

Irrigation System Selection for Container Nurseries ¹

Dorota Z. Haman and Thomas H. Yeager²

It is common knowledge that production of container plants requires irrigation. The size of the plant root zone is restricted by the container which is small in proportion to the plant size. As a result, the water available to the plant can be used rapidly, and daily water applications are typical in nurseries. Two types of irrigation systems are most frequently used in the container nursery industry: overhead sprinklers and microirrigation. Microirrigation includes various types of drippers, microsprayers and misters. In addition to these two types of irrigation systems, some nurseries use subirrigation. Subirrigation is less common since it requires land leveling, impermeable ground cover, and large flow rates available for water application. These systems are more often used in greenhouses than in the large, open nurseries.

There are several questions which come to mind when thinking about selection of an irrigation system: What should be considered when selecting an irrigation system? Is it always clear which system will be the best, the most efficient, and the most economical? Should everyone use micriorrigation? The answer to these questions is: It depends but, we can at least try to identify some guidelines for system selection.

SPRINKLER IRRIGATION SYSTEMS

There are some good reasons why overhead sprinkler irrigation systems are commonly used in the container nursery industry. They have been used for many years, and they are reliable and relatively low in maintenance. They can provide frost protection and be used for chemical injection. However, they have some problems. The biggest drawback is that they are usually very inefficient in water application, unless the runoff water can be recycled. With the potential for regulations regarding quantity of applied water and quantity and quality of runoff, the efficiency of irrigation systems is becoming a great concern. Among other factors, the efficiency of water application will depend on plant spacing, plant variety, type of irrigation system, and uniformity of water application.

The average efficiency of overhead sprinkler systems in the nursery is about 25%. This means that about 75% of the irrigation water does not get into the container in spite of the fact that scheduling of irrigation events is done properly, the water is applied only when needed, and in the right amounts. It is also assumed that plants are grouped by sizes and water requirements. Many nurseries operate at much lower

-
1. This document is AE263, one of a series of the Agricultural and Biological Engineering Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date March 1997. Reviewed December 2005 and April 2010. Visit the EDIS Web site at <http://edis.ifas.ufl.edu>.
 2. Dorota Z. Haman, associate professor, Agricultural and Biological Engineering Department; Thomas H. Yeager, professor, Environmental Horticulture Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. U.S. Department of Agriculture, Cooperative Extension Service, University of Florida, IFAS, Florida A. & M. University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Millie Ferrer-Chancy, Interim Dean

efficiencies, particularly if roads and walkways are irrigated and plants are spaced large distances apart.

The efficiency of overhead sprinkler irrigation systems can be significantly increased by using an impermeable surface for runoff collection and water recycling. Water recycling ponds are becoming a common part of many nurseries. However, runoff collection is often costly and requires additional land. In some cases, the conversion to microirrigation would be more appropriate.

MICROIRRIGATION

When should you select a microirrigation system? Is it an appropriate system for everybody? It is still difficult to economically justify the use of microirrigation in the production of small plants (sizes of 1 gal or less). However, if one produces large trees which are grouped in uniform zones, and they are not frequently moved around, microirrigation is the most efficient and appropriate system. It is also economically justified under these conditions. In addition, it can be potentially very efficient. A well-designed and managed microirrigation system can have an efficiency of 90-95%, meaning that less than 10% of applied water is wasted.

A big advantage of microirrigation is the fact that water is delivered directly to the root zone of plants. For plants which are sensitive to foliar diseases, dry foliage will be an advantage. Microirrigation systems are also suited for chemigation (chemical application with irrigation water). The water and chemicals are applied directly to the container media and there are no losses between containers which eliminates runoff due to irrigation from the nursery. Furthermore, there is no danger of chemical loss and contamination.

Once you decide that a microirrigation system is your choice, should you select drippers or microsprayers? The advantage of using small microsprayers or "spitters" is that they wet more of the container surface area and the water is more evenly distributed throughout the growing media. Due to this distribution, there is less chance of dry spots and preferential flow of water through the container. The microsprayers are also less likely to

plug, but the flow rate may be too large for small plants.

Drippers should be selected for smaller plants and hanging baskets. If they are used for larger plants, you may consider using more than one dripper per container to improve the water distribution. With drippers, you can irrigate more plants at the same time since the flow rate (gal/hr) from the dripper is much lower than from microsprayers. However, irrigation cycles will be longer in order to deliver the water required by the plant. Plugging may be more of a problem with a drip system than with microsprayers because orifice sizes are smaller. Before designing any microirrigation system, it is important to test your water quality and select appropriate filtration and chemical water treatment to avoid plugging problems.

SUBIRRIGATION

Subirrigation is usually used in small areas. It requires an impermeable, level surface. It is often used in greenhouses on tables, cement beds, or impermeable bed plastic covers. Normally, it is combined with a recycling system and the water is recycled from one area of the nursery to another area. Chlorination or some other water treatment may be necessary to avoid problems with spreading diseases from one part of the nursery to the other.

CONCLUSIONS

No matter which irrigation system you select, it is very important that the system be well-designed hydraulically to assure high uniformity of water distribution and potentially high efficiency of water application. The efficiency depends on the type of system and its design, and the management skills and irrigation scheduling. A well-designed, installed, and managed system is necessary for efficient water management. However, the understanding of plant water requirements, media water holding capacity, and irrigation system capabilities are necessary to achieve this high potential efficiency.