

Controlling Apple Pests

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Entfact-201

Control of the major insect pests of apples for commercial production sometimes involves timely insecticide applications. Unlike some crop pests, pests of apples can be very elusive and damage can often occur without individual pests being seen. To maintain healthy, productive trees and fruit, producers should recognize what pests to look for, understand pest biology, use appropriate preventive measures, and apply timely controls when needed.

The *Kentucky Commercial Fruit Spray Guide, ID-232*, provides a listing of the available insecticides and guidelines for applications at regular intervals for commercial producers, while *Disease and Insect Control Program for Home Grown Fruit in Kentucky, ID-21*, is the corresponding guide for home owners. Following these guidelines, a producer should be able to maintain a protective insecticidal shield at key times to reduce insect infestations. These guidelines are designed to protect against nearly any insect pest problem in tree fruit that can occur in the commonwealth throughout the year.

However, experience has shown us that all orchards do not have all pests during the whole growing season. Regular cover spray schedules provide preventive control without regard to whether the pests are present or whether the pest populations are large enough to be economically threatening. An important IPM concept is that pest populations need to be present in large enough numbers in order to justify the cost of pesticide applications. Applying unnecessary insecticide applications are very costly and can lead to the development of insecticide resistance or secondary pest outbreaks.

Monitoring

Which insecticide applications are unnecessary? These will be different for different orchards. They are determined through the use of pheromone traps and timely examination of the trees. Typically, trees should be examined once a week in the spring and early summer, and once every two weeks thereafter. Pheromone traps should be examined daily until initial catches are made then once a week until harvest.

Key pests to control in an orchard insect management program include codling moth, plum curculio, Oriental Fruit moth, brown marmorated stink bug, and San Jose scale. Other secondary pests include European red mites,

rosy apple aphids, Japanese beetles, and woolly apple aphids. The secondary pests are usually less threatening, in that rescue treatments are usually an effective means of control when economic infestations are found through scouting.

Predicting Insect Development Using Degree Days

Temperature plays the major role in determining the rate of insect development. Each insect has an optimum temperature at which it will develop at its fastest rate. For each insect there is a minimum temperature (termed threshold temperature) below which there is no development, as well as a maximum temperature (termed upper cutoff) above which development stops. By using the relationship between temperature and rate of development, when insects will pass through certain stages and damage can be predicted. This method of estimating time is called the degree day method. A degree day is the same as an average of one degree over the threshold temperature for a 24-hour period. The ability of these models to predict insect development depends partly on the accuracy of the data used in determining degree days.

The easiest way to calculate degree days each day is to subtract the threshold from the average daily temperature. The average daily temperature can be determined by averaging the minimum and maximum temperature over a 24-hour period. Minimum and maximum temperatures should be recorded from a Min/Max thermometer about the same time each day, preferably in the mid-morning or late afternoon. For example, if the min/max thermometer indicates a minimum temperature of 45°F and a maximum of 75°F, then the average temperature for the day was $(75+45)/2 = 60^\circ\text{F}$. If the threshold temperature was 50°F, then 10 degree days would have accumulated. Weather driven computer models for codling moth, Oriental fruit moth and San Jose scale are available on the UK weather website.

With apple IPM, degree day models are used primarily for three insects, Oriental fruit moth, San Jose scale and codling moth. Degree day accumulations are used to predict when certain biological events occur, such as egg laying, egg hatch, or scale crawler movement, they also synchronize for insecticide sprays. For these pests, degree days are accumulated after certain events, termed biofixes

(usually based on pheromone trap catches). These occur in the early spring.

Orchard Insect Management Program

The key to successful insect management in apple orchards, whether the orchard is managed by a conventional program or a reduced-pesticide integrated pest management program, is effective early season control. To achieve this, insecticide sprays are required during the following stages; dormant or delayed-dormant, pink, petal-fall, and first cover. The combination of these applications will help to manage some of the more difficult to control pests and get the season off to a clean start.

The dormant or delayed-dormant application is used to control several troublesome insects including San Jose scale, European red mite, and rosy apple aphid. This is an oil application. Usually 1 to 2 gal. of oil per 100 gallons of spray is used. Petroleum oils function as insecticides and miticides by suffocating eggs and other susceptible stages of some insects. Therefore thorough coverage is essential! Sprayers should be properly calibrated and the tree adequately pruned to allow for complete coverage.

Timing of the dormant oil can influence the degree of control of some pests. Apply a delayed-dormant oil spray unless San Jose scale is a major problem. Oil sprays applied at green-tip provide better control of European red mites and moderate control of San Jose scale. Dormant oil applications provide the best control of San Jose scale and should be used where infestations are heavy. Failure to apply either a dormant or delayed-dormant oil may require that additional in season treatments be applied. These are not only more costly, but are more disruptive to beneficial arthropods that keep secondary pests under control.

Insecticide sprays timed at the pink and petal-fall stages are required to control insects that cause cat-facing of the fruit. Cat-facing insects include plum curculio, stink bugs, and plant bugs. Plum curculio causes characteristic crescent-shaped wounds to the fruit by feeding and egg laying. Stink bugs and plant bugs damage fruit while feeding with their piercing sucking mouthparts. These wounds often develop into sunken pits or dimples on the fruit as the uninjured parts of the fruit expand more rapidly during development. Currently, because there is no effective method to predict when damage will be caused by these pests, insecticides should be included in the cover sprays at the pink and petal-fall stages.

With the exception of codling moths and San Jose scale, other apple pests can be effectively controlled with rescue treatments based on weekly examinations of the trees and fruit. Reduced pesticide programs for codling moth and San Jose scale involve scouting, pheromone trapping, and the use of degree day models. Specific information for

controlling selected apple pests is available in the following fact sheets:

- ENTFACT-202 - Plum Curculio
- ENTFACT-203 - Codling Moth
- ENTFACT-204 - San Jose Scale
- ENTFACT-205 - European Red Mite
- ENTFACT-211 - Rosy Apple Aphid
- ENTFACT-212 – Oriental Fruit Moth

Revised: 11/19