COLORADO FLOWER GROWERS ASSOCIATION, INC.

IN COOPERATION WITH COLORADO STATE UNIVERSITY
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Effects of Temperature on Rooting and Recovery of Carnation Cuttings

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Media temperatures of 60, 70, and 80°F were checked and recorded twice daily at a depth of 1.5 inches with a laboratory thermometer. These temperature levels were maintained as closely as possible. Daily fluctuations caused by variations in solar energy and air temperature were not compensated for.

Each temperature bench was divided into 4 plots with a mixture of 30% peat moss and 70% horticultural perlite plus 5 pounds of $CaCO_3$ per yd^3 placed in the north and south-central plots. Horticultural perlite was placed in the other two plots. Pink Sim cuttings, graded for uniformity, were stuck on January 29, 1967. Forty cuttings, 1 out of every 25, were taken at random for fresh and dry weight measurements so actual growth during both the propagating phase and the recovery rate trials could be measured. Intermittent mist was applied from 8 AM to 4 PM, using a 10-sec duration with an interval of 3.75 min. Measurements were made of mist delivered to each medium plot.

The 3 temperature treatments were lifted separately when the majority of cuttings appeared marketable. After grading, 10 from each subsample were prepared for fresh and dry weight analysis by removing the roots and washing. The remainder was placed in 33° storage and planted for recovery rate on March 4. When harvested April 1, the 12 plants in each replicate were weighed as a group.

Results

Media temperature affected length of time needed by carnation cuttings to develop satisfactory root systems. The 80 and 70° treatments were lifted after 14 and 15 days respectively, whereas the 60° lot was not ready until the 23rd day. Though lifted on different dates, there was no difference in rooting score (Table 1). Fresh weight gain during rooting was greatest in the 70° treatment whereas the 60° plot showed the greatest dry weight accumulation. The fresh weight gain during rooting was associated with a medium and block interaction as a result of different mist delivery to the 4 plots. Analysis of covariance

Table 1. Effects of 3 temperatures and 2 media on rooting and top growth of carnation cuttings.[1]

Treatment	Rooting Score[2]	Rooting Gain in fresh weight g[3]	Rooting Gain in dry weight g[3]	Recovery Gain in fresh weight g[4]
80° mix	86.3	12.6	2.21	144
perlite	91.3	19.0	2.92	117
mean	88.8	15.8	2.56	130
70° mix	80.8	17.0	2.78	122
perlite	91.0	24.4	3.14	127
mean	85.9	20.7*	2.96	124
60° mix	84.3	17.1	3.79	149
perlite	80.0	17.4	3.78	117
mean	82.2	17.2	3.79**	133
Media means				
mix	83.8	15.6	2.93	138*
perlite	87.4	20.3**	3.28	120

[1] Cuttings were lifted and stored when the majority were marketable.
[2] Mean of 100 cuttings, 2 replicates of 2 subsamples.
[3] Mean of 4 subsamples of 10 cuttings.
[4] Mean of 3 replicates of 12 plants. Weight gained from rooted cuttings.

showed that fresh weight increased with increasing mist. Dry weight gain was not affected by medium during rooting though fresh weight gain was greatest in perlite.

Cuttings rooted in the limed peat-perlite mixture showed greater gains during the recovery period (Table 1). Recovery rate was not affected by medium temperature.

Discussion

Medium temperature has been well documented in the literature as an important factor in increasing both root initiation and the efficiency of root inducing compounds. No growth response differences were reported as a result of temperature.

There was no difference in recovery rate between carnation cuttings rooted at 60, 70, or 80^{O} medium temperature. The 60^{O} treatment required 8 days longer to root satisfactorily than did the 70^{O} treatment. More dry weight accumulated during rooting at the lower temperature, probably a result of the extra time. Besides being a function of time, the extra dry weight could have accumulated at the lower temperature because of reduced respiration. Some heat emission must occur from the medium to the lower leaves of the cuttings. Although air temperature was assumed uniform for all treatments, this "leakage" from the medium would favor increased respiration levels with higher medium temperatures, especially at night with little air movement or mist. Adequate spacing should avoid the insulating effect of a dense leaf layer.

The most important function of bottom heat is in maintenance of a temperature differential favoring the cutting base over the top. The differential should be from 10-15^{O}F and is favored by lower air temperature at night and the cooling effect of a constant water film on leaves during the day. In this experiment cuttings rooted only one day faster at 80^{O} than at 70^{O}. Air temperature at night was near 52^{O}. Mist coverage maintained leaf temperature somewhat lower than the 65-70^{O} air temperature. It is probable that the differential obtained in the 70^{O} treatment was sufficient to achieve the optimal result. This experiment indicated no detrimental effects from the high temperature "forcing" sometimes employed by propagators faced with limited space and tight schedules.