VEGETABLE CROPS

INSECTS OF CRUCIFERS
Swede Midge
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CORNELL Cooperative Extension

IPM Integrated Pest Management

Entomology Department Geneva

Swede Midge (also known as the cabbage crowngall fly and cabbage gall midge)

Contarinia nasturtii (Keiffer)

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The swede midge has been confirmed to be present in Ontario, Canada, where it has caused serious losses in cole crops. Because of environmental similarities and the potential for movement of plants and soil between Canada and New York, there is concern that the swede midge may become present in New York. In the summer of 2002, there was a large-scale effort to scout fields of commercial cruciferous vegetables in western New York for swede midge. As of September 2002, no infested plants were found.

The swede midge occurs in Europe, as well as southwestern Asia and appears to feed only on plants in the family *Cruciferae.* In Europe, it is considered an endemic and common pest of cruciferous vegetable crops (e.g. cabbages, cauliflower, broccoli, and Brussels sprouts), often causing severe losses. It has also been reported on rutabaga, turnip, radish, horseradish, kale, canola, collard, field mustard and many common weed species, including pennycress (*Thlaspi arvense*), wild radish (*Raphanus raphanistrum*), and shepherd's purse (*Capsella bursa-pastoris*). It was not known to occur in North America until it was found on broccoli in 1996 in Ontario, Canada.

Description and Life Cycle

The adult (Fig. 1) is a small (1.5-2 mm), light brown fly (midge) indistinguishable from many other small midges except by a specialist. The adults appear in the spring from pupae, which have spent the winter in the soil. Adult flies mate soon after emergence and females then begin to look for suitable hosts. Adults are not strong fliers. Females lay their eggs in clusters of 2-50 eggs, with each female laying about 100 eggs

Fig. 1. Swede midge adult.

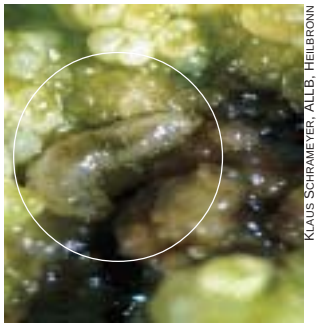


Fig. 2. Larva of swede midge.

Fig. 3. Growing tip of broccoli infested by larvae (circles).

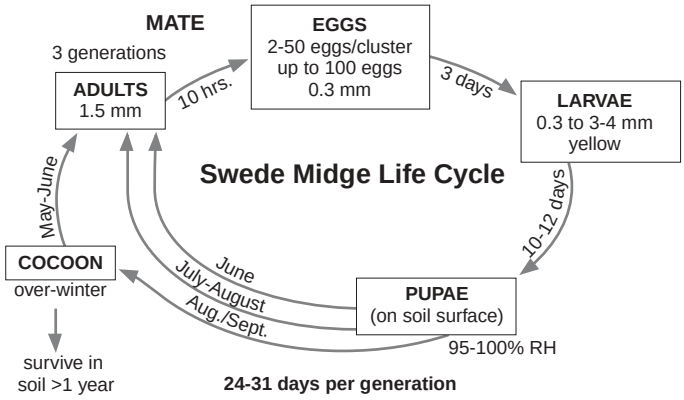
Fig. 4. Twisted leaves and brown scarring in the growing tip of cauliflower.

Fig. 5. Leaf puckering in cabbage.

Fig. 6. Blind head, swollen leaf bases, and brown scarring in red cabbage.

Fig. 7. Multi-headed cabbage.

Fig. 8. Multi-stemmed broccoli.



during her short (1-5 day) lifetime. Eggs are very small (0.3 mm), transparent in color when first laid but change to a creamy white color as they mature. Eggs are typically laid on the growing point of the plant (apical meristem). After a few days, depending on the temperature, the larvae hatch from the eggs and begin to feed on plant tissue. They feed typically in groups about the growing point of the plant. Larvae are small maggots initially about 0.3 mm in length before reaching their final size of 3-4 mm (Figs. 2, 3). Larvae can be seen with the naked eye. They are transparent and become increasingly more yellow with age and are lemon-yellow at maturity.

Depending on the temperature, larvae can complete their development in 7-21 days after which time they drop to the ground and become pupae in the soil. Adults can emerge from the soil within two weeks, again depending on temperature, and start the cycle again. In the fall, however, the pupae will sense the short day length and go into a state of diapause to spend the winter. It has been reported that some overwintering pupae can survive in the soil for more than a year. Pupae also need very humid conditions to emerge. Depending on temperature, the swede midge may have up to 5 overlapping generations per year in Europe (in Ontario, Canada it appears there are 3-4 overlapping generations).

Damage

Swede midge injury is difficult to diagnose because there are similar abnormalities which can be caused by other factors including mechanical injury from cultivation, insect and animal feeding, molybdenum deficiency, herbicide injury, genetic variation of the plant, and heat or cold stress. For confirmation of injury due to swede midge, the larvae should be dissected from the plant tissue. During feeding, larvae produce a secretion that breaks down the plant surface and liquefies the contents of the cell. Their feeding results in changes in the physiology of the plant and the formation of leaf and flower galls and a misshapen growing point of the plant. Damage caused by the feeding of swede midge larvae results in several early symptoms. The growing tip may become distorted and produce several growing tips or none at all, young leaves may become swollen, crinkled or crumpled and brown scarring may be seen on the leaf petioles or stems (Figs. 4, 5, 6). This early damage may result in the production of multi-stemmed plants or multiple heads later in the season (Figs. 7, 8).

How to Scout

Monitoring the adults using traps is very difficult since there are several similar looking midge species. Even low trap catches may not provide a good indication of the damage that is occurring in the field. Careful examination of young plants that show some unusual growth habits, especially at the growing point, is the best method. The main growing point and any side shoots should be examined carefully for damage and larvae. Brown, corky scarring is a key indication of the insect's feeding activity. It is easiest to find larvae prior to head development, i.e. the pre-cupping stage. Injury most frequently occurs at the borders of the field, especially near sheltered areas such as tree lines, so special attention should be paid to these areas. Suspected plants should be examined for the presence of larvae. Plant parts suspected to be infested can be examined with a hand lens for the presence of larvae, or plant material can be placed in black plastic bags and left in the sun for several hours. The high temperatures will cause the larvae to leave the plant and they then can be seen on the inside of the bag.

Management

The best management is to limit the spread of the pest since it is difficult to manage once it becomes present in an area. Because the adults are weak fliers, the primary avenues for introduction are believed to be through the movement of transplants, which may contain eggs or larvae, or soil, which may contain pupae. Since the pupae are located near the soil surface, working the soil will reduce the number of viable pupae. Since adults do not travel far, rotating a field to another non-cruciferous crop will also reduce the likelihood of infestation. Insecticides are used with some success to kill adults or prevent them from laying viable eggs. In Europe, degree-day models are used to time the application of non-systemic sprays against the peak flights of adults. Control of the larvae is much more difficult since the insecticide needs to enter the plant tissue where the larvae feed. Efforts are underway in several laboratories to evaluate the most effective use of insecticides against the swede midge.

What to do if you see injury?

If you suspect injury, contact your local Cornell Cooperative Extension Office.

For further information

www.gov.on.ca/omafra/english/crops/facts/swedemidge.html
www.inspection.gc.ca/english/ppc/science/pps/datasheets/connase.shtml
www.inspection.gc.ca/english/corpaffr/newcom/2002/20020529e.shtml
www.inra.fr/Internet/Produits/HYPPZ/RAVAGEUR/6connas.htm

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