The goals of pest management

By Ajia Paolillo

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Integrated pest management (IPM) uses a combination of methods to keep pest populations at an acceptable level, which are economical and have little effect on human health and the environment. IPM is a step-by-step process that identifies the target pest, monitors the population for action thresholds, chooses a management goal, implements the various methods and evaluates the results.

IPM encompasses insects and other arthropod pests, diseases and weeds that are found in enclosed areas and open outdoor environments such as citrus groves. Insect and other arthropod pests can cause damage to plants by feeding on the foliage and fruit or by serving as a vector for a disease pathogen. Certain plant diseases can negatively affect tree health, which causes reduced productivity and yields, and possibly death. Weeds compete with trees for nutrients and water and can serve as alternate hosts for damaging insects.

The first step in choosing an IPM plan is identifying the pest to be controlled. Accurately identifying the pest allows you to understand critical information such as its life cycle and effective control methods. The various methods used in an IPM program are physical and environmental modifications and cultural, mechanical, biological, chemical and regulatory controls.

THRESHOLDS

There are thresholds to consider before implementing pest control measures when pest populations are damaging crops. The *action threshold* describes the pest population at which control measures need to be implemented. It is determined by the level of damage that is acceptable before health, environmental or economic damage occurs. The *economic threshold* is the point at which the cost of controlling a pest equals the economic damage it is causing.

Whether you are battling an insect, disease or weed infestation, the economic damage the pest is causing will determine your action thresholds and guide you to appropriate control methods. The severity of damage a pest causes is an important consideration when choosing management options that are both environmentally conscious and economical.

For example, the Asian citrus psyllid (ACP) is the vector for *Candidatus* Liberibacter asiaticus, the pathogen that causes HLB disease. Chemical control is a method being utilized to manage ACP population levels. Researchers are looking into cultural practices such as tolerant and resistant citrus varieties as another way to manage this disease. They have also provided growers with recommendations for optimal tree nutrition.

Prevention, eradication and suppression are three goals in pest management.

Another pest managed in citrus is the rust mite, which is an arthropod. This pest causes a rust-type blemish on the fruit peel. The rust mite can cause significant economic damage to fresh fruit growers because it affects the exterior appearance of the fruit, making it less marketable. On the other hand, if you grow fruit that will be processed into juice, this mite usually does not cause a large amount of economic damage because it does not affect the internal juice quality. Rust mite control varies, allowing for different population levels depending on the fruit variety and target market. This results in varying action and economic thresholds.

Scouting and monitoring techniques are very useful tools for identifying existing pest pressures and populations. They also help determine action thresholds. You will be able to establish action and economic thresholds unique to your agricultural operation with the information from scouting and monitoring.

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The next step in an IPM program is to determine, based on your thresholds, the level of pest control you are trying to achieve. This can be considered the goal of your pest management plan. Prevention, eradication and suppression are three goals in pest management. Each one has different management options. In many cases, a combination of one or more will yield positive results.

How do you know what the goal of your management plan should be and what factors contribute to this decision?

PREVENTION

Prevention is most effective for pest populations in which control measures are difficult or not usually successful. One method used in prevention is physical modifications to the growing environment, which create a barrier between the pest and crop.

For instance, some citrus growers have started growing fresh fruit varieties in citrus undercover production systems (CUPS) to prevent inoculation from the ACP. This design allows trees to be grown in-ground or in pots, under a tightly woven protective screen. This screen does not allow the ACP to pass through, thus creating a physical barrier between plant and insect. This same screen is utilized as individual plant covers (IPCs) placed on young trees in traditional open-air citrus plantings. While the IPCs cannot protect the tree from the ACP forever, it provides a barrier from inoculation for a few years.

Depending on the target pest, other prevention-method combinations can be used. Scouting, as previously mentioned, will allow you to identify developing populations in your grove. You may find a population hot spot that can be controlled before the pest becomes established.

For instance, vines are difficult weeds to control, especially in large populations. Scouting in and around the grove for vines and pulling young seedlings will help prevent large-scale population establishment. With weed prevention, it is also important to control the weeds before they produce and disperse seeds over a large area. These actions are examples of cultural control methods. These practices, along with chemical controls such as pre-emergent herbicides for weed seeds and post-emergent herbicides for existing weeds, can help you get ahead of the issue.

Decontaminating personnel and equipment is another pest prevention method. For example, decontamination can be achieved through using a spray for citrus canker control on personnel and equipment. When using decontamination practices to prevent insect populations, you should remove any visible insects from clothing, keeping in mind that some crawler stages can be very small. Be sure to decontaminate vehicles and equipment that were used in another location to wash off weed seeds and insects and to kill diseases. If you know that you have an infestation of a target pest in one of your groves or blocks, visit that location last during the day. This will help prevent spreading the problem between locations.

ERADICATION

Some pests have a "zero" threshold and cannot be present in certain environments due to the severe human

health, environmental or economic damage they will cause. For instance, food establishments cannot have vermin or insects present, due to health hazards. Eradication is the pest management goal in these situations.

Eradication is the complete removal or elimination of the target pest population from the location or environs. This method is mainly used for buildings such as homes, offices, restaurants, etc. These areas are confined, usually making eradication possible. Eradication in citrus groves and other open outdoor environments is more difficult to achieve.

Eradication is usually the first goal when new invasive pests are introduced to Florida and is performed through regulatory agencies. For example, when the Mediterranean fruit fly was found in Florida, an eradication program was launched with successful results. This pest posed a significant threat to many crops in Florida, including citrus. Its establishment would have had a negative economic impact on the agricultural industry. Eradicating some pests may not be successful, depending on the life cycle of the pest, the rate of spread and environmental conditions.

SUPPRESSION

When eradication is not possible due to the large scale of the pest population, cost or the potential negative environmental and economic impacts, suppression may be the goal. Suppression is the practice of keeping pest populations at low enough levels to avoid reaching an action threshold. Most pest management programs utilize this method.

Suppression tactics will vary with the type of pest, the damage it causes and the acceptable population levels. Population suppression can be achieved by using chemical, mechanical, cultural and biological controls. When using chemical controls, it is important to be conscious of the effect the materials can have on non-target beneficial insects in the grove, such as honey bees, ladybeetles and other species used for biological control.

Biological control uses the pests' natural enemies to keep populations low. Examples of biological control include insects and even fungi or

bacteria. To sustain the natural enemy population used for biological control, the target pest must be present at some level to serve as a food source. All the control methods used should be economical for the grower and not cause subsequent human health or environmental issues.

SUMMARY

The three pest management goals of prevention, eradication and suppression are effective ways to control many pests in agriculture. When implementing control measures for a specific pest, remember that accurately identifying the pest is the first key to successful management. You must understand the life cycle and growing pattern to successfully control a pest population.

Prevention methods can be combined with suppression methods to achieve desired results when eradication is not practical. IPM utilizes cultural, mechanical, chemical, genetic and biological controls to lower pest populations.

Remember to evaluate the results of the methods used and determine how they can be adjusted to attain the desired pest population level. It is important to know which methods will work best in your unique operations and will yield the best results while considering health, the environment and economic feasibility.

Source: Applying Pesticides Correctly (7th Edition) by F.M. Fishel, 2014, University of Florida Institute of Food and Agricultural Sciences (UF/IFAS).

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