Cutworms are present across the Prairies, and in some years some species of cutworms can reach levels that are of economic concern in field crops. Researchers conducted a five-year project across the Prairies to develop better identification tools and a better understanding of cutworm biology and their natural enemies. The project resulted in the development of a quick and easy molecular method available for adoption by service labs and an improved understanding of natural enemies that can help reduce the severity and duration of cutworm outbreaks. The research resulted in various extension activities and publications, including a book reporting on the identification and control of 21 cutworm pest species, which is available to farmers and producer groups at [http://saskcanola.com/quadrant/media/files/resource/pdfs/Cutworm-booklet-Final-EN-May1-2017.pdf](http://saskcanola.com/quadrant/media/files/resource/pdfs/Cutworm-booklet-Final-EN-May1-2017.pdf)

Cutworms are present across the Prairies, and in some years some species of cutworms can reach levels that are of economic concern in field crops. Researchers conducted a five-year project across the Prairies to develop better identification tools and to better understand cutworm biology and their natural enemies for improving monitoring and control in different crops.

The five-year project, initiated in 2012, was led by researchers at Agriculture and Agri-Food Canada in Lethbridge, in collaboration with many others including researchers at other AAFC research centres, at the University of Alberta, the University of Lethbridge, Alberta Agriculture and Rural Development and provincial entomologists from Alberta, Saskatchewan and Manitoba. The cutworm project had four main objectives: development of molecular tools for rapid and accurate identification of cutworms, obtain knowledge of natural enemies of cutworms in different crops and their role in control, development of tools and information to improve monitoring of cutworm species and their control, and development of extension tools for agronomists and producers.

1. Molecular tools for rapid and accurate identification of cutworms
Accurate and rapid methods of identification are required to maximize control methods during cutworm outbreaks. Some species of cutworm feed below ground, which negates the use of contact insecticides, while other species are nocturnal foliage feeders making contact insecticides best applied in the evening. Identifying the species of cutworm by
visual examination can be difficult, even for the experts. Molecular methods allow for accurate species identification of the cutworm, whether it is an egg, larva, pupa, or moth.

To accelerate species identification, a multiplex PCR molecular tool was developed to detect and identify five key cutworm species. These species are the redbacked cutworm (*Euxoa ochrogaster*), army cutworm (*Euxoa auxiliaris*), pale western cutworm (*Agrotis orthogonia*), dingy cutworm (*Feltia jaculifera*), and bristly cutworm (*Lacinipolia renigera*). This resulting molecular identification method allows for rapid and accurate identification of key cutworm pest species. The protocol for the quick and easy test will be released into the public domain and commercialized by service labs.

2. **Natural enemies of cutworms in different crops; role in control**

Researchers made field collections of cutworm larvae to obtain information on species’ biology and parasitoids, over three years. Collections of cutworm larvae were made in 2012, 2013 and 2014 in north, central and southern Alberta with additional collections from Saskatchewan.

Over the three years, parasitoids reared from these larvae included at least three species of flies and at least 13 species of wasps. *Copidosoma bakeri* was the most common parasitoid recovered and previously has been reported to be among the main parasitoids affecting cutworms on the Prairies. Parasitism averaged about 20 per cent during the three years, but occasionally was much higher depending upon year and site of collection. These results confirm the importance of parasitoids as natural mortality factors helping to reduce the severity and duration of cutworm outbreaks.

During the project, *Cotesia vanessae*, a European species of wasp parasitic on cutworms, was discovered for the first time in North America and tested for its ability to develop on different species of Lepidoptera. Results identified 33 new host species, including many of the key cutworm pest species affecting crops in Canada. This finding identifies the potential for *C. vanessae* to be distributed to regions where it does not already occur, to increase parasitism of cutworms and delay/reduce the severity of future outbreaks. Future research could be undertaken to determine the current distribution of *C. vanessae* in Canada to identify regions for potential introduction.

3. **Cutworm life history & development**

From 2012 to 2015, field and laboratory experiments were performed to develop tools and information to improve monitoring of cutworm species and their control using agronomic methods. Overall, the results showed that pheromone traps were more effective than food bait traps to monitor adult cutworm populations. The results also showed that the use of fertilizer was associated with increased oviposition by bertha armyworm on canola. In tests on true armyworm, spring wheat was found to be less suitable for development than winter wheat, feed barley or malt barley.

The use of fertilizer also increased larval developmental time and weight. Larval weight of pale western cutworm was greatest when reared on wheat, and then canola and peas. Redbacked cutworm larvae developed more rapidly and attained greater pupal weights
when reared on canola than on wheat. Larval development of redbacked and pale western cutworms was greatest when reared on fertilized versus non-fertilized plants (canola, wheat). For a clubroot resistant variety of canola, oviposition by bertha armyworm was greater on infected plants. For a clubroot susceptible variety of canola, oviposition by bertha armyworm was greater on uninfected plants.

4. Extension tools
The information and results of the project have been published and presented in various publications and at numerous producer workshops and meetings. A book targeting farmers and producer groups reporting on the identification and control of 21 cutworm pest species, *Cutworm pests of crops on the Canadian Prairies: identification and management* will be available for electronic distribution before the 2017 growing season.

**Publications**


