

***Aphthona flava* Guill.**

INVASIVE SPECIES ATTACKED: Leafy spurge (*Euphorbia esula* L.)
Cypress spurge (*E. cyparissias* L.)

TYPE OF AGENT: Root feeding flea beetle

COLLECTABILITY: Limited

ORIGIN: Hungary and Greece

DESCRIPTION AND LIFE CYCLE

Adult:

Adults are orange-coppery coloured and 2-4 mm long. Of all the biocontrol *Aphthona* species released in B.C., *Aphthona flava* is the largest, with females slightly larger than males. Typically the flea beetles emerge from the soil in mid-June through mid-August, and persist into the fall if the air is warm. In B.C. the adults have been found present from mid to late June through to mid-October. One week after emerging, females begin to oviposit the eggs in clusters of 20 to 30 in the soil near spurge stems. Egg-laying is done every 3-4 days, with females averaging 224 each over the 3.5 month period. Oviposition is intense for the first two months, tapering off thereafter. Adults are uniquely sensitive to air movement and shadows which enables them to better cope within grazed pastures where they readily jump to avoid being consumed. Adults can be found in sunlight and will move into light or filtered shaded areas.



Fig. 1. *A. flava* adult on leafy spurge

Egg:

The pale yellow, 0.7 x 0.4 mm eggs hatch in 20 days.

Larva:

Larvae are white and slender with brown heads and often found in a comma-like position. The youngest larvae feed on latex-free fibrous roots. The later instars feed on larger young roots. The larvae stage requires 168 days over 11°C. Once mature, they are hardy to -6°C. Active feeding lasts about 105 days before they construct and move into a soil particle chamber. Larvae that have not completed the required feeding before winter or fail to experience at least 4-months of 10°C or less will not mature.

Pupa:

Mature larvae pupate the following spring within the chamber. Pupation begins after 28-57 days of warm spring temperatures. *A. flava* will spend 20-25 days in pupae form before emerging.

Overwintering stage:

Larvae overwinter within the soil in soil particle chambers.

EFFECTIVENESS ON HOST PLANT

Larva feed on roots causing significant damage to the plant. Larvae feed on root hairs, young roots and parts of the main root, reducing the plant's ability to absorb moisture and accumulate nutrients.

Adult foliar feeding is quite impressive as they consume small leaves and buds. Each *Aphthona* species group feeds in a specific manner; brown coloured flea-beetles, including *A. flava*, feed on the leaf margins. Foliar feeding can impede the plants' photosynthesis and can cause nutrient starvation.

HABITAT AND DISTRIBUTION

Native:

In Europe, *A. flava* is found in Italy, Austria, southern Poland and Russia, Bulgaria and Romania. It is also present in the former Czechoslovakia and Yugoslavia.

North America:

A. flava require warm sunny locations where soils are sandy or coarse gravel. They prefer sites with a high water table, therefore, gullies and river valley bottoms are suitable. The flea beetles are often found on sites where widely spaced spurge grows near cottonwood trees. Of all the *Aphthona* species, they require more heat units for development. Short surrounding vegetation (grazed areas) can increase the heat at what would otherwise be non-suitable locations. A climate with a 4-month period of temperatures of 10°C or less is required for complete development. Like all *Aphthona* species, they too compete poorly where ant populations are present.

British Columbia:

A. flava has been released into the Bunchgrass, Interior Douglas-fir, Montane spruce, and Ponderosa pine biogeoclimatic zones. At this time it has established and dispersed into each except the Montana spruce zone which is believed to be outside of *A. flava*'s desired habitat. All the successfully established sites are hot locations with cottonwoods and/or water sources nearby and have an almost equal ratio of open canopy and lightly filtered canopy. One consistent feature at all successful locations is where the host plants are surrounded by a mix of other plants of similar height to the spurge including vegetative forbs and small shrubs. At one non-established Bunchgrass site, it is believed that the plant density is too high and, therefore, not desirable. The flea-beetles appear to favour widely spaced plants mixed with other vegetation.

BRITISH COLUMBIA RECORD

Origin:

A. flava released in B.C. originate from Hungary and Greece. The flea beetles were released in 1982 and 1983 near Cardston, Alta. and reared to collectable levels before they were shipped to B.C. from 1990 to 1995.



Fig. 4. Short term established *A. flava* release site near Kamloops (Ponderosa pine zone)

History:

The first *A. flava* release was made north-west of Clinton in 1990. No recovery has been found at this particular location. Subsequent releases from the Alberta population were made between 1992 and 1995 in the southern interior and have successfully established. In 1999, the first field collection was made from a small site near Kamloops that continues to provide populations for redistribution. A second Kamloops area field collection site has been used to supplement field collections for redistribution. By 2012, these collection sites provided sufficient adults to release into new sites in the Boundary and East Kootenay areas as well as supplementing the non-established Clinton area site. Additionally in 2012, a small population was tested on cypress spurge in the North Thompson area near Little Fort. Assisted redistribution is still on-going.

Field results:

A. flava has established at many of the sites revisited. Further work has been limited as many of the release sites have become developed and are no longer accessible. In the past, adults were located the first week of August, in recent years they have been observed earlier, with collections starting in mid-July. In 1998, a 1994 release site near Kamloops had no plants remaining, but by 2005 the plants had re-established as had the *A. flava* population. Since then, the site has remained intact and is used as a collection source for further redistribution. Sampling done in 2008, 2012 and 2013 indicates that *A. flava* is dispersing only slightly and may not disperse as freely as other *Aphthona* species. To date, few release sites show long term establishment and dispersal appears to be quite localized. It is not known if limited dispersal results are the result of the decline of the spurge



Fig. 2. Established *A. flava* release site near Cache Creek (Bunchgrass zone)



Fig. 3. Established *A. flava* release site on Cypress spurge near Little Fort (Interior Douglas-fir zone)

patches or if the agent prefers to not readily disperse itself. The 2012 release made on cypress spurge near Little Fort was found established in 2014.

NOTES

- *A. flava*'s ability to drop and leap away when threatened enables the adult to survive in a grazed environment.

REFERENCES

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