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Fruitworm Factsheet

John C. Wise, Ryan VanderPoppen and Rufus Isaacs

Cranberry Fruitworm
Acrobasis vaccinii Riley (Lepidoptera: Pyralidae)

Cherry Fruitworm
Grapholita packardi Zeller (Lepidoptera: Tortricidae

Introduction

Cranberry Fruitworm (CBFW) and Cherry Fruitworm (CFW) are the two significant Lepidopteran pests directly attacking the fruit of blueberries in commercial fields in Michigan. Both pests have similar life histories, which makes it possible to address them together in one fact-sheet. Both CBFW and CFW are native to North America, as are the blueberries they infest. Without decisive management one or both of these pests can cause significant economic injury to the blueberry crop. This fact-sheet will discuss general life stages of CBFW and CFW, as well as Integrated Pest Management strategies for managing these pests in blueberries.

Hosts

Cranberry fruitworm can be found on blueberry, cranberry, and huckleberry where they feed on fruit (Immature Insects, Stehr).

Hosts of Cherry fruitworm include apple, plum, cherry, rose, blueberry, hawthorn, and peach (Tree Fruit Insects, Howitt). Larvae feed in fruit or growing shoots.

Identification

Adults of CFW are grayish black and 5 to 6 mm in length (Figure 1). CBFW adults are about 11 mm in length. Forewings of CBFW are grayish brown, with two identifying whitish triangles.

Eggs of CFW are flat, with a round to oval outline, and appear opaque (Figure 2). Upon maturity, the dark head capsule of the developing neonate is clearly visible within the egg (Figure 3). Eggs of CBFW are irregular shaped and initially appear as raised white scales. As they develop, CBFW eggs go through a progressive change of color from white to yellow to orange (Figure 4). Later, within 24 hours of hatching, the developing neonate's head capsule can be seen as a darkened spot within the egg. After hatch the egg is clear white, and looks similar to a newly deposited egg.

Larvae found within blueberry fruit in the month of June will be likely be either CBFW or CFW. CBFW larvae are pale yellowish green, and reach a length of 15 mm when fully developed (Figure 5). CFW larvae appear pink, are about 8 mm in length, and can be distinguished from CBFW by the presence on an anal comb.Hibernaculum of CFW are golden brown and about 6 mm in length. CBFW pupate within a hibernaculum that is about 10 mm in length, which will take the color of surrounding soil particles or detritus incorporated while building the structure (Figure 6).

Life Cycle

In blueberries, both CBFW and CFW go through a single generation per year. Adult emergence begins after the start of blueberry bloom and usually before early fruit set. In West Michigan adult flight normally begins in May and continues through early July for both species, as evidenced by pheromone trap catch data recorded at the Trevor Nichols Research Station (http://www.maes.msu.edu/ressta/tnrc/).

Egg laying starts soon after the first fruit set, peaking in the first two weeks after 100 % petal fall. Although adult flight can continue into July, egg laying dissipates rapidly after mid-June. Both species prefer to oviposit within the calyx "cup" area of the fruit, though CBFW tend to lay eggs more strictly along the inside rim of the calyx.

With favorable weather conditions, eggs hatch in 3 to 5 days. CFW tend to enter fruit in the calyx where they hatched, while CBFW tend to migrate out around the berry and enter adjacent to the stem, or on the "cheek" of the berry (Figure 7). One major difference between CFW and CBFW is the number of fruit that are infested within a single life-cycle. CBFW can enter up to 6 berries, while CFW generally enter 1 or 2 berries to complete development. With both species, feeding on immature green fruit causes premature ripening (bluing) of fruit. This characteristic makes infested fruit more readily identifiable. While feeding and moving between berries, CBFW produce a characteristic mass of webbed frass, filling the space in and around the fruit cluster. CFW also silk berries together when moving between fruit, but the frass stays entirely within the fruit, and the webbing is not as obvious.

Upon reaching maturity, the larvae leave the berries and move to over-wintering sites. CBFW larvae migrate off the bushes and form a hibernaculum shallow in the soil using natural soil particles or other detritus. CFW larvae form a hibernaculum above ground, in a sheltered area on the bush or in surrounding weeds.

Only after the winter cold period has been met, and the weather warms, will the larva in the hibernaculum begin to pupate. After being in the pupal stage for several weeks, the adults will emerge. This again correlates with blueberry bloom period, and mating and egg laying will soon follow for both species.

Monitoring and Control

Monitoring. The 3 practical phases to monitoring CBFW and CFW in blueberries include 1) monitoring adult trap catch, 2) scouting for eggs, and 3) scouting for larval infestations. 1) The emergence of adult males and moth flight can be monitored using sticky traps baited with female sex pheromone lures. Monitoring the emergence of adults provides two important pieces of information for pest management. First, the number of male adults caught in traps provides a relative estimate of population level and distribution within the field(s). Second, because egg laying typically begins shortly after initial adult emergence, adult catch in traps serves as an indicator for when egg monitoring should begin. 2) The second phase of monitoring fruitworms is scouting for eggs, which will provide the most reliable biofix for egg hatch timing and egg distribution in the field. Scouting for eggs should begin after there is some early blueberry fruit set and adult flight has commenced. Start by scouting along perimeter rows of blueberries that either have a history of fruitworm pressure or are adjacent to woods and/or abandoned blueberry fields. CBFW eggs tend to be laid between 3 ft and 5 ft high on bushes, and are often clustered such that when you find one there will be more in the near vicinity. Eggs can be seen in the calyx of fruit, and approximate age of CBFW eggs can be estimated by the progressive change of color from white to yellow to orange. CFW eggs are much more difficult than CBFW to see because of their flattened shape and opaque color. A 15-20X hand lens is helpful to see eggs and confirm a positive identification. 3) The third phase of monitoring fruitworm in blueberries is scouting for larval infestations. This is important for determining the effectiveness of the management strategy that has been utilized. In most cases a single injured berry will not show up at harvest as long as the larva is prevented from further infestation of the fruit cluster.

Cultural control. "Clean cultivation will reduce the populations of cranberry fruitworm within a field significantly, but insecticide treatments may still be needed to achieve satisfactory control of this pest" (Highbush Blueberry Production Guide). Due to the premature coloring effect larvae have on the fruit, it may be possible to physically remove infested clusters in small acreage operations.

Biological Control. As both CBFW and CFW are native insects, it is not surprising that there are a number of parasitic insects that attack them in their egg and/or larval stages. These include parasitic wasps and flies in the families Trichogrammatidae,

Ichneumonidae, and Braconidae. Selecting insecticides that have lower toxicity to these parasitoids (like IGRs and B.t.s) will enhance the effectiveness of biological control.

Chemical Control. When using chemical control both timing and good coverage of the fruit is critical. Once the commencement of egg laying is determined through field monitoring, there is an approximate 3 to 5 day window before egg hatch begins. Some insecticides (i.e; like juvenoid Insect Growth Regulators) are primarily active on eggs of CBFW and CFW and should be applied during this heavy egg-laying period. Egg hatch often occurs before 100% petal fall, such that insecticides toxic to pollinators should not be used. B.t.'s and most Insect Growth Regulators (IGR's) do not affect bees, so can be used during late bloom / early fruit set period. Larvae are the most susceptible to chemical control for a short period between the time that eggs hatch and the larvae enter the fruit. After successful larval entry the fruit acts as a refuge from contact with chemical residues on the surface. In the case of CFW complete coverage is critical because larvae may never leave the calyx cup before entering fruit. In the case of CBFW
it is possible to present an additional toxic dose to the larvae as they move from one berry to another, though the larvae are by then larger and more difficult to kill.

References:

Pritts, M.P., Hancock, J.F. 1992, Highbush Bluberry Production Guide (NRAES-55).

Howitt, A.J. 1993, Common Tree Fruit Pests Michigan State University Extension.

Stehr. F.W. 1987. Immature Insects. Kendall / Hunt Publishing Company.

Figure 1. Adults of CFW (left) and CBFW (right).

Figure 2. CBFW (top) and CFW eggs

Figure 3. Eggs of CFW are flat, with a round to oval outline, and appear opaque. Upon maturity, the dark head capsule of the developing neonate is clearly visible within the egg.

Figure 4. Eggs of CBFW are irregular shaped and initially appear as raised white scales. As they develop, CBFW eggs go through a progressive change of color from white to yellow to orange.

Figure 5. CBFW (top) and CFW larvae.

Figure 6. CBFW (left) and CFW pupae.

Figure 7. CBFW hatched larva, entering fruit near stem and webbed cluster.