

Eteobalea intermediella Riedl.

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

TYPE OF AGENT: Root feeding moth

COLLECTABILITY: Not established

ORIGIN: Serbia (Yugoslavia)

DESCRIPTION AND LIFE CYCLE

Adult:

Adult *Eteobalea intermediella* have yellow heads and black wings marked with gold metallic flecks. Their normal wingspan is 16 to 18 mm, but decreases when the plant roots become crowded during larval development. The first adults emerge in the spring. Mating begins immediately after adults appear. The females emerge with 60 developed eggs and may produce up to 180. The eggs are oviposited in loose strings of three to eight into axils, or on rough surfaces on the soil within 10 cm of the plant. They remain non-feeding during their entire adult life, which normally lasts two weeks in the field (up to 4 weeks in the lab). Adults are weak fliers, taking short flights to seek host plants. In their native range, *E. intermediella* are capable of two or more generations. When two generations occur, the adults emerge in late spring. When multiple generations occur, the adults' will overlap.



Fig. 1. *E. intermediella* adult (credit Powel et al. 1994)

Egg:

The 0.3 x 0.5 mm white eggs have a network of irregular meshing lines (reticulate), differing from *E. serratella* eggs which have parallel lines (striate). Incubation lasts 9-10 days at 25°C, changing from white to yellow. Most eggs hatch during the night and early morning. Just prior to hatching, two red eye spots can be seen inside the egg. *E. intermediella* eggs require high humidity and are more prone to fungal attack than *E. serratella*.

Larva:

The newly hatched larvae move to leaf axils or other soft tissue points where entry is easy. They can mine all parts of the roots. The feeding tunnels are lined with a silken tube. Multiple larvae can develop on a single plant, but the number depends on the plant and root size. In studies, up to 28 (19 larvae, three pupae and six pupae casings) were present on narrow-leaved Dalmatian toadflax, whereas, only one or two were common on yellow toadflax (this test plant study did not include Dalmatian toadflax).

Pupa:

Pupation occurs within the silk tunnel. When temperatures remain at 20°C, the new adults emerge in 20 days. These will go on to produce a second generation of larvae which will then overwinter. Excess soil moisture negatively impacts larval development.

Overwintering stage:

Second (or later) generation larvae overwinter in roots.

EFFECTIVENESS ON HOST PLANT

The feeding larvae, notably the later instars, consume and destroy a significant amount of nutrient reserves, which reduce the upper vegetative and reproductive parts. Attacked plants will produce fewer stalks, leading to decreased seedling production.

HABITAT AND DISTRIBUTION

Native:

In Europe, *E. intermediella* has a wide geographic range, is common within the Dalmatian toadflax distribution and is frequently found throughout the western Mediterranean countries, east to Iran, into southern Russia and central northern France.

North America:

The distribution of Dalmatian toadflax growing in B.C. is beyond the native range for *E. intermediella* and its most northern latitude limits, however, the climates are equivalent. It is possible that *E. intermediella* will colonize Dalmatian toadflax in B.C., however it is not expected to survive elsewhere in Canada. Preferred plants have a 4 mm diameter root. Moist soils are not suitable.

British Columbia:

E. intermediella were released only into rearing tents in the Bunchgrass biogeoclimatic zone. Long term populations did not develop and no field releases have been made, therefore, habitat preferences cannot be clearly defined at this time.

BRITISH COLUMBIA RECORD

Origin:

E. intermediella populations in B.C. originate from Serbia (Yugoslavia).

History:

All releases of *E. intermediella* have been made into propagation tents planted with Dalmatian toadflax. The biocontrol agents arrived as eggs, neonate larvae, and adults beginning in 1991. Subsequent populations were added in 1992 to 1994, 1996 and 1998. No long term establishment occurred in B.C. as a result of any of the shipments received and released onto Dalmatian toadflax.

Propagation results:

In 1991, the first 389 neonate *E. intermediella* larvae were received and transferred into the Dalmatian toadflax tents. In 1992, a second shipment of 360 neonate larvae was received and once more transferred into the rearing tents. For several more years additional shipments of eggs and neonate larvae continued to be transferred into the tents, 480 (1993), 133 (1994) and 559 (1996), respectively. A final attempt to establish a population was made in 1998 with 94 adults. In rearing tents, small populations persisted from 1999 until 2002. In 2004 the tents were dismantled after no further evidence of survival was observed.

Field results:

No *E. intermediella* field releases have occurred in B.C.

NOTES

- *E. intermediella* is proposed for Dalmatian toadflax sites in British Columbia and south west Alberta.
- It can exist with seed feeders *Brachypterolus pulicarius* and *Rhinusa* species.
- *E. intermediella* populations from Novi Beograd, Yugoslavia may be best suited for south central British Columbia.

REFERENCES

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2. Saner, M., K. Groppe and P. Harris. 1990. *Eteobalea intermediella* Riedl and *E. serratella* Treitschke (Lep., Cosmopterigidae), two suitable agents for the biological control of yellow and Dalmatian toadflax in North America, Final Report. CAB International Institute of Biological Control European Station.
3. Saner, M. and D. Schroeder. 1988. Project proposal, study and screening of *Eteobalea serratella* and *E. intermediella*, two candidate biological control agents of Dalmatian toadflax, *Linaria dalmatica* in British Columbia. CAB International Institute of Biological Control European Station.