Adding CO_2 to Carnation Stock Plants Improves Performance of the Cuttings

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Carnation stock plants, variety Pink Mamie, were grown in environmental chambers with a mean CO_2 concentration of 525 ppm. The average day temperature for these plants was 72.5F and they were watered with a nutrient solution averaging twice the concentration used normally on flowering plants. Averages are given here since the cutting performance was measured from composite samples of 120 plants taken equally from 4 temperatures and 3 nutrient levels. Nutrition produced no significant differences in performance in this experiment (1). Stock plant temperatures did cause a difference in cutting performance, but this difference is averaged out by grouping the data. Since we are interested not in nutrient or temperature effects in this study, the important consideration is that all were grown in CO_2 levels slightly less than 2 times atmospheric.

Twelve plots of 10 cuttings were planted on 6 dates from April 16 to October 1, 1963 and the data for the 120 plants averaged. Ten cuttings from stock plants in a similar environment but without CO_2 were planted on the last 4 dates only. All cuttings were of the same variety and contained 5 pairs of expanded leaves when removed from stock plants. No CO_2 was added after cuttings were removed from stock plants. Average weights of the cuttings, percent dry matter and planting dates are shown in Table 1.

Flowering trial	Per cutting			Planting date	Fls./sq. ft./week[b]	Mean grade of fls.	Fresh wt. residual plants /sq. ft.
	Fresh wt. grms.	Dry wt. grms.	Percent dry matter				
1	9.2	1.21	13.6	4/16/63	.78	4.15	741
2	8.8	1.28	14.5	5/16/63	.73	3.44	1119
3	7.1	1.21	16.9	7/16/63	.70	4.19	1391
4	6.7	1.12	16.9	8/16/63	.58	4.61	1217
5	5.7	.87	15.2	9/5/63	.61	4.48	1153
6	6.3	.89	14.2	10/1/63	.65	4.48	1081
check[a]	6.4	1.06	16.7	----	.57	4.32	1050

[a]Average of the last 4 planting dates — 40 plants
[b]Weekly values calculated for the period from planting date to the end of the first crop

Table 1. Growth of 6 plantings of carnation cuttings variety Pink Mamie produced on stock plants in similar environments except numbers 1 through 6 received a mean concentration of 525 ppm CO_2. Check received no additional CO_2.

Results

Yield comparisons in Table 1 are in two columns. A calculated figure for flowers produced per sq. ft. per week includes both numbers of flowers and time required to produce the first crop from planting date. The figure was calculated by dividing the yield per sq. ft. by the number of weeks from planting to the end of the first crop. A second yield column includes the weight of residual plants per sq. ft. at the end of the first crop. This figure is highly indicative of the speed of return and size of the second crop.

The check (untreated) should be compared with only the last 4 plantings of CO_2 treated stock. Cuttings grown with supplementary CO_2 outperformed those from untreated stock in speed of first crop, number of flowers and residual weight of plants after the first crop. The mean grade of first-crop flowers was higher for the CO_2 treated cuttings in 3 of the 4 plantings.

From work by Altstadt (2), fresh or dry weight per cutting was found a good indicator of cutting performance. In this study, CO_2 treated cuttings outperformed untreated cuttings even though they contained lower fresh and dry weights. It is possible that energy factors other than components of dry weight contributed to the higher yield and grade observed with cuttings produced under supplementary CO_2. It is logical that greatest possible benefits to the most carnation producers can result from the adding of CO_2 to stock plant environments.

Literature Cited

1. Altstadt, R.A. 1964. Environmental factors affecting growth of carnation stock plants and cuttings. Colo. Flw. Growers Assn. Bull. 176.
2. _____. 1965. Effects of cutting size and stage of development on subsequent growth. Colo. Flw. Growers Bull. 178.