TITLE: MANAGEMENT OF SWEDE MIDGE WITH CULTURAL CONTROLS AND SELECTED INSECTICIDES

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ABSTRACT: The swede midge (SM) is a serious pest of cabbage, broccoli and cauliflower. The first occurrence of SM in North America was in Ontario, Canada (2000) and has forced some farmers to cease growing crucifers. In 2005 we verified that SM was present in Cattaragus, Erie, Genesee, Madison, Monroe, Niagara, Orleans, St. Lawrence and Wyoming Counties. There is an urgent need to test management practices. We conducted a series of tests to determine the role of soil type and moisture on emergence of swede midge adults from the soil and whether selected insecticides on transplants could be an effective way of reducing the movement of contaminated plants.

BACKGROUND AND JUSTIFICATION:

The swede midge (SM), *Contarinia nasturtii* Kieffer (Order Diptera; Family Cecidomyiidae), is a serious pest of cruciferous plants including commonly cultivated crucifers such as broccoli, cauliflower, Brussels sprouts, cabbage, kale, collards, rutabagas (swedes), radishes and many Asian vegetables. SM has also been reported on canola, ornamentals and common weed species such as yellow rocket, pennycress and shepherd's purse. SM is a common and endemic pest in many brassica-growing regions of Europe. It has been known in Europe since the end of the 19th century and about 20 European countries are concerned with this pest. SM is considered a major pest with frequent crop losses and regular chemical treatments in Belgium, Switzerland, Germany, northern Poland, France, Slovakia, and the Netherlands (Baur, 2004). In 2000, *C. nasturtii* was identified in Ontario, Canada, the first record of occurrence in North America. Damage on broccoli plants likely caused by this pest was observed as early as 1994, but was erroneously attributed to a molybdenum nutrient deficiency. In 2002 we (Kikkert, Hoepting and Shelton) began an intensive detection survey of western NY crucifer fields for the presence of SM and in the fall of 2004, the first occurrence of SM was confirmed in Niagara County. In 2005, SM was confirmed in Cattaragus, Erie, Genesee, Madison, Monroe, Niagara, Orleans, St. Lawrence and Wyoming Counties (Shelton et al., unpublished). We have developed an educational program for SM that includes the widely distributed brochure on SM biology and ecology. However, we lack information needed for developing a reliable set of management practices.

OBJECTIVE: Determine: 1) the effect of soil type and moisture on emergence of swede midge adults from the soil; 2) whether insecticides applied to transplants could effectively reduce infestations.

PROCEDURES:

Soil type and moisture: Soil moisture and temperature are crucial for swede midge populations to develop. Swede midge pupate in soil each generation and overwinter as pupae in soil, and this may offer a good opportunity to control them by manipulating soil moisture and the depth of pupae. Soil samples were collected from swede midge-infested counties (Niagara, Genessee and Erie) in 2005. The soil types varied considerable and represented fine loam sand, fine sand, clay loam, muck, Chenango shale loam and silt loam soil. The soil samples were taken to our laboratory and air-dried in a screening house. Dried soil was ground using a pestle and mortar and sifted though a 2 mm sieve. Five different moisture contents (0, 25, 50, 75 and 100%) were made for each type of soils. After swede midge larvae were inoculated in different soils, emergence number and timing were

recorded daily until no more swede midge adults emerged (i.e. no new emergence from soil for 7 continuous days).

Insecticides for transplants: In 2005, acetamiprid was labeled in the us for swede midge control. The efficacy of acetamiprid on swede midge on cauliflower seedlings was evaluated using foliar sprays, because the movement of vegetable seedlings could be an important reason for the rapid spread of swede midge in Canada and the US.

RESULTS AND DISCUSSION:

Soil type and moisture: The results indicated the extremely dry and wet soil hindered swede midge emergence. Optimal moisture content for swede midge emergence was from 25%-75%, varying in different soils. The distribution of swede midge pupae was also studied in different soils. Under laboratory conditions, most swede midge pupated within the top 1 cm of soil, regardless of soil types. Furthermore, we covered swede midge pupae with 2, 5, 10 and 15 cm depths of soil, and then checked the emergence number and timing. We found the 2 cm depth of soil cover had no any negative impact on adult emergence. However, more than 5 cm depth of soil cover effectively reduced the emergence number and delayed the emergence timing. Field trials will be conducted in the future to test the potential of manipulating soil moisture and depth of pupae as components of an overall IPM program to control swede midge.

Insecticides for transplants: Our results indicated the efficacy of acetamiprid on swede midge was 99.52, 100 and 99.83 % when cauliflower seedlings were sprayed before inoculation with swede midge, 0 day and 4 days after inoculation, respectively. The efficacy of acetamiprid was reduced to 69.89 % when seedlings were sprayed on day 8 after inoculation, and swede midge larvae could successfully pupate and emerge after the spray. Acetamiprid can effectively control swede midge on cauliflower seedlings, especially in the early stage of insect occurrence.

Taken together, these two studies suggest that existing swede midge infestations in the field may be able to be reduced through such common practices as plowing and tilling the soil to bury the pupae or to saturate the soil. These may prove to be viable cultural practices. These studies also suggest that the spread of swede midge can be reduced by treated transplants prior to shipment. These later findings may make their way in to federal or state regulations.