SWEDE MIDGE IN CANOLA INFOSHEET

Tracey Baute, Meghan Moran *(Ontario Ministry of Agriculture, Food and Rural Affairs) and*
Dr. Rebecca Hallett *(University of Guelph, School of Environmental Sciences)*

Swede midge, *Contarinia nasturtii,* native to Eurasia, was first found in North America on cruciferous vegetables (Brassicaceae) in Ontario in 2000. Since then, it has spread to Quebec, Nova Scotia, PEI, Manitoba, Saskatchewan and several U.S. states. It first appeared in canola in Ontario in 2003. Yield impact on canola has been variable and is strongly dependent on midge population levels, timing of infestation relative to plant stage and timing of insecticide application. Extreme swede midge populations in Northeastern Ontario resulted in the Ontario Canola Growers' Association strongly recommending that producers avoid growing canola for 3 years in the New Liskeard area in an attempt to suppress swede midge populations.

Identification: The adult swede midge is a tiny light brown fly roughly 1.5–2 mm (1/16 in.) (Figure 1). It is difficult to properly identify from other closely related midges. Larvae are small (0.3–3 mm), transparent, off-white-to-yellow maggots that are hidden within the growing point of the plant (Figure 2).

Figure 1. Adult swede midge
Photo credit: D.K.B Cheung

Figure 2. Swede midge larvae
Photo credit: D.K.B Cheung

Life Cycle: There are four to five overlapping generations per year in Ontario starting in mid-May until October (Figure 3). Each generation can take 24 to 31 days to complete, depending on temperature. Swede midge overwinters as a larva in a cocoon in the soil, pupating in the spring before emerging as an adult. First adult emergence is in mid- to late May, though not all swede midge emerge at the same time. There are two main emergence phenotypes that have their first peaks about 10-14 days apart in late May to early June. Rainfall totaling 6mm or more over a 7 day period triggers emergence. Adults live for only 1 to 3 days and, although considered to be relatively weak fliers, they are capable of moving several hundred meters and can be carried much further by wind. Females are ready to mate on the same day they emerge, laying their eggs in clusters of 20-50 eggs on the youngest, most actively growing portions of the host plant. Larvae hatch from the eggs and feed in clusters on the growing point of the plant. Larvae may feed for 1 to 3 weeks, depending on temperature. Once mature, the larvae drop to the top few centimeters of soil to pupate for two weeks until emerging as an adult. Some larvae of every summer generation will enter diapause with increasing numbers as day length shortens in late summer. Some midges (2-10%) remain in diapause for two years, possibly more.

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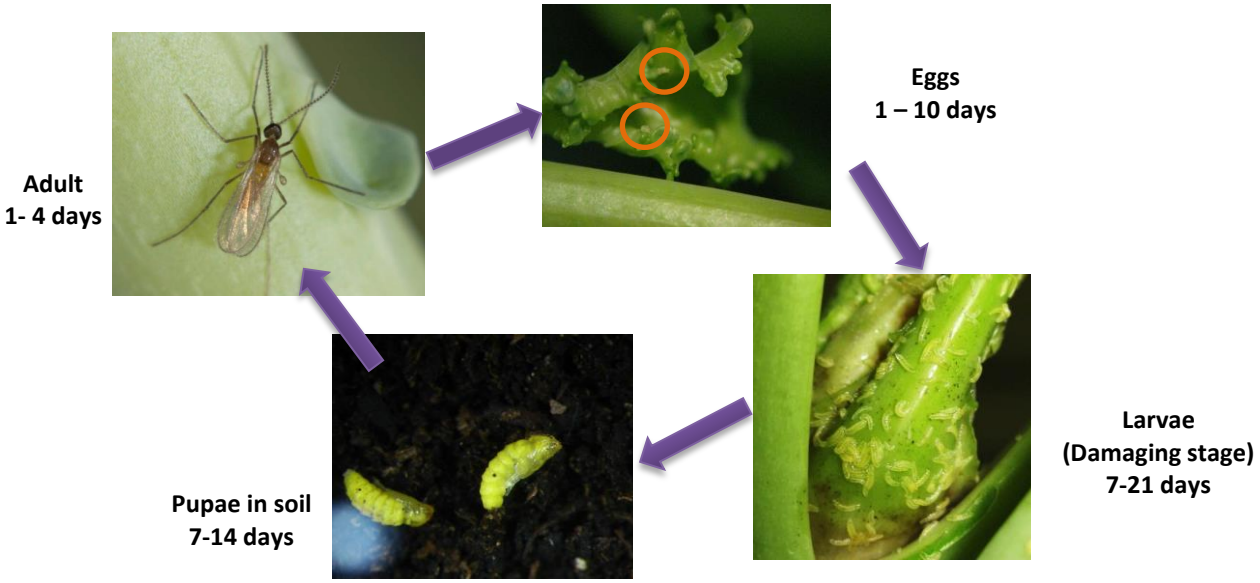

Figure 3. Swede midge life cycle. Three to four generations per year in Ontario. Photo credits: Adult - D.K.B Cheung; Eggs, Larvae and Pupae - L. Des Marteaux

Damage: Enzymes in the saliva of the larvae break down plant tissue, resulting in swollen and distorted leaves, shoots and flower buds (Figure 4). On young plants, the main growing point of the plant may die, preventing bolting and producing blind heads. Secondary racemes may develop from the destroyed primary shoots which prolongs days to maturity. It may take 5 or more days for damage symptoms to become apparent and damage will remain until harvest. On injured plants, pull open growing points that show symptoms and look for small maggots feeding within. This will confirm that injury was caused by swede midge and was not due to herbicide application or mechanical injury. However, as damage is persistent, larvae may have already left the plant for pupation. Damage before bolting may lead to stunting of the plant and bunching of pods at the top of the stem like a bouquet or witches' broom (Figure 4 e). If the canola plant is beyond the bolting stage (GS 30-39 or 2.1-2.10) before the midge infests the plant, the impact is usually not as extreme, but any developing bud tissue in the leaf axils will be susceptible to infestation. Winter canola may experience some swede midge damage in the fall, but tends to avoid much of the injury in the spring and summer because plants are at an advanced growth stage when exposed to swede midge.

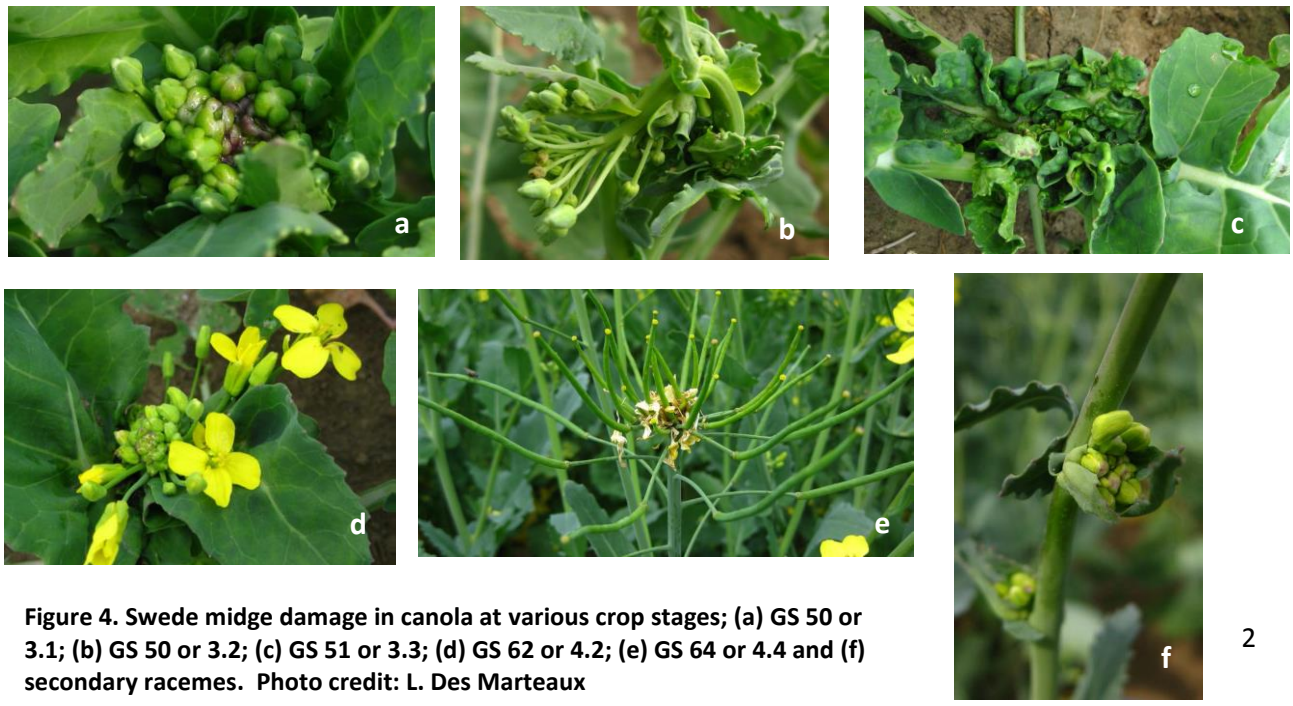

Figure 4. Swede midge damage in canola at various crop stages; (a) GS 50 or 3.1; (b) GS 50 or 3.2; (c) GS 51 or 3.3; (d) GS 62 or 4.2; (e) GS 64 or 4.4 and (f) secondary racemes. Photo credit: L. Des Marteaux

Risk Factors for Swede Midge:

- Canola fields grown in areas of known infestation, within close proximity to last year's canola crop or other cruciferous crops (eg. broccoli).
- Less than 3 years rotation of a field out of canola.
- Late planted fields are most at risk as they will be in the younger vulnerable stages of the crop when adult activity is peaking (late May to mid-June). Early-planted spring canola incurs much less damage than late-planted canola.
- Canola fields under stress from other factors (i.e. poor emergence, heat, dry conditions, poor soil fertility, flea beetle injury).
- Fields adjacent to cruciferous weeds and cover crops including mustard (i.e. wild, white, black, brown, garlic, hedge, etc.), hoary alyssum, stinkweed, penny-cress, wild radish, tillage radish, shepherd's purse, yellow rocket pepper-grass and volunteer canola.

Scouting: This pest requires intensive monitoring and management to protect the crop from injury. Swede midge scouting focuses on monitoring for the adults using pheromone traps (Figure 5). Larvae are difficult to see or may have exited the plant before the damage is observed.

Begin trapping in early May, as soon as seedlings have emerged in order to determine when first adult emergence or arrival has occurred and when thresholds are reached. Start monitoring traps when plants have one true leaf and continue until the crop is in full bloom. As swede midge numbers can increase to threshold levels quickly, it is important to check traps regularly (every 2 days) to determine the number of adults captured per trap per day.

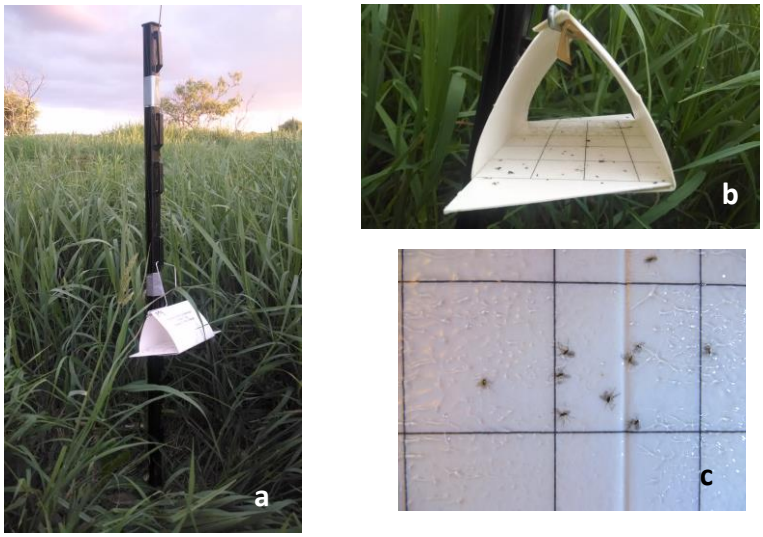

Figure 5. (a) Each swede midge trap is placed on a stake and hangs no higher than 25 cm from the ground. (b) The lure is positioned on the inside ceiling of the trap and is replaced every 4 weeks. (c) A sticky lining is positioned in the floor of the trap and are checked and replaced at least twice a week, counting the number of midge found per trap per day. Photo credits: a & b – J. Williams; c – J. D. Heal

Swede midge traps can be purchased at Solida: www.solida.ca. For each field, monitored for an 8 week period, the following supplies are required:

- 4 white Jackson traps per field
- 66 liners (=2 liners changed twice a week for 8 weeks + 2 extra)
- 8 pheromone lures (one per trap, changed after 4 weeks of use)

Other supplies needed include 4 stakes per field (preferably rotational pasture stakes) and some binder clips. Place each stake at least 200 feet apart from each other along the field perimeter. Expand each

trap into a triangle. Slide the sticky liner face up into the floor of the trap. Fix the lure onto the metal clip provided by the trap supply company and hang the clip so that the lure is positioned along the inside ceiling of the trap. Use the larger metal hanger also provided to hang the trap so that the bottom is no higher than 25 cm from the ground. Use a binder clip to secure the trap on the stake in case of wind. Change the inner sticky liners of the trap each time you check them (every 2 to three days). Lures also need to be changed every 4 weeks.

Threshold: Once seedlings have one true leaf, begin counting the number of midges captured in each trap and add them together. When a total of 20 adults have been captured from the start of trapping, the first insecticide application is required. Subsequent insecticide treatments may be necessary if an average of 5 adults per trap per day are caught and the canola is still in pre-flowering stages. To determine this, count the total number of midges captured per trap and divide by the number of traps and the number of days since you last counted. Make the insecticide application as soon as possible once the threshold has been reached. Do not use damage symptoms to time spray applications.

Management Strategies

Prevention and Cultural:

- Crop rotation is very important. In fields with known infestations, rotating out of canola and other crucifer crops for at least 4 years is the best strategy.
- Avoid planting canola closer than 2km from the nearest canola field or from the previous year's field.
- Control all cruciferous weeds and cover crops in and along field perimeter that can act as alternative hosts, including mustard (i.e. wild, white, black, brown, garlic, hedge etc.), hoary alyssum, stinkweed, penny-cress, wild radish, tillage radish, shepherd's purse, yellow rocket pepper-grass and volunteer canola.
- Plant spring canola as early as possible to avoid the crop being in the most vulnerable stage in early June. If fields cannot be planted early, consider planting a different crop that is not a host to this pest. The crop is most vulnerable during the vegetative (rosette) stage to the green bud stage (GS 11 - 51 or 2.0-3.3) when tiny flower buds are developing in the centre of the plant and during secondary bud development (GS 58).
- Clean all farming equipment that is used in infested fields. Leave infested fields until last when working in fields to reduce the risk of spreading the insect to non-infested fields. As swede midge overwinter and pupate in the top 1-2 cm of soil, cocoons can easily be picked up on wheels and moved to other locations.
- Tillage shortly after harvest may help reduce overwintering populations.

Biological Control

- Parasitic wasps that attack swede midge were recently found in Saskatchewan and Quebec canola fields. Research is underway to determine their presence in Ontario. Insecticides negatively impact any potential natural enemies so only apply insecticides when pest thresholds have been reached.

Chemical Control

- Spray immediately once thresholds are reached.
- Currently registered products do not provide 100% control.
- Matador/Silencer (ai: lambda-cyhalothrin) and Coragen (ai: chlorantraniliprole) are registered for swede midge on canola.

- When using Matador or Silencer which are pyrethroids, avoid spraying in the heat of the day. Spray in the evening or early morning before day temperatures rise. Efficacy decreases as temperatures increase.
- A surfactant must also be used with Coragen. Thorough coverage is important to obtain optimum control. Do not use Coragen within 60 days of planting with either Lumiderm or Fortenza (also from Group 28 diamides) seed treatments that season.
- Use high water volumes (≥200 litres/ha) and smaller droplet size to ensure good coverage and penetration of crevices were swede midge larvae are feeding.
- Multiple treatments are likely necessary. Leave a minimum interval of seven days between treatments.
- Rotate chemistries to avoid resistance.
- For further information on rates and label precautions, refer to the OMAFRA Publication 812, Field Crop Protection Guide: http://www.omafra.gov.on.ca/english/crops/pub812/p812toc.html

Other Resources:

OMAFRA Publication 811, Agronomy Guide for Field Crops:
http://www.omafra.gov.on.ca/english/crops/pub811/p811toc.html

OMAFRA Publication 812, Field Crop Protection Guide:
http://www.omafra.gov.on.ca/english/crops/pub812/p812toc.html

Ontario Canola Growers: http://www.ontariocanolagrowers.ca/

Field Crop News: http://fieldcropnews.com/

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