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Title: Ecology of swede midge host plant interactions

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Research Abstract

The swede midge, *Contarinia nasturtii* (Diptera: Cecidomyiidae), is an invasive insect pest of canola (*Brassica napus* L. and *B. rapa* L.) and other brassicaceous vegetable crops in Canada. It has caused serious damage to canola crops in eastern Canada and is expected to have similar effects on canola production in western Canada if populations become established on the prairies. Feeding by swede midge larvae results in damage to its host plant, with typical damage symptoms including crumpled leaves, swelling of buds or petioles, corky scarring, and death of the meristem.

Very little is known about the chemical ecology of swede midge, its host plant range on the prairies, or how susceptible and resistant plants react to swede midge infestation. The purpose of this project was to learn more about swede midge ecology. To do this, our project studied: (1) the host range of swede midge with emphasis on common brassicaceous weeds found on the Prairies; (2) host plant resistance in these weed species; (3) the potential biochemical basis of resistance; and (4) the factors that make plants susceptible to swede midge damage.

Eleven potential host plants of swede midge that are commonly found on the prairies were studied. We found that adult swede midge would lay eggs on all of these species, except for flixweed (*Descurainia sophia*) (Figure 1). Swede midge preferred to lay eggs on *B. napus* and *S. alba* and had less preference for *Camelina microcarpa*, *Lepidium densiflorum*, and *Arabidopsis thaliana*. These non-preferred plants might have qualities that make them resistant to swede midge; however, glucosinolate content of the plants does not appear to play a role in swede midge host plant choice. Other mechanisms of resistance need to be investigated. Investigation of infested *B. napus* (AC Excel) at the gene-level revealed that swede midge larvae triggered a plant defense response. However, the response by the plant was not sufficient to kill swede midge larvae. Other genes associated with plant cell structure and development were also highly expressed in infested plants; their role in plant response to swede midge infestation requires further study and may help improve our understanding of midge/host plant interactions that could contribute to future development of resistant host plants.

In conclusion, the majority of brassicaceous plants that grow on the prairies, both weeds and crops, can support swede midge larval development. Flixweed is the only non-host plant we identified. If swede midge become established on the prairies, control of these weeds and volunteer Brassicaceae crop plants will be important in managing swede midge populations. Our project identified several 'non-preferred' host plants. Studying their response to swede midge infestation, as well as the response of crop plants to swede midge infestation might help identify resistance genes, but this requires additional research.

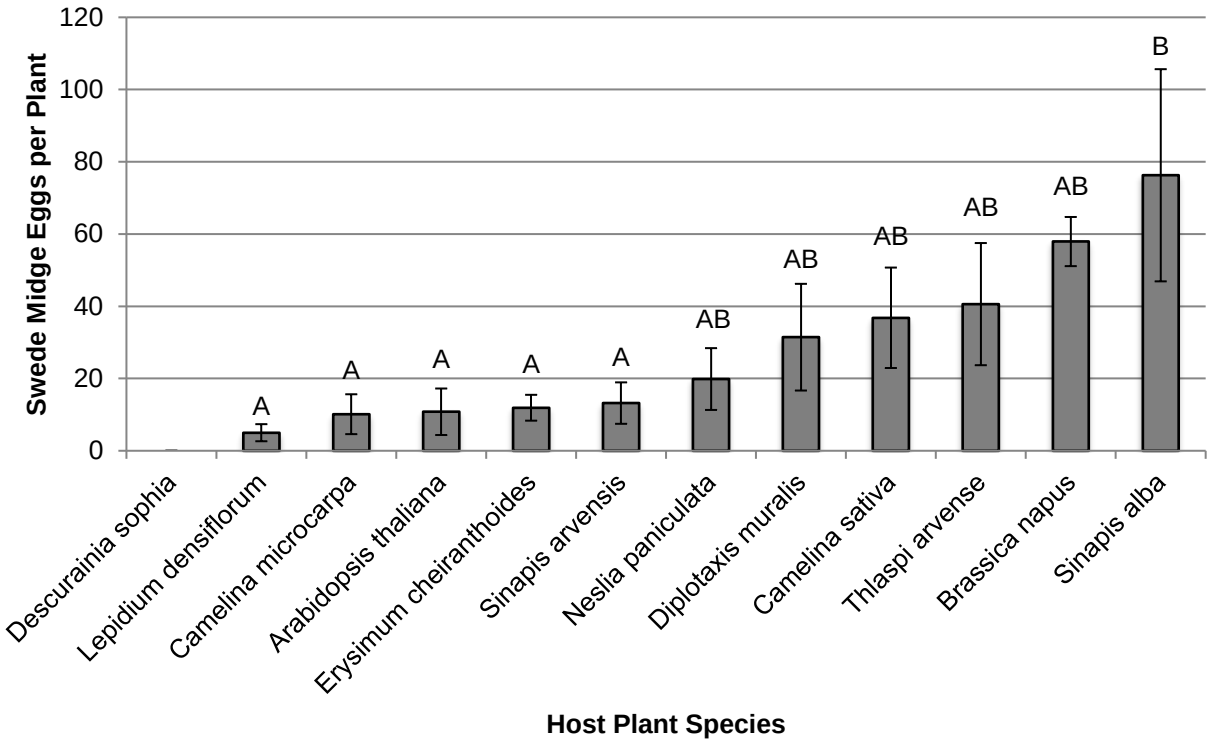

Figure 1. Mean (±SE) eggs laid per plant on 12 species of potential larval hosts of swede midge in a no-choice laboratory bioassay; flixweed (*Descurainia sophia*) was not an acceptable oviposition host. Means with the same letters are not significantly different ($p > 0.05$).

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