General view, left photo, of 15 gallon containers showing the main line and the laterals. Side view, right photo, showing the connection of the flexible tubing to the cans and to the main line.

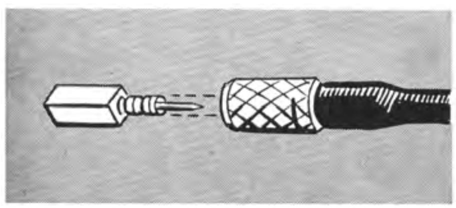
Adjustable Nozzles Simplify Irrigation Of Large Container Plants

F. K. ALJIBURY

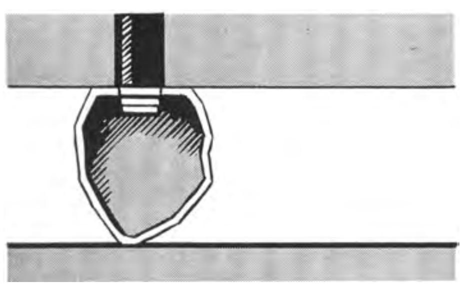
ADJUSTABLE NOZZLES are now being used to irrigate large containers. The system is simple, economical, and can be operated manually or automatically. One- and five-gallon container plants have generally been watered by overhead sprinklers. However, because the canopy of larger plants is widespread and the larger fifteen-gallon containers are spaced farther apart, these containers cannot be watered by sprinklers. Hand watering these plants by a drag hose has been the most commonly used method. This method is slow, labor consuming, expensive and often results in poor growth and nonuniformity. Assuming a labor cost of $1.35 an hour, each container costs the nurseryman $1.00 per year in labor alone. The nursery industry has been forced to find ways to reduce production costs, increase profit, or both. This article reports experiments to provide a better, and less expensive, irrigation system for large plant containers.

Several flexible tubing systems are being used to water large containers; however, several operational problems have prevented wide acceptance by the nursery industry. The most serious objection to such systems is that the nozzle continues to apply water on the bed after the container is sold, creating puddling of the ground surface in addition to water loss.

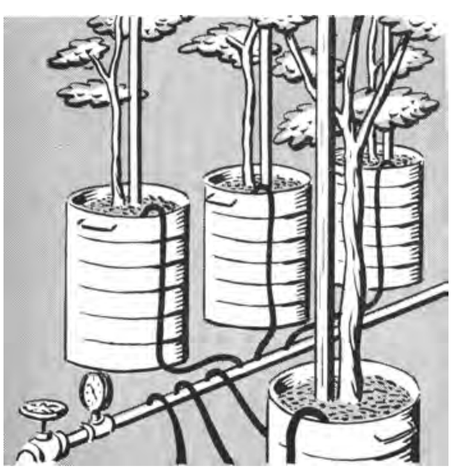
The system illustrated in photos taken at Select Nurseries, Brea, California, is



Drawing above shows nozzle connected to flexible tubing with adjustable pin to left. Cross section, below, shows flexible tubing tap as connected to main line.



Sketch below shows connection of main line to main valve and water pressure indicator.



Sketch below shows tubing clamped to edge of container and water spray from nozzle.

designed by installing a main line lengthwise, dividing the area of the containers into two sections. The containers on each side of the main line are then watered by flexible tubing of ⅛-inch inside diameter. The tubing is connected to the main line by a tap (see sketch), and is fastened to the container either by a clothes pin or hook. The water flows out to the container through an adjustable nozzle, as shown in sketch. By turning the pin at the end of each nozzle, the flow can be turned off completely or adjusted to apply any desired volume of water. The table shows the flow of the nozzle adjusted to its highest application at different pressures. When a container is sold, the unused nozzle is turned off and left on the ground.

NOZZLE DISCHARGE AT VARIOUS PRESSURES

Pressure (PSI)	Flow (GPM)
2.5	0.108 poor discharge
3.0	0.127*
4.0	0.135
5.5	0.190
10.0	0.215
15.0	0.285
20.0	0.340
30.0	0.380
45.0	0.485
60.0	0.570

*Minimum pressure requirement in laterals

The system is operative up to 60 PSI (pounds per square inch). However, best operation is obtained when the pressure at the valve is less than 30 PSI. The size of the main line is dependent upon the number of containers to be watered and the available pressure. The main design factor to remember is to have no less than 3 PSI pressure at the end of the main line. If 3 PSI pressure is maintained at the end of the main line, any number of containers can be watered from the same main line. The cost of the system amortized over 10 years is 7 cents per can per year.

The system can be operated either manually or automatically. To operate the system automatically, tensiometers, electrically wired and connected to a controller, are installed in the root zone of the containers. When the tensiometer gauge reaches a preselected reading of soil dryness, a signal is sent to the controller which turns the valves on. The two valves shut off automatically after the plants are watered for a preselected period determined by the nurseryman.

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Chemical Control Of Pythium Root Rot In Ornamentals with Dexon and Terrazole

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Dexon controlled damping-off and root rot of zinnia seedlings caused by Pythium ultimum when used as a drench at 27 to 70 ppm in solution (or incorporated in the soil at the rate of 55 to 110 ppm). However, the drench at 70 ppm and soil preparation at 110 ppm controlled the disease for one month under the conditions of the tests reported here. More chemical was needed when incorporated with the soil (110 ppm = 6.2 oz per cubic yard) than when it was used as a drench (2.5 gal of 70 ppm solution per cubic foot = 0.9 oz per cubic yard). If soil is steamed or chemically fumigated, periodic drenches of 70 ppm at one-month intervals are suggested to prevent reinfection by Pythium root rot. Terrazole controlled Pythium damping-off and root rot when incorporated into the soil at the rate of about 55 ppm (3.5 oz per cubic yard). Terrazole is not yet available for use on ornamentals.

Water mold root rot caused by species of *Pythium* and *Phytophthora* is a continuing problem to growers of container-grown plants. These fungi are common to all soils and attack the roots of many plants. A disease situation occurs when a significant number of roots are rotted or when the base of a plant is girdled by an infection.

Water molds are killed by heating or chemically treating soil but they are so prevalent that recontamination is a common occurrence. When this happens root rot is usually more severe in treated soil than nontreated soil. Many saprophytic microorganisms which compete with, and limit the growth of, *Pythium* and *Phytophthora* are eliminated when soil is steamed or chemically fumigated. Treatment with chloropicrin, methyl bromide, SMDC, DMTT, and other materials does not eliminate as many saprophytic microorganisms as does steaming at 212°F. Lower temperature treatment with steam-air mixtures also leaves many beneficial saprophytic organisms. However, water mold root rot can be very severe even in soils given these treatments.

Dexon (p-dimethylaminobenzenediazo sodium sulfonate) which is now in wide use in California by the ornamental plant industry is a particularly effective chemical for the control of water mold fungi. Precise information on the minimum effective dosages is not available. A series of experiments were conducted in the Department of Plant Pathology greenhouses at the University of California, Berkeley, to determine the minimum effective dosage (concentration and time interval between applications). Terrazole (5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole), a new fungicide not yet available for use on ornamental plants, was also tested.

Zinnia elegans var. California Giant (Ferry Morse) was used as the test plant in the experiments described in this report. Ten seeds were planted per three- or four-inch pot. Counts of emerged seedlings were made two weeks after planting. *Chrysanthemum morifolium* var. Iceberg was also used in the experiments to determine phytotoxic levels, but was not sufficiently susceptible to water mold root rot under the conditions that existed in the greenhouse to be used as a test plant for pathological studies.