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Pea Leaf Weevil

The pea leaf weevil (*Sitona lineatus*) is an introduced insect pest that feeds on a wide range of legume species, and may reduce yields of field pea and faba bean crops.

First recorded in Alberta in 2000, this serious pest is expanding its range from British Columbia and the northwestern United States into the southern prairies of Alberta and Saskatchewan.

Background

Adults overwinter in shelterbelts, ditches and perennial legumes. In southern Alberta, field pea and faba bean are the major crops at risk of economically significant damage from this pest. Pea leaf weevil adults will feed on dry beans and other legumes, but the damage is usually minor as they do not reproduce in these crops.

The pea leaf weevil may reduce yields of field pea and faba bean crops

Although adults feeding on the leaves and growing point of seedlings can also cause economic damage, most economic losses result from larval feeding on *Rhizobium* or nitrogen-fixing nodules on plant roots.

An integrated pest management program in combination with other methods, such as biocontrol, trap crops and chemical applications, is being studied for the potential control of pea leaf weevil.

Life cycle

Under Alberta conditions, the pea leaf weevil produces one generation per year. The pea leaf weevil develops through four life stages: egg, larva, pupae and adult.

The entire development period from egg to adult takes approximately 10 weeks with new generation adults emerging in late July through August in southern Alberta.

Adult

The adults emerge from overwintering in late April and early May, feeding on any legume plant stands for early food sources. They only congregate in pea or faba bean fields to reproduce. The pea leaf weevil moves primarily by flying (at temperatures above 17° C), or they may walk short distances.

The adult is a slender, grayish-brown weevil with a short snout. The adult is about 5 mm long with 3 light-coloured stripes extending lengthwise down their abdomen.

Females lay 1,000 to 1,500 eggs in the soil near seedlings. Adults are very long lived and may lay eggs over three months, so all stages can be found simultaneously even though there is only one generation per year.

Eggs

Eggs are small, smooth and oblong or oval-shaped. The eggs are white when laid on the soil surface near plant stems, but darken to almost black as hatching approaches.

Larva

Larvae develop in the nitrogen-fixing nodules associated with the roots. They are C-shaped, and light milky white with a dark brown head. Larvae are cylindrical, legless, soft and fleshy, and about 3 to 6 mm in length.

After hatching, the larvae feed on the *Rhizobium* nodules on pea roots for about six weeks, developing through five instar stages before pupating in the soil.

Pupa

The pupa is white, adult-like and immobile. Pupation takes place in the soil. New generation adults start emerging from the soil in late July, with peak emergence occurring in mid-August. They continue feeding on pulse crops before overwintering.

Host plants and crop damage

The pea leaf weevil uses peas and faba beans as reproductive hosts and can cause economic damage to these crops. Economic damage is caused mainly by the larvae.

The adult weevils feed on emerging pea seedlings in May and June, chewing leaf margins and growing points, which produces a characteristic scalloped or notched edge. The plants can typically compensate for the leaf loss damage.

The larvae cause the most serious damage. Once the larvae hatch, they begin feeding on the *Rhizobium* or nitrogen-fixing nodules of the pea roots, resulting in partial or complete inhibition of nitrogen-fixation by the plant. This damage results in poor plant growth and low seed yields, and may make the peas more susceptible to drought stress.

The adults will feed on the leaf margins and growing points of many other legume seedlings including alfalfa, dry beans, clover, lentils, lupins and vetch, but generally they do not cause economic damage. Serious damage to seedling alfalfa has been reported on several occasions.

Monitoring

Producers need to start scouting for pea leaf weevils as soon as peas emerge and continue up to the sixth-node growth stage. Adult pea leaf weevils are difficult to monitor because they drop to the ground when approached, and they are difficult to see against the soil.

A threshold level of 3 of 10 seedlings with damage on the clam leaf (the most recently emerged pea leaves that are still folded together) has been recommended.

The adult pea leaf weevil can be confused with the sweet clover weevil. However, the pea leaf weevil is the only one that has three, light-coloured stripes extending length-wise down the abdomen.

Pea leaf weevil populations are estimated by plant damage assessments performed during the last week of May and first week of June, typically the time of maximum damage up to the sixth node stage. Eggs laid after this stage do not cause economic damage.

The best way to determine levels of infestation is to look for damage on the clam leaf. The pea leaf weevil, which can fly a long distance (a few km), usually enters the field from the outside, so initial damage will occur along the field borders.

Select at least 5 locations along the field margin and 5 locations approximately 100 metres into the field to assess pea leaf weevil damage for threshold determination. At each location, a row of 10 to 20 seedlings should be selected, and the terminal leaf on each seedling examined for the characteristic crescent-shaped notches. If the average proportion of seedlings with terminal leaf damage from all spots exceeds 30 per cent (i.e., more than 3 out of 10 seedlings, or 6 out of 20), then the weevil poses a yield risk and warrants control.

Spring weather conditions have a large effect on the timing and severity of pea leaf weevil damage. When warm conditions (greater than 20° C) persist for more than a few days in late April or early May, the weevils arrive in fields early, which corresponds to the potential for higher yield losses. In years where cool weather persists, the arrival of pea leaf weevils can be much later, and the resulting yield effect appears to be lower, especially when the crop advances past the sixth node stage before weevils arrive.

The Alberta Insect Pest Monitoring Network produces annual insect forecast maps, available on Alberta Agriculture's website at the following url: http://agriculture.alberta.ca/bugs-pest

Economic thresholds

The economic threshold for pea leaf weevil is to spray at the 2- to 3-node stage when one or more feeding notches appear on 30 per cent of the clam leaf pairs. At this feeding level, chemical control with a registered foliar insecticide could be economical, depending on environmental conditions.

However, if this feeding damage does not occur until after the sixth node pea stage, control will not likely be required. Research studies from plots have not found yield differences in foliar sprayed versus untreated plots that had varying levels of weevil damage, including damage above economic thresholds.

Control

Cultural

Cultural control practices can be included as part of an integrated pest management strategy. Fields under no till systems suffer less damage than those under conventional tillage. Seeding crops early and inoculating the pea crops to maximize yields is recommended. Using crop rotations with a non-host crop other than field pea or faba bean is also recommended.

Trap cropping of the pea leaf weevil can be done by planting a border in the fall with winter peas or adjacent, earlier planting of a spring cultivar. Close monitoring of the trap crop is needed, so the weevils in the trap crop area can be controlled before they move to the rest of the field.

Chemical

The most consistent control for pea leaf weevil is obtained with a registered insecticide seed treatment. If high populations of pea leaf weevil were in the area in the previous year, then a registered insecticide seed treatment should be considered.

Foliar applications with an insecticide can be used for control of early feeding on pea roots and leaves before the peas reach the sixth node and before the adults lay too many eggs.

Foliar applications of insecticide are recommended at the 2- to 3-node stage when 1 or more feeding notches appear in 3 out of 10 seedlings in 5 to 10 locations in the field. If feeding damage occurs only on the lower leaves and not on the clam leaf, the weevil has probably already laid eggs, and there is no use in spraying. Pea leaf weevils are likely to re-invade the stand later in the season, but control is not usually warranted.

Please refer to Alberta Agriculture's current *Crop Protection* guide (blue book), Agdex 606-1, for products registered for pea leaf weevil control – see the website at http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/All/agdex32

Trap crops can be used for pea leaf weevil. If damage is restricted to the trap crop area, then it may be economical to spray insecticide on the field borders before the pea leaf weevils move into the main crop.

Biological

Biological control options for pea leaf weevil could be an important part of an integrated pest management strategy. Preliminary observations indicate that native ground or carabid beetles will eat pea leaf weevil eggs. Further research is needed on biological control options for the potential control of pea leaf weevil.

Best management practices

- Plant early to maximize yields and potentially escape the weevil in cold springs.
- No-till cropping systems, integrated pest management systems and good crop rotations are recommended.
- Use inoculants and adequate levels of fertilizer to maximize crop yields.
- Registered seed treatments are recommended if high populations of pea leaf weevil were in the area the year before.
- Trap crops can be planted along field borders in the fall or early spring. If warranted, spray trap crops with a registered insecticide to control pea leaf weevils before they move into the main crop.
- Scout for pea leaf weevils as soon as peas emerge and continue up to the sixth node growth stage.
- Foliar applications of registered insecticides are recommended at the 2- to 3-node stage when 1 or more feeding notches appear on one-third of clam leaves of seedlings in 5 to 10 locations in a field.

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