

Root Weevil

Management in Pacific Northwest Nurseries & Landscapes



NORTHWEST CENTER FOR
ALTERNATIVES TO PESTICIDES



Introduction & Purpose

The purpose of this guide is to provide home gardeners, landscapers and nursery growers with information on the identification, detection, sustainable removal, and prevention of root weevils. Root weevils cause substantial economic losses and aesthetic damage of flowering shrubs and food plants. This guide was created so that those living and working in the Northwest can learn how to deal with root weevils using alternative methods that are free of pesticides. A worksheet is included at the end which outlines the integrated pest management (IPM) scouting and monitoring process for root weevils.

Root weevils are in the Curculionidae family, which includes snout type beetles whose larvae develop on the roots of various plants. Many species of root weevil are egg-laying females that reproduce asexually.¹

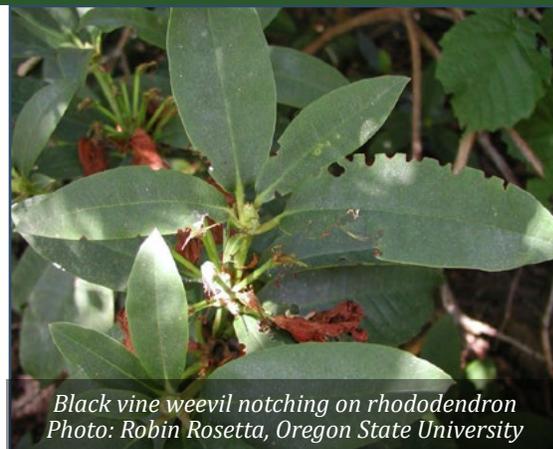
There are numerous species of root weevil found in nurseries and other landscapes across the Pacific Northwest.² The most common and significant of weevil species are: black vine weevil (*Otiorhynchus sulcatus*); woods weevil (*Sciopithes obscurus*); strawberry root weevil (*Otiorhynchus ovatus*); rough strawberry root weevil (*Otiorhynchus rugosostriatus*); obscure root weevil (*Nemocetes incomptus*); clay-colored weevil (*Otiorhynchus singularis*); and woodburn weevil (*Dyslobus ssp.*).^{3,4}

Although root weevils are considered a pest in the Pacific Northwest, some do have an important role in the ecosystem. The knapweed weevil (*Cyphocleonus achates*) has become an important bio-control agent for spotted knapweed in Minnesota.⁵

Damage

Root weevils are known for their characteristic leaf notching from June to September as adults start chewing semicircular notches into leaf edges, causing scalloping.^{1,6,7}

Damage to foliage occurs as notching of leaves or needles but seldom impacts plant health.^{2,8,9} Root-feeding larvae do most of the damage, often girdling plants at the base of the trunk, which can lead to death.^{3,7} Strategic placement of potted monitoring plants such as rhododendrons or strawberries can attract weevils and be used to detect damage that is difficult to locate on conifer seedling needles.^{1,3,4,9} Such monitoring plants can be examined for notched leaves in the spring and also searched for adult weevils at night.



Black vine weevil notching on rhododendron
Photo: Robin Rosetta, Oregon State University

Biology & Identification

Eggs

Weevils can feed for many days before they start laying eggs. Each root weevil adult can lay up to 500 eggs per growing season. Eggs are laid on the soil near the base of host plants and hatch in 10 to 14 days.^{1,8,10,11} Eggs are less than 1 mm in length and spherical. They are white and then turn pale brown after a few days.^{1,3,10}

Larvae/Nymphs

Root weevil larvae are C-shaped, legless and have a dirty white coloration with a dark head.^{2,3} Larvae are the most destructive life stage, feeding on roots and lower stems. They can be found down to ten inches deep in the soil with one generation per year, but different life stages may be present at the same time.⁸



Adults

Adult root weevils vary in length from about ¼ inch to ½ inch.^{3,7,12} They have a short broad snout with antennae attached and vary in color from slate gray to blackish brown and generally have some small yellow or white flecks on their backs.^{1,3,12} Root weevils behaviorally act the same across species. Adult root weevils cannot fly.^{1,2,3,7,13} The exceptions are the obscure weevil and the black vine root weevil. The adult obscure weevil sometimes remains in the foliage rather than climbing down the plant trunk to hide during the day as the black vine weevil does.^{1,12}

Life History

A one year life cycle is normal for all root weevil species: egg, larvae, pupa and adult.^{1,3,12}

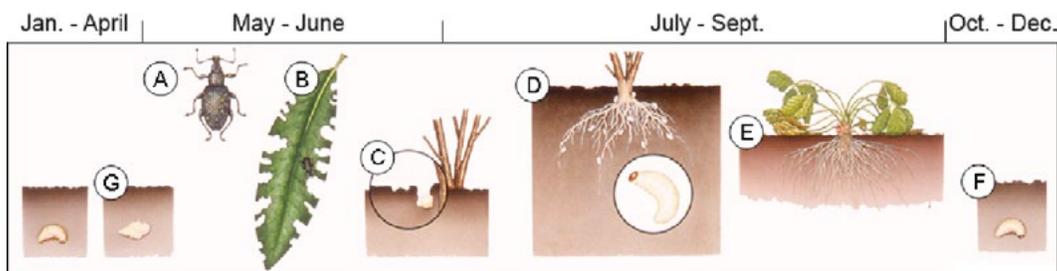


Figure 1 : Schematic life cycle of the black vine weevil *O. sulcatus* (Griegel 2009, modified by Hirsch, 2012). (A) Adult weevil. (B) Damage inflicted by adult weevils on leaves. (C) Eggs in soil. (D) Root feeding larvae of the black vine weevil. (E) Root feeding behaviour of larvae may cause wilting of the plant. (F) Hibernating larva. (G) Pupa of the black vine weevil.

Habitat

Weevils are most commonly found in rhododendrons, but attack over 100 different plant species. They attack yews (*Taxus*), hemlock (*Tsuga*), strawberry (*Fragaria*), various vines and flowers and even potted houseplants. In the Pacific Northwest, weevils also feed on salal (*Gaultheria shallon*), huckleberry, blueberry, and many other *Vaccinium* plant species.³

Scouting/Detection & Monitoring

Spring

- The larvae pupate in the spring, and emerge as adults from late May through June.
- Observe leaves for first signs of root weevil notching in late spring.^{1,2,3,7,12}

Fall

- Root weevil adults typically live for at least a couple of months, and some may be present into autumn.
- Larval injury can be confirmed by digging plants in autumn and early spring to expose root feeding larvae.¹

Summer

- Continue observation of leaves for signs of root weevil notching in early summer.
- Most root weevils are nocturnal—hiding during the day and feeding at night.^{1,3,7,8}
- Adult weevil presence can be confirmed by night inspection of foliage on warm, still evenings.^{2,4,14}

Winter

- Root weevils overwinter in their adult or larval stage, during which the adult is inactive during the coldest winter temperatures.^{3,12}

Sustainable Treatments & Prevention

Prevention

There are many low-cost, safe ways to prevent weevil infestation. Sticky tape on the sides of greenhouses or in doorways can trap root weevil adults. It is very important to restrict soil movement from infested to non-infested areas. If this is not possible, sterilization is required to prevent root weevil spread.⁹ Planting resistant varieties of rhododendrons and azaleas is the easiest way to prevent root weevil infestation and damage. Entomologists at Washington State University have found many hybrids and species of rhododendrons to be resistant to root weevil damage, especially those that are lighter in color and have a slight roll on the edges which make it too wide for the weevil's mouth.¹²

Biological Control

Predators of root weevils include ground beetles, spiders, frogs, toads, rodents, birds, and nematodes.^{7,8,16} Beneficial nematodes (*Heterorhabditis spp.* and *Steinernema spp.*), have shown some effectiveness in controlling larvae in container-grown seedlings as well as trees when applied as label directs, and as a drench in the fall placed in the tree's root zone where weevil larvae are found.^{4,10} They parasitize larvae, pupae and also newly-emerged weevil adults.³ Effectiveness of this biocontrol is based on environmental conditions. Nematodes cannot be exposed to direct sunlight and the soil should be thoroughly wet and at a temperature of at least 52°F prior to application.⁹



Manual Control

Foliage damage, though not harmful to plant health,^{3,4,7,12} causes concern with Northwest gardeners and growers as chewed leaves can remain on plants such as rhododendrons for years⁹ and can economically impact nursery growers, due to an inability to sell affected plants that may not be aesthetically pristine. Weevils can be picked from the leaves and plants at night by use of a flashlight. Sticky barriers such as Tanglefoot, Tangletrap, Tack Trap or StickEm will prevent adult weevils from reaching the plant's leaves by trapping them along their avenues of travel up the stalk.³ In a nursery setting, place the feet of tables that hold container seedlings in containers of salty/soapy water or oil to prevent weevils from crawling up the table legs to access container seedlings.⁸

Monitoring

Many low-cost, safe methods exist for monitoring root weevil infestation. In spring, 6" by 6" grooved boards, pieces of burlap or cardboard can be placed loosely on top of mulch at the base of host plants to offer a place for adults to hide during the day.⁶ Avoid placing monitoring materials in spaces that receive intensive watering as these areas are often avoided by weevils.

References

1. Cranshaw WS. Root weevils. Insect series. Colorado State University Extension; 1985. No.: 5.551.
2. Landgren C, Porter F. Horticultural, landscape, and ornamental crops: Christmas tree plantation pests. In: PNW Insect Management Handbook. Oregon State University; revised 2020 Mar. Available from: <https://pnwhandbooks.org/sites/pnwhandbooks/files/insect/chapterpdf/insect20-f-hort.pdf>
3. Helm H. JARS v55n4 - Root weevils: troublesome rhododendron pests [Internet]. Bainbridge Island, WA: Virginia Tech; 2018 [cited 2020 Oct 27]. Available from: <https://scholar.lib.vt.edu/ejournals/JARS/v55n4/v55n4-helm.htm>
4. Bouska C, Edmunds B, Bell N. Small fruit crops: blueberry pests. In: PNW Insect Management Handbook. Oregon State University; revised 2020 Mar. Available from: pnwhandbooks.org/sites/pnwhandbooks/files/insect/chapterpdf/insect20-i-small-fruits.pdf
5. Chandler M. Spotted knapweed biocontrol [Internet]. Minnesota Department of Agriculture; 2019 [cited 2020 Sep 11]. Available from: <http://mda.nighthawkmtg.com/plants/pestmanagement/weedcontrol/noxiousslist/spottedknapweed/knapweed>
6. Utah State University Extension. Root weevils [Internet]. Undated [cited 2020 Oct 27]. Available from: https://utahpests.usu.edu/ipm/notes_ag/fruit-root-weevils
7. Rosetta R. Control sneaky root weevils with beneficial nematodes [Internet]. Corvallis, OR: Oregon State University; 2017 Sep [accessed 2020 Oct 27]. Available from: <https://extension.oregonstate.edu/news/control-sneaky-root-weevils-beneficial-nematodes>
8. Kegley S, Foushee D, Robertson N, Overton E. Black vine weevils at the Coeur d'Alene Nursery. Forest Health Protection [Internet]. 2015 Sep;15(09). Available from: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd477239.pdf
9. Cram MM, Frank MS, Mallams KM. Forest nursery pests. US Department of Agriculture, Forest Service Washington DC; 2012.
10. Gill S, Shrewsbury P, Reeser R. Controlling a major nursery pest: black vine weevil, *Otiorynchus sulcatus* (Fabricius). University of Maryland Cooperative Extension; 2003 [cited 2020 Oct 27]. Available from: https://extension.umd.edu/sites/extension.umd.edu/files/_docs/programs/ipmnet/FS805BlackVineWeevil.pdf
11. Hoover G. Black vine weevil [Internet]. Penn State Extension; 2010 Nov [cited 2020 Sep 11]. Available from: <https://extension.psu.edu/black-vine-weevil>
12. Thurston County Local Hazardous Waste Program. Common sense gardening: root weevils [Internet]. 2012 [cited 2020 Oct 27]. Available from: <https://www.co.thurston.wa.us/health/ehcsg/pdf/weevilguide.pdf>
13. Berry RE. Insects and mites of economic importance in the Northwest. Second edition. Corvallis, OR: OSU Bookstores; 1998.
14. Oregon State University PNW Nursery IPM. Obscure root weevil [Internet]. 2007 Apr 19 [cited 2020 Oct 30]. Available from: http://oregonstate.edu/dept/nurspest/obscure_root_weevil.htm
15. Moorhouse ER, Charnley AK, Gillespie AT. A review of the biology and control of the vine weevil, *Otiorynchus sulcatus* (Coleoptera: Curculionidae). Ann Appl Biol. 1992 Oct;121(2). Available from: <https://doi.org/10.1111/j.1744-7348.1992.tb03455.x>
16. Cox C. Dealing with root weevils without using pesticides. Journal of Pesticide Reform. 2005;25(2):2.

Root Weevil Scouting Worksheet

Location: _____ Time: _____ Last Scouting Event: _____

Date: _____ Temperature: _____ Observer: _____

It is important to know exactly what each stage of the root weevil life cycle looks like. Spending a few minutes per plant, be sure to take thorough notes and make observations. If there are too many plants on the landscape for individualized attention, scout every third plant you come across or those exhibiting leaf damage. Refer to the guide for treatment recommendations and plan accordingly.

Were larvae found? (circle one) Yes / No

Observations:

.....
Were pupae found? Yes / No

Observations:

.....
Were adults observed? Yes / No

Observations:

.....
Was leaf damage observed? Yes / No

Observations:

.....
Recommended treatment:

.....
Plan for executing recommended treatment:



King County

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Wastewater Treatment Division

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