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Watering Carnations

by

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The amount of water applied to carnations is a factor within the control of every grower. Watering is so important to quality crops that thorough examination of related factors is essential to better understanding of the whole subject of water relations.

A rooted carnation cutting contains about 86 percent water. As it grows and produces more woody tissues, this percentage decreases to about 83 percent at the 6-month age and 80 percent at the age of one year. The cut flowers and stems also decrease in water content as the plants age. This decrease in water content usually coincides with an increase in overall quality and shippability of the flowers. The percentage of water in carnation plants decreases as available light increases. The more water available to the plant and the more frequently it is applied, the higher will be the percentage of water in this plant or its cut flowers.

How to tell when to water

Properly placed tensiometers are the most objective means of telling when to water plants. The vacuum tension registered on one of these instruments tells the grower a definite stage of dryness regardless of the soil texture. In other words, the tensiometer tells the grower how easy or difficult it is for the plants to take water from the soil.

One or two tensiometers on most greenhouse ranges are sufficient for purposes of teaching the workers when to water. When the feel and appearance of a soil are correlated with plant response and with tensiometer readings, a grower can fix the irrigation interval easily and then move the tensiometer to a different soil or mixture.

Slight wilting of plants early in the day is another good means of determining when to irrigate. When using this method, one should consider the previous irrigation history of the plants. If plants have been watered frequently, they wilt at very low soil tensions, whereas plants that have been watered properly will not show signs of wilting until the soil moisture tension reaches at least 50^{0} millibars. Carnations can be established in sand or volcanic scoria on 3, 4, 5 or 6 day watering intervals and all of these will begin wilting as their time for watering approaches. This same thing can be done in soils. Actually the one who cuts the flowers is in the best position to decide (by the feel of the plants) whether a bench is ready for irrigation.

The soil or medium influences the frequency of irrigation. A soil high in clay holds more water, but much of this water is not available to plants. A fine sand holds water well and gives it up freely to plants. Coarse sand and sandy loam are intermediate between these two extremes. Coarse sand or scoria holds less water but gives it up to plants freely. Sandy loams are usually retentive of water though a good percentage of that water is bound and not available to plants.

Looking at this another way, soils with 20 percent or more clay may appear moist when irrigation is necessary, while fine sandy soils may appear extremely dry on the surface before plants begin to suffer from lack of water. Figure 1 illustrates the differences in frequency of irrigation requirements encountered in widely different soils growing comparable plants in the same environment.

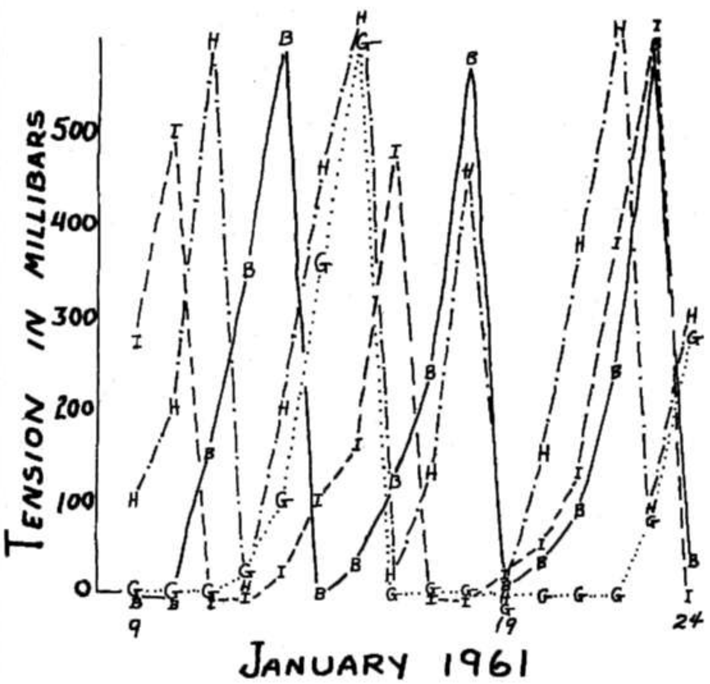

Fig. 1. Relative time required to reach irrigation tensions in four soils (tensions return to zero each time following irrigation):
- B - CSU greenhouse soil--5 days
- G - Valentine sand (fine sandy soil)--10 days
- H - Fort Collins loam--4 days
- I - Table Mountain sandy loam--7 days

When container soils are modified, irrigation frequencies may change considerably. Usually additions of sphagnum peat or other organic matter decrease watering frequency while additions of sand up to 25 or 30 percent have little effect on frequency. Additions of clay to a light soil usually increase required irrigation frequency. Figure 2 illustrates moisture tensions in a clay subsoil, compared with this same soil to which peat and/or sand was added. The soil and its mixtures were producing comparable crops in the same environment at the time measurements were made. The textural analysis of the subsoil was 53 percent sand, 20 percent silt and 27 percent clay.

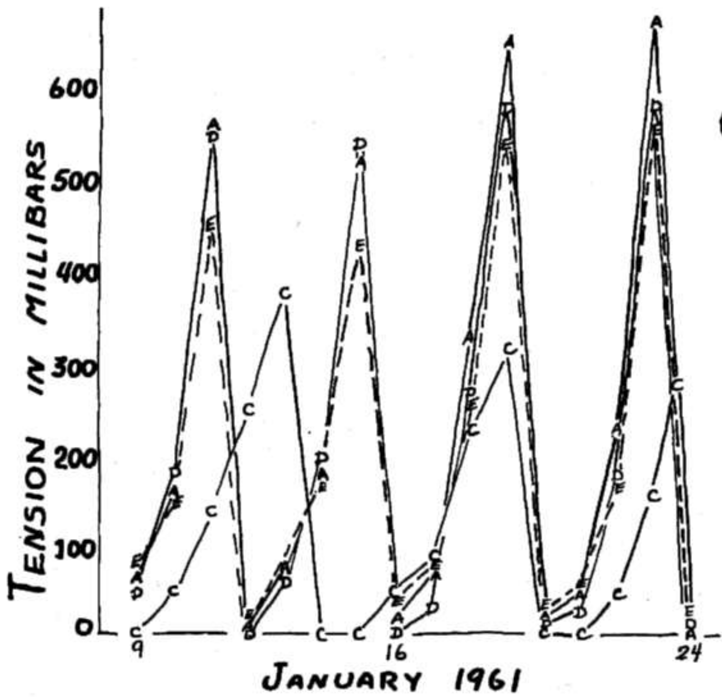

Fig. 2. The effect of modifying a soil on time to reach tensions of near 500 millibars (tensions return to zero each time following irrigation):
- A - Subsoil--4 days
- C - Subsoil plus 1/3 sphagnum peat--6 days
- D - Equal parts of subsoil, peat, and coarse sand--4 days
- E - Subsoil plus 1/3 coarse sand--4 days.

Moisture levels affect growth

Optimum soil moisture levels for carnations were explored in three separate experiments at Colorado State University. In the first experiment (5) William Sim was watered at tensions of 100, 200 and 300 millibars. No differences in yield were found, but the average grade of flowers improved as the tension at irrigation was increased. The second experiment (4) compared watering tensions of 300, 500 and 850 millibars on White Sim. Within these moisture tensions yield was not affected, however plants watered at the highest tension were visibly shorter and the foliage and stems harder. The grade of flowers produced was approximately the same, although no keeping quality tests were made on the cut flowers. These two experiments point up an optimum tension before irrigation of 300 to 500 millibars.

A third experiment (2) was designed to compare the growth of carnations watered at a tension of 300 millibars with those watered daily. Krilium was incorporated in the soil to insure good structure and aeration. During the nine months of this experiment approximately the same number of flowers with the same average grade were cut from these two treatments. Cut flower life from the two treatments was almost identical.

These experiments indicate that carnations are extremely tolerant to soil moisture levels. For a degree of safety the soil should dry to a tension of .3 to .5 bars, which insures adequate aeration for healthy root growth in most all greenhouse soils. Watering at tensions less than .3 bar, especially in tight soils and when light is low, leads to high water content of the plants and soft growth. Drying the soil to high moisture tensions, especially during the warmer part of the year, reduces flower quality and causes hard growth.

When in doubt about watering in winter, wait a day. When in doubt during the summer, water.

Methods of irrigation

A number of methods of irrigating carnations are used successfully. Manual application of water to the surface with a hose is still used widely although it is the most expensive method. On the average, carnations require about 65 irrigations per year with 10 to 15 minutes of labor required per 100 square feet of bench. This adds up to 11 to 20 man hours per 100 sq. ft. per year--- a tidy sum for an irrigation system.

In recent years many carnation growers have installed Gates sprinkler irrigation for carnations and other bench crops. This watering system has proven popular wherever tried because it puts the water around the periphery of the bench where it is needed most. If enough 180° nozzles are used, adequate water gets to the center of the bench with a minimum of splashing on the upper parts of the plants. Alternating 180° and 45° nozzles has improved the system for wider benches. An adequate volume of water so the system can be used under low pressure minimizes splashing.

When a new bench is planted, the watering pattern must be studied carefully for the first month and additional 45° nozzles placed in the line to cover any dry spots in the center of the bench. Another precaution to keep in mind is that it is so easy to water with the Gates system that some growers tend to overwater.

Plastic soaker hose such as Greco or Gro Hose are in use in many areas. The life of this hose is usually about 3 years, so it is more expensive per year than the longer lived Gates. Black hose is preferable because of less algal growth inside the hose. This system works especially well in fine or tight soils. It is also good on ground beds of loose, sandy soil.

Flood irrigation is used in many parts of the world. An adequate head of water and ground beds are essential to success with this system which is so commonly used in the field. The soil in most raised benches is purposely prepared so that it will not conduct an appreciable head of water across it. If conditions are right, this is one of the least expensive methods of watering.

Caparas (1) conducted studies with a temporary water table method of irrigation. In order to use this system benches must be level and the bottom one or two inches water tight. Excess water overflows just above this watertight area. Plastic liners now offer an inexpensive means of water proofing the bottom layer of such a bench. Caparas found that the excess water remaining in a 2-inch water table following surface irrigation was absorbed by the upper soil within 12 hours. The yield and mean grade of flowers produced in plots with a temporary water table was equal to that from surface watered free draining plots. Keeping quality of the cut flowers was more uniform and the number of irrigations was decreased by 35 percent. A temporary water table and capillary movement of water upward insures more thorough wetting of the soil at each irrigation and eliminates the need for double watering in hot, dry weather. This method of watering is especially well adapted for media such as sand or scoria.

Flower quality

Optimum soil moisture is essential to quality growth and quality flowers. Insufficient water, especially in bright weather, causes smaller flowers, fewer petals, and hard foliage and stems. Growing plants in soil that is continuously too wet leads to poor root growth, elongated internodes and plants that wilt easily when conditions become adverse. These plants produce soft flowers of inferior shipping and handling qualities.

Fairchild (3) found that flowers kept equally well when cut at any time from the day they were irrigated to the day before irrigation. However, Caparas (1) obtained evidence indicating thorough soaking of the soil at irrigation was essential to uniform cut flower life. Flowers from plants growing in "dry spots" in the bench invariably kept one or two days less.

Each soil and each situation requires some study in order to irrigate according to the needs of the crop. The least expensive method of thorough watering done on the right frequency pays off in quality and and in profits.

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