UT Extension
W 278

Sustainable Nursery Irrigation Management Series

Part I.
Water Use in Nursery Production

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Part 1 of the three-part series, “Sustainable Nursery Irrigation Management,” is devoted to responsible practices for watering nursery-produced crops and focuses primarily on the general importance of proper irrigation practices and some of the issues that lead to water competition in this country.

Water is essential to plant life and is a critical input to nursery crop production. For plants, water is used in temperature regulation, as a carrier for nutrients and plant hormones, and is the hydraulic force behind growth. Water is taken up by plant roots and is lost to the environment through the stomates and the leaf cuticle. A water deficit can negatively affect plant growth, plant health and the amount of time needed to grow a crop to a marketable size.

Irrigation can shorten the production period for field nursery crops and increase quality, which has a positive impact on nursery profitability. Because the nursery industry has shifted from primarily field-produced crops to container-produced crops, the need for irrigation is increasing. Over 75 percent of nursery crop value (gross farm gate) in 17 of the major nursery producing states is currently grown in containers (USDA 2009). Container nursery production is not possible without the use of irrigation (Figure 1).

The demand for fresh, high-quality water is increasing across the U.S. and the world. In eight of the 10 most populous states and in the top 10 nursery-producing states (based on farm gate

Figure 1. Because nursery containers have limited volume and coarse, soilless substrate is used, daily irrigation during the growing season is almost always necessary to prevent plants from desiccating.
Photo credit: Diana Cochran

value), competition between human, industrial and agricultural water use is becoming a major issue. Most wholesale nurseries require relatively large amounts of water for irrigation (Figure 2). A container nursery with 70 percent of the land in production under overhead irrigation could use between 14,000 to 19,000 gallons of water per acre per day during the peak growing season.

Figure 2. Container nurseries require large volumes of water. Photo credit: Amy Fulcher

Scientists and industry leaders anticipate that there will be less water available for agricultural production in the future. U.S. municipalities in California, Delaware, Florida, Maryland, Michigan, North Carolina, Oregon and Texas already have responded to competition for water and/or concerns regarding water quality and runoff by creating legislation to monitor or regulate irrigation practices (Fernandez et al. 2009). Growers and researchers are exploring novel ways to alleviate this concern.

Nurseries have two main strategies for alleviating competition for water: improved irrigation efficiency and use of alternative, possibly lower-quality water from nontraditional sources. Many practices can improve efficiency, including irrigation scheduling, refining irrigation volume, irrigation system selection and delivery, substrate composition, plant spacing, and plant grouping within irrigation zones. The ability to use lower-quality alternative water sources depends on the type and quantity of contaminants in the source water and the sensitivity of specific species to those contaminants.

Overhead irrigation is commonly used to produce small containers (5 gallon and smaller). Inefficient application can occur easily with overhead irrigation due to a lack of delivery uniformity, which can be caused by inappropriate system design or clogged or damaged emitters (Figure 3). This leads to over- or under-irrigation of part or all of the target crops. In addition to poor delivery uniformity contributing to inefficient irrigation application, container spacing plays a substantial role in application efficiency. Up to 80 percent of overhead irrigation misses the intended target depending on pot spacing (Gilliam et al. 1992). The potential consequences of inefficient irrigation include wasted water; increased nutrient and pesticide leaching (removing nutrients and pesticides from the foliage, root zone and production surfaces); increased water runoff and movement of contaminants in runoff; increased biotic and abiotic stresses; reduced plant growth; increased plant death; and increased production duration (Figure 4). The potential consequences of under-irrigation include the latter four.

Figure 3. Overhead irrigation often provides nonuniform water delivery within an irrigation zone. Here, water is being released unevenly from the emitter. Also, the irrigation zone is irrigating beyond the production block, thus wasting water. Photo credit: Amy Fulcher

Water is necessary for industrial, municipal and agricultural purposes. Nursery crop production, especially container production, is dependent on water to grow healthy crops in a reasonable time period. Nursery crop production is often located in or near populated regions of the U.S., which can create competition for water. Growers can use several strategies covered in the UT Extension publications, “W 278: Part II. Strategies to Increase Nursery Crop Irrigation Efficiency” and “W 279: Part III. Strategies to Manage Nursery Runoff,” to increase irrigation efficiency and manage nursery runoff.

Figure 4. Over- and under-irrigation can lead to unmarketable plants due to poor plant quality, disease and death. *Photo credit: Amy Fulcher*

Glossary of Terms

Cuticle — Protective waxy layer on the outside of leaves.

Irrigation Efficiency — Calculation that can refer to one of the three following aspects of nursery crop irrigation: 1. amount of water beneficially used divided by amount of water extracted, 2) amount of water retained in pot (or soil) divided by amount extracted or 3) amount of yield increase (yield irrigated crop – yield nonirrigated crop) divided by amount of water extracted.

Stomates/Stoma — Small openings, generally on the lower leaf surface, that permit gas exchange for photosynthesis and loss of water vapor (transpiration).

Water Deficit — Condition in which less water than is needed is available to a plant.

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