

IN COOPERATION WITH COLORADO STATE UNIVERSITY
 Richard Kingman, Executive Director
 2785 N. Spear Blvd. , Suite 230, Denver, Colorado 80211

Summer Quality in Carnation Benches

JOE J. HANAN, DONALD MOON AND W. D. HOLLEY

The temperature difference from evaporative pad to exhaust fans in long greenhouses results in quality and yield differences that are observed but seldom measured. To determine seriousness of the problem, two 100-foot benches at the CSU Bay Farm were divided into plots and records kept on production in the 1972 cooling season. One bench of soil and one bench of gravel were divided into six plots of CSU Red with seven buffer plots of CSU White. The end plots on the gravel bench were Caribe. The cooling system in 1972 conformed for the most part to the 1971 Greenhouse Manufacturers' specifications. Tests on the cooling system were conducted during the summer, with temperature differences from pad- to fan-ends ranging from 3° to 10° during the hottest part of the day. The results for cooling studies and air temperatures in the carnation benches will be reported later.

Data on yield of CSU Red are given for 4-week periods beginning May 15, 1972, through September 4. Quality reported is for the period between April 17, 1972, and August 7. Records for the CSU White buffers were not kept until observation showed considerable difference between the cultivars. Yield on the buffers covered the period between June 26, 1972, and October 16.

Yield

The monthly yield per plant for the reporting periods (for each plot in soil and inert media) is shown in Figure 1. The total mean yield for CSU Red was 1.4 flowers/mo/plant, whereas CSU White (including two plots of Caribe) was 1.57 flowers — a difference of 12 percent. The differences in yield were not statistically significant. But the gravel plots of CSU Red always produced more flowers per plant per month than the soil plots — 19 percent on the average. With higher temperatures at the fan-ends, one would expect higher production. This was the trend shown by CSU White, with the differences between soil and gravel not as consistent.

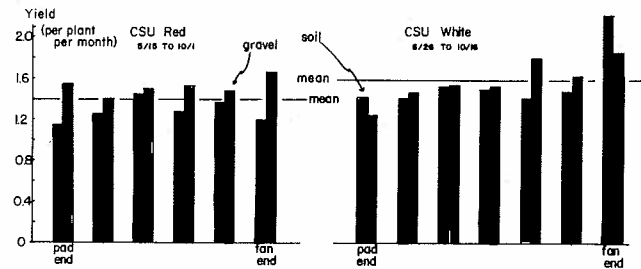


Figure 1. Mean yield per plant per month for the periods indicated for CSU Red and CSU White grown in soil and in an inert medium. The pad- and fan-ends for gravel plots contained the cv "Caribe" instead of CSU White.

The confounding of buffer plot results with Caribe makes conclusions difficult. Higher production in soil plots may have been due to lower genetic productivity of Caribe. The mean yield difference between fan- and pad-end plots was not significant, but the value of 2.01 flowers/mo/plant for the fan-end is 51 percent higher than 1.23 flowers/mo/plant for the pad-end, both soil and gravel combined.

It was more meaningful to compare average yield/mo/plant for each month for the extreme end plots. The results, shown in Figure 2, confirm general observation. That is, higher temperatures at fan-ends will result in higher production unless some means can be found to significantly reduce the temperature gradient. Under conditions common to most greenhouses in Colorado, the yield differences in 100 feet can be as high as 1.4 flowers/mo/plant (4-week period beginning September 4, CSU Red, Figure 2).

Quality

The differences in cut flower quality from pad- to fan-end were highly significant (Figures 3 and 4). The advantage of

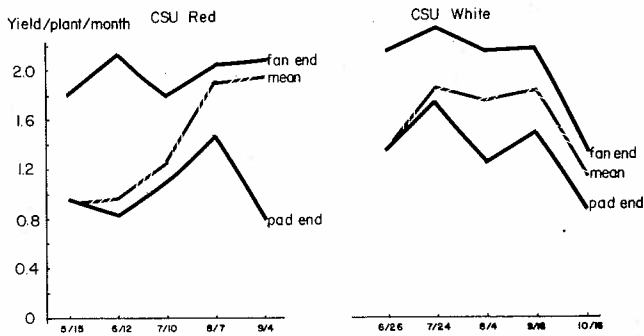


Figure 2. Mean yield per plant per month for each month for CSU Red and White in fan- and pad-end plots. The curve labelled "mean" includes all plots.

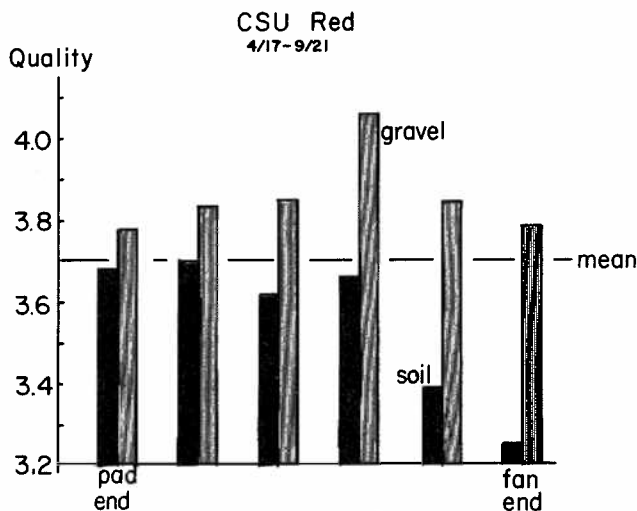


Figure 3. Mean quality index for CSU Red carnation cut flowers as a function of bench position. Note: Reporting period is 4/17 through 8/7.

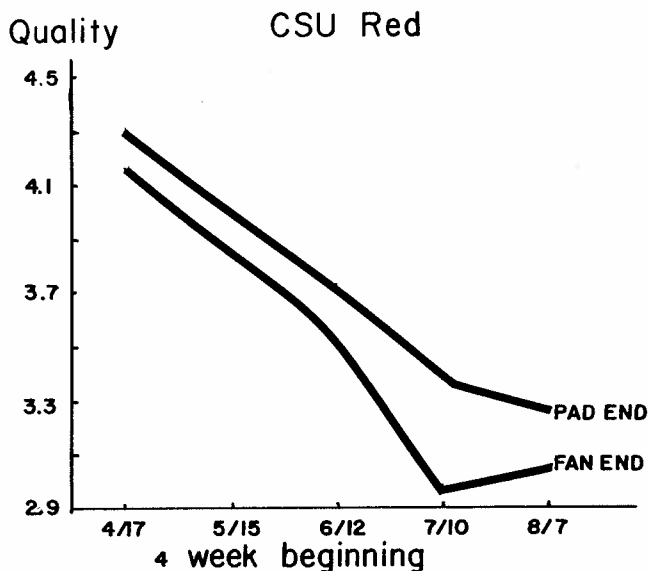


Figure 4. Quality index of CSU Red carnations in pad- and fan-end plots for summer period.

inert media under periods of high water requirements may be noted in Figure 3. As fan-end temperatures rose, quality of flowers produced in soil declined markedly, whereas gravel maintained a consistently high flower quality when the entire reporting period was averaged. An idea on fancy grade production may be obtained from the fact that a decline of 0.1 quality index point from 4.3 for 100 flowers represents 7 percent fewer fancies. A decline of 0.2 index points from 4.3 is 17 percent fewer fancies per 100 cut-flowers. The difference between soil and gravel was nearly 0.6 quality points for the fan-end (Figure 3). Table 1 shows the percentage distribution of grades for the fan-end plot, with gravel producing 7 percent more flowers for the entire reporting period.

Table 1. Percent grade distribution for fan-end plots of gravel and soil, CSU Red, April 17, 1972, through September 28, 1972.

	Fancy	Standard	Short	Design
Soil	14	38	22	26
Gravel	22	40	21	17

If the quality index for the extreme bench-ends is compared for each month of the cooling season (gravel and soil combined), a continuous decline in quality during the cooling season was evident (Figure 4). Throughout this period, yield was increasing (Figure 2). Not until September was there any indication of recovery from high temperatures. The percentage grade distribution for the 4-week period beginning July 10 (for the fan- and pad-end plots) is given in Table 2. Of the total flowers cut, the pad-end plot produced 7 percent fancies and 11 percent design, whereas the fan-end plot had no fancies and 37 percent design.

Table 2. Percent grade distribution of CSU Red cut flowers for the 4-week period beginning July 10, 1972.

	Fancy	Standard	Short	Design
Pad-end	7	36	46	11
Fan-end	0	30	33	37

Summary

The results, using 1971 cooling specifications, show serious effects on carnation cut flower quality during the heavy cooling period. While inert media tends to reduce the effect of high temperatures, quality will nevertheless decrease. At present, it does not appear that switching to 1971 cooling specifications will greatly change the general trend to lower quality. It will reduce differences between fan- and pad-ends of the bench. But until entirely new systems of temperature control and cooling can be devised, quality will not be maintained through the cooling period.