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Effects of Mist, Media and Spacing on Carnation Cutting

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Previous articles on carnation propagation research (CFGAs Bulletins 206 and 207) have presented the results on media, temperature and foliar feeding. A somewhat more complex experiment was designed to study simultaneously the factors of mist, media and spacing. Most of the methods used have been described in the previous articles.

Uniformly graded Pink Sim cuttings were stuck March 8, 1967, under three mist levels. Within each mist level were 3 randomized blocks containing two media. Cuttings were stuck at 4 spacings to complete the design. The number of treatments totaled 24. The main plot levels were as follows:

Treatment	Days	Interval	Duration	Hours/	Mist	
					delivered/	cm
		min.	sec.	day	day	
A	1-15	3.75	30	9	8.32	
B	1-15	3.75	10	9	2.32	
C	1-11	3.75	10	9	2.45	
	12	7.50	10	6	.90	
	13	7.50	10	4	.60	
	14	7.50	10	2	.30	
	15		No mist			

Media used were perlite and the peat-perlite mixture described previously. Cuttings were spaced 3, 4, 5, and 6 cm. Because of the different spacings, Jiffy Grow #2, diluted 1:20, was sprayed on the cutting bases with a hand atomizer rather than on the foliage. A 70° temperature was maintained in the media. Fresh and dry starting weights were obtained.

On the evening of March 23, the cuttings were lifted and graded. Measurements of growth during the rooting phase (fresh and dry weight) were made on 10 cuttings per sample. Twelve of the remaining cuttings were stored and planted in flats on March 29 to measure recovery rate. The 72 flats were randomized on a greenhouse bench and rotated twice a week to minimize variation due to position.

Groups of growers evaluated appearance of the 24 treatments on 1, 8, and 15 days after planting by rating each treatment as good, fair, or poor. The recovery rate trials were harvested April 30.

Results

Media and spacing affected rooting score and growth during both propagation and recovery (Table I). Rooting score was superior in the mix and depressed in both media by heavy misting at close spacings. Fresh weight gain during propagation was not affected by media, however, the optimal fresh weight gain in mix was at 5 cm spacing, while the optimal gain in perlite was at 6 cm. Dry weight gain for the same period increased with space.

Growers showed no preference between media the first day but favored the mixture by the second week. Mist preference also shifted from C to B during the first 2 weeks with A remaining last throughout. Spacing decreased in importance to the growers with time for recovery. Correlation analysis showed that grower evaluation was not reliable when cuttings are first planted but increased in accuracy with recovery time. Rooting score was closely related to recovery.

Cuttings rooted in peat and perlite mix were superior in recovery rate. 5 cm was an optimal spacing in the mix while 6 cm was superior for perlite rooted cuttings. Mist level B made the greatest fresh weight

¹This reports part of the work by the author in partial fulfillment of the requirements for the Master of Science degree in Horticulture.

gains during recovery in both media. Mist program A depressed recovery in the mix whereas C was depressive in perlite.

Discussion

The typical cutting spaced at 5 cm (Table 1 and Fig. 1) weighed 7-8 grams before sticking, gained 2.3 grams of top growth during 15 days of rooting. When planted out for recovery, cuttings that had been rooted

The proper use of mist is an important tool for the propagator. It enables cuttings to continue growth during propagation, possibly resulting in a nutritional status more favorable for rooting than that present when first removed from the stock plant. Insufficient mist depresses both fresh and dry weight gain and delays rooting. Large cuttings given ample space can be rooted in minimum time. Crowding of cuttings is

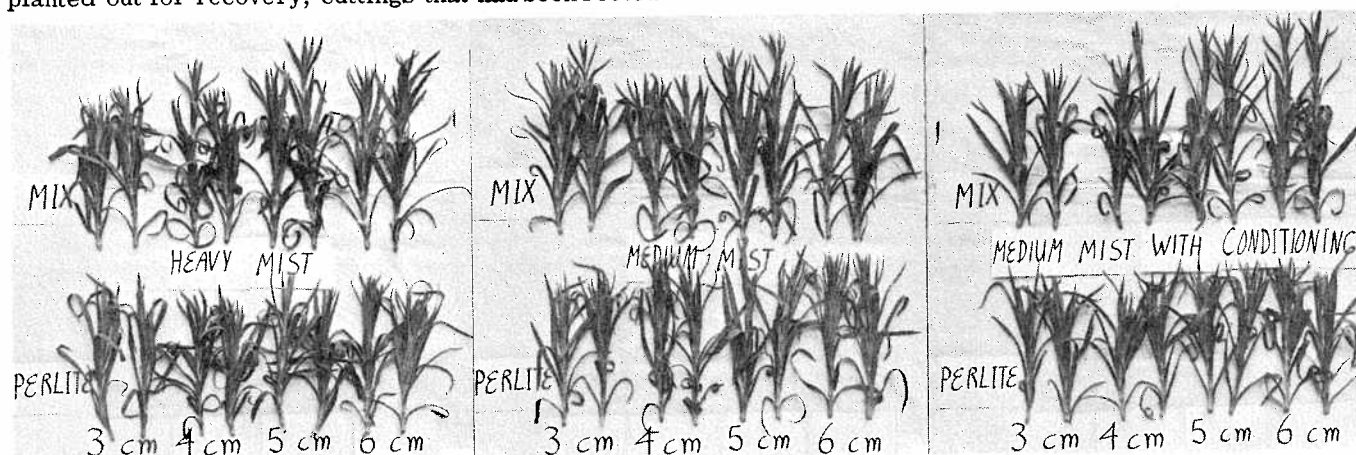


Fig. 1. Relative top growth after one month of recovery from rooting at different spacings, in two media, and under three misting regimes.

in mix gained 10 grams (doubling their size) in 32 days, whereas those rooted in perlite gained only 4.6 grams. This is the dramatic difference illustrated in Figure 2.

an outdated practice acquired before the use of mist as a means of avoiding excessive dehydration. By maintaining the cutting in a turgid condition, regardless of spacing, mist allows the propagator to choose

Table 1. Effects of 2 media, 4 spacings and 3 misting programs on rooting and recovery rate of carnation cuttings.

Density and misting program	Rooting						Recovery	
	Score		Gain in fresh wt. g ¹		Gain in dry wt. g ¹		Gain in fresh wt. g ²	
	Mix	Perlite	Mix	Perlite	Mix	Perlite	Mix	Perlite
3 cm A	70.3	67.3	13.5	13.4	2.62	2.20	50	26
B	86.0	77.0	16.7	15.3	2.80	2.42	109	31
C	84.7	73.7	11.4	15.2	1.94	2.34	70	14
mean	80.3	72.7	13.9	14.6	2.45	2.32	76	23
4 cm A	84.3	74.3	20.0	15.1	3.85	3.82	83	50
B	86.3	83.3	16.6	14.5	3.08	3.44	100	69
C	90.7	81.3	19.4	10.9	4.02	2.49	92	48
mean	87.1	80.7	18.7	13.5	3.65	3.25	92	56
5 cm A	96.0	78.7	22.0	24.3	4.92	6.82	128	45
B	89.0	92.3	17.7	24.7	4.10	5.74	135	68
C	95.3	81.7	28.2	19.7	5.50	5.05	94	49
mean	93.4	84.2	22.6	22.9	4.84	5.87	119	54
6 cm A	85.0	80.3	19.9	26.6	6.62	6.68	127	64
B	91.3	83.3	14.6	20.2	4.80	6.29	120	79
C	93.0	82.0	22.9	22.9	5.49	6.52	127	67
mean	89.8	81.9	19.1	23.0	5.64	6.50	125	70
Mist A	83.9	75.2	18.8	19.8	4.50	4.88	97	45
level B	88.2	84.8	16.4	18.6	3.68	4.47	116	62
means C	90.9	79.7	20.5	17.0	4.24	4.10	96	44
mean for medium	87.7	79.9	19.4	18.5	4.15	4.48	103	51

1/ Mean for 3 samples of 10 cuttings. 2/ Mean for 3 samples of 12 cuttings.

the optimum spacing consistent with quality. Adequate spacing reduced the tendency of heavy mist (1 cm/hr) to adversely affect root development.

When sufficient space was provided no reduction of mist or other conditioning was necessary at the end of the rooting period. Conditioning of cuttings by providing no mist on the final day in the propagation bench reduced wilting for several days after planting but depressed fresh weight gains during the first month. Since resistance to transplant wilting is accomplished by adequate spacing without the reduced performance associated with gradual conditioning, spacing must be considered an important factor in production of superior carnation cuttings. Conditioning was more detrimental to recovery growth with cuttings rooted in perlite than with those rooted in the peat mix. The recovery rate of heavily misted cuttings was not as rapid as for cuttings receiving mist in moderate amounts.

Mist stimulates fresh weight gain during rooting up to a certain maximum growth level. It appears advisable for propagators to use sufficient mist to insure optimum growth during the rooting phase. Rooting score is related to fresh weight gain but not to dry weight gain or % dry matter. As spacing increases % dry matter increases which may explain why 6 cm is little better than 5 cm for a 7-8 g cutting. Although adequate spacing is an important quality factor it may be overdone.

Evaluation of Cuttings

Rooting score was found closely related to recovery rate after planting. Any treatment or procedure during the rooting phase that results in superior root development within a given time period should produce the best performing cutting.

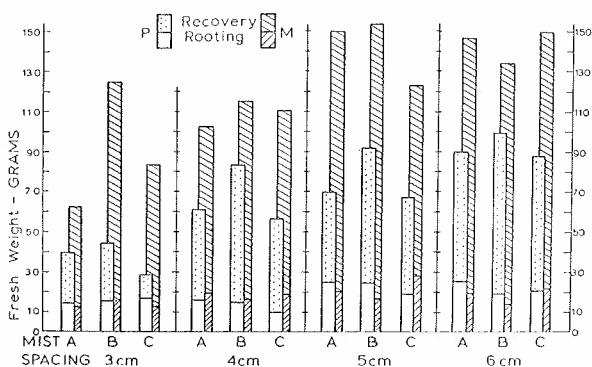


Fig. 2. Relative fresh weight gain during propagation and during the first month after planting for cuttings rooted under 3 misting programs in 2 media at 4 spacings.

Performance of cuttings cannot be judged by their appearance during the first week after planting. This was demonstrated when growers were asked to evaluate 24 groups of recently planted cuttings. Each group had received a different set of treatments during 15 days in the propagation bench. The first day following planting, growers preferred cuttings with

high dry matter content that had been given the widest spacing (6 cm) and gradually reduced mist. At this time no preference was shown for either perlite or the peat-perlite medium. A week later the peat-perlite mix was preferred 15 to 1 and after two weeks 20 to 1.

With this grower evaluation, spacing gradually decreased in importance as a quality factor. This was probably the result of delayed recovery by widely spaced cuttings with higher than optimal dry matter content. More difficult to explain is the greatest recovery rate occurring with cuttings rooted under an intermediate mist level maintained until lifting. Cuttings subjected to a conditioning period were delayed in recovery although they had greater resistance to wilting after planting. Perhaps transplanting is such a shock that cuttings cannot be prepared for it or protected from it. By conditioning cuttings the propagator may actually be subjecting them to an extended period of excessive stress. Two days of stress may be more than twice as detrimental as one day. Loomis (1) emphasized that a sharp line exists between conditioning and stunting and that excessive conditioning might be disastrous with some plants.

Literature cited

1. Loomis, W. E. 1923. Some relations of hardening to transplanting. *Proc. Amer. Soc. Hort. Sci.* 20: 206-215.