Trapping Swede Midge in Michigan

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Background

Swede midge, *Contarinia nasturtii* (Kieffer) (Diptera: Cecidomyiidae), is a new invasive pest in Michigan; its presence was first confirmed in the state in 2015, in commercial cole crops farms on the East side of the state.

Potential Impact

Michigan produces close to 80 million pounds of cabbage worth over $10 million annually (Anon., 2014). USDA statistics for Michigan for broccoli, cauliflower, and some other cole crops are not available, but the potential economic losses due to swede midge are even greater in the state when adding these other crops. Crop losses due to swede midge were as much as 85% in Canada (Hallett and Heal, 2001), 100% in Europe (Chen et al., 2011) and, the Michigan farm where swede midge was first discovered in 2015 did not harvest the crop because of 100% loss due to swede midges. In addition, this grower is considering not growing cole crops in the near future due to swede midges. Crucifers in the northeastern United States exceed $100 million annually and the entire region is predicted to be suitable for swede midge colonization (Chen et al., 2011), *therefore this research is important to the entire North Central Region*.

Typically, invasive insects exert greater economic losses at the invasion front, soon after establishment and initial population growth; this is thought to occur partly due to a release from their natural enemies, which have not yet caught up to them. Therefore we expect that growers will experience greater losses soon after swede midge establishment than later on once biological control agents have started consuming them. This means that growers now need more help with identifying this problem because its new and unfamiliar to them, and they also face greater pest pressure in the initial years.

Work since the swede midge discovery in 2015 and 2016

In the 2016 growing season, through a 1-year grant funded by Michigan State University's AgBio Institute (Project GREEEN) we set up a monitoring network of pheromone traps across the southern half of Michigan's Lower Peninsula (Figure 2). The traps were placed at 17 conventional (n=10) and organic (n=7) farms, which produced cole crops throughout the entire growing season. Traps were checked weekly and we verified the presence of swede midges using their DNA (Frey et al. 2004) for all insects that looked similar morphologically under the microscope. Unfortunately, after the end of the growing season, the company that supplied the pheromone lures informed us that they made a mistake when formulating the pheromone; therefore they expected them not to work well, if at all. We noticed during the season that something was not right, because of the low number of insects captured in the traps despite obvious damage symptoms. Nevertheless, we captured a total of 59 swede midges during the 2016 season, which were confirmed by PCR using their DNA (Figure 3), with a spike in catch in late July and

early August. All of our organic farms and 66% of the conventional farms had confirmed swede midges. Although swede midge was first discovered in Michigan on the east side of the state (Thumb area), we found that they were spread throughout our sampling range, including at some of the southwestern farms.

One positive thing that came out of the pheromone lure debacle is that we extracted the DNA of each insect that looked like a swede midge from our traps to make sure that what we found was indeed a swede midge. We went further and sequenced the PCR products for many of these specimens; therefore we now have our own sequence data ready to be used for designing real-time PCR primers.