IRRIGATION FOR NURSERY

TENSIOMETERS, AUTOMATIC TIMING FOR SPRINKLER CONTROL

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Experimental site of container plants at start of experiment.

Automatic sprinkler irrigation for nursery container plants—using tensiometers to determine water needs and an automatic clock system—can result in reduced labor and water costs, more efficient irrigation, and less worry for the operator. This report compares three methods of watering: manual irrigation with a drag hose, a manually operated sprinkler system, and the automatic system.

THE NURSERY CONTAINER-plant industry, along with other phases of agriculture, is confronted with the problems of obtaining satisfactory labor, rising costs of production, and increased land values. Either production methods must be devised to reduce costs, or the selling prices to consumers must be raised—or both. The experiment reported here reduced costs and improved irrigation efficiency.

The test plot included 200,000 one-gallon plant containers covering about two acres at a nursery in Orange County. Several varieties of woody ornamentals were planted in a mix consisting of 50% (by volume) redwood shavings and 50% clay loam soil. Three methods of water application were tested: hand watering, manually operated sprinklers, and automatic sprinklers.

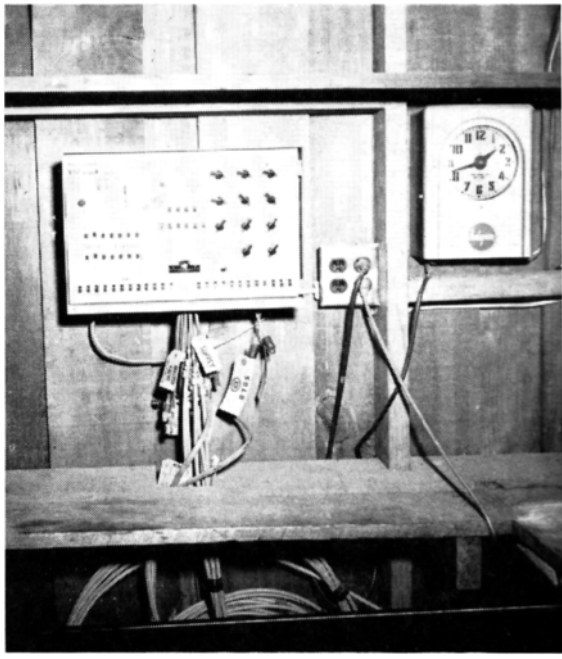
Hand watering

A drag hose was used by the irrigator for hand watering. Frequency was determined by the irrigator's judgment of weather and the appearance of the plants.

Tensiometers, including wiring to complete circuit to controller panel, are seen in two photos above of container plants.

CONTAINER PLANTS

Two new irrigation systems for nursery container plants described and evaluated on these and the following pages offer nurserymen the possibility of reduced labor and water costs as well as more efficient water application.



Clock and controller panel for activating watering system.

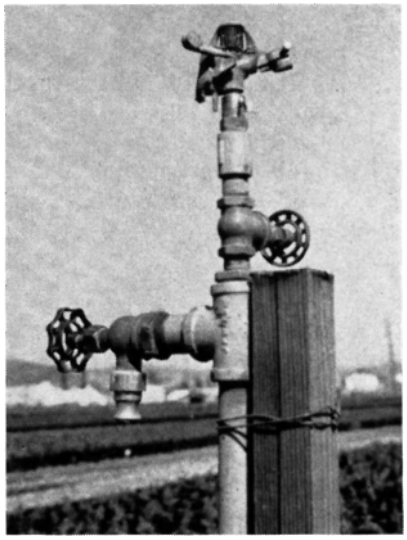
In general, water was applied every three days in the summer and amounted to about 1 inch per irrigation. It is estimated that this water amounts to about 8 ft per year. The tedium of the job, disinterest, lack of knowledge, absence due to illness, and the excessive amounts of water used were all factors emphasizing the need to improve this system of irrigation.

Manually operated sprinkler system

In an attempt to solve the problems of hand watering, a manually operated sprinkler system was installed consisting of risers and sprinkler heads attached to the buried pipe system previously used for hand watering. Risers of ½-inch galvanized pipe were installed 3 ft above ground at 40 by 50 ft spacing. Sprinkler heads discharged 4 gallons per minute or about 0.2 inch per hour. Frequency of watering was still determined by the judgment of the irrigator and depended upon the weather and the appearance of the plants. Also, in general, the water was applied every other day in the summer. The main advantages of this system over the hand watering were: better distributon, more rapid coverage, and savings in the amount of water applied (about 6 ft instead of 8) resulting from knowledge of sprinkler application rates and less dependence on labor. Here too, however, frequency of irrigation was still a question, and further improvements were indicated.

Automatic sprinkler system

The ideal system desired is one in which water can be applied in accordance with the plant's need and with practically no labor. This was accomplished in the last experiment by using tensiometers and an automatic clock system. The tensiometers were of a standard type, but included an electrical circuit from the clock to the gauge. The tensiometer gauge contained an adjustable pointer, contacted by the gauge indicator (as the



Typical sprinkler setup including valve for hose connections.

Tensiometer installation in more mature container plants.

Experimental site of container plants at end of experiment.

soil moisture was depleted) to activate the sprinkler system controller. Tensiometer cups were placed in the area of maximum root zone, and the depths were changed as the roots developed. Each variety of plants of the same stage of growth contained two tensiometers. The clock was set to operate the sprinkler at 3 a.m. following activation by the tensiometers. This hour was chosen because wind velocities were low and operation was convenient. The main advantages of this system over the manually operated system included the relatively precise determination of water need by the tensiometers, and that less water was used annually (about 5 ft) with less dependence upon labor.

Benefits

Irrigation costs with hand watering were 2 cents per can per year; with manually operated sprinklers, .5 cent per can per year; and with automatic sprinklers, .1 cent per can per year. In determining these comparative costs, the basic water supply components of pipes and pumps were not included, since they remained the same in all three methods of irrigation. Actual costs, therefore, were slightly more than the above. The sprinkler systems were amortized over a ten-year period.

Savings in water (purchased at a rate of $30 per acre-foot) plus visual improvement of growth and relief from worry influenced the cooperator to adopt the automatic system for his entire nursery.

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Irrigation for nursery container plants . . .

PLASTIC TUBE IRRIGATORS WITH ELECTRIC CONTROL

N. W. STICE · L. J. BOOHER

Large container-grown plants can be irrigated and fertilized by using nine ⅛-inch-diameter plastic tubes radiating from a central riser. Each master unit of the system is operated by a clock-controlled 3-inch valve and is capable of irrigating 720 containers simultaneously in five minutes. Four of the units now operating at a Sacramento nursery, where this study was conducted, can irrigate 2,880 containers in 20 minutes.

THE IRRIGATION and fertilization of large numbers of container plants often present problems for the nursery operator. Plants growing in gallon cans are usually irrigated and fertilized by overhead sprinklers. However, this system will not provide uniform water applications for larger trees or shrubs grown in 15-gallon containers.

At the Oki Nursery in Sacramento, a system has been installed to irrigate individual containers by using one-eighth-inch plastic tubes. Assistance with design of the system was obtained from the extension irrigationist, University of California, Davis, and the Sacramento County Farm Advisors' office. Each master unit of the system is operated by a 3-inch, electric-clock-controlled valve and is designed to irrigate 720 containers in five minutes. The 15-gallon containers are placed on 4-ft centers, so that the area covered is 16 × 720 or 11,520 square ft, excluding roads and driveways.

Nine ⅛-inch plastic tubes water nine containers from one valve.