

Groundcovers promote water-use efficiency and pest management

By Sandra M. Guzmán, Larry Duncan, John Santiago and Lorenzo Rossi

The implementation of pest management technologies might have an impact on other management areas in the grove. Landscape fabric groundcovers, for example, have been used for pest management in citrus production. Groundcovers also recently have been used to promote the homogeneous availability of water for uptake by roots, better tree physiological development for new plantings, and higher yields when managed with proper irrigation-scheduling methods such as soil moisture sensor use.

This article presents a third-year update on a groundcover study for water management developed at a commercial field in Fort Pierce, Florida, and provides an overview of the opportunities and challenges when using groundcovers for pest management.

The benefits of groundcovers for vegetable production are well known. However, there is still more to be studied for citrus. A three-year study was performed in a commercial grove in Fort Pierce to identify if black fabric mulch groundcovers influenced tree development, yield, and irrigation and nutrient requirements. The groundcover used for this study was a fabric blend that helps retain water and nutrients in the upper layer of the soil, making it easily available for uptake. Plastic or reflective groundcovers were not part of this study.

Lemon trees were planted in 2019 with and without groundcovers in raised beds with flatwood soils (Riviera series). All treatments

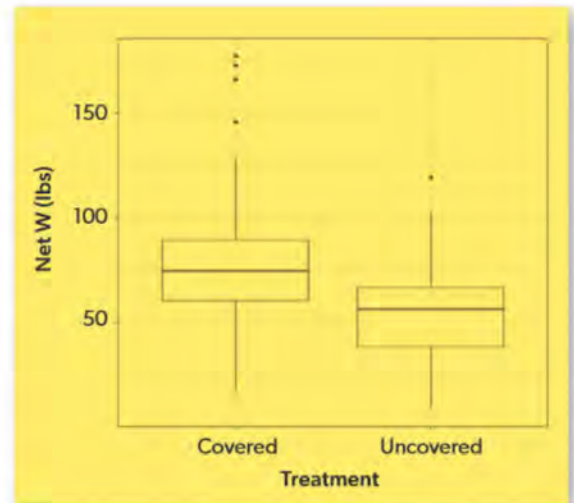


Figure 1. Summary of fruit weight results per tree in pounds were managed using a soil moisture sensor-based irrigation scheduling system.

BIG BENEFITS

The overall fruit weight of trees with groundcovers was 30% greater than trees without groundcovers (Figure 1). Similarly, canopy growth and trunk diameter increased with the groundcover.

Results showed that when using both soil moisture sensor-based irrigation and groundcovers, the water savings can be as much as 20% on top of the already known savings of using precision irrigation.

The benefits of water savings can also be



reflected in nutrient savings. When the upper layer of the soil is moist for a longer time, nutrients are more available for plant uptake. Although the same nutrient management plan was implemented for both the covered and uncovered treatments, the research team found that the trees with groundcover acquired more soil micro-nutrients than trees in bare soil.

The lemon tree rhizosphere of plants treated with groundcovers resulted in a more diverse rhizosphere bacterial community composition. A greater microbial diversity within the rhizosphere is associated with benefits in plant health, and in this case, HLB-affected lemon tree health. Much of the changes in rhizosphere bacterial diversity may be attributed to the influence of groundcovers on soil characteristics such as temperature and moisture.

Interestingly, no significant differences in root growth and development were observed in groundcover and control trees. This last observation confirms that groundcover does not have negative effects on the root system of lemon trees.



Figure 2. Landscape fabric mulch in a lemon grove illustrates its potential for weed control (left), loss of weed control due to soil accumulation on fabric (center) and Spanish needle root penetration (right).

Photos by Eduart Murcia

The field management crew felt it was easier to handle the treatment with the groundcover since the application of herbicides in tree rows was minimized. However, they found it difficult to reinstall the groundcovers in areas where tree losses required some replanting. Thus, groundcovers could be more advantageous for new

plantings since it is more efficient and less costly to install them on new plantings than on existing trees.

WEEVIL REDUCTION

The advent of huanglongbing (HLB) in Florida citrus has likely reduced the tolerance of trees to some common pests and diseases, making them more



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damaging. Diaprepes and blue-green root weevils that were once less acutely damaging to groves on the central ridge than in some flatwoods regions, due to lower populations on the ridge, appear to have increased in importance. Fabric mulch groundcovers decreased the amount of weevil larvae entering the soil by as much as 96% in controlled laboratory conditions.

Fabric increased the growth of trees in diaprepes-infested groves in previous studies in the flatwoods and on the ridge. Fabric mulch has been recommended and used for diaprepes root weevil management for nearly a decade in the Texas citrus industry and is increasingly being used in Florida.

Nevertheless, important questions must be studied. There are no profitability estimates based on long-term weevil management trials. The fabric has not entirely eliminated weevil damage to roots. Thus, root damage and tree condition need to be characterized over time and in terms of fabric coverage (width), soil properties, etc. Economical methods to prevent soil accumulation and weed establishment on the fabric surface need to be developed to maintain weed control and prevent weevils from accessing soil when weed roots compromise the fabric barrier (Figure 2, page 12).

FINAL REMARKS

The use of fabric mulch groundcovers in citrus production continues to be studied for its potential use as a barrier to soil entry by root weevils. Reductions in water, energy, nutrient and herbicide applications are some of the additional benefits of these covers.

Although more research is required, the use of groundcovers has shown significant increases in lemon production in flatwood areas. Fabric mulch groundcovers could be a practical and profitable cultural practice, especially if installed before planting. 🍊

Sandra M. Guzmán and Lorenzo Rossi are assistant professors, and John Santiago is a Ph.D. candidate — all at the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) Indian River Research and Education Center in Fort Pierce. Larry Duncan is a professor at the UF/IFAS Citrus Research and Education Center in Lake Alfred.

Moving Forward

By Rick Dantzler, CRDF chief operating officer



There are those who believe the federal government should deliver the mail, protect the borders and do little more, but most Americans believe the federal government should do significantly more. Political arguments usually revolve around the extent and method of governmental response, not whether the government should be responding at all.

That is what I believe will happen with the federal government's response to Hurricane Ian. Most reasonable folks will understand that a robust response is going to be required. I believe the debate will revolve around such policy questions as construction setbacks on barrier islands or whether some areas should be rebuilt at all, not on the scale of the federal response.

And I fully expect federal policymakers to understand that Florida's citrus industry is going to need assistance in its recovery from the hurricane.

After the damage assessment gets further quantified, those who represent the industry will undoubtedly meet to discuss possible avenues of assistance, develop a plan and begin executing it. So, while at times it does not seem that this industry can catch a break, I predict there will be significant federal help in the offing. That, in addition to new therapies that are either here or soon will be, will get this industry back on its feet.

What are these new therapies? New applications in the use of 2,4-D and gibberellic acid are showing an ability to stick fruit on the tree to reduce drop, create more uniform color break and increase fruit quality, resulting in more, larger and sweeter fruit. And any day now, the Environmental Protection Agency is expected to approve a new peptide product that can be sprayed or injected. The great majority of growers trialing the product have experienced a positive result.

The biggest new therapy on the horizon, of course, is injecting oxytetracycline. In mid-September, a company submitted a Section 24(c) with state regulators and a Section 3 with federal regulators. At the time of this writing, a decision from state regulators was expected in October 2022, and the company is busy ramping up production to meet anticipated demand if approval is forthcoming. This therapy will work and is safe, and the Citrus Research and Development Foundation (CRDF) is continuing to think through additional research to complement the therapy's effectiveness.

Perhaps most encouraging, plant breeders are nearing fulfillment of the research goal of a breeding solution for HLB. A private company has developed a CRISPR Valencia tree that appears to be HLB-tolerant and will not be considered a genetically modified organism. The University of Florida Institute of Food and Agricultural Sciences has done the same, and conventionally bred citrus keeps getting more tolerant with each new generation. I get many questions about this, so CRDF and Florida Citrus Mutual likely will be sponsoring an educational session on this topic soon.

Hurricane Ian hurt our industry, but I predict federal assistance will help us recover and your investment in research will soon pay off in big ways.

It is always darkest before the dawn. The sun will rise.



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