

Part I. Current projects in biocontrol of weeds

ON THE POSSIBILITY OF BIOLOGICAL CONTROL OF NORTH AMERICAN GOLDENRODS IN EUROPE

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Four or possibly more introduced species of the genus *Solidago* L. of the family Asteraceae occur in Europe. Some of them, namely *S. gigantea* Ait. and *S. canadensis* L. have become very serious weeds, especially on the most fertile forest lands - in inundated forests. During a stay in Canada I made a survey of phytophagous insects feeding on these species for the selection of suitable species for possible importation into Europe for biological control of goldenrods.

Insects injurious to root-stalks and roots

More than 50% of plants examined were injured by mining larvae of Lepidoptera and Diptera, but the only damage of any economic importance, was caused by three species of Tortricids, namely *Eucosma derelicta* Heinr. and *E. dorsisignatana similana* Clem., and less frequently, *Sonia canadana* McD. All hibernate as grown larvae and reach maturity during the sprouting of the host plant. The females presumably lay eggs on stalks close to the ground, since mining always starts from the lower part of the stalk downwards to the root-stalk, where the larvae hibernate. In spring mining leads upwards again and usually ends in the sprouting bud of the stalk, on removal of which the pupa or mature larva can easily be found.

Only the two species of *Eucosma* can be recommended as promising species for possible importation into Europe for further research.

Insects injurious to stalks

Here, the small larvae of mining Diptera were predominant, but the most conspicuous and more important were the gall-makers. The Tephritid fly *Eurosta solidaginis* Fitch. was the most common species and its galls, the size and shape of poppy-heads, are usually formed on the upper parts of the stalks. Its bionomy and ecology are relatively well-known (cf. Uhler, 1951; Miller, 1959). It is monovoltine, over-wintering as mature diapausing larva. Adults

are on the wing in the second half of May. There is a high mortality (over 75%) stated to be caused by the predacious larvae of the beetle *Mordellistena aspersa* Melsh. living in the galls, as well as through parasitism by Chalcids of the genus *Eurytoma*.

The second most common species was the gall-forming tortricid *Epiblema scudderiana* Clem., which broadens the stalk. It also hibernates as a mature larva or pupa in the gall. High mortality (almost 75%) is caused by larval predation, by birds and by parasites.

The least frequent gall-making species was the Gelechid moth *Gnorimoschema gallaesolidaginis* Ril., galls of which are more robust than those of the former species. It hibernates in the egg stage and larval feeding begins very early in the year and by the second half of May the galls are fully-grown. Pupation occurs in July or August and moths emerge in August and September. Moths hatched from only one quarter of the galls and from half parasites emerged; a quarter died from unknown factors.

Phytophagous insects found within the stalks are of less importance than those in the root-stalks, but they seem to be specific to *Solidago* and their importation into Europe - naturally without their natural enemies - may be considered.

Insects injurious to flowers and seed

A few gall-makers of the family Agromyzidae were found, but they are unimportant:

Insects injurious to leaves

Besides some incidental polyphagous insects, such as the Chrysomelid *Microrhopala vittata* F. or the Tortricid *Clepsis clemensiana* Fern., only one important species was found, the Chrysomelid *Trirhabda canadensis* Kby. Its life-history and ecology are given by Balduf (1929) and Marcovitch (1916). Hibernation occurs in the egg stage and the blue-black metallic larvae hatch at the end of May, with feeding concentrated on the top leaves. About the middle of June they pupate below the soil surface. The beetles fly from the beginning of August, when they also begin feeding. This is not as important as that of the larvae, but may have an effect. The light-brown eggs are laid in groups on the lower part of the stalk, mostly under dying leaves or in the sheaths.

This is probably the most promising species for possible importation into Europe, and hence starvation tests were undertaken with larvae and adults on 15 cultivated plants of various families. Both larvae and adults fed on all three species of *Solidago* tested; in addition larvae fed almost normally on *Aster laevis* L. Adults only nibbled on *Aster laevis* L. and on *Chrysanthemum indicum* L. These results were obtained from relatively little material and should be repeated on a larger scale.

References

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