Insect and Disease Management Basics

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Basic insect and disease management in highbush blueberries starts with good monitoring methods to determine if and when a problem is occurring at a level where action is needed to suppress it. For insects, this usually means some sort of trapping system that provides the grower with information about when a pest arrives or emerges and how many are present. This information combined with knowing the stage of the crop (i.e., if it's at a vulnerable stage for damage) helps growers make decisions about spraying or other interventions.

For diseases, monitoring for the presence of diseases before they cause damage is too difficult because spores are too small to see. Instead growers monitor for environmental conditions that are suitable for disease to infect the crop; that is, an infection period. This has mostly to do with surface wetness from rain or other wetting events combined with temperature over a period of time. This monitoring is done with some type of weather monitoring equipment. This equipment can be as simple as a recording thermometer and a rain gage. Or, it can be a fully equipped weather station with many sensors. More sophisticated weather monitoring can be done that provides the ability to forecast infection risk using modeling programs. Insect pest development can also be monitored this way using growing degree-day (GDD) accumulations, which helps focus scouting efforts on the right period of time, thereby saving scouting costs.

For both insect and disease threats, growers need to know what they're looking for and when to look for it. This requires a good working knowledge of what key insects and diseases look like, how to monitor for them and something about their life cycles. For less common problems, it requires having a fast reliable way to identify the cause of a problem coupled with access to recommendations for control.

Below are some examples of key insect and disease problems common in New England. They include a description of the insect or pest, a bit about their life cycle, the damage they cause, how to monitor for them and some cultural/biological and chemical control strategies. The presentation will cover these and additional insects and diseases of blueberries. At the end of this article you'll see a listing of resources that you can use to look further into the details of blueberry insect and disease problems.

INSECTS

Blueberry Maggot

ID/Life Cycle: The adult fly, similar in size to a house fly, is black in color, with a pattern of dark and clear bands on its wings. The maggots are small, white, legless, and are found inside infested fruit.

This insect overwinters as pupae in the soil beneath the blueberry bushes. Emergence of overwintering adults coincides with the ripening of blueberry fruit and spans several weeks, which extends their period of activity in the field. Females lay their eggs singly beneath the surface of a ripening berry. The emerging larva feeds inside the berries for a two-week period. When full grown, the larva drops to the ground, if the berry has not already fallen. It pupates in the soil, where it will remain for the winter. There is one generation per year.

Damage: Flies lay eggs under the fruit skin just as the fruit begins to turn blue and larvae feed within the fruit. Maggots are later found in ripening and harvested fruit. Maggots feeding within

developing fruits render fruit unmarketable. Berries become soft and mushy. Undetected infested berries contaminate pack-out.

Management

Monitoring: Yellow sticky rectangle traps can be used to monitor blueberry maggot populations in the planting. Traps are placed in the upper third of 4-8 bushes around the perimeter of the planting and another 2-4 traps on interior bushes. Bushes with traps should be marked with flagging tape so they can be easily found. Traps should be set out prior to any fruit ripening (approximately 900 GDD (Base 50˚F) from 3/1) and checked every few days to determine when Blueberry Maggot flies are becoming active. Sustained catch of the blueberry maggot fly in traps indicates that it is an optimal time to make an insecticide treatment; sustained catch means not just the first one or two flies, but consistent catch of several flies per week.

Control strategies

Cultural/Biological:

- Eliminate wild *Vaccinium* in the vicinity of cultivated blueberries.
- Preserve natural enemies whenever possible by selecting spray materials that are less toxic to beneficials.
- Prune to achieve small, open bushes with good sunlight penetration through the canopy, reducing shading on the soil surface to generate a less favorable habitat for build-up of this pest.
- Set out a high density of traps (1 trap per bush) in small plantings to trap-out this insect.

Chemical:

- Apply recommended insecticides when trap catches indicate a sustained population.
- If repeat applications are needed, rotate insecticides from different IRAC groups to reduce the chance of resistance development in the pest.
- Be aware of pre-harvest intervals for materials applied close to harvest.

Cranberry/ Cherry Fruitworm

ID/Life Cycle: Both Cranberry Fruitworm and Cherry Fruitworm are native to North America, as are the blueberries they infest. The adult forms of these fruitworms are small brownish-gray or grayish-black moths. Eggs are laid near the calyx of green fruit and are pale creamy color. Larvae found within blueberry fruit in June are small and pale yellowish green in color.

Fruitworms overwinter as larvae and pupate in the spring, emerging as adult moths after the start of bloom and usually before early fruit set. Once mated, moths move into blueberry plantings when fruit is small and green to lay eggs directly on the fruit. Larvae then tunnel into the fruit and begin feeding. Infested fruit turn prematurely blue making them easy to identify when scouting. Larvae will consume from 3-6 berries, filling them with brown frass, and web together fruit with silk. Upon reaching maturity, larvae leave the berries and move to over-wintering sites in nearby woods or hedgerows. There is one generation per year.

Damage: Larvae feed on ripening fruit. Feeding reduces the crop and spoils marketability of the berries.

Management

Monitoring: Pheromone traps can be used to monitor male populations of this pest and helps to identify the initial flight into a blueberry planting. Traps should be placed immediately after bloom or at approximately 350-400 GDD base 50˚F from 3/1. Monitor trap catches twice weekly and remove trap catches in order to identify a peak flight or follow GDD until 85 GDD

after the date of first sustained moth catch (biofix), showing the date egglaying starts. Egglaying continues for 400 GDD from that point. Secondary scouting can be done for egg laying by inspecting green fruit with a hand lens. Scout the periphery of the planting especially near woods and hedgerows. Finally, scout for infested fruit by looking for prematurely pigmented berries.

Control strategies

Cultural/Biological:

- Eliminate wild *Vaccinium* in the vicinity of cultivated blueberries.
- Eliminate weeds and trash around plants to cut down on overwintering protection for larvae.
- Clean cultivate between rows to disrupt pupation sites and reduce the population of this pest.
- Hand pick and destroy infested fruit in small plantings.
- Preserve natural enemies whenever possible by selecting spray materials that are less toxic to beneficials.

Chemical:

- Apply recommended insecticides beginning one week after peak trap catches which usually coincide with berry-touch or when 85 GDD from biofix have elapsed. Repeat applications as needed for duration of the egg laying period (400 GDD).
- Rotate insecticides from different IRAC groups to reduce the chance of resistance development in the pest.
- Use pesticides that are less toxic to predators (e.g., insect growth regulators or B.t. products) to promote populations of natural enemies.

DISEASES

Mummy Berry

ID/Disease Cycle: The first symptom of this disease is browning along the major leaf veins on newly emerging leaf clusters. The leaves wilt quickly and bend to resemble a shepherd's crook. A light gray powdery layer of spores develops at the leaf base. These spores go on to infect flowers and fruit. Infected green berries appear healthy but cutting them open reveals a white fungal growth inside. When berries start to ripen, infected berries appear pinkish tan and slightly ridged. They feel rubbery and contain a gray to black fungal mass inside. Infected berries eventually become faded, shrivel up, and fall to the ground. After the fruit skin has weathered off, the berries look like tiny black pumpkins.

The fungus overwinters in the mummified fruit on the ground. In early spring, trumpet-shaped mushroom cups produced on the mummies eject windborne spore that infect young shoots. Frost may increase susceptibility of blueberry shoots to infection. Spores are produced on blighted shoots and are carried to flowers by wind, rain, and insects (bees), resulting in fruit infections. Mummies that fall to the ground provide inoculum for the disease in the following year.

Damage: The fungus infects and invades the developing fruit rendering it unmarketable.

Management

Monitoring: Consult scouting records from previous years to determine if build-up of this disease is indicated. Monitor weather conditions to identify likely infection periods. Scout fields beginning at budbreak for symptomatic tissue.

Control strategies

Cultural/Biological:

- Plant resistant varieties whenever possible.
- Prune bushes to open the canopy to light, air, and spray penetration.

- Cultivate beneath plants in fall and again in early spring to disrupt overwintering inoculum.
- Apply a 3-4" layer of mulch material over the soil surface in early spring before mushroom cups emerge to create a physical barrier to spore release.

Chemical:

- Apply recommended fungicides at budbreak if scouting and weather monitoring indicate risk of infection.
- Time fungicide applications closely to frost/freeze events that predispose tissue to infection.
- Repeat fungicide applications at recommended intervals if weather conditions are conducive to infection.
- Rotate fungicide materials from different FRAC groups to avoid promoting the development of resistant strains of this disease.

Botrytis Blight/Gray Mold

ID/Disease Cycle: Rotted berries are typically covered with a gray fuzz of the mycelium and spores, which gives the disease its name. Infection occurs during bloom on flowers and tender green tissue. Moderate temperatures (60˚F – 68˚F) and frequent rain favors disease development. The fungus survives the winter on dead twigs and in soil organic matter. It is present every year, but only causes severe damage during cool, wet periods several days in duration. The most critical period for infection is during bloom.

Damage: Damage is to fruit production, quality and storage life. The fungus can cause stem blight as well.

Management

Monitoring: Consult scouting records from previous years to determine if build-up of this disease is indicated. Monitor weather conditions to identify likely infection periods. Scout fields beginning at bloom for symptomatic tissue.

Control strategies

Cultural/Biological:

- Prune bushes to open the canopy to light, air, and spray penetration.
- Avoid overhead irrigation that wets plant surfaces.
- Avoid excessive nitrogen fertilization that can result in a dense canopy.
- Harvest frequently to limit the amount of overripe fruit present in the field.
- Refrigerate harvested fruit as soon as possible after harvest.

Chemical:

- Apply recommended fungicides at bloom if scouting and weather monitoring indicate risk of infection.
- Repeat fungicide applications at recommended intervals if weather conditions are conducive to infection.
- Rotate fungicide materials from different FRAC groups to avoid promoting the development of resistant strains of this disease.

Resources:

New England Small Fruit Pest Management Guide: www.umass.edu/fruitadvisor/pdf/2010NESmallFruitGuide.pdf
New York (Cornell) Blueberry IPM: http://www.fruit.cornell.edu/berry/ipm/blueberryipm.html
Michigan Blueberry IPM Facts: http://blueberries.msu.edu/
Michigan State Enviro-Weather pest modeling site: http://www.enviroweather.msu.edu/