New Developments for Managing Swede Midge in Brassicas on Small Organic Farms

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Introduction
Swede midge is an invasive insect pest threatening the viability of organic production of brassica crops in the Northeastern U.S.

- Swede midge (SM), Contarinia nasturtii, attacks all Brassica crops, including broccoli, cauliflower, cabbage, kale, kohlrabi, etc., as well as canola and mustard-type weeds.
- SM is a fly that lays eggs in the meristems of these crops, and instars of the feeding midge/larva cause scarring and distortion of plant tissues, including lack of head formation, resulting in unmarketable crops.
- Larvae pupate in the soil and emerge as adults with 4-5 overlapping generations per year.
- Once SM becomes established, it can cause complete loss of marketable crops.

Small Organic Farms Highest Risk for Economic Losses from Swede Midge
- Multiple plantings of brassicas in close proximity from early spring to late fall provide constant supply of suitable host(s) that allow SM to flourish.
- Organic vegetable farms tend to have a relatively small land base, sometimes less than 2 acres, which is simply not enough area for crop rotation to be effective.
- Conventional production of brassicas allows for the use of systemic insecticides that are very effective at controlling SM. Unfortunately, none of the OMRI-listed insecticides are systemic or consistently effective.

In Northeast U.S.:
- Brassicas are grown on 62% of organic vegetable farms and are critical for these farms to earn income.
- 663 acres or $2.5 million in just organic broccoli, cabbage and cauliflower, grown on 364 farms are at risk.
- New York accounts for 79% of this production.

Urgent Need: To develop effective pest management tools for small organic growers to protect them from devastating swede midge outbreaks

Method
From 2015 to 2017, SM was studied on seven small organic farms that were suffering economic losses from SM in six New York counties including Allegany, Cattaraugus, Ontario, Seneca, Schuyler and Tompkins.

Swede Midge Population Monitoring
- Pheromone traps were used to monitor season-long SM population dynamics and relate them to management strategies and crop damage.
- Over 50 traps were deployed annually.

On-Farm Trials of Novel Management Strategies
- Insect exclusion netting in combination with various mulches including black plastic, landscape fabric, hay, and straw mulches.
- Garlic oil as a repellent.
- Effect of tillage practices on SM emergence.
- Effect of post-harvest practices on SM population.
- Plant preference/Trap crop studies.

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Result Highlights
Key to managing swede midge is to crash its population and/or prevent population buildup.

New Recommendation for Crop Rotation
- Problem: Without any scientific research, entomologists conservatively recommended far and wide rotation of brassica crops be: > 1 km (3168 ft) and > 3 years.
- Issue: Not feasible on most small farms.
- Three years of monitoring SM population activity indicated that in New York, spring emergence of the overwintering generation begins in mid-May and lasts until mid-July/late-August, with peak activity in late-May and June.

Effect of Planting Date on Swede Midge Damage in Red Cabbage
(High SM pressure: ~200 SM/trap/week)

- Waiting to pant brassicas until after spring emergence decreased swede midge damage dramatically, increasing marketability by 70%.

Insect Exclusion Netting Provided 100% Control

New Recommendation for Far and Wide Crop Rotation:
- On farms with multiple secluded fields ~500 ft and >2.5 months
- The same field may be cropped to brassicas in consecutive years, provided time is given to crash SM population in between crops.

Successful Swede Midge Management
71% (5 out of 7) of small organic farms no longer suffer economic losses from swede midge

- 3 implement the new recommendations for crop rotation
- 1 uses insect exclusion netting for their high-value broccoli
- 1 uses crop rotation, row cover over quick growing brassicas, and has abandoned growing broccoli.

Future Research
- Investigation of ground barriers (e.g. plastic mesh, landscape fabric, tarps) to prevent SM population/emergence to disrupt SM life cycle.
- Pheromone mating disruption.