BIOLOGICAL CONTROL OF GARLIC MUSTARD

Locations	Canada, United States
Dates	01/01/1998 - Ongoing

Summary

Crushed garlic mustard leaves and seeds smell like cultivated garlic and have been used as flavouring in cooking for centuries. Garlic mustard is a brassica from Eurasia that was accidentally taken to North America and became invasive in many of its forests. Together with partners, CABI is exploring the possibility of using specially selected and tested insects from the native range in order to safely control the plant's spread and impact in the introduced range.

The problem

Garlic mustard (*Alliaria petiolata*) is not related to garlic but is a biennial cruciferous (brassica) plant. Native to Eurasia, it was accidentally introduced to North America in the 19th century. It is one of the few non-indigenous herbaceous species that can invade and dominate the understory of North American forests and affect forest regeneration. It is considered one of the most serious invaders in the northeastern and midwestern USA and southeastern Canada. Several methods have been used to control its proliferation in natural areas; hand removal can be effective in small infestations, while fire, cutting and

herbicide treatments have been used to reduce densities in large infestations. However, these treatments are costly, need to be repeated over several years and may face regulatory restrictions.

What we are doing

This project to investigate the potential for biological control of the weed was initiated in 1998 by Prof. Bernd Blossey (Cornell University, USA). A team from CABI's centre in Switzerland has been surveying for natural enemies and assessing host specificity of selected insects.

Biological control is based on the concept that a plant may become invasive because of the absence of natural enemies that keep it in check in its area of origin. The project aims to identify and introduce host-specific natural enemies as biological control agents. A guiding principle is that an agent should not impact plants other than the target. Risk of non-target damage is assessed by testing whether a potential agent feeds or develops on other plant species.

By reviewing the literature, we found records of 69 herbivorous insect species and seven fungi associated with garlic mustard in Europe. 30 species were collected in subsequent field surveys in Switzerland, Germany, Austria and Daghestan (Russia) in 1998–2000. Six insects were prioritized as potential biological control agents: the root-feeding flea beetle, *Phyllotreta ochripes*, two shoot-mining weevils, *Ceutorhynchus alliariae* and *C. roberti*, two seed-feeding weevils, *C. constrictus* and *C. theonae,* and the root-crown weevil, *C. scrobicollis.*

Results so far

We have so far discounted four species: the flea beetle, *P. ochripes*, the stem-mining weevils, *C. alliariae* and *C. roberti* and the seed-feeding weevil, *C. theonae*.

A population model developed for garlic mustard using data from Esther Gerber's PhD study, created with CABI and developed by Adam Davis (USDA-ARS, Illinois), indicated that the root-mining weevil, *C. scrobicollis,* was the most suitable candidate for release so far. Combined with the seed feeder, *C. constrictus,* the two agents will potentially have a large impact on the garlic mustard demography.

The seed-feeding weevil, *C. constrictus*, has been tested in collaboration with the University of Minnesota, and a joint petition for release was submitted together with Dr Rob Bourchier (AAFC, Lethbridge). It was recommended by USDA-APHIS Technical Advisory Group in 2024 as a first step for the approval process in the USA, and it was approved for release in Canada in 2025.

In the US, the petition to release *C. scrobicollis* was recommended by USDA-APHIS TAG and under section 7 consultation by the US Fish and Wildlife Service. The weevil is now in the last phase of the approval process.

In Canada, the petition to release *C. scrobicollis* was approved by the Canadian Food Inspection Agency, and since 2018, it has been released in Ontario and British Columbia. Feeding data recorded from field release sites are encouraging. Weevils are currently being reared in Switzerland and Canada for further releases.

Donors

USDA-APHIS-CPHST, USDA Forest Service

Partners

University of Toronto, Canada, USDA-ARS, University of Minnesota, USA, Minnesota Department of Natural Resources, USA, Agriculture and Agri-Food Canada (AAFC)

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