Water-conserving irrigation strategies minimize overwatering, runoff

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Overhead irrigation system used to irrigate the three-gallon container-grown landscape shrubs in the experiment. Credit: Photo by Aaron Warsaw

Conserving water and reducing the environmental impact of runoff are two of the most important issues confronting container nursery operations. Current regulations and laws in five states limit water consumption by container nurseries, and some states also limit nutrient concentrations in runoff. Excessive runoff from container plants often results from poor irrigation efficiency; in some cases as little as 13% to 26% of overhead irrigation is retained in the container.

When runoff is not properly managed, water, fertilizers, and other agricultural chemicals can end up in surrounding water resources, with the potential for environmental contamination. Facing predictions of

increased water costs, lower water availability, and increasingly stringent legislation, nursery owners have a keen interest in implementing irrigation practices that conserve water and reduce runoff without adversely affecting crop quality.

Aaron L. Warsaw, R. Thomas Fernandez, Bert M. Cregg, and Jeffrey A. Andresen of Michigan State University published a research experiment in *HortScience* that investigated whether irrigation scheduling based on daily water use (DWU)—the combined loss of water from plant transpiration and substrate evaporation—could conserve water without negatively impacting plant growth. The researchers set out to determine the effect of scheduling irrigation according to DWU on water conservation and plant growth, determine DWU and water use efficiency (WUE) of several types of common container-grown woody ornamentals, and evaluate the effect of irrigation volume on substrate soluble salt levels.

Fernandez explained the significance of the experiment, remarking; "Applying irrigation based on plant demand or daily water use is a key concept in water conserving irrigation scheduling. However, scientific information regarding the water use of woody ornamentals is limited. Quantifying the DWU of a wide range of container-grown woody ornamentals will allow various species and cultivars to be categorized by water use so those with similar water uses can be grouped together, thus minimizing overwatering and excess runoff."

Ten different woody ornamental plants were grown in containers in 2006 and 2007, and five in 2008. Overhead irrigation was applied in four treatments: a control irrigation rate, irrigation scheduled to replace 100% DWU per application, irrigation alternating every other application with 100% replacement of DWU and 75% DWU, and irrigation scheduled on a three application cycle replacing 100% DWU followed by two applications of 75% DWU. Irrigation applications were separated by at

least 24 hours during the experiment.

Daily water use was calculated by measuring the difference in volumetric moisture content 1 hour after irrigation and just prior to irrigation the following day. Species were classified as low, moderate, and high water users with six low, five moderate, and 13 high water users in the study.

According to the study, "scheduling irrigation according to plant DWU substantially reduced the amount of irrigation applied compared with a control for 23 of the 24 species of container-grown ornamentals evaluated in this experiment while producing larger or the same sized plants for all species."

The authors note that the best DWU treatment to use will depend on a number of factors. The ideal irrigation regimen should provide the most economical balance between crop returns and water management concerns; the cost of water, type of irrigation system, and programming capabilities of the system should all be considered when deciding which regimen to use. "For example, a nursery in close proximity to a large urban area in a state where water use and runoff are highly regulated may elect to irrigate at a slight deficit using either the 100-75 or 100-75-75 irrigation schedules to minimize water extraction and runoff. However, using deficit or DWU irrigation techniques requires monitoring of soluble salts, which, although not found in our study, may build up under these regimes depending on climatic factors."

More information: The complete study and abstract are available on the ASHS HortScience electronic journal web site: hortsci.ashspublications.org/c … t/abstract/44/5/1308

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