

BIOLOGICAL CONTROL OF DIAMONDBACK MOTH IN CANADA

Locations	Canada
Dates	01/04/2014 - Ongoing

Summary

The diamondback moth is a global pest. Canadian farmers often have use chemicals to protect their crops. This is costly and the pest is becoming immune, meaning additional control options are needed. In Europe, Asia and Africa, *Diadromus collaris*, is a major parasitoid of the moth. It has been introduced to several countries or regions and has established as a successful biocontrol. CABI is therefore carrying out life table studies in Europe to determine if its introduction is a viable strategy.

The problem

The diamondback moth, *Plutella xylostella* (Lepidoptera: Plutellidae) attacks a wide variety of Brassica crops globally. It is likely that it was introduced to North America from Europe arounds 150 years ago where it now occurs throughout the continent wherever brassicas, its host plants, are grown.

In western Canada (Manitoba, Saskatchewan, Alberta and British Columbia) the moth mainly attacks canola (oil seed rape) and mustard crops, whereas in eastern Canada (Ontario, Québec and all Maritime Provinces) it is a pest of vegetable crops of the Brassicaceae family.

Populations regularly infest canola in the Canadian Prairies and this mostly has minor effects on the economy. In some years however, moth populations reach huge outbreak concentrations. In 1995 for example, more than 1.25 million hectares were sprayed with insecticide to control these pest populations which cost an estimated C$45 to C$52 million for producers. On an even greater geographic scale, an outbreak occurred in western Canada in 2001, where approximately 1.8 million hectares were treated with insecticide.

In some regions this pest however is now resistant to chemical insecticides. This limits farmers' control options and increases crop losses and production costs. So, additional sustainable control options are needed.

What we are doing

In Europe, Asia and Africa, *Diadromus collaris* is a major parasitoid of diamondback moth pupae. It has previously been introduced successfully in several countries or regions including Australia, Barbados, the Cook Islands, Malaysia and New Zealand. Here it has established and is controlling the moth as a 'classical biocontrol' in as sustainable and targeted way.

Diadromus collaris is not currently present in Canada, so a team from CABI are conducting life table studies in Europe to determine if the introduction of *D. collaris* populations from Europe is a viable strategy.

Results so far

Life table studies to determine the impact of parasitoids on diamondback moth populations in Europe were conducted in northwestern Switzerland between 2014 and 2016. Net reproductive rates were found to be <1 in seven out of eight life tables, suggesting that *P. xylostella* populations in Switzerland are mostly driven by immigration and recolonization. In total, seven primary parasitoid species and one hyperparasitoid were associated with the diamondback moth. Pupal parasitism by *D. collaris* reached up to 30%, but since generational mortality was mainly driven by abiotic mortality factors and predation of larvae, the overall contribution of pupal parasitism was low (<6%). In Canadian regions, where *P. xylostella* has increasing populations and low larval mortality, the addition of *D. collaris* may be a promising approach.

In 2021, we investigated if pupal parasitism by *D. collaris* varies with habitat. We exposed sentinel DBM pupae on cabbage plants in two canola fields in the Delémont valley and in parallel in two nearby forests to compare pupal parasitism by *D. collaris*. Parasitism in canola was 35% and 48%, whereas in forests it was 0% and 4%. The experiment was then repeated after canola fields were harvested. Parasitism in harvested canola fields was still 28% and 66%, but in forests parasitism increased to 26% and 38%, suggesting that after harvest parasitoids are more likely to search for hosts in bordering habitats.

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