



Raspberry Crown Borer

[*Pennisetia marginata*]

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Quick Facts

- The raspberry crown borer attacks raspberry plants in northern Utah, causing cane-wilt and death.
- Crown borer has a 2-year life cycle; it spends much of it as a grub (larva) tunneling in the lower cane, crown and roots of raspberry plants.
- To prevent infestation, use only clean planting stock, don't transplant canes between fields, and maintain healthy, non-stressed plants.
- Once a raspberry planting is infested with crown borer: 1) dig and destroy infested crowns and roots, and 2) apply an insecticide as a heavy drench/soak to the lower cane and crown for at least 2 consecutive years in mid-October to target first year larvae, and in the spring before bud break to target overwintered larvae before they tunnel deeply into crowns.

The raspberry crown borer is a stout-bodied clear-winged moth (Lepidoptera: Sesiidae) that resembles a yellow jacket wasp (Fig. 1). It is native to North America, and was first reported from New England states in the mid-1800s. Today, it is a common cane-boring insect pest of raspberry in northern Utah. Although its host range includes all brambles in the genus *Rubus*, it is only known to cause damage to raspberry in Utah. Larvae tunnel in the lower cane, crown, and upper roots of raspberry causing entire canes to wilt and break off at the crown (Fig. 2). Raspberry crown borer infestations are usually not severe, but populations build up slowly over several years, reducing vigor and yield of plantings by as much as 30% (Raine 1962). In a recent survey of raspberry plantings in northern Utah, crown borer was found in 36% of sites; however, plant infestation levels were low, ~1% (Claudia Nischwitz, unpublished data).

HOST PLANTS

Raspberry (red and black) is the primary host infested in Utah; however, all *Rubus* spp. are potential hosts, including blackberry, loganberry, boysenberry, thimbleberry, and salmonberry.



Fig. 1. Adult female raspberry crown borer. Black and yellow bands on the body mimic a paper wasp to ward off predators. Females have smooth antennae¹.



Fig. 2. Raspberry plant crowns damaged by raspberry crown borer larval tunneling. Note hollowed-out crowns and sawdust-like frass from larva².

LIFE HISTORY

The raspberry crown borer requires 2 years to complete its life cycle (Fig. 3). In a study in British Columbia, Canada, very few completed development in 1 year; the vast majority required 2 years (Raine 1962). In late summer and early fall, adult moths emerge from pupae at the base of raspberry canes, leaving pupal skins attached to their emergence holes. Adults are day-flying moths; their mimicry of stinging wasps provides them with protection from predators. The female releases a sex pheromone to attract males for mating. Mated females lay eggs during the day. Each female lays from 25 to 200 eggs over a 5-day period. Eggs are laid singly on the underside of bramble leaves. Eggs hatch in late summer and early fall, and young larvae crawl down the outside of canes to the crown where they form a protected cell, hibernaculum, just beneath the soil surface. The following spring, larvae chew into the cambium layer just under the bark before tunneling into the crown and upper roots where they feed heavily during the summer and spend their second winter. In their second spring, larvae bore upward about 1-5 inches (2.5-13 cm) in the cane pith before tunneling sideways through the wood and bark, leaving the epidermis intact. Larval growth is completed in the second summer, and pupation occurs in the hollowed-out area of the cane.

Adult: Reproductive and Dispersal Stage

- Moth with banded black and yellow body and transparent forewings with brown borders; wing span of 1 – 1 ¼ inches (2.5-3 cm) (Fig. 1).
- Fly during daylight hours in August and September (Fig. 3).

Egg

- Small (1/16 inch or 1.5 mm diameter), reddish-brown; laid individually on the underside of host plant leaves near the margins.
- Eggs hatch in 4 to 8 weeks depending on temperatures.

Larva: Damaging Stage

- Newly hatched larvae are white with a dark head and about ¼ inch (6 mm) long; tunnel under the bark into the cambium of the lower cane and crown of host plants.
- Mature larvae have a dull white body and reddish-brown head; they reach 1 – 1 ¼ inches (2.5-3 cm) in length and tunnel in the crown and upper roots (Fig. 4).

Pupa

- Reddish-brown in color, ¾-1 inch (2-2.5 cm) long; pupal skins may remain attached to emergence holes in canes when adults make their exit.

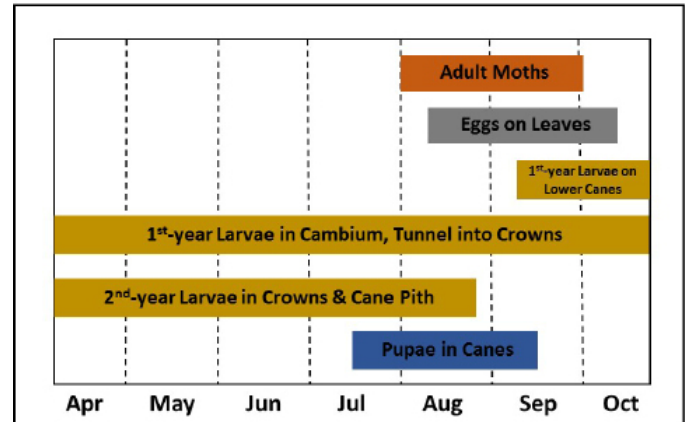


Fig. 3. Life history of raspberry crown borer in Utah. Two years are required to complete a full generation. Larvae are most susceptible to controls when they are in their first year in the fall and spring.

HOST INJURY

The first indication of injury is the wilting and dying of foliage on canes in late spring and early summer. Heavily damaged canes become spindly and break off at the crown (Fig. 5). Those canes not killed directly are predisposed to winter-kill. Holes in the crown and upper roots contain sawdust-like frass produced by the larva (Fig. 2). Larvae tunneling in crowns and upper roots (Fig. 4) reduce plant growth and vigor, reduce yield, and cause cane and even entire plant death. Larval tunnels provide openings for secondary pathogens that can further stress plant health.



Fig. 4. Larva and its tunnel in a raspberry plant crown³.



Fig. 5. Wilted raspberry canes from raspberry crown borer injury to plant crown and roots².

MONITORING AND THRESHOLDS

Look for brittle, hollow canes when pruning and trellising canes in the spring. Another opportunity for scouting is during mid- to late summer; look for wilted or dead canes that are hollowed out at the base (Fig. 5). Crown borer infestation can be confirmed by cutting open lower canes to reveal tunnels near the base. And finally, look for galls and swollen crowns that are particularly noticeable in October (Fig. 4).

A female sex pheromone was identified and shown to be effective in monitoring and mass-trapping in field trials; however, due to the compound's instability at warm temperatures, its effectiveness declined after 2 days (Judd et al. 2012, Teasdale et al. 2013). In field tests in Utah, brief performance of pheromone lures proved to make them impractical for field use.

MANAGEMENT

Sanitation

Dig out and burn infested canes and crowns in the late summer and fall. Remove alternate hosts, such as wild blackberry, from the area.

Insecticides recommended for **COMMERCIAL** raspberry and blackberry production in Utah.

Chemical Name	Examples of Brand Names	Insecticide Class ¹
bifenthrin	Brigade ^R , Capture ^R	Pyrethroid (3)
chlorantraniliprole	Altacor	Diamide (28)
diazinon	Diazinon ^R	Organophosphate (1B)
pyrethrin	Pyganic ^O	Botanical (3)
azadirachtin	Aza-Direct ^O , Neemix ^O	Insect Growth Regulator, Botanical (UN)

Biological Control

Several natural enemies have been documented attacking raspberry crown borer. An unidentified eulopid wasp was recovered from crown borer eggs in Arkansas (McKern et al. 2007). An ichneumonid wasp, *Pterocormus chasmodops* (Heinrich), was found emerging from pupae in Washington (Pavuk and Williams 1988).

Research trials with entomopathogenic nematodes have shown some success; *Steinernema feltiae* applied during the summer in Colorado provided 33-65% reduction in crown borer larvae while *S. carpocapsae* and *Heterorhabditis bacteriophora* reduced larvae by 53 and 33%, respectively, when applied in spring in Arkansas. Optimal temperatures and moist soils are necessary for successful performance of nematodes. Irrigate plants just before applying nematodes.

Insecticides

The protected feeding habits and protracted life cycle of raspberry crown borers make it difficult to control. Chemical control efforts should be directed at killing first-year larvae in the fall (mid-October) as they crawl down canes to overwinter in hibernacula just below the soil line, or in the early spring (April to early May) before they tunnel deeply into the crown. Studies in Arkansas in blackberry found that insecticide treatments were most effective when applied in October or April. Insecticides applied in May and July did not provide acceptable control. An exception is for entomopathogenic nematodes; it is important to wait until soil temperatures warm, typically in late June and July. In a trial in raspberry in Colorado, entomopathogenic nematodes were successful in finding crown borer larvae within crowns when applied during the summer.

Protect pollinators by avoiding sprays when blooms are open!

Insecticides recommended for **HOME GARDEN** raspberries and blackberries in Utah.

Chemical Name	Examples of Brand Names	Insecticide Class ¹
carbaryl	Sevin, Bonide Fruit Spray	Carbamate (1A)
malathion	Malathion	Organophosphate (18)
acetamiprid	Ortho Max Flower, Fruit and Vegetable Spray	Neonicotinoid (4A)
pyrethrin	Pyganic [○]	Botanical (3)
neem oil	Neem Oil [○] , Garden Safe [○]	Insect Growth Regulator, Botanical (UN)

¹Insecticide Resistance Action Committee (IRAC) mode-of-action classification codes. To minimize resistance development in the insect population, rotate among classes.

[○]OMRI approved for organic production.

[℞]Restricted use products.

All brands are registered trademarks. Examples of brands may not be all-inclusive, but are meant to provide examples of products registered on caneberries in Utah. The availability of insecticides changes frequently. ALWAYS READ THE LABEL FOR REGISTERED USES, APPLICATION AND SAFETY INFORMATION, AND PROTECTION, RE-ENTRY, AND PRE-HARVEST INTERVALS.

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