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Raspberry Horntail
(*Hartigia cressonii*)

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Do You Know?

- The raspberry horntail is a caneboring wasp that can cause crop loss to raspberries in northern Utah.
- Apply insecticides in the spring targeting adults, to prevent egg-laying in the new canes.
- Infested canes often become evident during summer when tips wilt and die back.
- Frequent pruning of infested cane tips during summer can lower horntail populations in a field.
- Several species of parasitic wasps attack horntail larvae within canes and can provide biological control.

The most injurious insects to caneberries are those that bore within the canes resulting in cane dieback, reduced fruit yields, and even cane death. The most common of the borers attacking caneberries in northern Utah is the raspberry horntail [*Hartigia cressonii* (Kirby)], a type of wasp (Hymenoptera: Cephidae). It was first documented in Utah in the 1980s, and is known to occur in other western states. Horntails spend the winter as mature larvae in the previous year's canes, pupate in the early spring, and emerge as adults to mate and lay eggs in primocanes (first year canes) just after cane growth begins. Early-season egg-laying and protection of the eggs and larvae within canes create challenges for horntail management and potential for high infestation levels in raspberry fields. Recent research to evaluate the susceptibility of raspberry varieties and observations of high parasitism levels of horntail larvae in some fields, provide new insights into raspberry horntail management.

HOST PLANTS

raspberry, other brambles, rose

LIFE HISTORY

There appears to be only one generation per year in northern Utah. Egg-laying extends from early spring to early summer, so larvae of all sizes can be found in canes during the summer.



Fig. 1. The raspberry horntail larva bears a spine on the tail end[1]



Fig. 2. Raspberry horntail adult[2]

Mature Larva – Overwintering Stage

- **Size, shape, and color**: cylindrical, white body about 1 inch (25 mm) long; hardened, brown head; short spine on the tail end (Fig. 1).
- **When and where:** spends the winter in a silk-lined cavity in the lower cane.

Pupa

- **Size and color**: tan and about ¾ inch (18 mm) long.
- **When and where:** pupation occurs within the cane in the early spring.

Adult – Reproductive and Dispersal Stage

- **Size, shape, and color**: narrow-bodied wasp, iridescent black, and with long antennae; ½ to ¾ inch (12-18 mm) long (Fig. 2).
- **When and where**: emerges through a small hole it cuts in the lower cane, beginning in early spring.

Egg

- **Size, shape, and color**: pearly white, oblong, with a curved point at one end, and about 1/16 inch (2 mm) long.
- **Where**: females insert eggs singly under the epidermis of new canes; usually only one egg per cane, but multiple horntail larvae per cane have been observed.
- New larval tunnels are initiated in the lower portion of canes suggesting that eggs are laid near the base of canes.

Larva – Damaging Stage

- **Shape and color**: cylindrical, white body with brown head capsule and a short spine on the tail end; bear three pairs of legs (Fig. 1).
- **Size**: range in length during development from about 1/8 to 1 inch (3 to 25 mm).
- **Where**: the young larva tunnels upwards in a spiraling pattern within the growing cane; it feeds primarily in the cambium just below the bark.
- When a larva reaches the cane tip it feeds heavily in the cambium and pith.
- The older larva turns around and begins tunneling downward, primarily through the center pith, to form a cavity to spend the winter.

CROP INJURY

The raspberry horntail exclusively attacks first-year growth, or primocanes. Both summer- and fall-producing varieties of raspberries are attractive hosts. The upward tunneling of young larvae in the cambium and heavy feeding of older larvae near the tips of canes can cause the cane tip to soften, wilt and die back (Fig. 3). Cane-tip wilting becomes evident in June and July. In larger diameter canes, less wilting symptoms have been observed. The cane tip may recover, but the cane is crooked and weakened (Fig. 4). The downward tunneling of older larvae in the center pith in late summer can cause structural damage to the canes. Damaged canes may die, break off, and have reduced fruit yields. Yield loss studies have not been conducted, but when canes die back or are pruned to remove horntail larvae, the number of fruit-producing buds is reduced.



Fig. 3. Wilted cane tip (left) and cane tip with leaf dieback (right) due to horntail larval injury[1]



Fig. 4. Cane tip that recovered, but is crooked and weakened from horntail larval tunneling[1]

MONITORING AND THRESHOLDS

The dark trails of young horntail larvae tunneling under the epidermis of primocanes can be seen upon careful inspection of the outside of canes, in some cases. Tunnels and larvae can be observed upon cutting open canes. Once larvae tunnel upward to the cane tips, heavy feeding usually causes evident wilting and browning of leaves (Fig. 3). Cane tip wilting and dieback can be observed in June through August in northern Utah. The University of California Pest Management Guidelines for raspberry horntail (Perry et al. 2003) recommends an economic threshold of three actively wilting canes per 100 row ft. Primocane infestation levels approaching 80% were observed during 2009 in Laketown, UT. More typically, infestation rates of one cane per 5 to 10 feet of row have been observed in northern Utah raspberry fields. These infestation levels are more than three times higher than the California threshold, suggesting that crop loss commonly occurs in Utah raspberry fields.

MANAGEMENT

Cultural Practices

Healthy plants are less attractive to insect pests and better able to withstand environmental stresses. Good crop production practices include selection of suitable planting sites, selection of raspberry varieties adapted to a site, soil preparation before planting, maintaining optimal soil fertility, and prevention of nutrient deficiencies such as iron chlorosis, which is common to alkaline soils of Utah. Use of good production practices is important to reduce horntail infestation.

Pruning and Sanitation

Prune and destroy infested canes when tip-wilting becomes apparent; this will remove larvae and reduce the population for the next season. Wilting of cane tips is apparent from June to August. Cut the canes about 6 inches below the tip to ensure that larvae are removed. Cane tips with a larva feeding in the pith often become soft. In small plantings, or if infestation levels are low, larvae can be killed by squeezing the soft cane near the tip with gloved fingers. Prune or mechanically destroy horntail larvae one to two times per week to ensure that larvae do not tunnel down the canes and escape removal.

Varietal Susceptibility

Research was initiated in 2009 to evaluate the relative susceptibility of summer- and fall-producing raspberry cultivars at the Utah State University Horticultural Research Station in Kaysville, UT.

Table 1. Mean cumulative number of raspberry horntail larvae per 12 row feet in 17 summer and 10 fall raspberry varieties from late June to mid August, 2009, Kaysville, UT.

Summer variety	Mean no. of larvae	Fall variety	Mean no. of larvae
Cascade Dawn	1.5	Himbo Top™	3.0
Cascade Delight	1.8	Polana	3.0
Royalty	2.8	Joan J	3.3
Moutere	3.0	Jaclyn	4.3
Cowichan	4.3	Caroline	4.8
Georgia	4.3	Ruby	5.3
Coho	4.8	Anne	5.5
Titan	5.3	Summit	5.5
Chemainus	5.5	Polka	7.5
Tulameen	5.8	Heritage	8.3
Cascade Bounty	6.0		
WDNV2	6.3		
Saanich	7.0		
Canby	8.5		
Reveille	10.3		
Lauren	10.8		
Willamette	12.0		

Summer varieties had a wide range of infestation levels, from 1.5 to 12.0 larvae per 12 row feet (mean cumulative counts from late June to mid August) (Table 1). 'Willamette', 'Lauren', 'Reveille', and 'Canby' had the highest densities of horntail larvae. 'Cascade Dawn', 'Cascade Delight', and 'Royalty' were more resistant. Infestation levels in the fall varieties ranged from 3.0 to 8.3 larvae per 12 row feet (Table 1). 'Heritage' and 'Polka' were the most susceptible; 'Polana', 'Himbo Top™', and 'Joan J' were more resistant. Additional years of data collection from more locations are necessary to develop firmer conclusions on varietal resistance to the raspberry horntail, but these data provide preliminary information.

Insecticides

Timing

Adult horntails emerge from the previous year's canes beginning in the early spring. Application of contact insecticides targeting adults can prevent or reduce egg-laying into new primocanes. New primocanes should be protected as soon as they begin to grow. Adult horntails may be active from early spring through early summer, so several applications may be required for severe infestations. Do not apply insecticides that are harmful to pollinators during bloom.

An alternative insecticide timing and approach is a crown and soil drench of the systemic insecticide, imidacloprid (Admire) during late spring to early summer; however, efficacy against the raspberry horntail hasn't been documented. Admire is upwardly mobile in many plants, and may be translocated into canes to contact hatching eggs and young larvae.

Products

Botanical (21)[I]
- rotenone + pyrethrin (Bonide Liquid Rotenone Pyrethrin Spray, Pyrellin EC, Pyganic)[OH]

Carbamate (1A)
- carbaryl (Sevin)[H]

Insect Growth Regulator (18B)
- azadirachtin (Aza-Direct, Neemix)[OH]

Neonicotinoid (4A)
- acetamiprid (Assail)
- imidacloprid (Admire) – systemic; soil apply; incorporate with 0.25 in irrigation or rainfall within 2 hr of application
- thiamethoxam (Actara)

Organophosphate (1B)
- diazinon (Diazinon)[R]
- malathion (Malathion)[H]

Particle Barrier/Repellent
- kaolin clay (Surround)[OH] - likely a suppressant only

Pyrethroids (3)
- bifenthrin (Brigade[R], Capture[R], Ortho Bug-B-Gone Max Lawn & Garden Insect Killer[H])
- esfenvalerate (Asana)[R]
- fenpropathrin (Danitol)[R]

permethrin (Bonide Eight, Gordon's Bug-No-More, Hi-Yield, Maxide)[H]
zeta-cypermethrin (Mustang)[R]

[I]Insecticide Resistance Action Committee (IRAC) mode of action classification codes. To minimize resistance development in the insect population, rotate among insecticide modes of action.

[O]OMRI approved for organic production.

[H]Homeowner products available.

[R]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 rapidly. ALWAYS CHECK THE LABEL FOR REGISTERED USES, APPLICATION AND SAFETY INFORMATION, AND PROTECTION AND PRE-HARVEST INTERVALS. THE PRODUCT LABEL IS THE LAW, AND MUST BE FOLLOWED.

NATURAL ENEMIES

Parasitic wasps attack horntail larvae during late June to mid August in northern Utah. Parasitism of horntails occurs in the upper portion of canes where cane diameter is smaller and tissues are softer to facilitate egg-laying by parasitoid adults into canes. At least two types of parasitoid wasps were observed attacking horntail larvae during 2009, and will be identified after further study. One is an ectoparasite (feeds externally on its host) where multiple small parasitoid larvae were seen feeding on a single horntail larva (Fig. 5). Pupae of the ectoparasite were found alongside the dead and shriveled horntail larva within canes (Fig. 6). A second type of parasitoid is an endoparasite (develops within its host). Based on appearance of the adults, the endoparasite is likely an ichneumonid wasp. Predation of adult horntails may occur, but has not been documented.



Fig. 5. Ectoparasitoid larvae feeding on a raspberry horntail larva[1]



Fig. 6. Pupae of ectoparasitoid wasp and shriveled horntail[1]

ADDITIONAL READING

Perry, E. J., M. P. Bolda, and L. J. Bettiga. 2003. Caneberries: Raspberry horntail. UC Pest Management Guidelines. UC Agriculture and Natural Resources Publication 3437 (2 pp.). University of California, Davis, CA. http://www.ipm.ucdavis.edu/PMG/r71300311.html.

[1]Images courtesy of Diane Alston and the students in her research lab
[2]Image courtesy of Whitney Cranshaw, Colorado State University

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