

Eteobalea serratella Treit.

INVASIVE SPECIES ATTACKED: Dalmatian toadflax (*Linaria dalmatica* (L.) Miller)
Narrow-leaved Dalmatian toadflax
(*L. genistifolia* spp. *dalmatica* (L.) Maire & Petitm.)
Yellow toadflax (*L. vulgaris*) - preference

TYPE OF AGENT: Root feeding moth

COLLECTABILITY: Not established

ORIGIN: Italy and Serbia

DESCRIPTION AND LIFE CYCLE

Adult:

Eteobalea serratella adult moths have slender bodies measuring 8-9 mm long. Adults are black with yellow heads. Their black wings are covered with golden metallic flecks. They do not grow to their normal wingspan of 16-18 mm in crowded larval development conditions. Adults begin to emerge in early summer and live for about two weeks in the field (survival in the lab is up to four weeks). During this lifespan, they do not feed. Adults are weak fliers. Females emerge with up to 60 developed eggs and begin oviposition immediately. They will lay up to 180 eggs on the plant close to the stem base. The moths possess a good host finding ability, seeking new sites within short flights.

Egg:

The white, 0.3 x 0.5 mm eggs change to yellow as they mature. *E. serratella* eggs have parallel lines (striate), differing from *E. intermediella* eggs which have a network of irregular meshing lines (reticulate). Eggs hatch in 9 - 10 days at 25°C, most frequently during the night or early mornings. Just prior to hatching, red eye spots can be seen inside the egg. *E. serratella* eggs show less susceptibility to fungal attack than *E. intermediella*.

Larva:

The newly hatched larvae bore into the plant at leaf axils or other soft tissue points where entry is easiest. The larvae move downward to the root, feeding into the root crown and on small roots. They can mine all parts of the roots. The tunnels are lined with a silken substance. Multiple larvae can develop on a single plant, but the number depends on the plant and root size. Complete larval development takes 11 months and when mature they will be a maximum of 12 mm long. There is no rest period required for *E. serratella* as the larvae will continue to feed throughout the winter if temperatures and humidity are optimal. Excess soil moisture has a negative impact during larval development.

Pupa:

The larvae pupate within the silk tube.

Overwintering stage:

E. serratella overwinters in the larval stage and will continue to feed and develop as long as ideal conditions are present.

EFFECTIVENESS ON HOST PLANT

The larval stages, notably the later instars, cause destructive control. Overall plant production is reduced when plants have been attacked by *E. serratella*. Seed weight is most significantly reduced and the flowering and seed producing periods are shortened. Continued attack reduces the plants' ability to develop normally and, therefore, leads to a decrease in the number of new seedlings. In dry conditions, yellow toadflax can be killed.



Fig. 1. *E. serratella* adult (credit Powell et al. 1994)

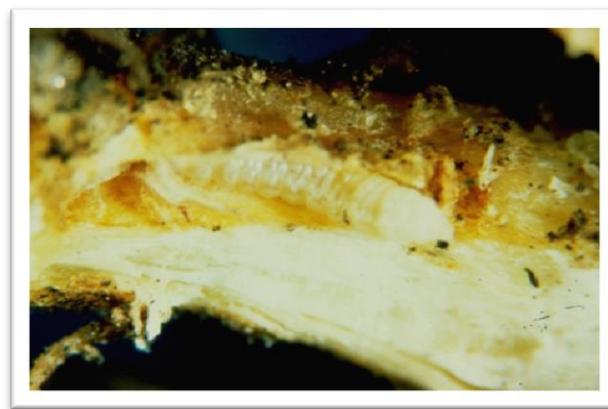


Fig. 2. *E. serratella* larva (credit Powell et al. 1994)

HABITAT AND DISTRIBUTION

Native:

In its native habitat, *E. serratella*'s locations are restricted to dry terrestrial sites, favouring the northern Eurasian areas that coincide with their host plant distribution. Potential suitable areas are grasslands, pastures, cropland and road or utility right-of-ways. *E. serratella* shows a preference for yellow toadflax over narrow-leaved Dalmatian toadflax.

North America:

Releases made in Canada and the U.S did not maintain long term establishment. Potential suitable sites could be similar to the areas they occur in Eurasia. *E. serratella* shows a preference for yellow toadflax over narrow-leaved Dalmatian toadflax.

British Columbia:

E. serratella were released in the Bunchgrass biogeoclimatic and Interior Douglas-fir zones. Insufficient populations developed to allow for field releases and further study, therefore, their preferred habitat is not known at this time.

BRITISH COLUMBIA RECORD

Origin:

E. serratella populations released in B.C. originate from Serbia and Italy. The population from Serbia was reared on Dalmatian toadflax.

History:

Three unsuccessful attempts to propagate *E. serratella* moths in rearing tents on Dalmatian toadflax and yellow toadflax were made in 1992, 1995 and 2004. In 2010, the plots were dismantled. No further efforts have been made to introduce *E. serratella* to B.C.

Propagation results:

In 1992, 180 eggs were received from Serbia stock via Agriculture and Agri Food Canada quarantine facilities in Regina. The eggs were incubated in the lab and the resulting 106 larvae were quickly transferred to host Dalmatian toadflax plants. In 1995, 1523 eggs were received in two shipments in August and within hours of receiving the shipment, the eggs were transferred onto yellow toadflax plants. This population went on to produce a small quantity of *E. serratella* that continued to survive for two years. After observing no adults in 1998, the plants were excavated and the roots were dissected but no larvae or feeding evidence was found. Establishment failure was determined to be the result of unsuitable habitat and the plots were discontinued. The third attempt was made in 2004 with plants obtained from Alberta that were potentially infested with *E. serratella* larvae. These plants were transplanted into a satellite rearing location northeast of Kamloops in what is considered ideal *E. serratella* habitat. From 2008 to 2009 plant roots were dissected in August to coincide with the mature larva stage, however, no larva or feeding evidence was found. In 2010 the plots were not tented and random excavations occurred in June, but, no larvae or feeding evidence was found. In 2010, the last rearing attempts for *E. serratella* were discontinued.

Field results:

No field releases were made in B.C.

NOTES

- *E. serratella* can exist with seed feeders *Brachypterolus pulicarius* and *Rhinusa antirrhini* (there is an adventive variety of *R. antirrhini* found on yellow toadflax).
- Yellow toadflax sites in south central B.C. should be treated with *E. serratella* from Rome, Italy.

REFERENCES

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2. Powell, G.W., A. Sturko, B. Wikeem and P. Harris. 1994. Field guide to the biological control of weeds in British Columbia. Min. For. Res. Program.
3. Saner, M. 1990. Impact of the root miner, *Eteobalea serratella* Tr. (Lep., Cosmopterigidae), on reproduction of the weed, *Linaria vulgaris* (Scrophulariaceae). In: Biology, Proc. Symp., Hungary, 39:531-532.
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