DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

FSA7082

Biology, Identification and Management of Raspberry Crown Borer

Donn T. Johnson
Professor,
Extension Entomologist - Fruit

Soo-Hoon S. Kim
Graduate Student - Entomology - Fruit

The raspberry crown borer (RCB), *Pennisetia marginata* Harris (Lepidoptera: Sesiidae), is a clearwing moth. The color markings of both the male and female moths (Fig. 1) resemble markings of yellowjacket wasps. RCB is one of the most damaging pests of blackberry and raspberry crops in North America. Its range extends from the Canadian Pacific Northwest to Florida in the Southeast (Lawrence 1903, Lovett 1921, Raine 1962, Breakey 1963, Howitt and Pshea 1965).

FIGURE 1. Raspberry crown borer moth male (top) and female (bottom).
Photo: Donn Johnson

Background

This pest is native to the United States. In Europe, two raspberry clearwing moths, *P. hylaeiformis* (Laspeyes) and *P. bohemica* (Králič & Povolný), feed on crowns of various blackberry and raspberry cultivars, causing similar damage. The adult raspberry crown borer is in the same family (Sesiidae) as the grape root borer, peach tree borer, lesser peach tree borer, strawberry crown borer, dogwood borer and lilac borer. The RCB has a two-year life cycle in the cooler northern states and a one-year life cycle in warmer southern states like Arkansas.

Identification

The RCB adult has a black abdomen with four yellow transverse stripes and comblike antennae (plumose). Adults are about 1 inch (25 mm) in length (Fisher and Sultan 2010) (Fig. 1). They emerge from brown pupal cases at the base of the cane (Fig. 2). The larva is white, has legs, a brown head and, when mature, measures 1 to 1½ inches (25 to 33 mm) in length (Fig. 5).

FIGURE 2. Raspberry crown borer pupal cases at base of cane.
Photo: Soo-Hoon Kim

Arkansas Is Our Campus

Visit our web site at:
http://www.uaex.edu

Biology

Raspberry crown borer adults emerge from pupal skins on lower canes in early September to October in warmer southern states and from August to September in more northern states (Fig. 2). Females release a sex pheromone to attract males to mate. This moth flies during the day to mate, and each female lays about 140 brown eggs (1 mm diameter) singly near the margin on the underside of blackberry leaflets (Fig. 3). After hatching, the small white larva has a light brown head (Fig. 4), walks down the cane and bores into the cambium at the cane base just below soil level where it overwinters. The following spring, the larva bores into the crown (Fig. 5), and by early summer, tunnels into the pith in the base of the cane (Fig. 5). Larvae in Arkansas mature and pupate the first summer in late August, and moths emerge from mid-September to mid-October. Reddish brown pupal skins measure about 1 inch (2 cm) long and remain behind at the soil line, often sticking out of larval tunnels in the base of canes or upper crowns or lying on the soil by the cane (Fig. 2).

In cooler states north of Arkansas, moderate-sized larvae measuring ½ to ¾ inch (1.3-2 cm) long remain in the crown through a second winter. The second spring, larvae tunnel into the pith, as noted earlier, where they mature, pupate and the moths begin to emerge in late August.

Damage

Canes damaged by RCB larvae can be confused with symptoms of several diseases that kill canes. Canes weakened by RCB will have a larval tunnel in the pith at the cane base that often breaks off during high winds. Positive identification of RCB infestation is obtained by pruning the cane at the soil line and looking for a tunnel often housing a white larva (Fig. 5). These RCB-damaged canes will wither, wilt, form a shepherd's crook and die (Fig. 6). As the number of RCB larvae per plant increases over several years, a planting has the potential to experience a 30% or more decrease in plant vigor and yield (Lovett 1921, Schaefers 1974).

FIGURE 3. Female raspberry crown borer laying brown egg (L) on underside of blackberry leaf (R).
Photos: Donn Johnson; Soo-Hoon Kim

FIGURE 4. Hatching (L) and newly emerged raspberry crown borer larva (R). **Photos: Jeff Barnes**

FIGURE 5. Young raspberry crown borer larva tunneling in blackberry crown (L), mature larva tunneling inside base of a blackberry cane (C) and cross sectional view of a larval tunnel in cane base (R).

Photo: Donn Johnson

FIGURE 6. Tunneling of a raspberry crown borer larva inside the base of this blackberry cane caused cane to wilt by June.

Photo: Donn Johnson

Sampling

After harvest in July or August, a grower can inspect the cane base of pruned-off fruited canes or wilted primocanes for RCB tunnels and larvae (Fig. 5). In October, look for pupal skins sticking out of the base of canes or on the soil near canes (Fig. 2).

In September (northern states) or October (southern states), a grower can determine the potential for RCB infestation next season by inspecting the margin on the underside of blackberry leaves for presence of brown RCB eggs (Fig. 3).

Since 2010, a sex pheromone lure has been tested for its attractiveness to RCB male moths. Once it is commercially available, the lure could be used in sticky traps to monitor adult flight and determine the end of the egg-laying period. At that time a grower could check for completion of egg hatch and apply an insecticide soil drench. An alternative tactic may involve placement of one or more lure-baited traps per acre to mass trap RCB males over several years to reduce the local RCB population below economically damaging levels.

Cultural Control

The removal of alternate hosts such as wild brambles (particularly wild blackberries) from the area will help reduce local RCB populations. If the population is low, you could kill the RCB larvae you see in tunnels in the base of canes or dig up RCB-infested plants.

Biological Control

There are a few natural enemies of the raspberry crown borer. The nematode *Steinernema feltiae* caused 33% to 67% raspberry crown borer larval mortality when applied to soil in Colorado in June and July (Capinera et al. 1986). In early April, applying a soil drench of the nematode *S. carpocapsae* to the base of blackberry plants caused 53% raspberry crown borer larval mortality (McKern et al. 2007). In Ohio, two parasitoids, *Pterocormus chasmodops* and *Bracon bembeciae*, emerged in the fall from raspberry crown borer pupae, and Eulophid parasitoids emerged from eggs in Arkansas.

Chemical Control

There are currently three insecticides that have RCB on the label: Brigade 2EC, Altacor and Hero. Brigade 2EC and Hero are both IRAC Group 3A

compounds (pyrethroids/pyrethrins) and Altacor is in Group 28. Published efficacy tests conducted using Brigade 2EC caused 90% to 100% larval mortality only when applied as a soil drench after egg hatch from fall to early spring before larvae tunnel into the crown and become protected from insecticide. Application on November 3 gave 100% control whereas application on April 7 gave 89% control (McKern et al. 2007). Since two out of the three products labeled for RCB are in the same chemical class, rotation of chemistries between Groups 3A and 28 is advised to prevent development of resistance. Also, please follow label instructions and safety procedures and check to make sure that the chemical you are using is registered for use in your crop.

References

Breakey, E. P. 1963. Biology and control of the raspberry crown borer *Bembecia marginata* (Harris). Wash. Agric. Exp. Stn. Tech. Bull. 39.

Capinera, J. L., W. S. Cranshaw and H. G. Hughes. 1986. Suppression of raspberry crown borer, *Pennisetia marginata* (Harris) (Lepidoptera: Sesiidae) with soil applications of *Steinernema feltiae* (Rhabditida: Steinernematidae). J. Invert. Path. 48:257-258.

Fisher, P., and M. Sultan. 2010. Raspberry crown borer. Ontario Berry Grower 6:2-3.

Howitt, A. J., and A. Pshea. 1965. The biology and control of the raspberry crown borer, *Bembecia marginata* (Harris) in Michigan. Mich. Agric. Exp. Stn. Q. Bull. 48:167-172.

Lawrence, W. H. 1904. The raspberry root borer or blackberry crown borer. Wash. Agric. Exp. Stn. Bull. 63.

Lovett, H. A. 1921. The loganberry crown borer, *Bembecia marginata* (Harris), pp 119-120. *In* Third Crop Pest and Hort. Report. Ore. Agric Exp. Stn. 1915-1920.

McKern, J. A., D. T. Johnson and B. A. Lewis. 2007. Biology and control of the raspberry crown borer (Lepidoptera: Sesiidae). J. Econ. Entomol. 100:398-404.

Raine, J. 1962. Life history and behavior of the raspberry crown borer *Bembecia marginata* (Harr.) (Lepidoptera: Aegeriidae). Can. Entomol. 94:1216-1222.

Schaefers, G. A. 1974. Raspberry crown borer: control in relation to period egg hatch. J. Econ. Entomol. 67:451-452.

All chemical information is given with the understanding that no endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned. Before purchasing or using any pesticide, always read and carefully follow the directions on the container label.

Printed by University of Arkansas Cooperative Extension Service Printing Services.

DR. DONN T. JOHNSON is professor and Extension entomologist - fruit in the Department of Entomology, University of Arkansas Division of Agriculture, at the University of Arkansas, Fayetteville. **SOO-HOON S. KIM** is a graduate student - entomology - fruit in the Entomology Department at the University of Arkansas, Fayetteville.

FSA7082-PD-4-12N

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director, Cooperative Extension Service, University of Arkansas. The Arkansas Cooperative Extension Service offers its programs to all eligible persons regardless of race, color, national origin, religion, gender, age, disability, marital or veteran status, or any other legally protected status, and is an Affirmative Action/Equal Opportunity Employer.