

Pest Common name (Scientific Name)

Beet leafminer (*Pegomya betae*) – primary species found in Idaho

Spinach leafminer (*Pegomya hyoscyami*) – possible pest in Idaho

Host Plants

- Sugar beet
- Other crops, including table beet, chard, and spinach
- Weeds, including lamb’s-quarters, pigweed, Russian thistle, others



Figure 1. Beet leafminer (*Pegomya betae*) adult.

Authors

Desireè Wickwar, Program Manager, Integrated Pest Management, Department of Entomology, Plant Pathology, and Nematology, Kimberly Research and Extension Center

Erik Wenninger, Professor, Department of Entomology, Plant Pathology, and Nematology, Kimberly Research and Extension Center

Integrated Pest Management of Leafminers in Sugar Beet

Description

The common name, *leafminer*, refers to any insect that lives and feeds within the **mesophyll** of a leaf (the tissue between the upper and lower layers of epidermis). The beet leafminer is the most common leafminer affecting sugar beets in Idaho. Other species that are present in North America, but very rarely cause damage to sugar beet in Idaho, include the closely related spinach leafminer.

Adult beet leafminers are slightly humpbacked, slender flies about ¼ inch (7 mm) in length with a greyish body and clear wings (Figure 1). Eggs are white, cigar-shaped, and only 1/25 inch (1 mm) long (Figure 2). The eggs are usually laid on the underside of leaves, often in clutches of up to ten. **Larvae** (maggots) are cylindrical, with one end tapering to a point, and lack a distinctive head or legs. Newly hatched larvae start out transparent green and shift to opaque yellow as they progress through three growth stages (Figure 3). They are rarely observed unless the **mines** (light green/yellowish streaks/patches on a leaf) are peeled open.

Biology

Beet leafminers typically overwinter as pupae in the soil. Adults emerge in early spring, mating and depositing eggs soon thereafter. A single female may lay hundreds of eggs in



Figure 2. Beet leafminer eggs.



Figure 3. Beet leafminer larvae (maggots).

her lifetime. Eggs hatch in 3–10 days, depending on ambient air temperatures, and larvae immediately burrow into the leaf tissue. After 7–12 days, larvae drop to the soil to pupate. The pupal stage generally lasts 10–20 days (except during overwintering). There are up to three overlapping generations of beet leafminers in sugar beet per year in Idaho.

Damage

Leafminer larvae hollow out the inner leaf tissue (mesophyll), leaving the upper and lower layers of the leaf intact. Initially, the feeding of leafminer larvae within leaves causes the development of narrow, winding “mines,” which appear as light green or yellowish streaks or patches on the surface of a leaf (Figure 4A). When mining is extensive, mines may overlap to form larger blotches or blister-like necrotic patches that become dry and brittle as they age (Figure 4B and 4C). Extensive necrotic patches may inhibit photosynthesis.

Young sugar beet plants are less tolerant of leafminer damage than older plants. Later planting dates can make plants more susceptible to damage since stand establishment occurs when leafminers are more abundant. Research in Idaho shows that while evident yield reduction can be observed if damage is severe early in the season, yield effects are generally subtle if leafminer damage occurs after stand establishment.

Monitoring

Field scouting during early spring, when egg clusters can be seen easily on the undersides of leaves, is key for early detection and effective management. Inspect leaves for mines as well, though they can be difficult to see until the damage becomes more extensive. To spot larvae within leaves, hold them up to light or peel them open. Scout for eggs and larvae in several areas within each field since infestation levels vary across each field and among different fields.

There is no formal threshold for leafminers in sugar beet, but heavy infestations in young plants are more likely to cause damage than in more mature plants.

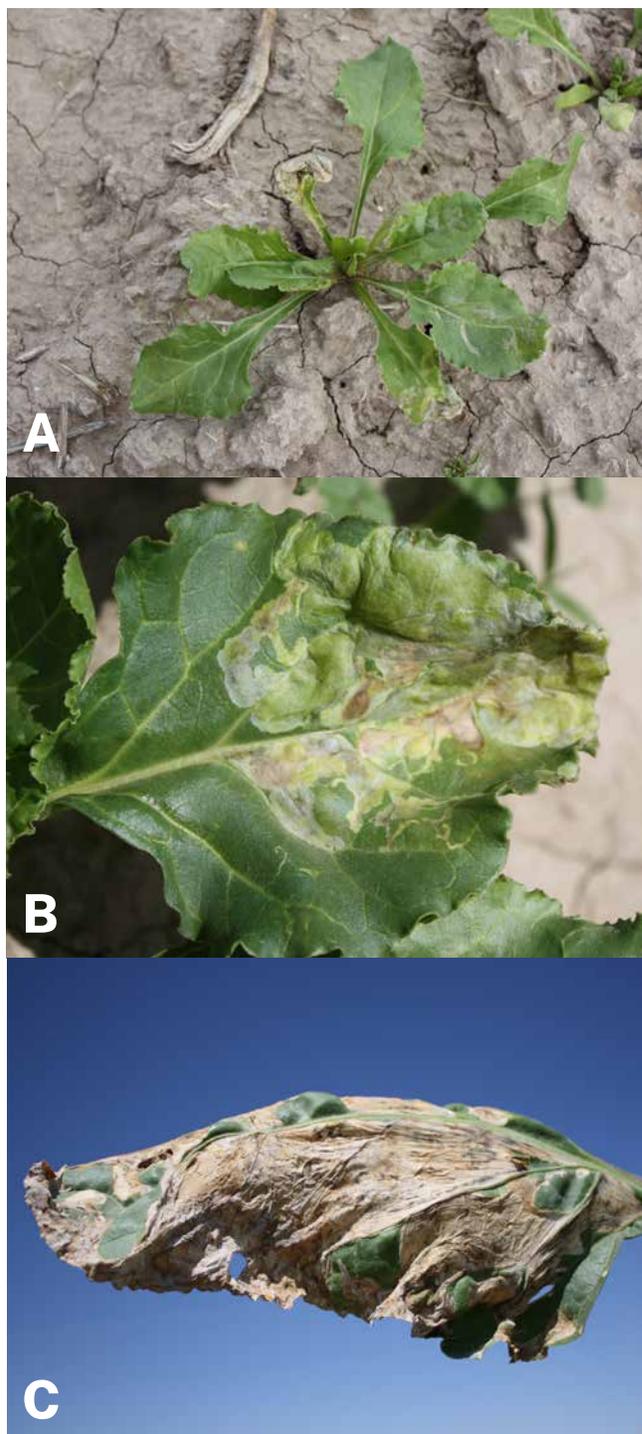


Figure 4. A, Damage to sugar beets caused by the feeding of leafminer larvae, particularly on leaves. B, Upon closer inspection, the small mines in infested leaves eventually grow and merge into large, blister-like patches. C, Extensive leaf mines eventually desiccate, causing entire leaf death.

Management

Primary Management Tactics

Early season insecticide applications, including seed treatments, provide protection to immature plants; mature plants tolerate more damage. Although management heavily relies on insecticides, conserving natural enemies by limiting the use of broad-spectrum insecticides can contribute to leafminer control.

Cultural

- Early planting ensures that plants are relatively large when attacked and are thus less susceptible to damage.
- Rotating sugar beet as far as possible from the previous year's beet fields can reduce the risk of severe infestation.

Biological

Limiting the use of broad-spectrum insecticides helps conserve natural enemies that contribute to leafminer suppression. Parasitoid wasps that attack beet leafminers can be abundant in unsprayed fields; however, extent to which they suppress leafminer densities remains to be studied.

Chemical

- There are no formal thresholds, but insecticide application may be justified if leafminer egg and mine densities are high when plants are in the seedling stage. Mature plants tolerate more damage.
- Foliar insecticides are most effective when applied before most eggs hatch or soon after the first appearance of mines.
- Studies in Idaho (Wenninger 2010–18) show that two foliar insecticide applications (spaced about a week apart and beginning at the first appearance of eggs) provide good control of leafminers.
- Efficacy of foliar insecticides declines after larvae are protected within leaf mines, but moderate levels of control are still possible when applied at this time, especially if an adjuvant is used (in accordance with the insecticide label).
- At-plant application of systemic insecticides

can provide early season control, which may be sufficient to protect plants in the more susceptible seedling stage.

- Studies in Idaho (Wenninger 2010–18, Strausbaugh et al. 2010) show that thiamethoxam-based seed treatment may provide slightly better control than clothianidin-based seed treatments, but most commonly used seed treatments are effective.
- Idaho studies (Wenninger 2010–18) show that similar levels of control can be achieved with timely applications of foliar insecticides or seed treatments. Foliar treatments can be skipped if not justified by scouting, which makes it a more economical practice.
- For recommendations of which pesticides to use in the management of leafminers, see the [PNW Pest Management Handbooks](#) website.

Further Reading

Strausbaugh, C. A., I. A. Eujayl, and P. Foote. 2010. "Seed Treatments for the Control of Insects and Diseases in Sugarbeet." *Journal of Sugar Beet Research* 47(3/4): 105–25.

Wenninger, E. J. 2010–18. Unpublished data.

Caution: Read Pesticide Labels

Pesticide labels override other recommendations.

ALWAYS read and follow the instructions printed on the pesticide label. The pesticide recommendations in this UI webpage do not substitute for instructions on the label. Pesticide laws and labels change frequently and may have changed since this publication was written. Some pesticides may have been withdrawn or had certain uses prohibited. Use pesticides with care. Do not use a pesticide unless the specific plant, animal, or other application site is specifically listed on the label. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

Trade Names — To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.

Groundwater — To protect groundwater, when there is a choice of pesticides, the applicator should use the product least likely to leach.

Any uncredited images were taken by the author(s) and are copyrighted by the University of Idaho. Please direct permission requests to use to UI Extension Publishing at calspubs@uidaho.edu.