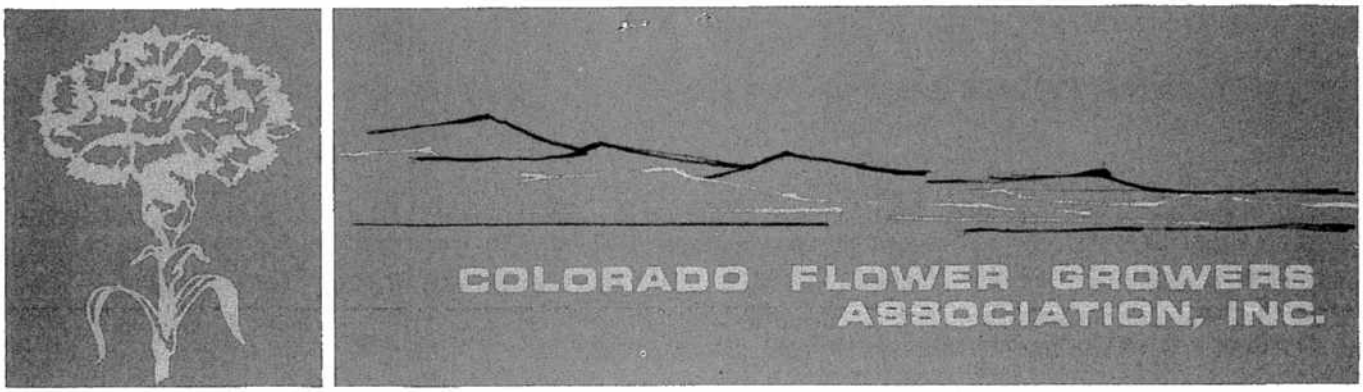

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Bulletin 240 May 1970

Effects of Day Temperature on Carnations in an Inert Substrate

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Yield and grade of carnation flowers were increased by ventilating during winter at 72 or 75F compared to lower temperature settings when plants were growing in an inert substrate and were freely supplied with CO_2, water and nutrients.

It should be understood that these day temperatures are not maintained by the heating system. They are maximum day temperatures at which the cooling-ventilating system came on. The outside temperature on many winter days in Colorado is sufficiently low that these maximum temperatures are not reached in the greenhouse. If such be the case, the house remains a closed system throughout the day and high CO_2 levels can be maintained. When ventilation comes on, CO_2 immediately drops to that in the outside atmosphere.

Earlier work on carnations in soil

Holley, Goldsberry and Juengling (CFGA Bull. 174) found that as CO_2 concentration was increased, the temperature requirement for carnation growing in soil increased slightly. In levels of CO_2 of 500 ppm highest yield and grade were produced with night temperature at 55F and the day temperature ventilation-cooling set at 69F. When the day temperature cooling point was raised to 73F, plants were hardened and yield reduced even though CO_2 was increased to around 700 ppm. Since the data obtained in this earlier experiment are so important, they are condensed and reproduced here. Night temperature in all treatments was 55F.

The year prior to the experiment reported here it was observed that carnations grown in inert media were almost too large. Flowers and stems weighing 40 to 50 grams (almost 2 ounces) were commonplace. This experiment was therefore designed in an attempt to produce more flowers of a slightly lower weight in the same area.

Table 1. Effects of 4 temperature-CO_2 combinations on yield and on yield of Blue grade carnations—January to May 1964.

Day conditions	CO_2 ppm	Yield Blue grade	Total
Heated to 61F ventilated 73F	575-930	880	1514
Heated to 57F ventilated 69F	379-670	1339	2113
Heated to 57F ventilated 69F	300-550	1099	1699
Heated to 60F ventilated 66F	250-310	1180	1838
Difference req. for significance			
5% level		106	147
1% level		149	206

Methods

The north bench of each of the 4 compartments in the CSU Temperature House (1) was planted with rooted cuttings of Red Sim and White Pikes Peak on July 2, 1968. Each bench contained 126 plants or 42 square feet. The medium was Idealite (manufactured lightweight aggregate) that had been used one year previously. An automatic peripheral watering system delivered a complete nutrient solution to the plants from 4 times daily in summer to once daily in winter. CO_2 was supplied at a constant rate from a tank of liquid CO_2 donated by Liquid Carbonics Company. A level of around 1000 ppm was maintained when ventilation was off from 8 a.m. to 5 p.m.

All compartments were heated to 53± 1 F at night and 61± 1 F during the day. The four compartments were ventilated and cooled automatically at 66F for Compartment A (west), 69F for B, 72F for C and 75F for

Compartment D (east). Total measured light for the 4 compartments due to position and structural shadows had previously been determined on a percentage basis as 100-97-100-103 (A to D respectively). Plants were pinched once then allowed to flower. Flowers were cut 4 times weekly and graded according to SAF 4-grade system.

Table 2. Effect of ventilation temperature on yield and grade of carnation growing in inert substrate.

Ventilation temperature °F	Grade				Total yield
	Design	Green	Red	Blue	
66	12	281	729	566	1588
69	37	317	745	495	1594
72	37	225	863	580	1705
75	67	185	807	668	1727

Results

Total yield and yield in the four grades for the two cultivars from start of flowering to May 24, 1969 are shown in Table 2. Yield (not corrected for light) was essentially the same at 66 and 69F. Yield increased for 72 and 75F with differences between the two temperatures not significant. The number of Blue grade flowers tended to increase with each temperature increment while the number of red grade remained nearly the same except at the 72F temperature.

Production of design grade flowers while low percentage-wise was relatively high in the 75F treatment. Except for 2 periods following brief low temperature problems, the trend was a small increase in design grade flowers with each temperature rise. 44 of 67 designs produced by the 75F treatment were cut in April and May. Higher continuous daily temperatures at this time caused a general reduction in grade in this treatment only, including some "sleepiness" in flower appearance.

In light of these results we can recommend a winter ventilation temperature of 72F for carnations growing in Colorado in inert media and freely supplied with water and nutrients. This is an aspirated temperature and should allow sufficient margin for error from the intake to outlet ventilation points.

As outside temperature increases during April or early May, the ventilation (fan on) temperature should be reduced to 65F for the summer and early fall months.

Literature cited

1. Hanan, Joe J. and W. D. Holley. A temperature house for plant research. Proc. Am. Soc. Hort. Sci. 75:799-803. 1960.