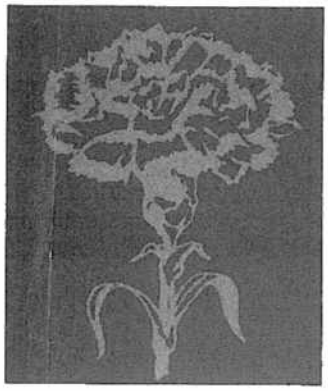

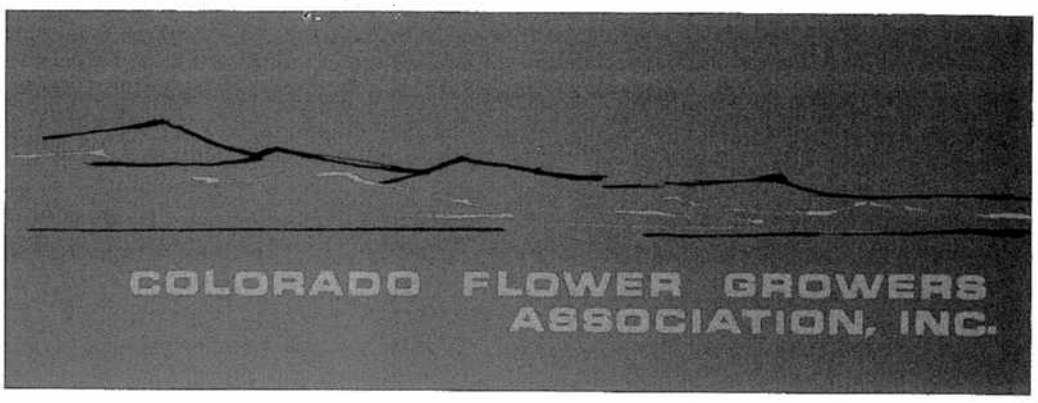

IN COOPERATION WITH COLORADO STATE UNIVERSITY
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Inert Media and Irrigation Frequency

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A number of growers have inquired about substitutes for Idealite, the desirable particle sizes and moisture holding capacity. In addition, some have, when faced with soft growth, reduced the watering frequency much below that recommended. A recent study, still in progress, indicates that reducing irrigation frequency is very likely to stunt the carnation. Hardening will occur, but production will be reduced. At CSU, we have found that carnations in suitable inert media may be watered twice daily throughout the dark months with no visible softening if proper attention is paid to nutrition and environmental control. This requires tissue analysis.

Table 1 shows the results of some particle size analyses that were conducted on various inert media under test at CSU. The maximum moisture holding capacity of each, per square foot, for a substrate 7 inches in depth, is given. By measuring the amount of water going on the bench from the irrigation system, the length of a cycle can be adjusted in accordance with moisture holding content. Materials **B, C, D** and **E** are presently undergoing test under a variety of watering frequencies. The preliminary result can be seen in Fig. 1. The plants watered once every other day, regardless of medium, have been severely stunted with production between July 3 and January 22 amounting to 283 flowers. The wettest treatment (right picture), watered not less than twice daily, have produced 343 flowers. There is some indication that Medium **D** will reduce yield, possibly because of high moisture content and poor aeration (193 flowers). Surprisingly, Medium **B** compares well with **E**, the standard Idealite mix, at 206 and 212 flowers respectively. Medium **C** has produced the most, 238 flowers. These differences between media are not statistically significant, and complete analysis must await completion of the experiment.

Table 1. Particle size distribution of various inert media and their moisture holding capacities.

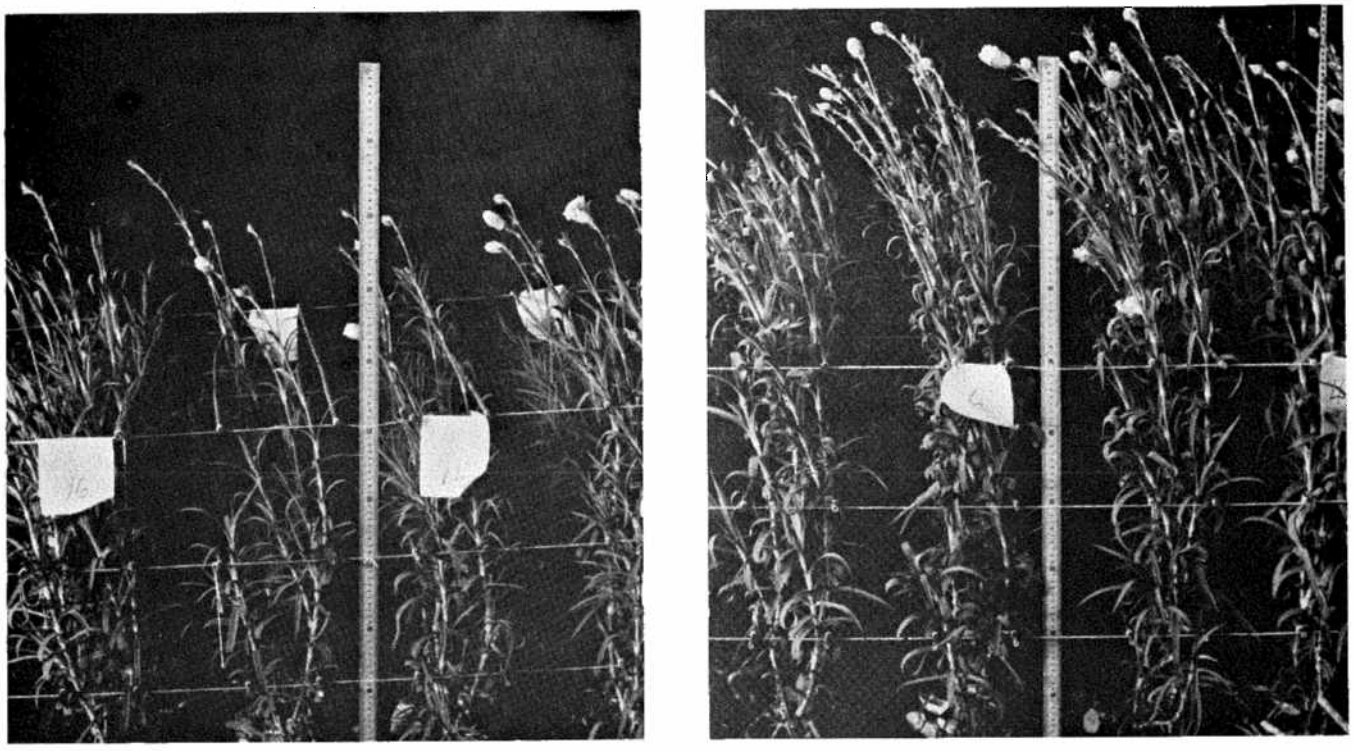
Medium	Remarks	Percent of particles with diameters larger than:[1]				Percent of particles with diameters smaller than 0.02"	Bench capacity[1] (qt/ft^2)
		0.20"	0.12"	0.04"	0.02"		
A.	Granitic sand and gravel	7.1	25.7	75.6	98.2	1.8	3.3
B.	Large idealite	100.0	(Particles ranging from 5/16" to 3/4")				1.5
C.	River sand and gravel (squee-gee)	23.7	83.0	95.5	98.8	1.4	2.0
D.	Fine idealite	00.0	00.0	53.9	94.9	5.0	4.5
E.	Regular idealite	42.3	76.7	98.9	99.4	0.5	1.8
F.	Scoria (volcanic ash)	46.7	62.0	79.1	92.0	7.1	5.8[3]

[1] Percentages are by weight.

[2] Bench capacity: Maximum moisture holding capacity of a medium 7 inches in depth, quarts per square foot.

[3] Approaches and exceeds maximum moisture capacity of good greenhouse soils.

Fig. 1. Effect of irrigation frequency on carnation growth in different inert media. Plants on the left watered every two days, beginning in October, 1968. Plants on the right watered not less than twice daily throughout the same period. Both treatments irrigated with gates system, identical fertilizer solution, planted July 3, 1968.



It is our belief that moisture content of inert media at bench capacity should not exceed 3.0 to 3.5 qts/ft^2 (about 1.5 pounds of water per gallon of medium 7 inches deep), when the medium is watered daily. Above 3.0 qts, it may be necessary to reduce the frequency, particularly when moisture capacity approaches 4.5 qts/ft^2. However, when this is done, the advantage of inert media over good soils is reduced due to increased water stress on the plant in removing water from the substrate and yield may be reduced with shorter stems. Bench capacities of 1.5 qts/ft^2 (0.6 pounds of water per gallon of medium, 7 inches deep) are satisfactory, if watered often. This has resulted in a slight change in our thinking. A good medium should have a gradation of particle sizes between 0.8 and 0.02 inches diameter. Uniform, smooth particles are not desirable. At least 80% of the particles should be larger than 0.12 inches, 95% larger than 0.04 inches, and not more than 2% smaller than 0.02 inches. The percentage of particles less than 0.02 inches play a large role in influencing water capacity, and as percentage of these particles increases, the moisture content increases rapidly. The air supply is reduced in direct relation to increased moisture holding capacity.

In order to avoid undesirable stress on the plant, we assume that for a medium 7 inches in depth, containing 3.0 qts/ft^2, less than 1.0 quarts should be removed between irrigations. If more is removed, the suction required on the part of the plant to extract moisture probably increases very rapidly. This will have a marked effect on the plant as compared to the same situation in soils where the relationship between suction and moisture removal is not quite so steep, and the plant can go longer between irrigations without visible effect. If, on the basis of previous information, a mature carnation plant uses water at the rate of 1.0 qt/ft^2/day, then once daily irrigation is required. Water use rates as high as 1.3 qts/ft^2/day, at noon, for one year carnations in their second crop, have been measured during October. Under these conditions, 2 irrigations per day are required, each irrigation applying one qt/ft^2, or slightly less. The relationship between number of irrigations and length of irrigation cycle can be determined.

Increasing the frequency increases the time the lower foilage is wet. This has resulted in more disease in some cases. Gus Nilsson suggests Diathane M-45, applied on the lower foilage, will reduce spread, particulary of *F. roseum*. Care should be given to scheduling the irrigation as early in the day as possible, not late afternoon, and reducing water pressure to a point where the water just reaches the inside rows, in order to reduce waterlogging. Spacing of the nozzles is critical. A plant directly in front of the nozzle will result in stunting the inside rows. Proper nutrition will do more to reduce soft growth with less effect on yield than reducing irrigation frequency.