Clemson IPM Program Newsletter

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Integrated pest management is an ecologically-based approach to managing pests with an emphasis on using multiple management strategies. The principles of IPM can be applied to any pest of food or fiber production systems, landscapes, and urban environments. IPM considers multiple control tactics with the aim of minimizing selection pressure on one given tactic.

The Clemson IPM program (https://www.clemson.edu/extension/ipm/index.html) seeks to increase adoption of IPM practices in South Carolina by developing interdisciplinary, research based information, and providing it to the public in efficient and accessible formats. The goals of the IPM program are driven by the needs of stakeholders, who have an integral part in developing the priorities of the current program.

The Clemson IPM Newsletter will provide updates on research, extension programs, successes in IPM, important dates, and more!

@IPM_Clemson

Follow the Clemson IPM program on Twitter for real time updates throughout the growing season

Meet the Team

The IPM program at Clemson is comprised of the coordination team, extension personnel, and researchers throughout the state.

Pee Dee REC
Francis Reay-Jones, *Field Crop Entomology*
JC Chong, *Specialty Crop Entomology*
Joe Roberts, *Turfgrass Pathology*
Ben Powell, *Pollinator Specialist*

Coastal REC
Tony Keinath, *Vegetable Pathology*
Matt Cutulle, *Vegetable Weeds*
Brian Ward, *Organic Vegetable*

Edisto REC
Jeremy Greene, *Field Crop Entomology*
Mike Marshall, *Field Crop Weeds*
Dan Anco, *Peanut Specialist*
John Mueller, *Field Crop Pathology*

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Guido Schnabel, *Fruit Crop Pathology*
Juan Carlos Melgar, *Pomology*
Steve Jeffers, *Ornamental Crop and Tree Pathology*

UGA, Athens
Brett Blaauw, *Peach Entomologist*

Coordination Team
Francis Reay-Jones, *Program Coordinator*
Tim Bryant, *Associate Program Coordinator and Newsletter Editor*

Tell us what you think...

Please take a few minutes to fill out this survey to tell us what you would like to see in future editions of this newsletter!

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Critical Steps for Successful Mite Management in Greenhouse Ornamental Production

Contributing Author: **Dr. JC Chong**

Twospotted spider mite adult, nymph, end egg stage

Plant-feeding mites are some of the most common pests of ornamental plant production in greenhouses. There are close to 7000 mite species that feed on a wide range of host plants. When mite populations are allowed to proliferate unchecked, severe cosmetic damage and profit loss can occur. Mites can be managed effectively with integrated pest management (IPM) strategies, but knowing your production system and the mites that may attack it is a critical first step.

Developing tools and approaches to managing mites in greenhouses is the major focus of Dr. JC Chong, an ornamental crop and turfgrass entomologist at Clemson's Pee Dee Research and Education Center in Florence, SC. "Selecting the most suitable or effective miticides is paramount to the success of a mite management program. But, if your miticide selection process starts with chanting, 'Mirror, mirror on the wall, what is the most effective of them all?' well, I don't think you'll have much success," Dr. Chong says.

The best way to prevent spider mites from ever becoming an issue in greenhouse production is by starting with mite-free liners, cuttings, and seedlings. Pre-dipping cuttings and seedlings with a very low rate (0.1% to 0.5%) of horticultural oil prior to the plant materials entering greenhouses can prevent severe infestations. There are also several other miticides that can be used to dip cuttings. More information on cutting dipping can be found in this Land-Grant press article.

To monitor for spider mites in the greenhouse, a hand lens is an important tool. Ten to 16 times magnification is usually sufficient to identify mites, but eriophyid mites are much smaller and require either a microscope or a 20 times magnification hand lens. There are two ways to sample for mites. The first sampling method is examining individual plants from different blocks in a greenhouse for signs of mite injury and for mites themselves. Symptoms of injury often include stippling, bronzing, or the presence of webbing. The second method of mite sampling is to shake sampled plants over a white piece of paper or container and then count and identify the dislodged mites. There are no specific thresholds set for any mite species or crop, but due to the rapid growth potential of mite populations, management should be applied as soon as mites are identified.

Once a greenhouse producer detects an infestation, Dr. Chong says five major factors should be considered when implementing a management plan. These factors are mite species, mite life stage, type of miticide (contact vs. translaminar), compatibility of miticides with biological control, and miticide resistance.

The first important factor for mite management is proper identification. Mites are generally classified to the family level for the purpose of management. The most common families of mites include spider mites (family Tetranychidae), tarsonemid or thread-footed mites (family Tarsonemidae), ... (cont. page 3)

Common symptoms of mite injury in ornamental plants including, right: stippling of leaves, and left: webbing. Note that webs are only produced by some mite species and may not always be present.

eriophyid mites (family Eriophyidae), false spider or flat mites (family Tenupalpidae), and bulb mites (family Acaridae). Additional information on the life history, specific species, and host plants in each family can be found here. Understanding how to identify and differentiate among groups of mites plays an important role in effective management. Each has slightly different feeding behaviors, life histories, and preferred host plants, which can aid in the identification and inform how to effectively implement biological and chemical control. Some miticides have efficacy against several families, but many have a narrower spectrum of activity. There are commercial formulations that include miticides and insecticides for managing a wider range of pests, but Dr. Chong recommends using a product that only contains a miticide when primarily targeting mites.

Some miticides are only efficacious against a particular life stage of mites. For example, miticides that regulate the growth and development of mites are not effective in managing adult mites. Some products have efficacy against all life stages of mites. As soon as mites and their injury are identified, an application should be made using a product that has efficacy for the primary life stage present. You may think that, if available, a miticide with efficacy for all life stages should always be used; however, mite growth regulators can be more compatible with biological control, and can be used in a rotation with other materials to manage miticide resistance.

Mites may be exposed to miticides in different ways depending on the material. Contact miticides need to be either directly sprayed on the mites, or the mites come in contact with the residue on the leaf surface. Some miticides are translaminar, meaning they get taken up by the leaves and can be delivered to mites via feeding on the same leaves. Coverage of the full plant is more important when using contact miticides, but full coverage also makes translaminar miticides more effective. Understanding the feeding behavior of the mite species you are targeting can help improve your spray strategy to make better contact. Dr. Chong is currently testing one commercial product that may be applied as a soil drench and taken up into the plant to manage mites.

Biological control agents can be very helpful for limiting the development of mite populations. However, many miticides are also toxic to these biological control agents. It is important to understand how the chosen miticide impact the survival and reproduction of the biological control agents. Mite growth regulators, for example, are often compatible with biological control as they specifically target the egg and nymph stages of mites and do not hurt adult biological control agents. Suppliers of biological control agents for greenhouse use are often... (cont. page 4)

Mite sampling technique of shaking plant material over a white sheet of paper.

the best resource for determining how compatible your miticide program is with your biological control program.

Resistance management is the final consideration for a miticide program. Resistance is primarily managed through reduction in the number of miticide applications and rotation of miticide mode of action. Applications of miticides should only be made when they are truly needed, and preventative applications should be avoided. Once they are made, sprays should be made optimally with respect to the correct rate, sufficient spray volume, and excellent coverage. Miticide modes of action should also be rotated to reduce multiple exposures to the same material. There are 12 available modes of actions registered for mites in greenhouse production so there are many materials to choose from. Dr. Chong recommends a rotation of at least four to five modes of action for resistance management.

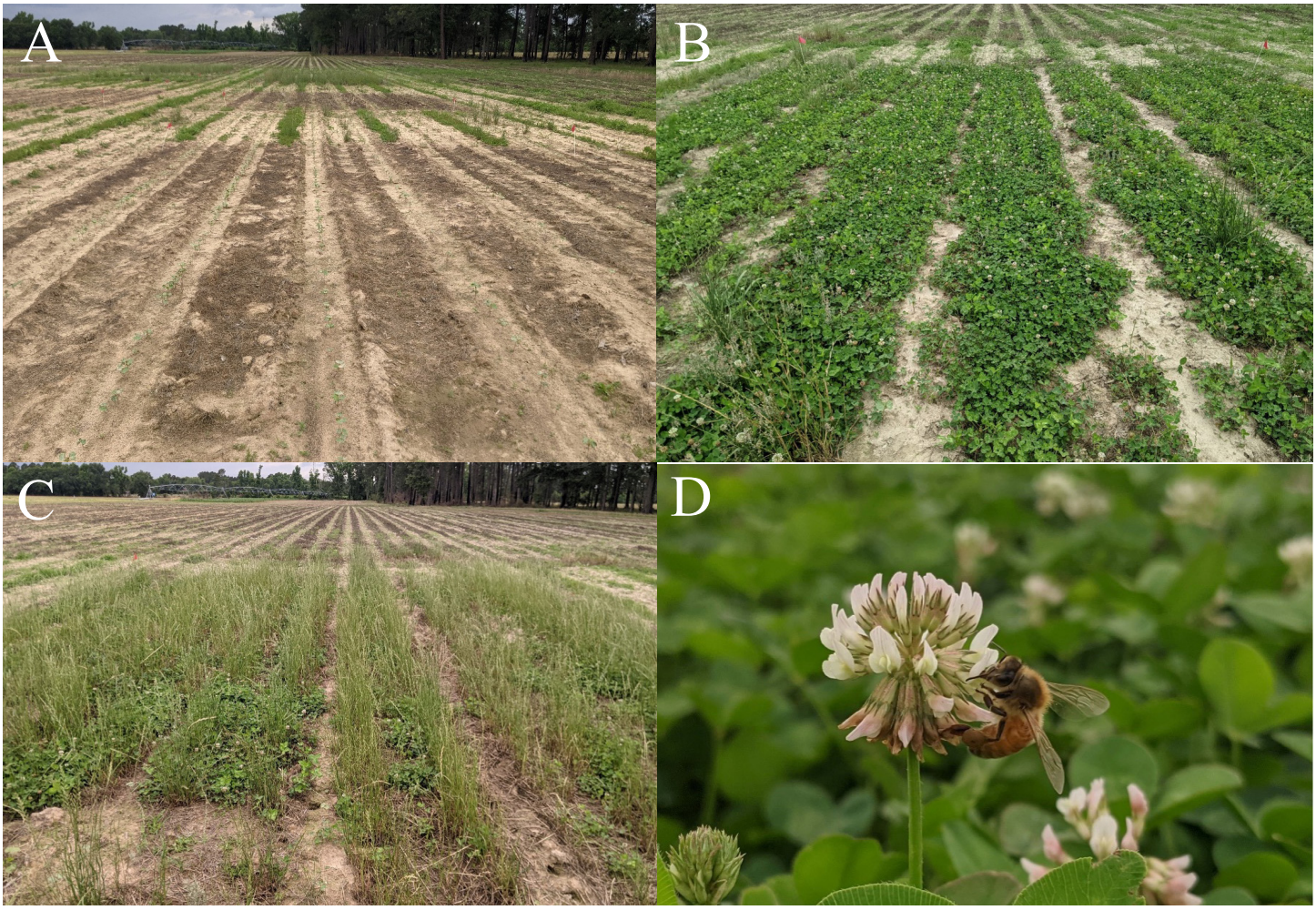
An effective mite management program integrates cultural, biological, and chemical control with emphasis on reducing the amount of chemical control needed and reducing the risk of miticide resistance development. An effective management program is based on a fundamental knowledge of which mite species are found in each production system and how to identify them. More information on mite management and a full list of labeled miticides can be found in this Land-Grant Press article.

Perennial Cover Crops in Cotton to Manage Early Season Thrips and Reduce Herbicide Usage

Contributing Authors: **Dr. Eric Billman, and Dr. Francis Reay-Jones**

Integrated pest management (IPM) emphasizes the value of using multiple control tactics to manage pests. While pesticides are valuable tools and are important parts of IPM programs, alternative management tactics can help to avoid or reduce the need to use pesticides. This integrated approach can be essential when pests develop resistance to commonly used pesticides. This is the case with thrips, which are common insect pests of cotton early in the season. Thrips injury can lead to severely stunted plants and yield loss or delays in maturity. Management of thrips in cotton has traditionally relied heavily on the use of insecticides. However, the main pest species of thrips that can feed on cotton, tobacco thrips, *Frankiniella fusca*, has developed resistance to the most commonly used insecticides used for their management. On-going research at the USDA-ARS in Florence, SC, and at the Clemson University Pee Dee REC is investigating the potential of perennial cover crops as a cultural practice to minimize both the need for insecticides for thrips control and herbicides.

Commonly used by growers in the southeastern U.S., cover crops provide multiple benefits, including helping to reduce soil erosion, outcompete weeds, increase soil health, and conserve soil moisture. These cover crops are then terminated with a herbicide prior to planting of the crop. (cont. page 5)



Varying cover crop treatments tests inlcuding; A) no cover crop or fallow, B) a perennial clover cover crop, and C) a perennial clover and annual ryegrass cover crop. Cover crops can also provide important habitat and forage for beneficial insects and pollinators (D).

As an alternative to the need to use herbicides to kill the cover crop, Dr. Eric Billman, a USDA ARS agronomist at the Coastal Plain Soil, Water and Plant Conservation Center in Florence, SC, is conducting research on the use of perennial cover crops that persist during the growing season while having minimal competition with the cash crop itself. A primary goal is to reduce the need to use herbicide by suppressing common weed species. An further benefit is that the presence of crop residue when using reduced tillage in addition to the cover crops can hinder the ability of thrips to find and damage cotton plants. The use of perennial cover crops has the potential as a cultural practice to address both insect and weed pest issues in cotton production.

A two-year pilot study ended last year, which showed that the use of combinations of red and white clover, annual ryegrass, or a mixture of all three can lead to reduced thrips densities on cotton compared to cotton plots with no cover crop. Annual ryegrass plots also had more thrips pressure than plots with perennial cover crop treatments. In addition, diversity of arthropods was greater in cover crop plots because of the increased diversity of plants. Weed pressure was also lower in plots with cover crops. This work is being expanded this year, with research examining a broader range of cover crop species in larger plots. This will allow a more realistic assessment of the use of cover crops as a management practice in cotton, in addition to allowing for more research into arthropod diversity. The work also aims to assess whether this increased arthropod diversity may help to contribute to biological control of pest species by increasing abundance of natural enemies, in addition to promoting pollinator abundance. Given the widespread insecticide resistance in tobacco thrips and resistance among some weed species to herbicides, this work provides a timely investigation into an environmentally friendly control tactic.