Colorado Flower Growers Association, Inc.

IN COOPERATION WITH COLORADO STATE UNIVERSITY
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Effects of CO2 on Carnation Stock Plants

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The effects of supplementary CO_2 on the yield and quality of one-year-old carnation stock plants were published in Bulletin 164 of the Colorado Flower Growers Association. Additional CO_2 increased yield and produced higher quality cuttings, especially through the summer months. The data suggested that CO_2 might be even more effective on stock plants continued in production a second year. The following data summarize the effects of supplementary CO_2 on the production and quality of the same stock plants during the second year.

Plant Environment

The growing temperatures were again maintained at 55-65F the second year and cooled to 70F during warm days. Similar watering, feeding, and fumigation practices were continued. The total solar energy received during the second year was 5 percent greater than the amount received the same period during the first year of production (Table 1).

During the second year the CO_2 flow rate was increased from 3 cu. ft./1000 sq. ft./hr. (used the first year) to 7 cu. ft./1000 sq. ft./hr. This flow rate was based on increased stock plant size and a desire to maintain higher CO_2 concentrations. Figure 1 shows the CO_2 levels for the two years.

Results

Cutting yield was not affected by CO_2 during the first 10 months of stock plant growth. A real difference in yield did not occur the first year until September, 1963. An increase of more than 15 cuttings per sq. ft. at this time and an additional 10 cuttings per sq. ft. in the spring resulted from CO_2 treatment (Fig. 2).

	Total solar energy in gm cal/cm^2		Cu ft/hr CO_2 injected into treated house	
	1962-63	1963-64	1962-63	1963-64
September	13,115	13,703	199.6	
October	10,749	10,393	272.2	783.3
November	6,327	7,634	476.0	1520.6
December	6,130	6,862	492.3	1805.1
January	7,290	7,318	744.3	1876.8
February	8,543	8,811	492.9	1609.2
March	13,095	13,719	498.5	1142.1
April	14,843	15,990	93.9	764.3
Total	80,092	84,430	3269.7	9501.4

Table 1. The solar energy received and the CO_2 injected during a two-year test on carnation stock plants.

Fresh and dry weight per cutting were used as criteria for evaluating quality. Starting the first week of January each year, 27 cuttings were taken from each treatment for a period of 19 weeks for fresh and dry weight measurements. Table 2 shows an average of all of these measurements. Fresh and dry weight of the CO_2 treated cuttings were greater than non-treated cuttings both years. Weights were greater the

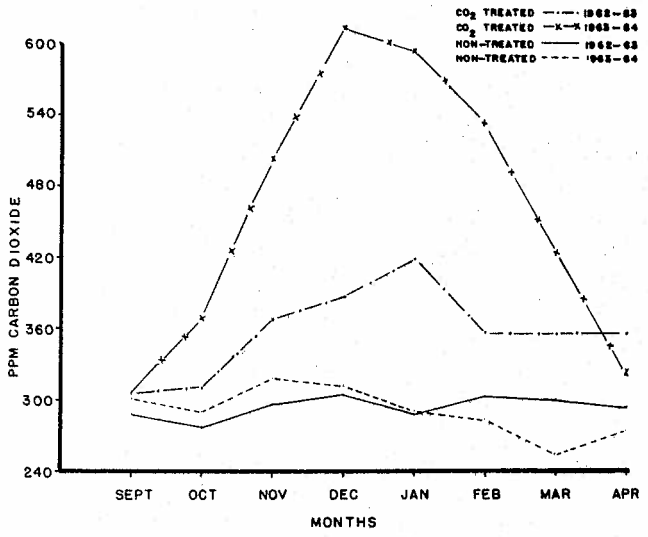

Figure 1. First and second year mean CO_2 levels in CO_2 treated and nontreated houses of carnation stock plants.

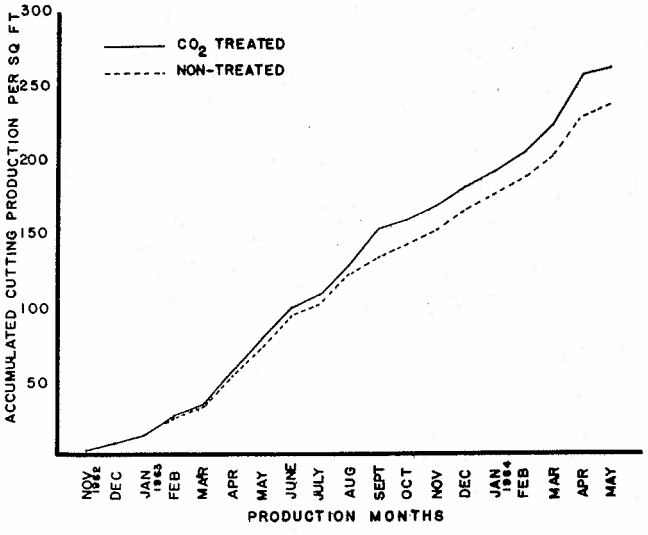

Figure 2. The accumulated production of carnation stock plants grown for 2 years.

	1962-63	1963-64
CO_2 treated		
Fresh weight, gms.	7.7	8.1
Dry weight, gms.	1.21	1.47
Percent dry matter	15.8	18.2
Nontreated		
Fresh weight	7.2	7.6
Dry weight	1.15	1.33
Percent dry matter	16.0	17.4

[a] Mean of 19 samples of 27 cuttings taken January to May.

Table 2. Mean[a] fresh and dry weights and percent dry matter of cuttings from CO_2 treated and nontreated stock plants for two years.

second year, possibly due to increased light as well as increased CO_2. The percent dry matter for the two treatments was approximately the same the first year. The increased CO_2 concentration the second year produced a significant increase in percent dry matter. Plants in both treatments were larger and were carrying a heavier load of cuttings the second year. In spite of this, cuttings produced with supplementary CO_2 compared favorably with those produced on young stock plants.

Conclusions

By maintaining approximately 550 ppm CO_2 in carnation increase blocks, stock plants can be used a second year with a minimum decrease in cutting quality. Care should be taken to control the plant load the second year. To prevent the possibility of nutrient deficiencies, the feeding program should be increased by 50 percent the second year.