

BIRCH-LEAFMINING SAWFLIES

by

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Distribution and hosts

Three species of birch leafmining sawflies attack birch in the prairie provinces. These are the ambermarked birch leafminer, *Profenusa thomsoni* (Konow), the birch leafminer, *Fenusa pusilla* (Lepeletier), and the late birch leaf edgeminer, *Heterarthrus nemoratus* (Fallen). All three species were accidentally introduced from Europe to North America early this century. These species are now widely distributed in Canada and the northern United States. In the prairie provinces, *P. thomsoni* is the most common species and *F. pusilla* is also abundant; however, *H. nemoratus* is rare. All native and exotic birches are susceptible to damage by at least one species of birch leafminer.

Description and life history

Adults of all three species of birch leafmining sawflies are small, stout, black insects, 3-4 mm long, with a wingspan of 6-7 mm. The adults are difficult to identify without expert assistance. The larvae are whitish, slightly flattened in appearance, and 6-7 mm long when fully grown. Variation in the black marks on the underside of the larvae may be used to discriminate among the three species (see Ives and Wong 1988 for photographs). The life history of only the two common species will be discussed.

The first species to attack birch in the spring is *F. pusilla*, which occurs in newly formed leaves in the exposed crown of the tree. In mid- to late-May, females each lay up to 20 eggs in slits near the midribs on the upper surfaces of

young leaves. Larvae hatch from the eggs in early June and feed on the tissue between the leaf surfaces. Mature fifth instar larvae do not feed, but emerge from the leaves in late June to mid-July and drop to the ground where they construct earthen cells (cocoons) beneath the soil surface. The majority of the larvae likely remain in the earthen cells to overwinter, with pupation occurring the following spring. However, a small apparent second generation sometimes occurs, which indicates that some first generation larvae may pupate immediately and emerge about one month later as adults to oviposit. Larvae of this second generation fall to the ground in late August.

Profenusa thomsoni has one generation per year. The parthenogenetic females emerge in July and lay eggs along the veins in the basal and central area of the upper surface of the leaves. There are five feeding larval instars and a sixth non-feeding instar. Sixth instar larvae emerge from leaves in late August and drop to the soil to construct small earthen cells in which they overwinter. Pupation occurs in early summer of the following year.

Symptoms and damage

The first signs of damage become noticeable in early June, when small, light green or gray spots appear on the leaves where eggs were deposited. When eggs hatch and larvae commence feeding, these spots develop into brown blotches that continue to increase in size and eventually merge, covering most of the leaf. Although most of the inner leaf tissue may be destroyed, tree health is not usually affected,

since a vigorous tree can withstand many years of light-to-moderate damage. Leafmining damage can stress the birch, however, and that, combined with lack of adequate moisture and attack by other insects or diseases, may cause branch and top dieback. This dieback, combined with leaf browning, reduces aesthetic value of birches in ornamental plantings.

Prevention and control

Healthy trees are better able to withstand attack. Tree health may be maintained by watering the roots in the fall before frost sets in, applying a suitable fertilizer each spring, and watering during dry periods in the summer (birches are shallow-rooted).

Pesticide application is the most common method of leafminer control on ornamental trees. Chemical control in forest stands has not been necessary because of low leafminer population densities and because birch is not an important commercial tree species. Several insecticides are registered for birch leafminers, but systemic insecticides such as Cygon are most commonly used. These may be painted on stems or applied as a soil drench in late May, after leaves are fully opened. Often these pesticides are ineffective because of incorrect application. Pesticide application may be considered undesirable because of unpleasant odour and potential impacts on environmental and human health. There is a need to develop alternative management practices for birch leafminers.

Research

Personnel at the Northern Forestry Centre and the University of Alberta (Dept. of Entomology) are cooperating in a large study of

birch leafminer biology and management. The biological research is concentrating on assessing sawfly phenological variation, understanding population structure and dispersal, and assessing impacts of natural enemies. This information will be used to develop strategies for management of birch leafmining sawflies.

Research into management of sawflies will concentrate on several novel techniques:

- (1) augmentation of native natural enemies, especially predators which may feed on overwintering larvae in the soil.
- (2) alteration of substrate beneath birches to decrease survival of overwintering larvae. For example landscape fabric or a sandy substrate may adversely affect larvae.
- (3) Inoculation of soil beneath birches with parasitic nematodes that will destroy overwintering larvae.
- (4) trapping of adults during flight and oviposition period using sticky traps placed in the tree crown.
- (5) introduction of exotic parasitoids into Alberta to increase larval mortality. These parasitoids are native to Europe and cause high mortality among *F. pusilla* larvae there. We will attempt to establish these parasitoids on local populations of *F. pusilla*. Attempts will also be made to locate parasitoids of *P. thomsoni* in Europe and import them to Alberta. We expect that at least some of these strategies will be successful and can be widely applied for management of birch leafmining sawflies in the prairie provinces.

Further reading

Ives, W.G.H.; Wong, H.R. 1988. Tree and shrub insects of the prairie provinces. Can. For. Serv., Northern For. Cent., Edmonton, Alberta. Info. Rep. NOR-X-292.

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