

PEA WEEVIL MANAGEMENT IN WINTER PEAS



Introduction

The traditional wheat-fallow rotation has changed in grain fields across central Washington. Winter peas were once considered a specialty crop, and marginal acreage was planted to winter pea until about 2012. At that point, the number of acres in Adams, Douglas, Grant, and Lincoln Counties increased significantly (Farm Service Agency 2020). With high fertilizer prices, the ability of peas to fix atmospheric nitrogen via root nodules makes it a great rotational crop with the region's winter wheat crops. For example, winter wheat following winter peas with no applied fertilizer yielded 59.0 bu/acre with a grain protein of 10.8% (Nelson, personal communication). Unfortunately, both winter and spring peas are under attack by the pea weevil, *Bruchus pisorum* (L.). The pea weevil is considered one of the most widely distributed species in the world (Kingsolver 2004). Heavy infestations of this key pest can reduce the pea seed to empty shells, severely impacting yields. A second impact of feeding by pea weevils is that it can make plants more susceptible to aphids and aphid-transmitted viruses (Crowder, personal communication).

In Washington State, a pea pest survey conducted in 2018–'19 detected pea weevil in Adams, Douglas, and Lincoln Counties, with densities ranging from 1 weevil per 25 sweeps—levels slightly above action thresholds (Reddy et al. 2018)—to as high as 21 weevils in 2018 and 71 the following year. Producers wanting to grow peas as a rotational crop to break pest and disease cycles, to control grassy weeds, or to benefit from atmospheric nitrogen fixation need to be able to distinguish this pest from other insects, know when and how to best sample for it, and know their management options if outbreak numbers are detected.

Description and Life Cycle

Pea weevils, despite their name, are not members of the “true” weevil group (i.e., Coleoptera: Curculionidae). They were

instead placed in their own family, Coleoptera: Bruchidae, and are commonly referred to as bean weevils or seed beetles. More recent phylogenetic studies have now placed this group within the leaf-beetles family, Chrysomelidae, despite being seed feeders (Zhang et al. 2022). Adult pea weevils are relatively small, with a body length of 3.9–4.9 mm and a width of 2.3–2.8 mm. These insects are globular in shape and have black, yellowish-brown, and white patches of setae (hair) on their bodies; a white scutellum (triangular structure just below the thorax); and a row of white diagonal spots separated by dark brown patches on the short elytra (hard-wing coverings) (Figure 1). The lower parts of the long legs are reddish orange (Kingsolver 2004).

B. pisorum has one generation per year. Adults emerge from their overwintering habitats at or close to the time peas start to bloom. Pollen feeding must take place before mating, as this is required for ovary development. After mating and egg maturation, females seek out appropriate hosts (see the host



Figure 1. Adult pea weevil. Photo by Pest and Diseases Image Library, Bugwood.org.



plants listed within the Pea Weevil at a Glance sidebar) to lay eggs. All sizes of pods are suitable for egg laying. As many as 126 eggs have been recorded on a single pod (Reddy et al. 2018). Upon hatching, larvae chew through the pod wall one to two weeks after the eggs are laid and ultimately end up feeding inside the pea seed. Larvae go through several instars for a period of four to eight weeks, then they pupate and emerge as adults from within the seed. Adults cannot reproduce in dried seeds (Reddy et al. 2018). Upon emergence, adults will seek a suitable place to overwinter, such as plant debris, rubbish, and even old outbuildings that may be near the field they emerged from.

Pea Weevil at a Glance

Host plants: *Pisum sativum* (field or Austrian winter pea and spring cultivars); *P. elatius* (wild pea); and *Lathyrus sativus* (Indian pea) are known host plants.

Where to look for pea weevil: Adults forage on pollen or flowers. Larvae and pupae feed and develop inside the pea pods.

Pest thresholds: Scouting for pea weevil should start before bud development and continue through the flowering period. Treatment measures and actions are recommended when 1 adult per 25 sweeps is collected to prevent pea weevil from reaching the economic injury level—that is, when the level of damage is equal to the cost of control.

Pesticide treatment: Registered foliar treatment examples for field or Austrian winter pea include Assail 70WP (acetamiprid), Fastac CS (alpha-cypermethrin), Brigade 2EC (bifenthrin), Besiege (chlorantraniliprole + lambda-cyhalothrin), Declare (gamma-cyhalothrin), Resonate 600 ST (imidacloprid), Lambda-Cy Ag (lambda-cyhalothrin), (fyfanon 57% EC), Malathion (organophosphate), Mustang Maxx (zeta-cypermethrin), and others. (Note: these pesticide formulations are known to be highly toxic to bees and other pollinating insects. For more information about off-target impacts on beneficial insects, please see the information listed in the Bee Precautions section of this publication.)

Damage, Economic Thresholds, and Sampling

Pea weevil damage is caused by direct larval feeding and adult emergence from individual seeds. Yield losses of up to 50% have been reported (Nikolova 2016). This feeding damage can greatly diminish both marketability (i.e., human consumption) and seed viability (Figure 2). Feeding by pea weevils can also make plants more susceptible to aphids and aphid-transmitted viruses (Crowder, personal communication).

The economic threshold for pea weevil in the Pacific Northwest (Washington, Idaho, and Oregon) is 1 weevil in every 25 sweeps (Reddy et al. 2018). Insect pressure even at this level can result

in a 10% infestation at harvest. In 2018, 72.2% of all winter pea lots across the region had weevil damage associated with pea weevil (Nelson, personal communication). Sampling for adults is recommended when adult female pea weevils are actively feeding on pollen, right as plants begin to produce flowers. Repeat sampling every three to seven days from that point forward (Figure 3) (Clement 1992).

Both field borders and interior parts should be sampled using a canvas-type sweep net starting midday. Adults are known to rapidly recover and take flight after being collected; therefore, care must be taken to accurately record pest numbers. Carbon dioxide can be used as an anesthetic to reduce insect activity. If no such gas is available, simply putting one's face near the open sweep net can block the light, thereby limiting insect activity and escape. Currently, there are no known specific pheromone lures that will attract adult weevils. A separate field experiment utilizing experimental pheromones from the company Alpha Scents were placed randomly at field locations, and their contents were compared with traditional sampling methods (Figure 4). Unfortunately, these experimental lures failed to attract any adult pea weevils throughout the sampling period.



Figure 2. Damaged seed. Photo by Lyndon Porter, USDA-ARS plant pathologist.



Figure 3. Early flowering growth stage of peas is the recommended time to begin sampling for adult pea weevils. Photo by Dale K. Whaley, WSU Extension.



Figure 4. Delta trap with an experimental pheromone lure. Photo by Dale K. Whaley, WSU Extension.



Figure 5. Sweep net contents on June 6, 2019. Photo by Dale K. Whaley, WSU Extension.

Survey Results for Eastern Washington

Beginning in early May when bloom initiation was starting, weekly samplings (100 canvas net sweeps) for adult pea weevils were taken in winter pea fields throughout the dryland region of Washington State. Twelve locations were chosen in 2018, and sampling was conducted for seven weeks (Table 1). Eight locations in 2019 were selected and sampled again for seven weeks (Table 2). In Tables 1 and 2, cells colored yellow indicate the pest was found below economic thresholds. Growers in these regions should be on the lookout for pea weevils, but management action is not warranted unless populations exceed action or treatment thresholds. Red cells in the figures indicate that pea weevils were found at levels that warranted control. Thus, these fields and those nearby should be treated with an appropriate insecticide.

In the first three weeks of sampling in 2019, no weevils were detected across the region when sampling during the morning hours. The question arose as to whether sampling at different times of day affected overall weevil capture. To test this theory, only afternoon samples were taken to see if warmer temperatures coincided with increased insect activity. Weevil numbers subsequently went from zero to 21 with the later sampling time frame. Therefore, the time of day when sampling is being conducted may play an important factor in getting accurate numbers of adult weevils. The highest number of adults (71) was collected in the first week of June, 2019, in the Waterville area (Figure 5).

Table 1. Pea weevil densities during seven weeks of sampling across eastern Washington in 2018.

Field #	AREA NAME	5/2/2018	5/9/2018	5/11/2018	5/16/2018	5/20/2018	5/24/2018	6/1/2018
1	Waterville Area 1	0	0	0	2	N/A	N/A	0
2	Waterville Area 2	0	0	0	0	N/A	N/A	0
3	Waterville Area 3	0	0	0	21	N/A	N/A	0
4	Waterville Area 4	0	0	0	7	N/A	N/A	0
5	Farmer	0	0	0	1	N/A	N/A	0
6	Waterville 5	0	0	0	0	N/A	N/A	0
7	Davenport	0	0	0	N/A	0	1	0
8	NE Sprague	0	0	0	N/A	0	1	0
9	Ritzville Area 1	0	0	0	N/A	0	0	0
10	Ritzville Area 2	0	0	0	N/A	0	1	0
11	S. Ritzville Area 3	0	0	0	N/A	0	1	0
12	Lind	0	0	0	N/A	0	4	0

Notes: Yellow = weevils below action thresholds, red = weevil numbers above action thresholds, N/A = no sample taken. The first three sample sets were taken starting at 8:00 a.m. Pacific Standard Time. Sampling after that started at 12:00 p.m. A final round of sampling was conducted both years after weevils were treated with insecticides by producers.

Table 2. Pea weevil densities during seven weeks of sampling across eastern Washington in 2019.

Field #	AREA NAME	5/9/2019	5/15/2019	5/23/2019	5/29/2019	6/6/2019	6/21/2019	6/28/2019
1	Waterville Area 1	0	0	0	12	14	0	0
2	Waterville Area 2	0	0	0	5	7	0	0
3	Waterville Area 3	0	0	0	2	10	16	0
4	Waterville Area 4	0	0	0	3	2	0	0
5	Waterville Area 5	N/A	N/A	N/A	N/A	71	0	0
6	Ritzville Area 1	0	0	0	0	0	0	0
7	Ritzville Area 2	0	0	0	0	1	0	0
8	Ritzville Area 3	0	0	0	0	0	0	0
9	Lind	0	0	0	0	0	0	0

Notes: Yellow = weevils below action thresholds, red = weevil numbers above action thresholds, N/A = no sample taken. The first three sample sets were taken starting at 8:00 a.m. Pacific Standard Time. Sampling after that started at 12:00 p.m. A final round of sampling was conducted both years after weevils were treated with insecticides by producers.

Management

Cultural Control

Avoid buying or planting unfumigated seeds. Volunteer plants can harbor insect pests and therefore should be controlled to limit their potential to infest the next season of crops.

Biological Control

There are 24 species of natural enemies of pea weevil recorded in the world (Kingsolver 2004). One such species, *Triaspis thoracica* Curtis (Hymenoptera: Braconidae), was said to be 70% effective at parasitizing larvae of *B. pisorum* in Russia. In the mid to late '30s, several attempts were made to introduce this beneficial wasp into the United States. At that time, Oregon, California, Pennsylvania, and North Carolina were chosen for mass releases, totaling some 140,000 wasps. Unfortunately, the establishment was never confirmed. Another experiment in Russia reported parasitization of up to 70% of *B. pisorum* eggs using the wasp *Uscana senex* Grese (Hymenoptera: Trichogrammatidae). This insect has been released in Brazil and Chile (Reddy et al. 2018).

Chemical Control

Insecticide treatment is recommended if 1 adult weevil per 25 sweeps is collected to prevent populations from reaching the economic injury level. Examples of insecticide products registered for pea weevil control are Acetamiprid (Assail 70WP), Alpha-Cypermethrin (Fastac CS), Azadirachtin (Molt-X), Bifenthrin (Discipline 2EC), Chlorantraniliprole, Lamda-Cyhalothrin (Beseige), Cyhalothrin Gamma (Declare), Imidacloprid (Resonate 600 ST), Lamda-Cyhalothrin (Lamcap II), Malathion (Fyfanon 57% EC), Phosmet (Imidan 70-W AG), and Zeta-Cypermethrin (Mustang Maxx). For a complete listing of insecticide products registered for pea weevil, visit the WSU Wheat and Small Grains' [Insecticide Mode of Action and Comparison Tool](#) website. To optimize the effectiveness of foliar-applied insecticides, it is important to target adults before egg laying and before small pods become visible. If crops are treated, recheck fields ten days after the treatment date and reapply insecticide treatment if action thresholds are again met. If pea weevils are found at the time of harvest, treat silos or storage areas with fumigants, like Diacon, or aluminum phosphides, such as Fumitoxin and Phostoxin.

Use pesticides with care. Apply them only to plants as listed on the label. When mixing or applying insecticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove the clothing and thoroughly wash the skin. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock. Refer

to the online version of the [Pacific Northwest Insect Management Handbook](#) for additional information regarding pesticide use, specific insecticide recommendations, and application rates for pea weevil. The handbook is also available at Extension offices in Washington, Oregon, and Idaho. If a pesticide label becomes damaged or illegible, visit the [Pesticide Information Center OnLine \(Picol\) Database](#) or [CDMS Applied Intelligence](#) websites to get a replacement.

Sanitation

Nonfumigated seeds that have been spilled around storage sites or during animal feeding should be cleaned up. These seeds may harbor weevils, thereby contributing to continued weevil pressure in the area as adults will emerge from seeds to seek overwintering sites.

Bee Precautions

The insecticide formulations listed in the Chemical Control section are known to be highly toxic to bees and other pollinators. Therefore, do not apply these products in a manner that will allow them to drift to adjacent crops or weeds or especially the surrounding plants in bloom. Avoid applications when bees or other pollinators are actively foraging by making applications during the early morning or evening hours to limit possible exposure. If bee shelters are nearby, such as in canola fields, it may be advisable to remove the bees during and for the two to three days following application.

Seed treatments containing imidacloprid are highly toxic to bees and other pollinators. To minimize the creation of dust from seed coat abrasion during planting, which may drift to blooming crops or weeds and poison foraging bees and other pollinators, make sure that planting equipment is functioning properly per manufacturers' specifications. For additional information on how to prevent unnecessary pollinator poisonings from pesticide use, read the following Extension publications [Pollination and Protecting Bees and Other Pollinators](#) (Lawrence 2015) and [How to Reduce Bee Poisoning from Pesticides](#) (Johansen et al. 2013).

Summary

The following is a summary of recommendations, information, and practices growers should consider for weevil control and management:

- Pea weevil has caused economic damage across eastern Washington.
- Learn how to identify pea weevils in the field.
- Take samples later in the day when adults will be more active to better determine pest levels.
- Be ready to use necessary control measures when 1 adult weevil per 25 sweeps is collected.

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