Pest management methods

UF UNIVERSITY of FLORIDA IFAS Extension

This is a CEU article that grants one General Standards (CORE) CEU when submitted and approved.

By Stephen H. Futch

The first step prior to selecting any pest control strategy or method is the proper identification of the pest(s) that needs to be managed or controlled for the crop you are growing. To properly select a pest control method, you will need to understand the benefits and limitations of each possible method. The method you choose should be the most effective and the least harmful to the environment or the people who may come in contact with it. In some cases, you may need to incorporate one or more compatible methods into an integrated pest management (IPM) program. With IPM, you will target the pests when they are in the most susceptible stage to increase the likelihood of successful control. When using IPM, you combine both pest and environmental information to prevent unacceptable damage by the pest to the crop, people, property or the environment.

Pest control methods discussed in this article will include:

- Biological control
- Mechanical control
- Cultural control
- Physical/environmental modification
- Host resistance or genetic manipulation
- Chemical control
- Regulatory methods

BIOLOGICAL CONTROL

Most pests found in agricultural settings will have various natural enemies that will control or suppress the pest effectively in many situations. These natural enemies will act as biological control agents to manage insects, mites, fungal pathogens and/or weeds. Biological control can be an effective tool in pest management.

Biological control is often targeted against pests that are not native to the geographical area. These non-native or introduced pests can easily become a problem because they lack natural enemies that control or suppress populations to levels that do not pose a risk to the crop being grown. To establish biological control programs, researchers will locate the native home of the introduced pest and then find its natural enemies. Once these natural enemies are found, extensive testing and evaluation is conducted to ensure they do not pose a risk to the sites where they will be released to control the introduced pest. The biological control agent will be reared and then released within a large area to reduce the introduced/targeted pest populations. If the new introduced biological control is well adapted to the new area, additional releases may not be needed. This entire process is highly regulated to prevent organisms that may themselves become introduced pests.

Maintaining sufficient populations of natural enemies after their introduction by avoiding detrimental production practices or the excessive use of broad-spectrum pesticides is an important consideration. When selecting a pesticide to apply in your farming operation, choose a product or products that pose the least amount of risk to the natural enemies to minimize damage to their populations or have negative environmental impact.

MECHANICAL CONTROL

Mechanical control is simply using devices, traps, machines or other physical methods to control or alter the environment where the pest may be found. These devices are used to prevent the pest from entering a given area or to aid in the ability to catch the pest and allow its removal.

For weeds, cultivation is a mechanical control technique that is economical, but only temporary as it must be repeated with each new emergence of weeds. Cultivation techniques will destroy most weeds, control their growth or disrupt the soil condition impacting their survival. If cultivation is not conducted frequently enough, seed production from uncontrolled weeds will increase future weed pressure by increasing the seed bank in the soil. A disadvantage to mechanical cultivation is that it can damage roots of the desirable crop, increase soil erosion potential and may not be effective for deep-rooted perennial grasses like Bermuda, torpedo or bahia grasses.

Mechanical devices like fences can exclude the pest from getting into an area if the pests are large. Exclusion devices can include screens on windows or patching cracks to prohibit entry. Fences work well on keeping many vertebrate pests from entering areas as long as the wire material is of a mesh density to prohibit entry of the pest.

Traps physically catch the pest. A trap can be physical in nature or simply a sticky surface which causes the pest to become stuck on it, allowing the pest to be eliminated from the selected area. A mouse trap is an effective trap method for small vertebrate pests.

CULTURAL CONTROL

When using cultural control, you alter the environment, condition of the host or site to prevent/suppress the pest infestation. By disrupting the normal relationship between the host, site and pest, you make it less likely for the pest to survive, grow or reproduce. Cultural practices which influence the survival of the pest can also include management actions such as selection of varieties, planting and harvest times, irrigation, crop rotation and/or the use of trap crops to keep the pest away from the desirable crop. In some crops, the use of mulches (plastic, shredded bark or wood chips) may also suppress

Implementation of New Federal Funding for Citrus Disease Research and its Relationship to CRDF

By Harold Browning

A synopsis of activities within and related to the Florida citrus industry's efforts against huanglongbing (HLB) is provided here. There are a lot of questions stemming from recent funding announcements, including pending actions to mobilize these funds, and also questions of how this will affect CRDF programs.

CRDF is now contracting the new research projects resulting from the 2014 research process. Twenty-eight projects were approved in February and range from 1-year to 3-year projects. These projects are being implemented as we approach the close of our fiscal year. In the same manner, commercial product delivery projects are advancing, focusing on near-term solutions and their evaluation under field conditions.

In relation to the congressional funding recently made available to assist in delivering solutions to HLB, there are three projects moving forward in the first tier via actions of the Multi-Agency Coordination Group (MAC). Two of these projects address antimicrobial strategies and thermal therapy that reduce *Candidatus Liberibacter asiaticus (CLas)* titers in infected citrus trees. These have been among the highest short-term priorities for CRDF in preserving the existing production of citrus in Florida.

The third project focuses on expanding the rearing and release programs for biological control of the Asian citrus psyllid (ACP). Existing programs for rearing and release of the ACP parasitoid *Tamarixia radiata* in California, Texas and Florida are being enhanced to provide greater numbers of parasitoids to cover areas not treated for ACP with insecticides. This biological control strategy should reduce rates of transmission of HLB from untreated areas.

Additional projects in the second tier are being planned for the congressional funding program and will be cleared to move forward soon. This program will benefit all citrus states and allow for increased cooperation and collaboration between the states.

The other federal funding recently announced is directed to the USDA, National Institute of Food and Agriculture (NIFA), Specialty Crop Research Initiative. This program will allocate $25 million per year over the next five years to HLB and other citrus disease research through a competitive grant process run through NIFA. The first round call for pre-proposals will likely occur within the next two months, with the decision on projects to be supported emerging this fall. While CRDF will not be directly connected to this grant process, this new research funding is likely to provide support for much of the work that is currently supported by CRDF through its Research Management Committee at a rate of about $15 million per year.

The timing of implementation of these two federal funding programs intersects several ongoing processes within CRDF, including the annual call for new research in fall-winter, as well as the Commercial Product Delivery program, which has the goal of moving research results to solutions. There are issues of timing and scope between all of these programs that are being addressed at present, and the goal is to make the best use of these federal funds as well as the grower investment in research that has been in place since 2006.

The federal programs will have a significant impact on increasing the visibility of HLB research nationally, and should expand the current efforts to new scientists and perhaps to pursue new directions toward solutions. At the same time, CRDF will carefully analyze these new programs against its own investments and make adjustments going forward to accommodate the new funding opportunities and to use the grower investment in a more focused and collaborative manner to address the needs of the Florida citrus industry.

Harold Browning is Chief Operations Officer of CRDF. The foundation is charged with funding citrus research and getting the results of that research to use in the grove.

CRDF Grower Dollars at work for you

Column sponsored by the Citrus Research and Development Foundation

pests, when properly used.

Sanitation can also be an important cultural practice whereby you eliminate the food, water, shelter or other necessities that are important to the pest's survival. In locations where weeds are the pest, removing them before they produce seeds or harbor pest insects may effectively improve crop conditions or the value of the desirable crop for future sale.

PHYSICAL/ENVIRONMENTAL MODIFICATION

In some cases, pests can be controlled and/or reduced by modifying the environment where they may be found. We all use this environmental method for storing food in our home with refrigerators. The refrigerated environment will aid us in keeping food longer and pest free. Just think of all the pest problems you would have at home without a simple refrigerator. In other cases, the use of modified temperature, humidity and/or air movement can greatly impact the ability to produce or store crops in an enclosed environment like greenhouses or storage bins/silos.

HOST PLANT RESISTANCE

Plant breeders frequently use natural host resistance or genetic traits when breeding plants to produce a new variety that has desired attributes which make it resistant or tolerant to a given pest or disease. Host resistance can also be enhanced by keeping the host plant healthy. Plants stressed by the lack of water or nutrients will not be able to resist pests as well as healthy plants.

CHEMICAL CONTROL

Pesticide is a broad and general term used for all chemicals used to control pests. Pesticides are usually toxic to some stage(s) of the pest. Pesticides can be used to control insects, nematodes, diseases and weeds.

Pesticides can be selective or non-selective. Selective pesticides kill certain organisms while not killing others. Non-selective pesticides kill a very broad range of pests indiscriminately.

Pesticides are frequently used because they are effective, fast-acting and easy to use as compared with other control options. By being fast-acting, the damage from insect pests usually stops quickly, as soon as a few hours or a few days for many weed pests. Many pesticides (fungicides) may need to be applied as a preventative spray as they may not be very effective once the disease is well established. Pesticides are commonly grouped according to the type of pest controlled, i.e. fungicides for fungi, herbicides for weeds,

insecticides for insects, etc.

Pesticides within a given class have similar chemical structures, properties or share a common mode of action (MOA). The MOA is how the pesticide works. It is important to rotate between MOA when repeatedly applying pesticides to minimize the risk of a pest developing resistance to a pesticide or an entire class of pesticide.

Pesticides that are absorbed and move within the plant are called systemic. Systemic pesticides are absorbed through the plant's leaves and/or roots and then translocated within the plant to provide pest control. On the other hand, contact pesticides are not absorbed or translocated within the plant. Contact pesticides must directly contact the pest to provide control.

Pesticides will vary in their length of control. Persistent pesticides remain active to control the pest for a long period of time, frequently measured in months or years. Non-persistent pesticides may only provide pest control for a short period of time and can be measured in a few hours to days.

REGULATORY METHODS

If a pest poses a serious danger to the public health or threatens to cause damage to agricultural crops, animals, forests or ornamental plants, then regulatory control methods would be set by local, state or federal agencies. Quarantine or eradication programs are directed by governmental agencies based upon federal and state laws that are intended to prevent the introduction and spread of pests.

Quarantines are designed to prevent pests from entering a pest-free area. When an area is under quarantine, produce or plants must be treated in a manner to minimize the movement of the pest out of that area with the use of fumigation or other methods to destroy the pest before shipment. The Florida Department of Agriculture and Consumer Services in conjunction with the United States Department of Agriculture would be in charge of developing and regulating plant and animal movement into and out of these regulated quarantine areas.

Eradication is the total elimination of a pest from a given area. For eradication to work, the pest needs to be isolated into a small geographical area. This allows control measures to be conveniently implemented to eliminate the pest. If the pest is widespread or has a wide host range, eradication is more difficult if not impossible to achieve.

When eradication efforts are undertaken, governmental agencies may be authorized to destroy weeds, plants or animals that pose a risk to the area.

Growers and agricultural producers are encouraged to use all pest management methods to successfully and effectively control pests to produce a safe and environmentally sound product. The safe and proper use of pesticides is the responsibility of all users.

Source of information: "Applying pesticides correctly" by Fred Fishel, SM 1, UF/IFAS

Stephen H. Futch is an Extension agent at the Citrus Research and Education Center in Lake Alfred.

'Pest management methods' test

To receive one Core continuing education unit (CEU), read "***Pest management methods***" in this issue of *Citrus Industry* magazine. Answer the 20 questions on the magazine's website (www.citrusindustry.net) or mail the answers and application information to the address at the bottom of the form. The article and test set will be valid for up to one year from the publication date. After one year, this test will no longer grant a CEU.

1. The first step in controlling any pest is the proper identification of the pest. T F
2. The pest method you choose should only take into consideration the cost of the pest control product. T F
3. IPM defines the important pest management practices. T F
4. Biological control entails the use of natural enemies to control or suppress pests. T F
5. Biological control practices are usually targeted against native pests. T F
6. Biological control attempts to locate the native home of the pest and then find natural enemies that suppress the pest in that environment prior to introducing the enemies as a biological control program. T F
7. Maintaining sufficient populations of natural enemies after introduction is not an important consideration. T F
8. When choosing a pest control program, the use of broad-spectrum pesticides is encouraged to eliminate all pests in a given area. T F
9. Mechanical control of a pest is achieved by using devices to control or alter the environment where the pest is found. T F
10. Cultivation provides long-term control of all weed species. T F
11. Cultivation is an effective control method for deep-rooted perennial grasses. T F
12. Screens on windows are an effective mechanical control device to prevent entry of many pests into buildings. T F
13. A mouse trap is an effective trap method for large vertebrate pests. T F
14. Cultural control can alter the environment, condition or host to prevent or suppress pest infestations. T F
15. Sanitation can be an important cultural practice to incorporate into a sound pest control program. T F
16. Pests can't be controlled by altering or modifying the environment. T F
17. Temperature, humidity and air movement can be used to greatly impact the storage of crops in closed environments. T F
18. Host resistance is a trait that can be used to successfully control pests. T F
19. Pesticide is a narrow and specific term used for chemicals that control pests. T F
20. Eradication is the total elimination of a pest from a given area. T F

Please mark the number below to rate this article and test:

Not very useful									Very useful
1	2	3	4	5	6	7	8	9	10

Pesticide Applicator CEU Form

First Name: _____ **Last Name:** _____

E-mail: _____

Pesticide License Number: _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Phone Number: _____

Please mail the answer sheet or a copy of the form to: Steve Futch, Citrus Research & Education Center, 700 Experiment Station Road, Lake Alfred, FL 33850

If you have questions regarding this form, test or CEUs, e-mail Steve Futch at shf@ufl.edu or call (863) 956-8644.