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INSECT PROFILES:
BLACKHEADED FIREWORM

Blackheaded fireworm is one of the most serious pests of cranberry in Wisconsin. The adult is a moth, placing it in the insect order Lepidoptera, which includes all moths and butterflies. It is in the leafroller family, Tortricidae, which includes many serious pests of fruit crops, including sparganothis fruitworm. The scientific name of blackheaded fireworm is *Rhopobota naevana*.

Blackheaded fireworm is a fairly specialized feeder. Host plants include cranberry, *Vaccinium macrocarpon*, evergreen huckleberry, *Vaccinium ovatum*, and 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 to ½ " long when fully grown, and range from cream colored to grayish or greenish; the head and the 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 ¼ " long. Adults are grayish-brown and with a wingspan of 1/3 -1/2 ".

Economic Importance.

Blackheaded fireworm has the potential of being one of the 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 pollination when broad-spectrum insecticides can be used.

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.

Damage/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.

Environmental Factors.

Newly hatched larvae are sensitive to moisture and are easily drowned. Larvae are susceptible to naturally-occurring predators, parasitic insects, and insect pathogens, but such natural controls are not reliably effective.

Scouting Procedure and Economic Threshold.

Optimum pest management of blackheaded fireworm relies upon monitoring of four life stages: egg, young larvae, older larvae, and adults. However, adequate management can be accomplished with a less intensive monitoring program.

Egg monitoring can 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 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. Second generation egg hatch usually occurs about 3-5 days after peak moth flight as determined by pheromone trapping.

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 has clearly shown that there is no numerical relationship between the number captured while sweeping 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 a one square foot grid, 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. When using sweep sampling, an action threshold of 2 larvae per 20 sweeps is often used as an Economic Injury Level at which controls are implemented.

Another way of checking for larval activity is to observe for webbed uprights. In first generation, these will be first seen along the warmer edges next to ditches. Visual observation is only a qualitative assessment, but will tell you when more precise sampling should begin.

Adult moths can be monitored using pheromone traps. Pheromone trapping provides reliable information on the flight period (and, therefore, the egg-laying period), and the relative abundance of the insect from year to year. Pheromone trapping also is necessary to time the application of mating-disruption pheromones, and to evaluate the effectiveness of a mating disruption program.

Remember that other insects can cause fruit and foliage damage similar to blackheaded fireworm.

Management.

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 immediately 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 is most often used if summer generation egg hatch occurs when bees are 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. Many Bt products are also allowed in certified organic production.

Chemical Control (Insecticides).

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 software will help predict the date of egg hatch. Registered and effective insecticides include acephate, azinphosmethyl, carbaryl, chlorpyrifos, diazinon, phosmet, and tebufenozide. Refer to a current product label for up-to-date information on rates and methods of application and appropriate safety precautions. Tebufenozide is an insect growth regulator that is highly effective against fireworm and other lepidopterous insects, yet is reasonably safe for beneficial insects. The other materials listed are broad-spectrum compounds.

Mating Disruption.

Pheromone-mediated mating disruption is registered for use against blackheaded fireworm and is effective. Technologies are still evolving, so check on current recommendations. Mating disruption has the benefit of being target-specific and therefore is not detrimental to beneficial predators, parasites, or pollinators. In some cases its specificity may be a drawback, especially if there are other pests present that also must be controlled. Currently, two application methods exist: sprayable pheromone that

can be used through all types of pesticide application equipment including chemigators, and passive point-source applicators that continuously emit pheromone.

References:

Cockfield, S. D., and D. L. Mahr. 1992. Flooding cranberry beds to control blackheaded fireworm (Lepidoptera: Tortricidae). J. Econ. Entomol. 85: 2383-2388.

Kachadoorian, R. 1995. Spatial distribution patterns, sampling, and development of blackheaded fireworm, *Rhopobota naevana*, (Lepidoptera: Tortricidae) eggs and larvae in commercial cranberry (*Vaccinium macrocarpon*) in Wisconsin. M.S. Thesis, University of Wisconsin, Madison.

Mahr, D., and T. Baker. 2001. Mating disruption for insect control: Where are we? Wisconsin Cranberry School Proceedings.

Roberts, S. L., and C. F. Brodel. 1985. The blackheaded fireworm. Univ. Mass. Ext. Publ.

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