Protocol for Monitoring Pea Leaf Weevil (*Sitona lineatus*)

Adult Monitoring using Feeding Notches

Timing: Pea leaf weevil populations are estimated by counting feeding notches (Fig. 1) on field pea or faba bean leaves between the 2nd and 6th node growth stages of the host plant (i.e., **late May to early June in typical years**). This period typically coincides with maximum foliar damage and the peak of pea leaf weevil distribution into primary host crops. "U"-shaped feeding notches are characteristic of adult pea leaf weevils.

Plant Damage Assessments: Assess 10 randomly selected plants for feeding notches at 10 different locations within the field (n = 100 plants total; Fig. 1). The first location in the first transect at a field should be 10 m from the field access point (if starting at a gate or driveway) and within 2 m of the field margin, with sampling locations separated by 25 m. Repeat in a second transect located 100 m from the field margin.

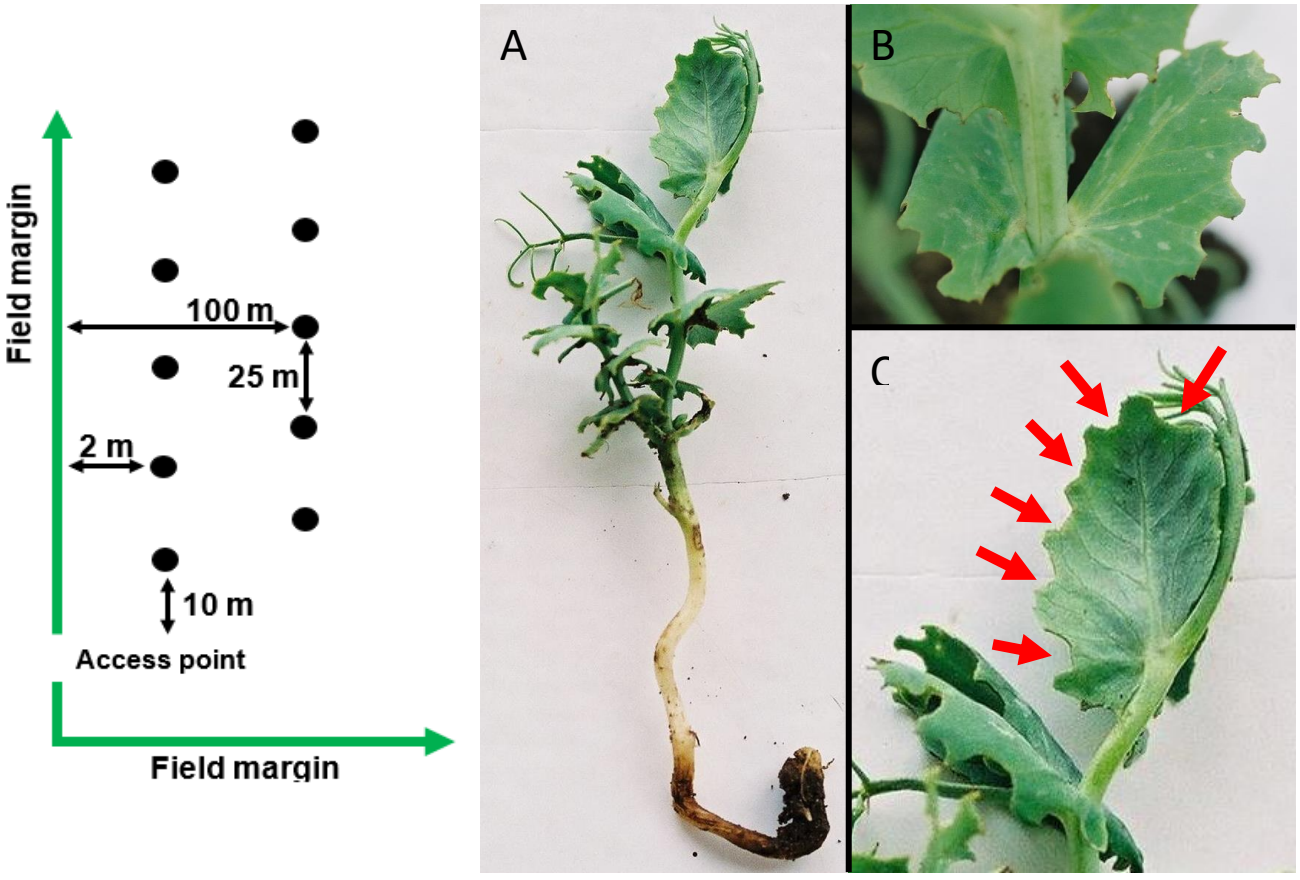

Figure 1: Sampling locations in a field pea or faba bean field and examples of adult pea leaf weevil damage on field pea seedlings. A: seedling with notches on all nodes; B: the stereotypical crescent shaped notches on the leaf margin; C: the clam or terminal leaf of the pea seedling with arrows indicating the feeding notches. All photos courtesy of Dr. L. Dosdall.

Record the following data at **each sampling location** within a field:

1. Plant growth stage (i.e., number of nodes) for each plant sampled or the average growth stage of plants in the field,
2. The total number of u-shaped notches (may be recorded per node) on the 10 plants sampled,
3. The number of feeding notches on the clam (terminal) leaf of the 10 plants sampled.

Pea Leaf Weevil Biology

Host plants:

The pea leaf weevil has two reproductive hosts: field pea and faba bean. These plants support larval development and are considered primary hosts. The primary hosts experience economic damage due to a combination of larval damage to root nodules and adult damage to foliage. In early spring and late summer, when the primary hosts are not available, adult weevils will consume foliage of all available legumes (wild and cultivated), including alfalfa, clover, and vetch. **The Prairie Pest Monitoring Network conducts an annual survey of pea leaf weevil in field pea crops to estimate population densities and the distribution of this invasive insect.** The same protocol can also be used to estimate weevil density in faba bean crops.

Identification, Life Cycle, and Damage:

Adult: Adults overwinter in alfalfa or other perennial legumes and emerge in the spring. Spring dispersal to field pea and faba bean crops is achieved primarily via flight, with dispersal within fields occurring on foot. Both photoperiod and temperature affect weevil activity in the late summer and early spring. Spring dispersal requires temperatures above 12ºC. Adults are slender, greyish-brown, and are approximately 5 mm long (Figure 2). The pea leaf weevil resembles the sweet clover weevil (*Sitona cylindricollis*) yet the former is distinguished by three light-coloured stripes extending length-wise down thorax and sometimes the abdomen (Figure 3). All species of *Sitona*, including the pea leaf weevil, have a short snout.

Adults feed upon the leaf margins and growing points of legume seedlings (i.e., alfalfa, clover, dry beans, faba beans, and field peas) and produce a characteristic scalloped or notched leaf edge (Figure 1). In early spring and late summer, significant notching may be observed on secondary host plants (e.g., alfalfa, clover). After field pea and faba bean seedlings emerge in spring, adult weevils disperse into these crops and the majority of foliar feeding damage is restricted to these two legume species. Producers may consider insecticide intervention when 30% of seedlings have damage on the clam (terminal) leaf.

Eggs: Individual female pea leaf weevils lay between1000 and 1500 eggs, on average. Eggs are laid singly on the soil surface or on developing plants as females feed and disperse. The majority of eggs are laid in May and June and require 18 to 20 days to hatch, depending on temperature and humidity.

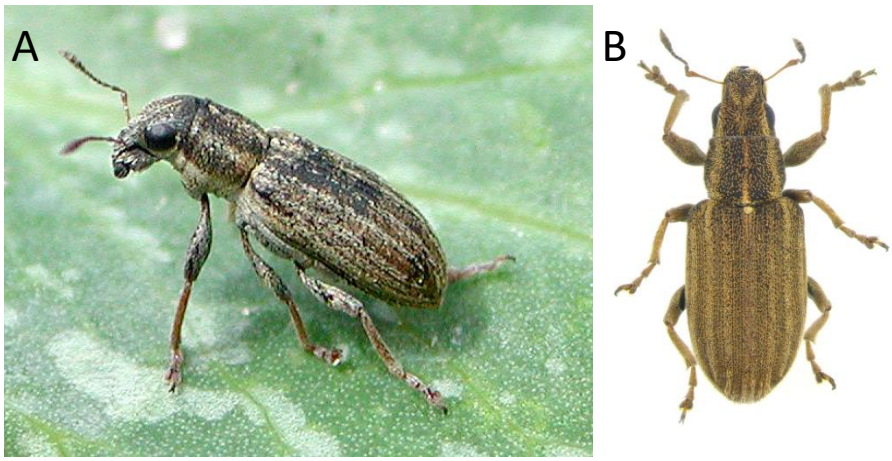

Figure 2: Adult pea leaf weevil (*Sitona lineatus*). A: lateral view of weevil on field pea foliage (Image courtesy of L. Dosdall); B: dorsal view (Image: H. Goulet).

***Sitona lineatus* Linnaeus** **Pea leaf weevil**	***Sitona cylindricollis* Fahraeus** **Sweet clover weevil**	***Sitona lineelus* Bonsdorff** **Alfalfa curculio**	***Sitona hispidula* Fabricius** **Clover root curculio**
5 mm long Three dorsal stripes extending laterally from head to abdomen; unlike any other S*itona* species, the fore-coxal cavities touch or nearly touch a narrow groove located on the ventral surface of the pronotum (Bright 1994; Bright and Bouchard 2008). **Hosts:** Peas, faba beans, seedling alfalfa.	**5 mm long** Uniformly dark grey to black. **Hosts:** Sweet clover, seedling alfalfa, cicer milkvetch.	**3-4 mm long** Smaller and lighter in colour than *S. cylindricollis.* **Hosts:** Alfalfa, sainfoin, cicer milkvetch, native vetches.	**4-5 mm long** Three dorsal stripes extending laterally from head to thorax; spotting pattern on elytra; “hairy” on abdomen. **Hosts:** Clovers, alfalfa, other legumes.

Figure 3. *Sitona* species that occur on the Canadian prairies.

Larva: Larvae develop under the soil over a period of 30 to 60 days. They are “C” shaped with a dark brown head capsule. The rest of the body is a milky-white color (Figure 4). Larvae develop through five instar stages.

In the 5th instar, larvae range in length from 3.5 - 5.5 mm. First instar larvae bury into the soil after hatching, and search out root nodules on field pea and faba bean plants. Larvae enter and consume the microbial contents of the root nodules. These root nodules are responsible for nitrogen-fixation, thus pea leaf weevil larval feeding can affect plant yield and the plant's ability to input nitrogen into the soil. Root nodule damage (Figure 5) results in inhibition of nitrogen fixation by the plant and results in poor plant growth and low seed yields.

Pupa: Pupation takes place in the soil and requires 15 to 20 days. New generation adults emerge from late July to August and disperse to annual pulse crops or perennial legumes where they feed prior to overwintering in the late fall.

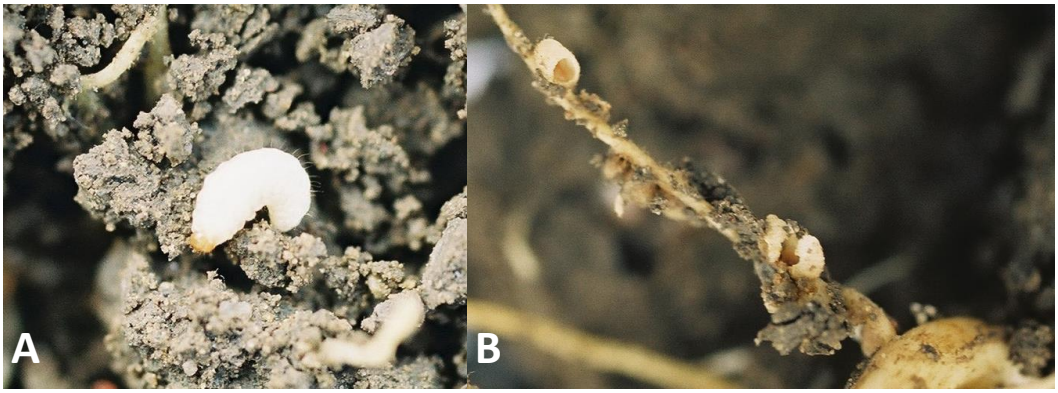

Figure 4: A) Pea leaf weevil larva in soil and B) root nodules on field pea damaged by larval feeding (images courtesy of L. Dosdall).

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