

Figure 4 is a comparison between time of production and the fresh weight of standard grade flowers. In all treatments, a decrease in fresh weight was found to occur just before peak production was reached, dropping to the lowest point on the tail-out. How low fresh weight dropped depended upon the day temperature (the higher the temperature the lower the fresh weight), and light intensity. In some instances, fresh weight became low enough to drastically reduce grade. The same trend was obtained with the size and color of flowers, as well as stem strength.

In all experiments, no significant differences were indicated between temperature treatments in regard to yield. Rather, yield appeared to be directly related to light intensity as shown in Figure 5.

In summary, it might be said that the optimum temperature for growth decreases as

light intensity decreases and the plant matures (1). As the temperature increased from 60° to 75°F:

1. There was no influence on yield.
2. Color intensity decreased (Also decreased with decreasing light intensity).
3. Per cent dry weight of stem increased.
4. Stem strength decreased.
5. Flower size decreased.
6. Leaf width decreased.
7. Internode length decreased.
8. Fresh weight decreased.
9. Stem length increased.
10. Keeping life increased.

## Discussion

From these results, we feel that the extreme of day temperatures for maximum quality in Colorado, in well-lighted houses, lie between 60° and 70°F. The particular temperature within this range depends upon the available solar energy. With young plants and very high light, 75°F may not be extreme. The latter is probably the minimum that can be obtained by commercial greenhouses in Colorado during the summer of a normal year. For carnations entering their second year of production, 70°F is perhaps too high even during periods of maximum light.

Table 1. Summary of the effects of day temperatures on Red Gayety benched May 21, 1957.

	60°	65°	70°	75°
Total yield	1619	1634	1696	1634
Flowers/ft <sup>2</sup> /yr. (May 21, 1957 to May 30, 1958)	38.4	38.9	40.4	38.9
Mean grade	4.15	4.27	4.16	3.86
Mean fresh weight (grams)				
Fancy grade	30.1	28.8	27.8	27.4
Standard grade	23.6	22.0	20.5	19.5
Per cent distribution of grades				
Fancy	29.6	30.2	31.1	24.5
Standard	59.4	60.5	52.0	43.5
Short	8.7	6.0	12.8	19.8
Design	2.3	1.3	4.1	12.2
Per cent flowers downgraded				
Insufficient weight	2.8	12.7	20.2	18.9
Defective flowers	0.2	3.4	21.8	32.2
Short Stems	27.8	18.1	5.1	0.5
Split calyxes	2.4	1.2	0.8	1.0
Total downgraded	33.2	35.4	47.9	52.6

Table 2. Summary of the effects of day temperatures on White Sim benched October 18, 1957.

	60°	65°	70°	75°
Total yield	478	528	551	486
Mean grade	4.15	4.57	4.25	3.85
Mean fresh weight (grams)				
Fancy grade	32.0	31.8	31.0	29.8
Standard grade	26.1	23.5	21.5	20.8
Per cent distribution of grades				
Fancy	21.3	64.4	39.9	21.8
Standard	68.6	33.1	49.5	53.4
Short	8.8	1.0	9.6	19.4
Design	1.3	1.5	1.0	5.4
Per cent flowers downgraded				
Insufficient weight	00.6	5.3	19.8	23.6
Defective flowers	1.3	1.3	15.6	24.0
Short Stems	52.9	11.9	5.6	1.0
Split calyxes	0.6	1.1	---	1.0
Total downgraded	55.4	19.1	41.0	49.6

# MEAN GRADE

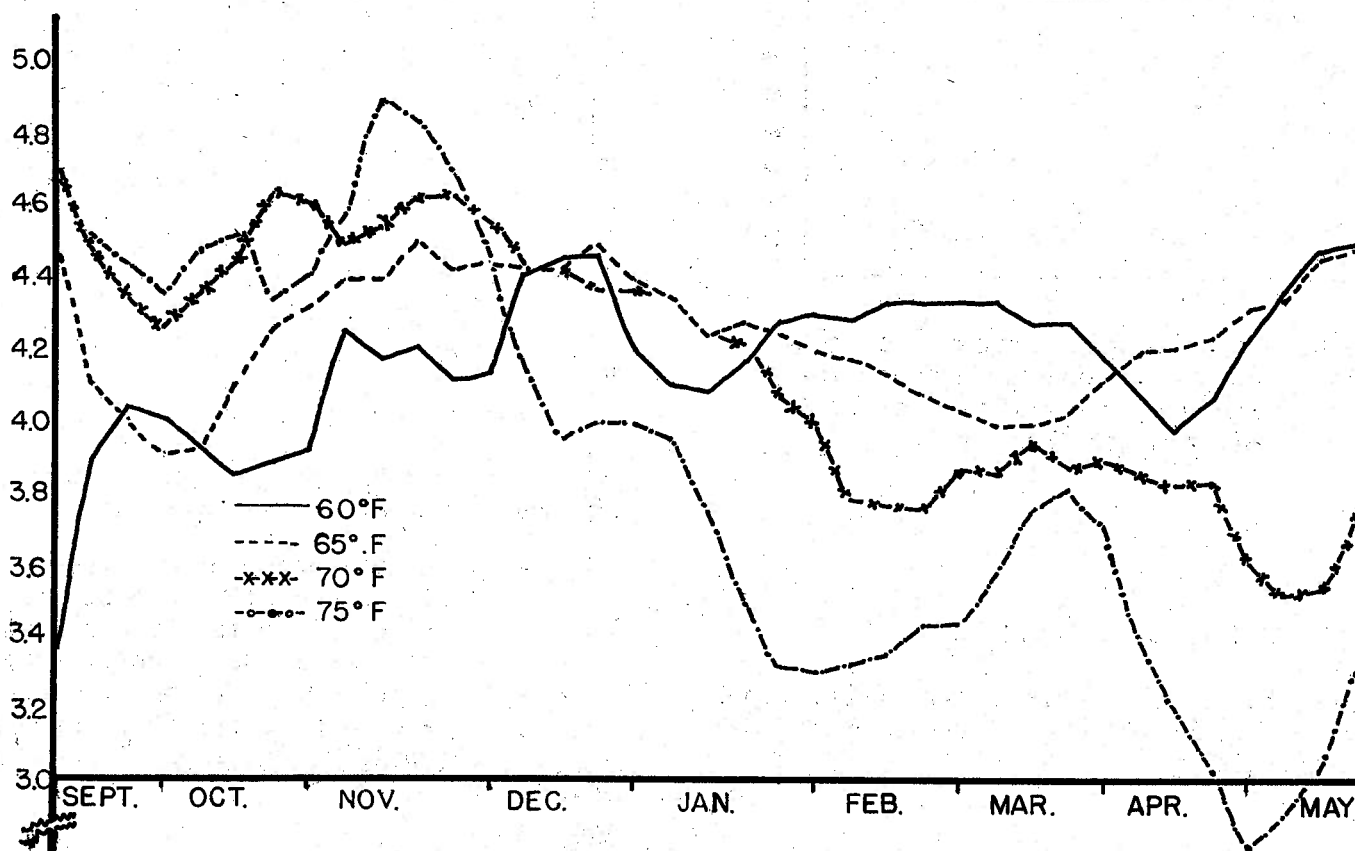


Figure 1. Weekly mean grade of Red Gayety carnations benched, May 21, 1957.

# PRODUCTION

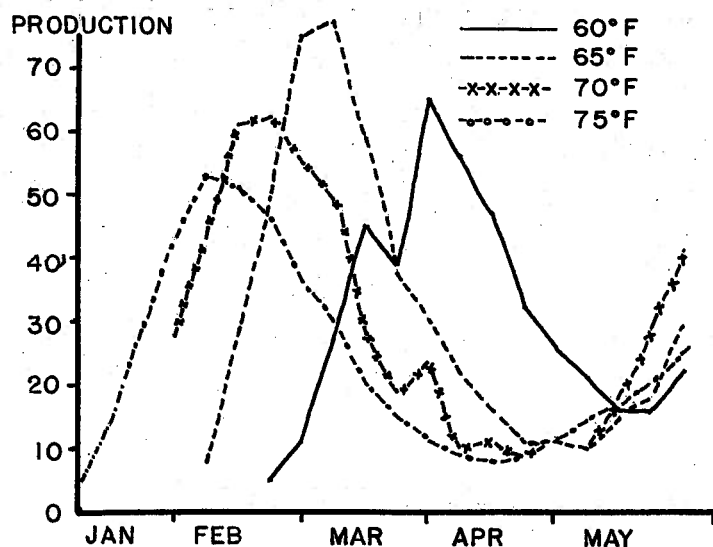


Figure 2. Weekly production of White Sim benched October 18, 1957

# MEAN GRADE

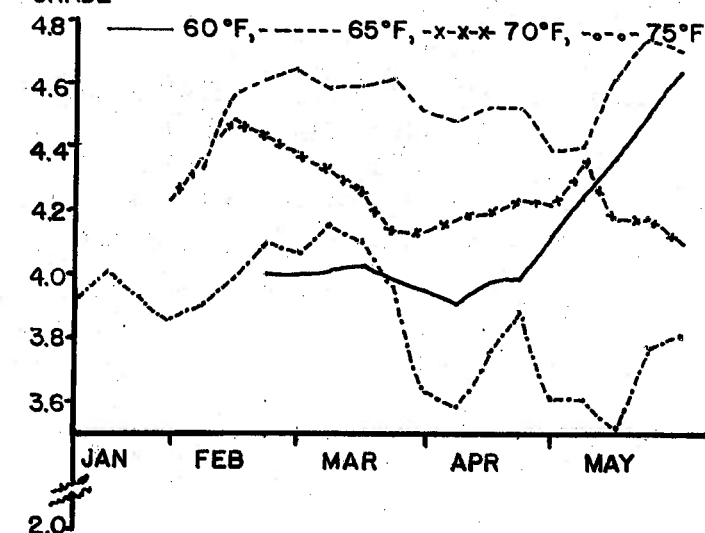


Figure 3. Weekly mean grade of White Sim benched October 18, 1957

Work by Schmidt (CFGA Bul. 93) suggested the range of optimum night temperatures to be 50° to 54°, with 54°F as the maximum. Depending upon the individual circumstances, temperatures below 50° night and 60°F day may be necessary.

It might be well to remember that the range of temperatures used in this investigation (60° to 75°F day and 52°F night) is

relatively narrow. Attempts to extrapolate beyond the limits considered here might be unsatisfactory.

Further research is presently being conducted to define when it may be best to change temperatures in relationship to light intensity.

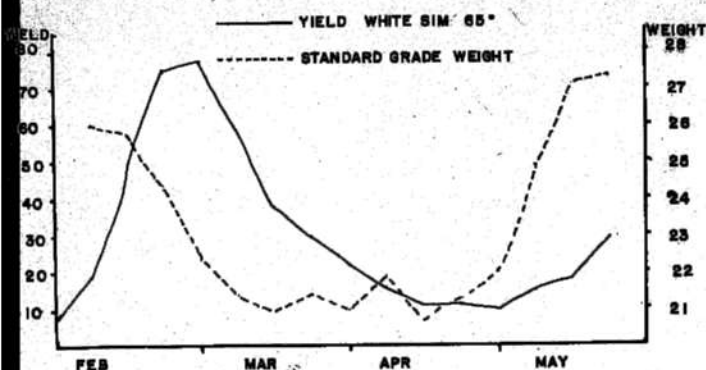


Figure 4. Relationship between the fresh weight of standard grade flowers and weekly production of White Sim benched October 18.

PERCENTAGE INCREASE OF DRY MATTER

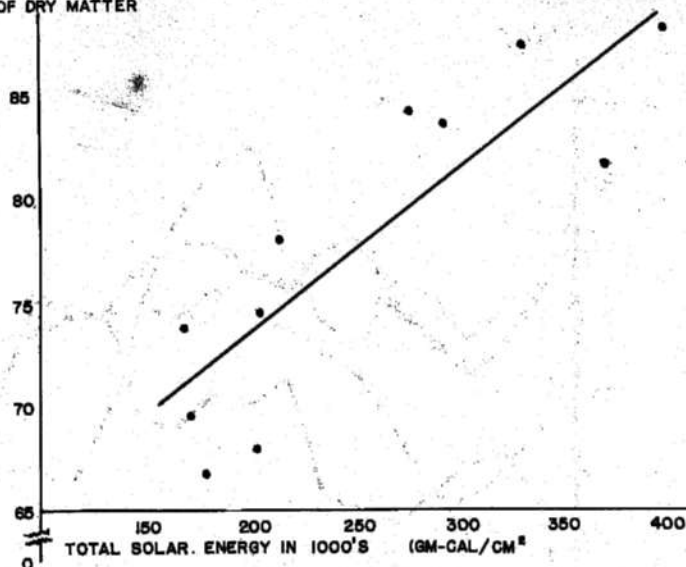


Figure 5. Relationship between per cent dry weight increase of carnations grown for 12 weeks at 65°F and total solar energy received. (Line drawn freehand. Solar energy a four-year average from Boulder, Colorado, 1944-1948).

#### Literature Cited

1. Went, F. W. 1957. The Experimental Control of Plant Growth. Chronica Botanica. Waltham, Mass. 373 p.

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