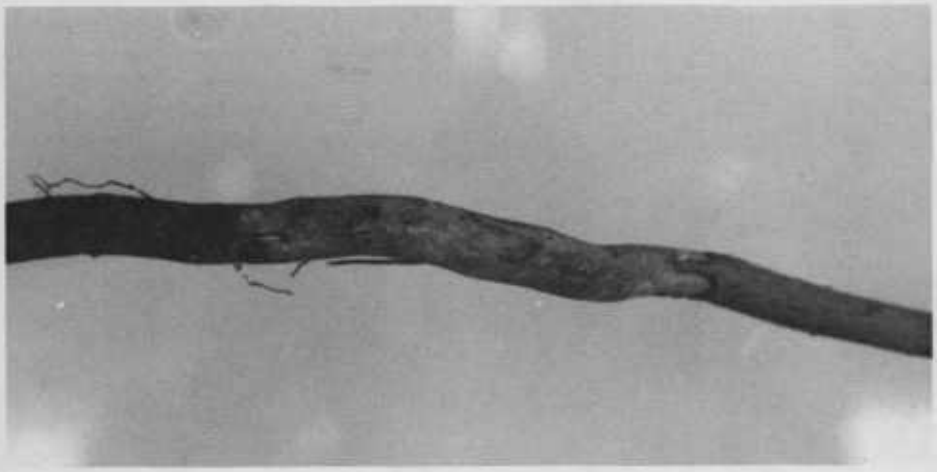
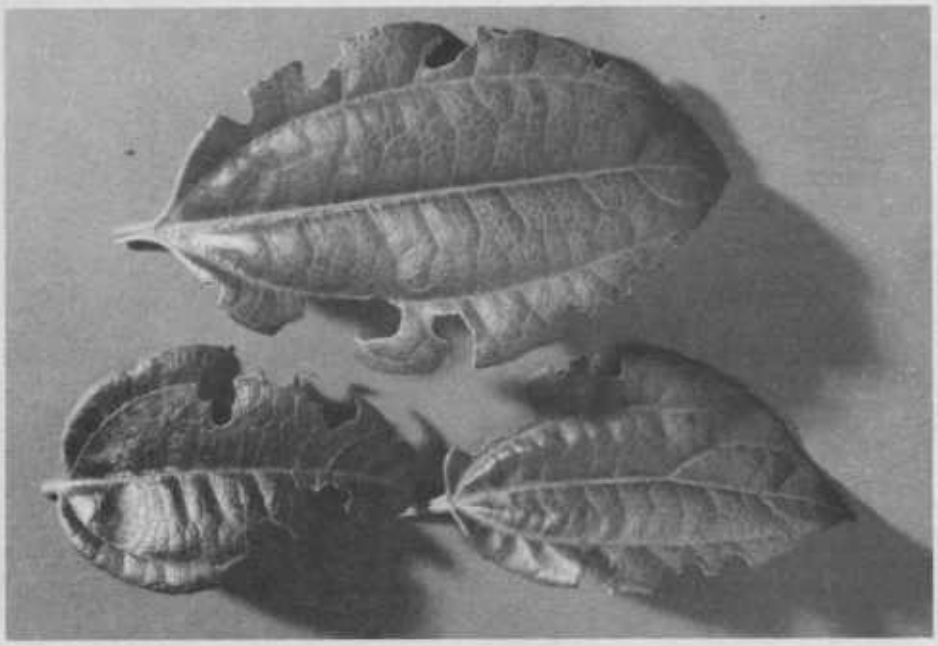
Controlling root weevils in commercial strawberries, caneberries, and blueberries



Girdled root, typical feeding damage by the root weevil larva



Notched leaves, typical feeding damage by the adult root weevil

Several species of root weevils injure strawberries, caneberries, and blueberries. Some also cause damage to grapes, ornamental plants, and Christmas tree plantations. All feed on roots in the larval stage. Their life histories differ significantly enough to affect your choice of management strategies.

Damage

The larvae, which feed on the roots, are the most damaging stage to strawberry and caneberry plants. They destroy small rootlets, girdle the larger roots, and occasionally chew into the plant crowns.

Such feeding activity is enough to seriously weaken or kill even mature plants. Additionally, it creates avenues of entry for plant diseases.

The adult weevils feed on plant foliage and produce characteristic leaf notching. This damage is usually insignificant to plant vitality.

However, the presence of adult weevils on the foliage of mechanically harvested caneberries presents a serious problem of crop contamination—weevils "harvested" along with fruit can be transported to the processing plant.

Processors must spend much time, money, and effort on the sorting line, removing these weevils. Occasionally, processors will reject berries because of weevil contamination.

Life history and behavior

Larvae are the usual overwintering stage of root weevils as most adults die with the coming of winter. However, during mild winters, some adults—particularly of the

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OREGON STATE UNIVERSITY EXTENSION SERVICE

Larva of the root weevil

Adult, obscure root weevil, "scalloping" leaf margin

black vine weevil and most of the crusted weevils—survive and can be active in late winter and early spring.

Emergence of adult weevils extends from April through July. A given species emerges over a period of weeks, which will call for special timing of your controls.

Adults, which are primarily nocturnal, begin to lay eggs 20 to 30 days after emerging. Between emerging and egg-laying, the adults make characteristic semicircular feeding notches (ragged edges) on the margins of host leaves.

They deposit eggs on the soil surface near a host plant or on the folded foliage. Hatching occurs in 10 to 20 days, and the larvae feed during late summer and again in the spring on the roots or crowns of plants.

When they mature in the late spring, the larvae transform to pupae in small earthen cells, from 1 to 4 inches below the soil surface. Adults usually emerge from the pupae in 3 to 6 weeks.

Adult root weevils—names, appearances, control dates

"Otiorhynchus group": Black vine weevil (*Otiorhynchus sulcatus*), rough strawberry root weevil (*O. rugosostriatus*), and strawberry root weevil (*O. ovatus*). Generally black or tan. The black vine weevil (*O. sulcatus*) is 0.6 inch long, the largest of our root weevils. The smallest is *O. ovatus,* the strawberry root weevil, 0.3 inch long.

They overwinter as larvae. Adults appear in May and June, and lay eggs that hatch in late July or after fall rains in September. Larvae feed on host rootlets in late summer through spring.

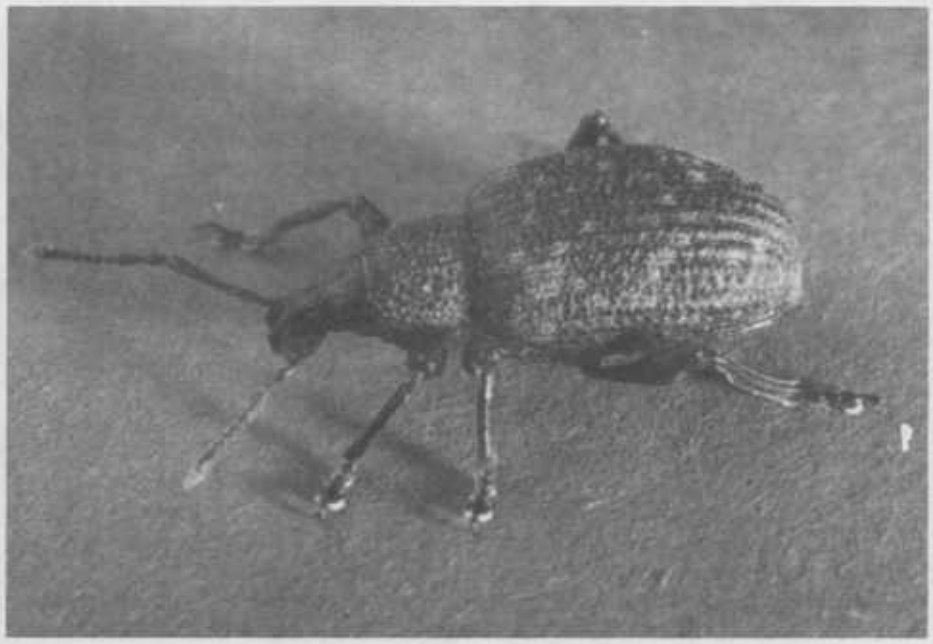
"Gray weevils" (*Dyslobus* spp.). *D. decoratus* is called the "decorated weevil" because of white spots on its gray body, 0.4 inch long. They overwinter as larvae and pupae. Adults appear in early spring, emerging March-April. They feed and lay eggs April-June. Larvae feed on rootlets during May and June and again in September. Control *adults* with chemicals in early April.

Woods weevil (*Nemocestes incomptus*). It is colored a mixture of tan, gray, and black spots with an obscure darker crescent across the rear back. Length 0.4 inch. *N. puncticollis* is tan with wide, irregular, black and gray mottling and is 0.25 inch long. They both overwinter as larvae. Adults appear in July. Larvae feed on roots from September through May. The chemical treatments recommended for the "Otiorhynchus group" should be effective.

Obscure weevil (*Sciopithes obscurus*) is mostly dark tan with a crescent-shaped wavy brown line near the back end. Length 0.3 inch. Larvae overwinter as well as some adults, so there is a little egg-laying in May. Most occurs in August through mid-October. The chemical control used for the black weevils is effective.

Ash gray weevil (*Peritelinus variegatus*) is dark gray, covered with whitish scales, and 0.2 inch long. The larvae overwinter, and adults appear in May. Larvae feed on roots from June through the following April. Control is the same as for the "Otriorhynchus group."

Crusted weevil (*Trachyphloeus bifoveolatus*) is dull black, but it's usually encrusted with a layer of surface debris matching its resting place. It is only 0.15 inch long. The adults rest under leaves on the soil surface during late summer, fall, and winter. Many move into buildings for the winter. Larvae are present from March through May; adults appear in August. Fall cultivation that removes both host and weed surface leaves is advised.



Adult, black vine weevil

Detection and sampling methods

Damage caused by root weevil larvae frequently begins in only a small portion of a field, such as a border next to brushy areas or even in the interior of a new planting where a previous infestation occurred. The infestation can spread rapidly if you leave it uncontrolled.

Therefore, if you find weak plants, carefully sample the area by removing the plant and examine roots and soil around the roots. Look for pruning and girdling. Sift the soil for the presence of small white larvae, pupae, or adults, if necessary.

In the late spring and summer when the adults are active (at least, by May 1), carefully inspect new plant foliage for characteristic notching. Newly made notches have green edges; last year's notches are brown and on the previous year's growth.

Adult weevils can be difficult to find. Most adults hide in the soil or under leaves on the ground during the day. Most adults feed after dark.

Therefore, you can detect them more easily on the plant with a flashlight, from 2 hours after dark until just before dawn.

On caneberries or blueberries, an effective way to sample for adults is to lay a white sheet on the ground after dark (and after the weevils have climbed back on the leaves!) and vigorously shake the vines.

Then you can see them against the light background of the sheet. Sweeping plants after dark with an insect net may also locate adults.

If you do find weevils, identify them and then control them, if necessary, by using one of the insecticides mentioned below for a given crop.

Apply insecticides with sufficient force and volume to insure penetration into the plant crowns. You'll obtain your best control if you use approximately 100 gallons of spray per acre.

If you're controlling adult weevils, spray in the late evening or early morning when they are *on the foliage* and the insecticide will come in direct contact with them.

To avoid pesticide residues on fruit, it is important to observe the intervals between application and harvest given in the control chart on the container. *Be sure* to understand and follow directions on the insecticides containers.

Use pesticides safely!

- **Wear** protective clothing and safety devices as recommended on the label. **Bathe or shower** after each use.
- **Read** the pesticide label—even if you've used the pesticide before. **Follow closely** the instructions on the label (and any other directions you have).
- **Be cautious** when you apply pesticides. **Know** your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.

Control

Strawberries

To keep infested strawberry fields in continued production, we suggest the following combination of chemical and cultural controls.

Furadan insecticide. Furadan 4 Flowable is registered for root weevil control in strawberries. It will kill both adult weevils and larvae in the soil if there is rain water or irrigation available to move it into the root zone.

Rate of use. Apply 2 quarts of Furadan 4 Flowable in 100 gallons of water per acre, concentrating the spray in a 10- to 12-inch band over the rows.

Time of application. Apply Furadan in the summer, between the end of harvest and October 1. Satisfactory control has been obtained with August and early September applications.

Restrictions. Do not apply Furadan if any berries remain after harvest. This is to prevent the poisoning of people, birds, or animals. Do not apply more than 2 quarts of Furadan per acre. Do not apply Furadan more than once per season.

Topping. Topping of the plants before treatment is desirable for a number of reasons:

1. It removes foliage on which adult weevils feed.

2. It destroys berries still present.
3. It allows more of the Furadan to reach the soil, where the adult weevils hide and the young larvae are feeding.
4. Residual activity of the Furadan is longer in the soil than on the plant foliage.
5. Rain or irrigation water can carry more of it into the soil and root zone where the root weevil larvae are most abundant.

Irrigation. You'll improve root weevil control if you follow a single application of Furadan with immediate sprinkler irrigation. This is probably because the Furadan not only kills the adults but also penetrates the soil to kill the larvae.

Therefore, we suggest that you follow an August application with about 1 inch of water by sprinkler irrigation. Rain should also leach the Furadan into the root zone, but growers in many strawberry-producing areas can't rely on an inch of summer rain. Fall rains in September will also carry Furadan into the root zone.

Caneberries and blueberries

Furadan is not currently registered for use to control root weevil larvae infesting these two crops. Consequently, insecticide control is directed at the *adult* stage, and—unfortunately—the initial adult occurrence coincides with bloom.

Control of adult weevils just after harvest will reduce egg-laying, which will minimize future problems.

Caneberries. *Malathion 25W* at the rate of 7 pounds formulation per acre has helped somewhat to control root weevil adults. Because it is not a very active insecticide on weevils and because you must use it *after* the pollination period to protect pollinating insects, some advisory statements are in order.

About 10 days before harvest, remove pollination units (hives) of bees from the field. The first warm and dry evening following this, apply the malathion spray when the weevils are active on the foliage, usually between 10:00 p.m. and 6:00 a.m. the following morning.

Three days later, sample the foliage in the evening as directed in the "Detection and Sampling" section (page 3).

If you still find root weevils, you may need a second evening application. Malathion has a 1-day preharvest interval.

Guthion 50W or *azinphosmethyl 50W* (Aceto Ag Chem Corp) can also be used for adult weevil control. Remove pollination units from the field about 10 days before harvest. In the evening, apply 2 pounds of 50W formulation per acre to the *lower portions* (non-fruit-bearing parts) *of canes* and to the *soil* beneath the plants.

Use approximately 200 gallons of water per acre to insure thorough soaking and contact of weevils. *Do not use* over 2 pounds of Guthion 50W or azinphosmethyl 50W per acre. Do not make applications within 3 days of harvest (you might contaminate fruit).

Blueberries. Malathion 50W at the rate of 8 pounds formulation per acre can be used as indicated for caneberries. Azinphosmethyl 50W (Aceto Ag Chem Corp), 2 pounds formulation per acre, is registered as a foliar spray. Apply it at night, and no sooner than 14 days before harvest.

Methomyl (Lannate or Nudrin) is now registered on blueberries for weevil control. Use at the ½-pound per acre rate as an evening foliar spray for adults. Observe precautions of removing pollination units (hives) before application. Do not apply within 3 days of harvest.

Adult weevils have been very difficult to control in caneberries and blueberries. A stringent scouting program, coupled with timely applications during favorable weather, will help reduce the problem; but it usually won't solve it in a single growing season.

Protect pollinators. Do not use any of the insecticides in fields during blooming periods or when pollinators are actively foraging. Guthion and methomyl can be hazardous to bees for up to 7 days after application; malathion, 1 to 2 days.

This publication was prepared by Glenn C. Fisher, Extension entomology specialist, and R. G. Rosenstiel, associate professor of entomology emeritus, Oregon State University. Mention of trade-name products does not mean endorsement of these products oy Oregon State University, and the fact that others are *not* mentioned does not mean any discrimination against *them*.

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