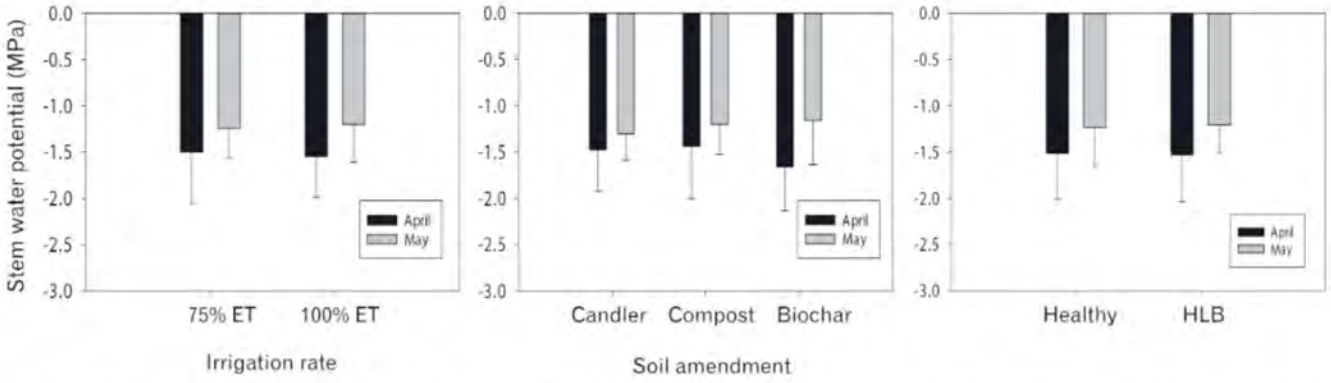

Figure 1. Water use as a function of tree health, irrigation rate and soil amendment. There were no statistical differences in stem water potential as a function of HLB status, irrigation rate and soil amendment. No differences were noted between HLB-affected vs. healthy trees, or between soil amendments or irrigation rates [full irrigation at 100 percent evapotranspiration (ET) or regulated deficit irrigation at 75 percent ET].

Irrigation management for young citrus trees

By Davie Kadyampakeni, Arnold Schumann, Mongi Zekri and Chris Oswalt

Irrigation management is important for achieving optimal citrus tree growth and promoting high water- and nutrient-use efficiencies in young trees. In the era of HLB, poor water-management practices, such as infrequent irrigation, lead to water stress in trees resulting in limited growth and impaired root development. On the other hand, over-irrigation (applying more water than the tree needs) results in excessive fertilizer leaching beyond the root zone, particularly in summer months when Florida receives more than 60 percent of its annual rainfall.

Growers can reduce irrigation pumping costs and save time by using tools such as soil moisture sensors and irrigation apps to decide when and how much to irrigate. This article will cover irrigation management practices for maintaining tree productivity.

GREENHOUSE STUDY SUMMARY

In a recent two-year greenhouse study, 1- to 2-year-old Hamlin orange trees were compared using drip irrigation on Candler sand at varied irrigation rates and with two types of soil amendments (compost and biochar). Results showed that water use was severely limited for HLB-affected trees, resulting in greater water content remaining in the root zone for well-watered trees. No differences in soil moisture content were observed between healthy and HLB-affected trees under reduced irrigation.

Stem water potential (a measure of water stress in the tree) determinations showed that there were no differences between irrigation rates and soil amendment, regardless of HLB status (Figure 1). However, well-watered trees showed greater root mass, trunk size and height compared to the trees that were not well watered. This study showed that for young trees, frequent irrigation is critical for maintaining tree growth, root mass and establishing a solid planting, though this needs to

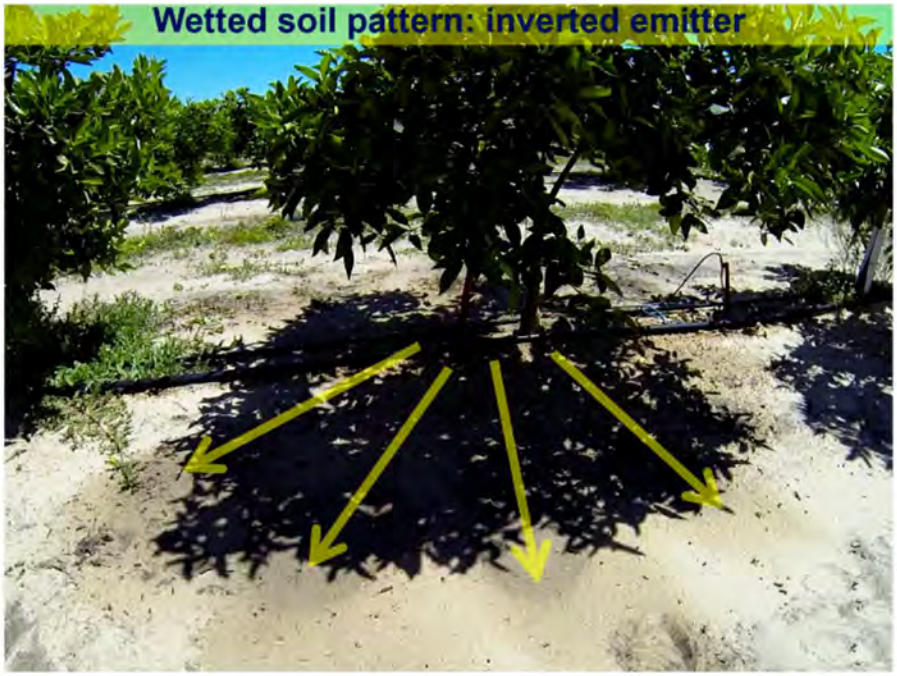

Photo by Arnold Schumann

Figure 2. Narrow wetting pattern for an inverted microsprinkler emitter for irrigating a young tree


Photo by Arnold Schumann

Figure 3. Root distribution for drip-irrigated citrus trees

be validated in the field. Researchers plan to conduct a field-scale study in different soils of Florida to further understand if young tree plantings would show similar responses as seen in the greenhouse study.

MICROJET AND DRIP IRRIGATION CONSIDERATIONS

Microjet irrigation, with one emitter allocated per tree, is the most common and versatile irrigation type for both young and mature trees in Florida groves. Microjets can be used for irrigation, fertigation and freeze protection on young trees. In order to improve water-use efficiency when the trees are very small, the microjets can be inverted at planting time to reduce the wetted soil area under the trees (Figure 2).

The reduced irrigated area is a better option for the size of root systems in years one to two, allowing a reduced irrigation run time and water volume to be used without compromising the depth of soil and root system wetted. For young trees, aim for a maximum soil water depletion of 25 percent (50 percent from November to January).

After two years, the microjets can be reinstalled in their upright position if the trees have grown adequately and their root systems require the maximum wetted soil area from irrigation. Refer to the July 2017 (http://citrusindustry.net/2017/07/10/understanding-soil-moisture-sensor-data/) and July 2018 (http://citrusindustry.net/2018/07/10/using-soil-moisture-sensors-for-citrus-irrigation/) Citrus Industry articles discussing the use of soil moisture sensors for optimizing irrigation scheduling.

Drip irrigation allows for better and efficient delivery of water, fertilizer and pesticides. In the first few years of tree planting, trees grow vigorously, establish dense root mass (Figure 3, page 26) and are set for good canopy establishment. Root density under drip irrigation is reported to be four to eight times the root mass observed under regular microsprinkler irrigation.

On Florida sandy soils, use of drip irrigation is probably a good way of achieving greater water savings. This is particularly true when used in conjunction with reflective or plastic mulch (for psyllid control) because little or no water is lost to evaporation, resulting in up to 40 percent water savings. When using drip irrigation on sandy Florida soils, daily irrigation with automated controllers is recommended. The use of a separate irrigation line to be used for freeze protection with microjets should be considered.

CONCLUDING SUMMARY

Overall, the use of soil amendments, particularly compost, is critical for improving water-holding capacity on sandy soils where most of the Florida citrus trees are grown. In addition, frequent irrigation practices using drip and microjet (microsprinkler) irrigation systems are important for achieving rapid tree growth, root mass and grove establishment along with high productivity.

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