



Wheat Midge Parasitism in the Peace River Region of Alberta

CATEGORY [insects](#) | October 18, 2023

Wheat midge parasitism was found to be as high as 71% in the Peace River region of Alberta. Parasitism was primarily by *Macroglenes penetrans*, the main parasitic wasp species that attacks wheat midge on the Canadian Prairies. A parasitic wasp species, *Inostemma walkeri*, was newly discovered in wheat midge for Canada and North America.

Wheat midge (*Sitodiplosis mosellana* (Géhin)) is a major pest in wheat on the Canadian Prairies. Wheat midge larvae feed on developing wheat kernels resulting in shriveled and misshapen kernels. Damaged kernels are lighter and are often lost during harvest resulting in yield loss. Additionally, damaged kernels remaining in the harvested grain contribute to downgrading of wheat quality. While wheat midge outbreaks have been documented in Saskatchewan and Manitoba since the 1980s, outbreaks of this pest in the Peace River region of northern Alberta and British Columbia were only first reported in 2011, although it is suspected that wheat midge was present at undetectable levels before then.

Natural control of wheat midge larvae by parasitic wasps has been estimated to control an average of 20–45%, and upwards of 62%, of the wheat midge population every year in Saskatchewan. Female parasitic wasps lay their eggs inside the wheat midge eggs and larvae. The immature wasp overwinters inside of the midge larval host, completing its development and emerging as an adult from its host the following spring. The primary parasitic wasp present on the Canadian Prairies is *Macroglenes penetrans* (Kirby). Another parasitic wasp, *Platygaster tuberosula* (Kieffer), can also be found near Langenburg, SK, where this species was released for biological control of wheat midge in the early 1990s. A third wasp species, *Euxestonotus error* (Fitch) is commonly reported attacking wheat midge in southern British Columbia. Due to the more recent discovery of wheat midge in the Peace River region compared to the rest of the Canadian Prairies, little information about wheat midge parasites is known for this area of western Canada.

As part of a larger effort to assess the pest status of wheat midge across the Peace River region's northern short-season growing environment, wheat heads from non-midge tolerant varieties were collected from commercial fields across the Peace River regions of AB and BC in 2016 and 2017. In total, 6000 wheat heads were collected from 11 fields in 2016 and 3000 wheat heads were collected from an additional 11 fields in 2017. The wheat heads were dissected and recovered midge larvae were overwintered. Parasitic wasps emerging the following spring were collected and identified.

Impact of parasitism on wheat midge populations in the Peace

Parasitism of wheat midge larvae ranged from 39 to 71% in 2016 and from 36 to 71% in 2017. The recovery of wheat midge larvae, and any subsequent parasitoids, from the wheat heads ranged from 1 to 285 larvae per 100 wheat heads. Observed wheat midge larval density was lower than expected and may have been related to prolonged diapause, mechanical injury during sieving, or desiccation of larvae in the wheat heads in the time between collection and processing. Despite the low larval density, parasitism was high, indicating that *M. penetrans* can contribute substantially to the control of wheat midge populations in the Peace River region.

A new parasitic wasp species is discovered for North American wheat midge

All of the parasitic wasp species recovered were *Macroglenes penetrans*, except for one wasp collected near Guy, AB, in 2017, which was identified as *Inostemma walkeri* Kieffer (Figure 1). This wasp is shiny, black and extremely small (0.9 mm long). Females have a long horn that extends from the top of the abdomen towards the head and contains a long ovipositor to help parasitize hosts in hard-to-reach places. This discovery of *I. walkeri* is the first report of this wasp species in North America, as well as the first report of this species in wheat midge globally. *Inostemma walkeri* has been found in Europe and Israel where it was reared from different midge species in oilseed rape

and lemons. This finding suggests that *I. walkeri* is a generalist parasitoid, and not necessarily specific to wheat midge as a host. However, more research on the Canadian prairies is needed to confirm how widespread this new parasitoid-host interaction is and what impact it has in other wheat production regions of Canada.

Parasitism of wheat midge by *Macroglenes penetrans* demonstrates the benefit of biological control agents when it comes to wheat midge populations in the Peace River region of Alberta. The degree of parasitism observed in this study revealed that *M. penetrans* followed, established, and is capable of a high level of control of its host over a relatively short time span of five to six years following initial damage reports in 2011. The discovery of a new parasitic wasp, *Inostemma walkeri*, at one location (the first reported in North America) and first report of this species parasitizing wheat midge worldwide was an exciting surprise.

The findings reinforce that wheat producers can benefit from these tiny parasitoid wasps. It also means the adoption of wheat midge management strategies, including practices that preserve and promote parasitoid populations carry value. Practices like planting midge tolerant wheat varieties, scouting diligently, adhering to economic threshold guidelines, plus avoiding foliar insecticide application after flowering is complete all preserve and bolster parasitoid control in wheat fields. As wheat cultivars and Canada's wheat growing regions continue to evolve, future research assessing the distribution and level of control provided by *I. walkeri* and other parasitoids of wheat midge will continue to benefit producers aiming to produce high yielding and high quality wheat.

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Dufton, S.V., Laird, R.A., Floate, K.D., Otani, J.K. 2021. Diversity, rate, and distribution of wheat midge parasitism in the Peace River region of Alberta, Canada. *The Canadian Entomologist*. 153 (4): 461 – 469. (Published Online 2021Apr14). <https://www.doi.org/10.4039/tce.2021.7>

For a global review of wheat midge and the most recent Canadian wheat midge management strategies, please see the following article:

Dufton, S.V., Olfert, O.O., Laird, R.A., Floate, K.D., Ge, X., Otani, J. 2022. A review of the global distribution of orange wheat blossom midge, *Sitodiplosis mosellana* (Géhin) (Diptera: Cecidomyiidae) and integrated pest management strategies for its management. *The Canadian Entomologist*. 154 (e30): 1-34 (published online 2022Jun21). <https://www.doi.org/10.4039/tce.2022.15>

PHOTO: Female *Inostemma walkeri* collected from a wheat field near Guy, AB in 2017. Source: Shelby Dufton (Agriculture and Agri-Food Canada, Beaverlodge)

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