BLACKHEADED FIREWORM

Common Name: Blackheaded fireworm
Scientific Name: *Rhopobota naevana*
Order: Lepidoptera (moths and butterflies)
Family: Tortricidae (the leafroller family)

Blackheaded fireworm is one of the most serious pests of Wisconsin cranberry production. Larvae feed on both foliage and fruit and, if left uncontrolled, can significantly reduce yields.

Biology and Damage

Host Plants:
Cranberry, *Vaccinium macrocarpon*
Evergreen huckleberry, *Vaccinium ovatum*
Holly, *Ilex* spp.

Description and Diagnosis:
Eggs are deposited singly on the leaf surface and are flattened, circular, and about 0.65 mm in diameter; first yellowish and then turning black close to hatch. The larvae are typical caterpillar-like, with a distinct head and several pairs of distinct legs. The larvae are 1/3 - 1/2" long when fully grown, and range from cream colored to grayish or greenish; the head and shield just behind the head are dark brown to shiny black. A very few short, fine, and indistinct hairs are scattered over the body. The pupae are yellowish brown and about 1/4" long. Adults are grayish-brown and with a wingspan of 1/3 - 1/2".

Early (l) and soon-to-hatch (r) eggs.

Fully grown larva.

Adults.
Left, on flower.
Right, museum specimen with wings spread.

Economic Importance:
Blackheaded fireworm is one of the potentially most damaging insects attacking cranberry in Wisconsin. If left unmanaged, the majority of the crop can be lost to this insect, and vine damage can be severe. There are several chemical and non-chemical ways to manage blackheaded fireworm, and damage can usually be avoided. In some years, egg laying and hatch of second generation larvae coincides with the blossom period, and significant damage can result to young early fruit before the end of fruit set.

Life Cycle:
Blackheaded fireworm overwinters in the egg stage on the foliage. Eggs hatch in spring about the time the plants are breaking dormancy. Although egg hatch is temperature dependent, it is not based on simple degree day accumulation and requires non-linear modeling for prediction of the hatch period. If hatch significantly precedes bud break, a substantial portion of the larvae will die without feeding. First generation larvae generally occur between mid May and mid June. First generation adults fly and lay eggs from late May to mid July. Second generation eggs are laid toward the tips of the uprights. Second generation larvae occur from mid June to the last half of August. Second generation adults fly from mid July through August. Overwintering eggs tend to be laid lower in the canopy than summer eggs, but still mostly on the current year's growth. Although normally there are two generations per year, there may be a partial or substantial third generation in warm years with an early spring.

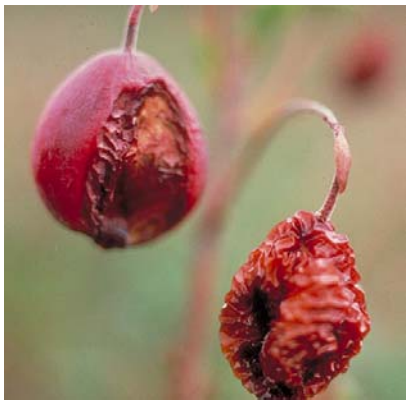
Environmental Factors:
Newly hatched larvae are sensitive to moisture and easily drowned. Larvae are susceptible to naturally-occurring predators, parasitic insects, and insect pathogens. However, parasitism by other insects is rare and may not be an important factor in natural control.

Damage and Symptoms:
First generation larvae feed on foliage, preferring the newly developing fresh growth as opposed to last year's leaves. They prefer to feed in the growing tip, and will web several leaves together to make refuges; as they get larger, two, three, or more terminals may be webbed together. They feed on the lower leaf surface leaving the upper surface intact, but this dies and turns reddish brown; the entire tip will turn brown as the larvae continue to feed. Second generation larvae feed on both foliage and fruit. When feeding on fruit, they feed at the fruit surface, causing a wound which will be invaded by pathogens; they usually do not tunnel completely within the fruit. Severe infestations not only damage a substantial percentage of the crop, but also weaken the vines resulting in a poor crop the subsequent year.

Webbing (left) and leaf "skeletonizing" (right).

Browned ("burned") uprights.

Damaged area of bed.



Fruit damage caused by blackheaded fireworm. Note how chewing is mostly at the fruit surface.

Monitoring and Control

Scouting Procedure and Economic Threshold:
Optimum pest management of blackheaded fireworm requires monitoring of four life stages: egg, young larvae, older larvae, and adults.

Egg monitoring should be conducted in early spring to determine the number and survival of overwintering eggs. From five locations on each bed, collect 20 uprights and examine the leaves with a 10x magnifying glass or low power microscope. Ideally, each bed should be sampled, but if time or cost is a constraint, at least sample all beds with a previous history of fireworm, as well as other, arbitrarily selected beds. If possible, retain up to 10 leaves with eggs from each bed under moist conditions in a warm environment (such as home or office) and examine periodically to determine percent egg hatch.

It is the youngest larval stages that are the most susceptible to chemical and microbial insecticide applications. Although young larvae can be captured with a sweep net, University of Wisconsin research clearly demonstrates that there is no numerical relationship between the number captured and the actual number in the vines. The best way to sample for young larvae is visual sampling. We suggest using a standardized area and number of samples, such as one square foot repeated four times per bed, and count the number of larvae

present.

Older larvae (half grown or larger) can be reliably sampled with a sweep net; that is, there is a numerical relationship between insects captured and the actual population density. This sampling technique can be used once during each generation for an overall assessment of the population level. However, treatment decisions should be made before larvae reach this size, and therefore should be based on visual sampling of younger larvae.

Industry IPM consultants sometimes use an action threshold of two larvae per 20 sweeps.

Adult moths can be monitored using appropriate pheromone traps. Use at least one trap per 20 acres, and a minimum of two traps for isolated areas less than 20 acres. Traps should be checked at least weekly.

Pheromone trap.

Natural Control:
Heavy prolonged rain near the time of egg hatch will kill many larvae. Some parasitic wasps attack blackheaded fireworm, but percent parasitism is always very low.

Cultural Control:
A 24-48 hour reflood after the peak of spring egg hatch will kill a high percentage of larvae. If the weather is cool during this period and plants have not substantially broken dormancy, there will be no plant injury from such a reflood.

Biological Control:
Microbial insecticides based on *Bacillus thuringiensis* (Bt) have provided some control. This method would most likely be used if summer generation egg hatch occurred when bees were still pollinating the crop thereby restricting the use of conventional insecticides. Bt-based insecticides have short residual activity (24-48 hours) and therefore may require a second application. They should be timed to target younger larvae. They work as stomach poisons and thorough coverage of foliage is essential to optimize control.

Mating Disruption:
Pheromone-mediated mating disruption has been developed for sparganothis fruitworm and blackheaded fireworm. Sprayable pheromone has been commercially developed and registered with EPA, but at the time of writing production has been stopped due to a lack of a viable market. Pheromone-impregnated “baggies” are also registered and, at writing, still commercially available. This method is acceptable for certified organic production.

Chemical Control:
To keep from disrupting beneficial insects, only those beds exhibiting potentially damaging population levels should be treated with broad-spectrum insecticides. Treat as soon as possible after egg hatch. Because of seasonal temperature changes, the spring egg hatch is

easily overlooked. Phenology models incorporated into Cranberry Crop Manager will help predict the date of egg hatch. Registered and effective insecticides include acephate, azinphosmethyl, carbaryl, chlorpyrifos, diazinon, tebufenozide, and spinosad. At the time of writing, the organophosphates were still under review by EPA with the potential loss of registration of azinphosmethyl and diazinon and possibly others. Refer to a current product label for up-to-date information on rates and methods of application and appropriate safety precautions.

References:

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This information was prepared by Daniel L. Mahr, Professor and Extension Fruit Crops Entomologist, University of Wisconsin – Madison. It is revised and modified from the Pest Profiles section of University of Wisconsin Cranberry Crop Management software CCM. November, 2005.

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