

**Intensive Insect Monitoring and Trapping  
 by David Biddinger 5/6/09**

Tree fruit production in the eastern US represents one of the most complex and potentially stable ecosystems in agriculture. Approximately 40-50 different insect and mite species and about 40 different plant diseases are potential pests in Pennsylvania tree fruit orchards during the growing season. Monitoring is the tool for acquiring periodic information about the pest situation in the orchard so that timely decisions can be made and action can be taken before economic injury occurs. While there is low tolerance for diseases and insects that directly injure the fruit, generally there is more tolerance for indirect pests that affect the foliage and woody tissues. Identifying the various pests and how, when and if control measures need to be taken to prevent injury, requires extensive knowledge of pest biology, phenology, and intensive sampling.

In the past, the use of broadspectrum insecticides reduced the need to know what pests were causing damage in grower orchards. From a grower's viewpoint, organophosphate (OP), carbamate (CB) and synthetic pyrethroid (SP) insecticides simplified a complex orchard ecosystem by economically and reliably killing the majority of pests. The decision to treat an orchard was often prevention based and several target pests and many non-target pests were killed in the same treatment. Timing of sprays was often not as critical as these non-selective compounds were toxic to all stages of a pest from egg to adult. The development of pesticide resistance in some of these pests, however, made timing of applications more important. For resistant pests only the damaging or more sensitive life stages should be targeted. By targeting fewer sprays, selection pressure for resistance could be reduced over the more frequent calendar-based programs. Alternations of pesticides with differing modes of action or different metabolic paths of enzymatic degradation are also needed to slow the development of pesticide resistance.

As more selective pesticides are being developed due to the Food Quality Protection Act (FQPA) and used in tree fruit pest management, it has become much more important to know exactly which pests are present to order to achieve acceptable levels of fruit injury. As implied by their classification, selective pesticides are more effective on some pest species than others and often vary in their impact on biological control agents. Proper identification of pests is more important with selective pesticides. Improper identification may lead to unnecessary applications to incidental non-pest insects that are not causing injury and can also lead to ineffective applications of selective pesticides for pests not in their spectrum of activity. Many beneficial insects acting as biological control agents also look similar to pest species (i.e. predatory & pest mites, predaceous & pest stink bugs, tarnished plant bugs & minute pirate bugs) and should not be targeted.

The effectiveness of many selective controls (i.e. IGR insecticides, biological insecticides, mating disruption, scab fungicides etc.) often depends on very accurate timing of applications and thorough coverage of the crop. Traps are commonly used in fruit orchards to monitor the activity of many insect pests. Regular monitoring provides information on when a particular pest's activity starts, peaks and ends and may also give an estimate of the populations size and its ability to cause various levels of economic injury. Such information may be used to assess the

need for management actions (i.e. pesticide application timings and selection, the need for additional monitoring, more intensive or effective control options etc.). While in-season, pest monitoring and sampling is very important in making pest management decisions later in that same season, monitoring/sampling for fruit injury at harvest is also very important. Validation of the pest management decisions you made during the season is reflected in the quality of the final product. Too much injury from a particular pest may indicate poor pesticide application timing, application method or choice of pesticide. Conversely, lack of any economically important surface injury on fruit bound for processing (i.e. leafroller injury, fly speck, sooty blotch etc.) may indicate an inefficient overuse of pesticides for non-target pests. Recording monitoring records, results from pest sampling, pheromone trap catches, and harvest evaluations is an extremely valuable tool as they allow you to see the results of management decisions and enable you to calculate the cost/benefits of those decisions in each block. By developing a record history for each block, you will be in a better position to make production input decisions in future seasons in a more efficient way. Advanced IPM practices such as these have been shown to reduce pesticide inputs (lb ai/A) by as much as 50% from conventional calendar-based pest management programs and greatly delay the development of pesticide resistance. See the Pennsylvania Tree Fruit Production Guide or the Mid-Atlantic Orchard Monitoring Guide for more detailed discussions on pest monitoring techniques and timings.

### **Pheromone Traps & Pest Phenology Models**

Many of the most economically important insect pests are moths (i.e. codling moth, Oriental fruit moth, leafroller, lesser peachtree borer etc.). For many of moth pests, artificial lures have been developed based on the specific sex pheromone that the female of each species uses to lure males for mating. Pheromone traps using these lures and a sticky coating are a quick and convenient way to monitor the populations of such pests. Traps are placed in the orchard before the beginning of moth emergence and are checked daily to record the first capture, or biofix, and then again at weekly intervals throughout the pest's life cycle each season. Each week the trapped insects and debris are removed and trap bottoms (the sticky portion) and pheromone lures are replaced as necessary. The biofix can be used to begin accumulating degree days for use in insect development models to predict future insect stage distributions for various pests throughout the season so that growers will know the optimum timing to control various pests. Insect traps alone should not be relied on for management decisions, but should be used in conjunction with direct tree inspections in the orchards. Trap catches can be affected by many factors (pheromone mating disruption, weather, trap design, trap placement, trap maintenance, pesticide applications) as well as pest population pressure. Variability in insect trap catches can be minimized if the overall trapping program is standardized and consistent (i.e. same trap design, trap density, lure source and lure age). Disease phenology models based on daily temperatures and rain events also provide continuous current information on the timing of recommended fungicides or antibiotics against apple scab or fireblight. This information can be combined with scouting information from individual orchards and used in making pest management decisions. Each season the information on moth captures in pheromone traps for codling moth, oriental fruit moth, leafrollers, and various other insect species as well as information on diseases in the Biglerville area are available at the PSU FREC web site: <http://frec.cas.psu.edu/> and it is also published by Penn State Cooperative Extension in the monthly newsletter, Fruit Times (<http://fruittimes.cas.psu.edu/Default.html>).



## **Advanced Pest Management Tree fruit intensive disease monitoring**

- Use of good scouting methods by knowing when to scout, the proper method of scouting and proper tool use are essential means of preventing disease infections. Scout based from growers past experience, tree growth stage or use models that predict the timing of disease occurrence such as scab, fire blight, powdery mildew, brown rot and bacterial spot on stone fruits to provide accurate timing and more effective use of fungicide/bactericide budget.
- Regularly scout by randomly or systemically sample the trees to get a representation sample from disease incidence and severity.
- Use weather data and disease forecasting model for scab, fire blight, sooty blotch and fly specs to determine when infection will occur and the need to initiate spray. To be effective, apply fungicides before infections become established and in a sufficient spray volume to achieve thorough coverage of the plant or treated area. Early fungicide sprays control the number of leaves that become infected and reduce the severity. Protection from fungicides is temporary because they are subject to weathering from light, irrigation, and rainfall. Reapply when needed to protect new growth when disease threatens.

Manage fungicide resistance by alternating the use fungicides with different modes of action within a growing season.

Keep records from monitoring, fruit injury sampling, disease infection periods and weather records for future use in developing a more efficient disease pest management plan.

## **Advanced Pest Management Tree Fruit intensive insect monitoring and trapping**

The following species at minimum should be monitored in each of the following crops with at least 1 trap for each species/10 acres:

- Apple & Pear – Codling Moth, Oriental Fruit Moth, Oblique-banded Leafroller. Pear Psylla and mite visual counts should also be made in both crops.
- Stone Fruits – Oriental Fruit Moth, Lesser Peachtree Borer, Peachtree Borer

Traps should be placed in the orchard at the beginning of flight of each species and maintained throughout the entire season (i.e., lures and floors exchanged every 4 weeks, traps checked weekly, moth capture data maintained for the entire season)

Manage insect/mite resistance by alternating the use insecticides/miticides with different modes of action or metabolic detoxification pathways between pest generations.

Encourage the establishment of beneficial insects for control of secondary pests like mites, aphids, leafhoppers, and leafrollers by using selective pesticides whenever possible.

Keep records from monitoring, pheromone trap catches, and fruit injury sampling for future use in developing a more efficient insect/mite pest management plan.

### Checklist

Do they have a copy of the Pennsylvania Tree Fruit Monitoring Guide and are familiar with it? (if no, disqualify).

Do they have a copy of the Mid-Atlantic Orchard Monitoring Guide and are familiar with it and pest life cycles? There are several fruit IPM guides from other states that might qualify as well. (if no, disqualify)

Do they have a weather monitoring station, access to remote weather information (i.e. Skybit), or regularly access the PSU Fruit Research & Extension Center at Biglerville website for pest development information? (if no, disqualify).

Do they use establish pest biofixes from pheromone trap catches and use phenology models to time spray applications for key pests? (if no, disqualify).

Are they familiar with various pesticide chemistries, modes of action, and their effectiveness of key pests? Do they rotate pesticides for resistance management (if no, disqualify).

What have they done to encourage biological control agents? (if no action, disqualify)

Did they maintain the proper numbers of pheromone traps for the correct species in each crop and use them in the manner proscribed above? (if no, disqualify)

Did they keep records from monitoring, pheromone trap catches, and fruit injury sampling? (if no, disqualify)

Did they conduct the monitoring and sampling themselves or hire a crop consultant?