Organic Management of Common Michigan Apple Pests

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There are more than twenty common insect and mite pests of apples in Michigan. Of these twenty pests only a few are of primary concern. Pests can be separated into two basic categories: Direct and Indirect.

Direct Pests: Feed directly on apples, buds, or flowers
Because they have an immediate impact on fruit yield; the most important pests in apples are typically direct pests.

Indirect Pests: Feed on leaves, wood, or roots
Indirect pests can also be important but in organic systems are typically controlled by predators, parasites, and pathogens.

Tips on Organic Insect/Arthropod

- Know your pests and beneficial insects/arthropods
- Ask your local extension educator, fellow growers, or use the web to identify suspicious insects
- Use insect traps to identify when/where pests are active
- Use degree day models to time pest management applications
- Scout orchards for damage at the appropriate times
- When using pesticides, use products that are as pest specific as possible
- Apply pesticides during evening to minimize damage to biological control agents and pollinators

Additional Resources

- http://www.ipm.msu.edu/about.htm a website providing access to degree day models and information on pests and management tactics.
- http://www.enviroweather.msu.edu a website with degree day models for many crops
- http://apples.msu.edu/ a website devoted to apples with extensive information on pests and management
- http://www.opm.msu.edu/ The MSU Organic Pest Management Laboratory
The Importance of Scouting

Successful pest management depends on a good understanding of the life history, population trends, and behavior of pests. Insects are cold blooded and experience time as a function of accumulated heat. Population development can be predicted using degree-day models. Scouting for pest presence, either by direct observation or through the use of species specific traps gives us a biofix or “starting place” for our models. If we know what stage an pest population is in we can better time our pest management to impact that stage.

Pheromone traps are important pest management tools. These traps work by releasing an attractive scent. When using traps biofix is identified as the first sustained capture of the pest of interest. Pheromone traps are usually specific to an individual pest although some pheromones trap multiple pests.

Indirect Pests: Aphids

Aphids damage apples by feeding on leaves, wood or roots. Aphids produce honeydew that can lead to sooty mold growth on fruit. Aphids have multiple generations per year. The rosy apple aphid (Dysaphis plantaginea), wooly apple aphid (Eriosoma lanigerum) and green apple aphid (Aphis pomi) are three of the most common aphids found in apples.

Organic management of aphids is most often accomplished through natural biological control. Pyganic®, Neem products, soaps and oils are products that can be used if natural biological control fails.

Indirect Pests: Mites

Mite feeding turns leaves brown, referred to as bronzing. Severe infestations can cause defoliation. Mites reproduce continually during the growing season with egg, nymph and adult stages. The European red mite (Panonychus ulmi) and two spotted spider mite (Tetranychus urticae) are two common pest mites found in orchards. Mites are most commonly managed with natural biological control. If biological control is disrupted by sulfur or insecticide applications pest mites can rapidly build up. In these cases, organic management relies on summer applications of horticultural oils.
**Indirect Pests: Leafrollers**

Leafrollers primarily feed on apple leaves but will also feed on the apple surface. Caterpillars “roll” leaves using silk forming the into a protective tube. A variety of leafrollers attack Michigan apples. The most common species are: Oblique banded leafroller (*Choristoneura rosaceana*), Redbanded leafroller (*Argyrotaenia velutinana*) and varigated leafroller (*Playnota flavadana*). OBLR are the most serious of the group, have two generations per year and overwinter as young larvae. A degree-day model is available for OBLR management.

Leafrollers are typically managed on organic farms through biological control. Mating disruption products are available for OBLR. If populations are extremely high, moths can be managed using Bt bioinsecticides such as Dipel® as well as Entrust®. Summer applications of pesticides for codling moth may also impact leafroller populations.

**Direct Pests: Codling Moth**

The **codling moth** (*Cydia pomonella*) is the #1 pest of apples. CM have two generations per year (Spring and Summer) and their host range includes: apples, pears, walnuts, and quince. Adult moths emerge from cocoons, mate, and lay eggs on leaves or apples. Young larva spend <1 day outside before entering apples. Larva feed on apple flesh and seeds and leave to find a pupation site. The second generation codling moth overwinter as larva in silken cocoons on tree bark, in soil litter, and on bins or prunings left in the orchard.

Organic management relies on mating disruption, good sanitation, and a few insecticides (CM virus, Entrust®, and oils) that kill eggs or young larva before they enter the fruit. Pheromones should be applied in early April prior to the first flight of codling moth in order to prevent mating. Insecticides should be timed using degree day models coupled with pheromone traps.
**Direct Pests: Oriental Fruit Moth**

The Oriental fruit moth (*Grapholita molesta*) within apples. OFM have between three and four generations per year. 1st generation OFM feed on apple shoots prior to fruit development and attack stone fruit as well as apples. Otherwise their life history is similar to codling moth. Larvae of these two species are difficult to tell apart. OFM typically feeds in the flesh of the fruit, while codling moth feed in the center.

Organic management relies on mating disruption, good sanitation, and a few insecticides (Entrust®, and oils) that kill eggs or young larva before they enter the fruit.

**Direct Pests: Apple Maggot**

Apple maggot (*Rhagoletis pomonella*) feed within apples. Damaged fruit have a lumpy or dimpled appearance with brown discolorations within the flesh. AM have one generation per year. Adults emerge beginning in June or July until September. Apple maggot larvae pupate in the soil.

Organic management relies on mass trapping, good sanitation, and a few insecticides (Entrust®, Surround®) that kill adults before they lay eggs or prevent egglaying (Surround®).

**Direct Pests: Plum Curculio**

The Plum curculio (*Contrachelus nunuphar*) is the single most difficult to manage pest in organic apples. PC has a single generation per year and damages the fruit in both adult and larval stages. PC emerge in the early spring prior to fruit development. PC females lay eggs in crescent shaped cuts in young fruit. Larva feed internally and most infested apples will fall in June. Larva move to the soil and emerge as adults in late August. Summer adults feed on apples prior to finding a place to overwinter.

Management of PC relies on several insecticides (Pyganic® and Surround®). Pyganic® applications target adults and should be timed based on traps. Surround interferes with female egg laying and should be applied to fruit as early as possible. Other management that is being explored include microbial pesticides, consumption of June drops by livestock, and mass trapping.