

Using integrated pest management principles

By **Tim Gaver**
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The Florida citrus industry has battled a considerable number of pest species throughout its history. These pests include mites, insects, nematodes, weeds, fungi, viruses, citrus canker and, relatively recently, huanglongbing (HLB), commonly referred to as citrus greening, a bacterial disease. Growers have utilized a number of pest management tools, including biological, host resistance, cultural, sanitation and chemical controls to deal with these native and exotic pests.

THE INTEGRATED PEST MANAGEMENT STRATEGY

An integrated pest management (IPM) program utilizes all appropriate pest control methods in a plan to reduce the populations of targeted pests and their potential damage to an acceptable level. While chemical control is often utilized, consideration should routinely be given to other possible methods like biological and mechanical control.

The first step to a successful pest control program is proper identification of the pest. Effective pest control is often dependent on basic knowledge of the pest, including the life cycle stage where the pest is most likely to be controlled by the method chosen. Most pests are more easily controlled



in their younger or immature stages, and become more difficult to manage as they reach maturity. A good example is targeting immature mealybug or scale insect crawlers before they settle under fruit buttons or form a protective shell as adults.

Knowledge of a particular pest will also include the action threshold, or the population level at which a crop is being damaged or will be damaged if pest populations continue to increase. In some cases, a small amount of damage may be less costly than the expense of treating an area to control or reduce the pest. Some citrus rust mite damage to the peel of processed citrus fruit is tolerated, while little or no damage is acceptable on fruit destined for the fresh market. Rust mite populations are managed according to the intended destination of the crop.

The goals of a pest control program can be divided into three broad categories or types of management, dependent on the pest present, environment, crop involved, and perhaps the potential value of the produced crop. The three pest control goals include prevention, suppression and eradication.

Prevention might be a goal when a citrus fungal disease such as melonose fungus on oranges and grapefruit intended for the fresh fruit market is

involved. The grower might apply a protective fungicide to susceptible young fruit when a wetting period of sufficient length is expected that would result in infection of the fruit rind.

An example of a goal of pest suppression would be to apply a miticide spray to a low population of citrus rust mites when conditions are suitable for that population of mites to increase to damaging levels. Frequent scouting and knowledge of action thresholds and the behavior of mite populations would help the grower make the decision of when to treat, thereby avoiding future damage.

Eradication of a pest is rarely the goal of pest control programs when treating large areas, usually because it is so difficult and costly to achieve. An exception would be an instance where an invasive pest has been accidentally introduced into an area, but has not yet become established. Examples would be unwanted introductions of the Oriental or Mediterranean fruit fly, and the necessary eradication effort would be planned and supported by government agencies. The canker eradication program in Florida that ended in 2006 is an example of an eradication effort to remove an unwanted bacterial disease that proved both costly and ultimately unsuccessful.

BIOLOGICAL CONTROL

A number of biological agents have been introduced into Florida to combat citrus pests after careful research of the potential consequences from such introductions. Beneficial predators or parasites have been brought in from other parts of the world to suppress populations of brown citrus aphid, citrus leafminer, citrus blackfly, citrus whitefly, numerous scale insects and other pests. Until recently, a number of armored and soft scale pests that were once significant problems have successfully been controlled by the combined action of native and introduced exotic natural enemies. This balance has been upset in a number of areas as a result of intensive chemical management efforts to control the Asian citrus psyllid (ACP), the insect vector of HLB, or citrus greening disease. This psyllid found its way into Florida in 1998 and rapidly spread across the state, quickly building to huge populations in the absence of effective natural enemies. A parasitic wasp, *Tamarixia radiata*, has been introduced and



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Asian citrus psyllid

become established across the state, but does not provide sufficient natural control of the psyllid populations to slow the spread of HLB.

HOST RESISTANCE

Utilizing rootstocks or varieties that are tolerant or resistant to various insect or disease pests is a common practice in many fruit and vegetable production programs. When considering host resistance in a new citrus planting that may be in production for many years, the selection of a scion variety that can be grown and marketed profitably may be more important than its susceptibility to selected pest issues. Citrus rootstocks are available that are resistant to citrus tristeza virus (CTV) and offer some tolerance or resistance to Phytophthora foot rot and root rot. Resistance to nematodes and the Diaprepes root weevil may also be an important consideration in some areas where these pests are endemic.



Adult diaprepes weevils

SANITATION

Vegetable growers utilize sanitation as a pest management tool when they destroy plant residues after a crop is finished, depriving pests of a host to continue their life cycles. Citrus growers have used sanitation practices to prevent or reduce the spread of citrus canker bacterial disease. Utilizing canker spray stations at grove entrances and exits to sanitize vehicles, equipment and harvesting personnel has been shown to be beneficial. In

groves where canker is an established problem, delaying hedging and topping operations and harvesting until the trees are dry has become a common practice. Some growers are finding that selective pruning of foliage that is heavily infected may also be beneficial. This practice is labor intensive and must be combined with fungicidal spray applications to be effective.

CHEMICAL CONTROL

In many cases, even though IPM tactics are utilized, pest populations can reach action thresholds, and pesticides must be applied to manage those populations. The selection of a pesticide to manage a pest should consider efficacy, cost per acre, length of control, ease of use and the potential effects on beneficial organisms.

Efficacy is the ability of a pesticide to control a pest population. The effectiveness of a chemical application can be dependent on many factors, including the pest to be controlled, weather conditions following the application, and if the pesticide was applied at the correct labeled rate by equipment that was accurately calibrated to apply the proper amount of finished spray per acre.

The length of control of a pesticide application will also depend on the pest, growth stage of the plant, weather and the pest population at the time of the application. Because no pesticide kills 100 percent of a pest population, applications that are made when pest numbers are very high can result in relatively short periods of control.



Citrus canker

Pesticides that are easy to use can increase the productivity and safety of pesticide applicators. Although large package sizes of liquid and dry pesticide products may lower the unit cost, smaller packages of dry products that contain the proper amount of product for each tank mix may improve application accuracy and efficiency. Formulations such as dry flowable products may be easier to measure and be less dusty than wettable powder formulations, leading to less handler exposure to the pesticide. Handlers should be provided measuring containers that are properly marked for the correct amounts and have written mixing instructions posted at the mix/load site to ensure that the proper pesticide amounts are mixed and applied.

Selection of a pesticide product that has a low per acre cost often conflicts with the goal of using a product that is "soft" on beneficial insects. Planning a pest control program for the entire season can help to minimize costs while protecting populations of helpful organisms at certain times of the year.



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Answers to often-asked questions about CRDF

By Harold Browning



We often get questions about CRDF programs and the research to find solutions to HLB, canker and other diseases. In this column, we will address some of the more often asked — and sometimes difficult to answer — questions. Some of these questions arose at a recent discussion with the Florida Citrus Production Managers Association, and are posed by many others in the industry.

How many research projects are currently being funded? The portfolio of research that is currently funded by CRDF is 130 projects, representing 68 new projects just getting started, with the balance being research that has been ongoing for the past one or two years. The vast majority of these projects focus on HLB solutions. Since CRDF provides financial support for projects that achieve adequate progress for up to three years of duration, we always have a balance of relatively mature and new projects. This allows us to begin new projects each year, incorporating the latest research results as well as to investigate new ideas and adapt to the changing environment of infectious disease.

What are the timelines for delivery of solutions to HLB? The urgency of protecting existing citrus trees from disease decline and to find ways to protect new plantings requires short timelines for solutions, and we hear frequently that time is our enemy with HLB. Short-term solutions have been a major focus of CRDF in sponsoring research on psyllid vector control, to evaluate treatments being applied to enhance infected tree health, and to evaluate other management tools such as therapeutic treatments for infected trees. Predicting exactly when research will be completed and the results ready for field use is difficult. Furthermore, if the results must pass through regulatory consideration or product commercialization, it becomes even more challenging to predict timelines.

One of the important objectives of our Commercial Product Development Committee is to develop timelines for these projects and to set aggressive goals and assure major steps in the delivery of the solutions will be completed. Clearly, timelines associated with development of resistant plants and their incorporation into new plantings is a longer term scenario. The time often is communicated as many years. Importantly, this aspect of the research has been under way since early in the infection of citrus canker in Florida (mid-1990s) and for a number of years specifically for HLB, and thus we are moving along the timeline toward that longer term end-point. The intent of CRDF and the scientists involved in HLB research is to keep the urgency of delivering multiple solutions foremost in our planning.

What are we doing about citrus black spot research? With citrus black spot concerns increasing, CRDF is encouraging the establishment of research priorities for this new disease. Since the disease currently has limited distribution in Florida, there is an opportunity to affect the rate of spread by better understanding the disease and its spread characteristics under Florida conditions. The University of Florida-IFAS is advising CRDF on research needs, and this will be considered as CRDF prepares for the next call for research proposals. This will complement citrus black spot research projects that are already under way with CRDF and other funding.

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



Column sponsored by the Citrus Research and Development Foundation

An example of this would be using organophosphate or pyrethroid pesticides to control minimal ACP populations during the dormant or cool season, and utilizing spray oils or other “soft” pesticides during the warm seasons for ACP control when beneficial populations are higher. Information on the potential for a product to affect friendly organisms can be found on the pesticide label or from other information from the manufacturer.

PESTICIDE RESISTANCE MANAGEMENT

In addition to the other factors involved in pesticide selection, the potential for pest resistance to a product should be considered. Pesticides are grouped according to their mode of action (MOA), which is the specific manner in which their chemistry affects a pest. Organizations devoted to managing pesticide resistance worldwide include the Insecticide Resistance Action Committee, Fungicide Resistance Action Committee and the Herbicide Resistance Action Committee.

Repeated applications of pesticides with the same MOA can result in insect, weed or fungal populations with resistance to that particular product or other products with that same MOA. Rotating pesticide applications using products with a different MOA is the best recommendation to avoid resistance. When practical, coordinating applications with a like MOA with your adjacent growers can help avoid developing pest resistance. This can be especially useful for managing an insect like whiteflies or ACP which can fly from one grove or field to another to avoid treated areas. Attempting to cut pesticide costs by using less than labeled rates can also contribute to the buildup of resistance when more pests survive the application. For citrus growers, the MOA of pesticides can be found in the **Pesticides Registered for Use on Florida Citrus section of the 2012 Citrus Pest Management Guide SP43** or on the web at <http://edis.ifas.ufl.edu/cg017>

Growers should utilize all of the appropriate IPM principles to reduce the number of pesticide applications as much as possible and actively contribute to a responsible environmental stewardship effort. Correctly identifying pests, choosing the appropriate pesticide and applying the product at the correct rate are all important factors in a successful and sound pest management program.

Tim Gaver is an Extension agent at the St. Lucie County Extension Service, Fort Pierce; Stephen H. Futch is an Extension agent at the Citrus Research and Education Center, Lake Alfred.

“Using integrated pest management principles” test

To receive one CORE continuing education unit (CEU), read “*Using integrated pest management principles*” 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 this 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 provide a CEU.

1. *The Florida citrus industry has only recently had to battle damaging pests.* T F
2. *Mature insect pests are usually more easily controlled than immature insects because they are larger.* T F
3. *Pest control program goals might include:*
a. Annihilation; b. Suppression; c. Wait and see; d. Resistance Circle One
4. *Utilizing host resistance as a pest management tool is only used in the vegetable industry.* T F
5. *Eradication should be the goal of every pest management program.* T F
6. *The selection of a pesticide should consider:*
a. Efficacy; b. Effects on beneficial organisms; c. Cost; d. All of the above Circle One
7. *Eradication of an introduced exotic pest with severe damaging potential is usually left up to the growers who have the pest.* T F
8. *The mode of action (MOA) of a pesticide refers to how quickly the pesticide kills a pest.* T F
9. *Growers should always use the least costly pesticide available in order to improve their profit margin.* T F
10. *Waiting until pest populations are very high before a pesticide application is recommended because the number of sprays will always be reduced.* T F
11. *Using just a little bit less than the recommended rate of a pesticide is a good way to reduce costs and causes no long-term harm.* T F
12. *A parasitic wasp, Tamarixia radiata, has proven to be the most effective management tool to prevent the spread of HLB.* T F
13. *Applying a copper fungicide to young grapefruit in the postbloom period for melanose control would be an example of pest:*
a. Eradication; b. Suppression; c. Prevention; d. Sanitation Circle One
14. *Pesticide resistance is only a potential problem with insecticides.* T F
15. *Wettable powder formulations of pesticides are always recommended for use because they are cheap, and dust is not a problem.* T F
16. *The mode of action (MOA) of a pesticide registered for use on citrus can be found in a section of the 2012 Florida Citrus Pest Management Guide.* T F
17. *The efficacy of a pesticide application can depend on:*
a. The pest to be controlled; b. Weather conditions after the application; c. The pesticide used; d. All of the above Circle One
18. *Planning a pest control program for the entire season can help to protect populations of beneficial organisms.* T F
19. *Using citrus rootstocks that have resistance to certain diseases is an example of using host resistance as a pest management tool.* T F
20. *Examples of good pesticide application stewardship would include:*
a. Utilizing pesticides with “soft” chemistry; b. Applying pesticides at the correct rate; c. Rotating MOAs of pesticides to avoid resistance; d. All of the above Circle One

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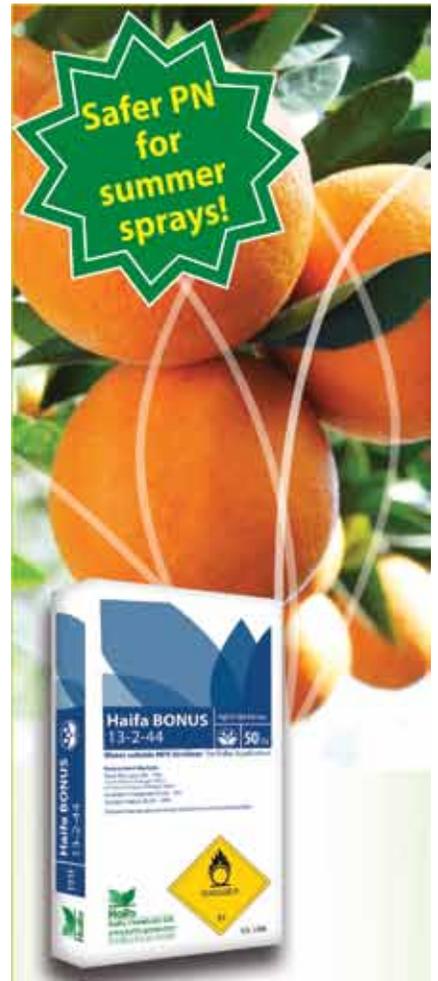
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