AGRICULTURAL EXTENSION UNIVERSITY OF CALIFORNIA

FLOWER AND NURSERY REPORT

FOR COMMERCIAL GROWERS

MODIFYING CARNATION BENCHES FOR BETTER DRAINAGE

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Raised carnation benches often stay wet for prolonged periods during the winter, particularly in older nurseries where loam or clay loam soils are used. Evapotranspiration rates are low in winter and the shallow soil depth limits the amount of water that can drain after irrigation. Growers do not usually consider this a major problem (unless insufficient soil aeration causes yellowing of the foliage), since continuous high soil moisture levels are known to increase flower production. According to one report, production was increased even at moisture levels high enough to cause incipient chlorosis due to poor soil aeration. Keeping life of the blooms was decreased slightly (based on flowers harvested from mid-April to August) but the reduction was considered commercially negligible (1). Observations at San Jose generally support these findings.

In one study, rooted 'Red Sim' carnation cuttings, with five shoots each, were transplanted singly to large containers filled with 6 inches of relatively porous soil mix. One group was irrigated daily beginning October 20; another continued to be irrigated as needed. The initial crop was cut during the end of October and the return crop was evaluated from January through April. The plants irrigated daily produced substantially more second crop flowers than those irrigated as needed in the control group. The keeping life of flowers from daily irrigated plants averaged only slightly less than that of the flowers from the as needed control plants. The variation in keeping life, however, was much greater for the wet-grown flowers (table 1).

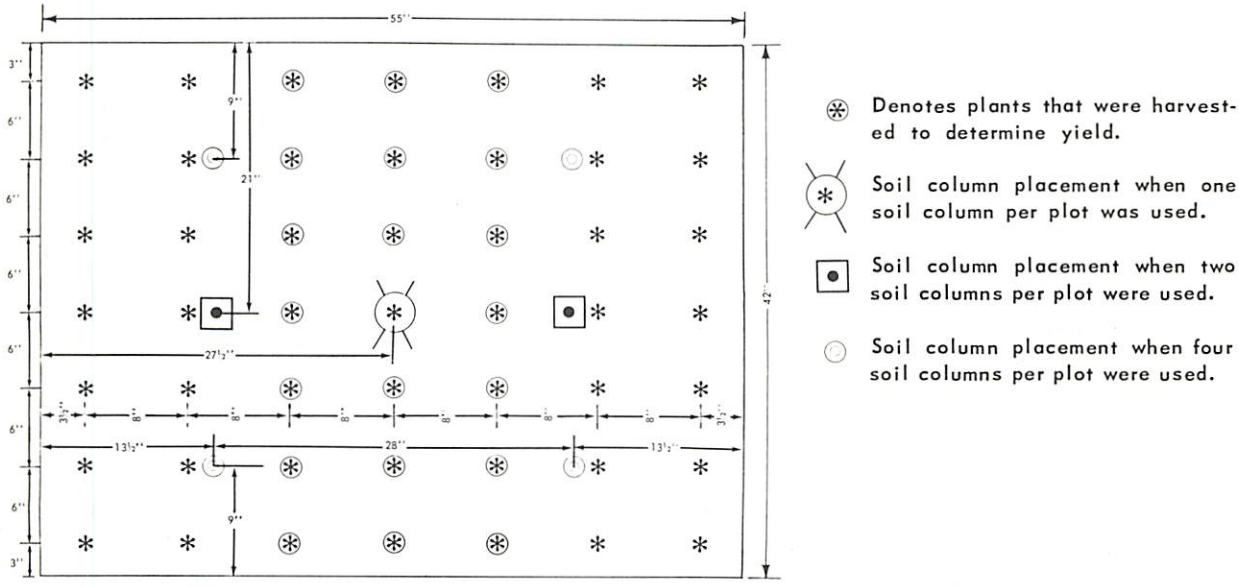

Figure 1. Diagram of soil column placement used to investigate effect on raised carnation bench drainage.

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The University of California's Agricultural Extension Programs are available to all, without regard to race, color, or national origin.

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TABLE 1. Production and Keeping Life of Carnations Grown Under Two Irrigation Treatments and Harvested From January Through April, 1970. San Jose.

Irrigation Treatment	Number of Blooms Per Plant[1]	Keeping Life (days)[2]	Range in Days Keeping Life
Daily	12.3	8.14	5 – 11
As needed (control)	10.0	8.53	8 – 11

[1] Average of four containers of one plant each.

[2] Average of all blooms harvested and held in deionized water at 71° F.

From a consumer standpoint, flowers of excessively variable vase life are probably as unacceptable as those of uniformly poor keeping quality. Overly wet, shallow soil may, therefore, be causing some quality problems during the winter even though the plants look vigorous and production and stem length are excellent. The situation can be improved by installing deeper benches or by changing to a more porous mix (2). Since these approaches may be impractical in some nurseries, a concurrent experiment was run to determine the feasibility of improving internal drainage by extending the soil depth with vertical soil-filled pipes.

An existing carnation bench raised 12 inches above soil level was filled with 6 inches of soil mix after being modified by extending 16-inch sections of 2-inch-diameter plastic pipe downward from holes cut in the bench bottom. These were filled with soil mix from the bench. The cracks between the bottom bench boards were left open. Treatments consisted of none, one, two, and four pipes per 16 square feet. Each was replicated three times with watertight partitions separating the compartments. Figure 1 diagrams pipe placement and the relationship to plants harvested to determine yield.

Rooted 'Improved White Sim' carnations were planted three per square foot on August 21 and pinched September 4, 1969. Three middle rows of seven plants each were used for evaluation, leaving two rows on either side of each plot to serve as buffers. Each plot was irrigated as needed throughout the experiment. Production and keeping life in deionized water at 71° F. were recorded for the first crop harvested from January 26 through March 30, 1970.

The plants were maintained through the summer, but no data were taken. They were then cut back to blind wood on September 18 and production was recorded for the return crop harvested from the following January 28 to April 1. Keeping life was again evaluated for a group of flowers cut on March 25, 1971.

The installation of vertical soil-filled pipes improved the internal drainage characteristics of the 6-inch-deep benches. This is shown by the greater number of irrigations required by the modified benches during the winter period (table 2). The lower percent dry weight of stems and the slightly greater stem length of flowers harvested from the unmodified benches during this period (table 3) also indicate that the average soil moisture was higher in these plots (1). The improvement in soil drainage resulted in approximately 10 percent less production in the plots with the most pipes (one per 4 square feet), but the flowers from these plots consistently kept longer than those from the control plants. These data are summarized in tables 4 and 5.

TABLE 2. Number of Irrigations Applied to Sections of Raised Carnation Benches Modified With Plastic Pipes, November 13, 1969 Through March 4, 1970. San Jose.

Number of Pipes Per 16 Square Feet	Number of Irrigations[1]
None	12.7 a
One	15.3 b
Two	16.3 b
Four	18.7 c

[1] Figures are averages based on three replications; those followed by the same letter are not statistically different ($p = .01$).

TABLE 3. Length and Percent Dry Weight of Carnation Stems[1] Harvested January 26 Through March 4, 1970, From Plants Grown in Modified Raised Benches. San Jose.

Number of Pipes Per 16 Square Feet	Stem Length (inches)	Percent Dry Weight[2]
None	25.9	13.9
One	24.4	14.2
Two	23.8	14.6
Four	24.1	15.3

[1] Based on average figures for the first 30 flowers harvested from each replication.

[2] Percent dry weight of 45 cm. stem less bloom.

The soil used in this study was a potting mix from a commercial nursery. It contained a high amount of bulky organic matter and drained well even after it had compacted to about 5 inches deep by the end of the experiment. Typical bench soils contain more field soil than the potting mix used and, because of their lower porosity, would be expected to show greater differences than those shown in table 2 under similar test conditions. It is probable that pipes placed in such benches at spacings greater than those used in this study would still result in improved drainage.

TABLE 4. Production Per Square Foot of Carnations Grown in Modified Raised Benches and Harvested During Two Late Winter Periods. San Jose, 1970-1971.

Number of Pipes Per 16 Square Feet	Average Number of Flowers Harvested[1]	
	1/26 to 3/30/70[2]	1/28 to 4/1/71[3]
None	6.1	29.4 a
One	6.4	28.5 ab
Two	6.4	27.9 b
Four	6.7	26.4 c

[1] Based on the average of three replications of 49 plants each per 16 square feet.

[2] Differences not significant.

[3] Figures followed by same letter not statistically different ($p = .05$)

TABLE 5. Vase Life of Carnation Flowers Harvested During Three Periods From Plants Grown in Modified Benches. San Jose, 1970-1971.

Number of Pipes Per 16 Square Feet	Vase Life in Days[1] [2] Flowers Harvested		
	2/9 – 2/25/70[3]	3/4/70[4]	3/25/71[5]
None	8.62 a	8.00 a	8.10 a
One	9.00 b	8.25 ab	8.40 a
Two	8.92 ab	9.25 bc	9.00 b
Four	9.18 b	9.63 c	9.25 b

[1] Flowers held in deionized water at 71° F.

[2] Figures in vertical columns followed by same letter are not statistically different ($p = .05$).

[3] Average of 5 blooms per replication—15 blooms per treatment.

[4] Average of 4 blooms per replication—12 blooms per treatment.

[5] Average of 10 blooms per replication—30 blooms per treatment.

LITERATURE CITED

1. Hanan, J. J., and F. D. Jasper. "Consumptive water use in response of carnations to three irrigation regimes." *J. Amer. Soc. Hort. Sci.* 94:70-73. 1969.

2. Holley, W. D., and M. P. Novovesky. "Carnation production in an inert substrate compared to soil." *Colo. Flow. Grow. Bul.* No. 256, Sept. 1971.

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