Title: Soybean Gall Midge Survey in North Dakota

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Background information:
The soybean gall midge was discovered in 2018 by entomologists in Iowa, Nebraska, and South Dakota who observed dead or dying soybean plants associated with an infestation of midge larvae at the bases of the stems (Fig. 1). These midges were identified as a new species in 2019. Soybean gall midge is now established in five states including Nebraska, Minnesota, South Dakota, Iowa and Missouri. Its distribution continues to expand from a total of 67 counties in 2018 to 140 counties in 2022. Soybean gall midge causes economic yield losses in soybeans in some areas with high populations, especially in east-central Nebraska.

Objectives:
   1) To survey for soybean gall midge.
   2) To develop extension outreach material on soybean insect pests for the NDSC, soybean
      farmers, crop consultants, IPM scouts and the soybean industry.

Research Findings / Outcomes:

Objective 1: Survey for soybean gall midge.

At each field site, the GPS location was recorded. A line-transect was walked near the field edge and 10 consecutive plants were pulled up at 10 sampling sites per field for a total of 100 plants per field. The sampling sites were separated by 50 m. If any darkened areas were present on stems, usually near the base, the outer epidermis of the stem was peeled back to see if larvae were present. Soybean crop stages were between VE (cotyledon emergence) and R7 (beginning maturity).

We surveyed a total of 436 soybean fields for soybean gall midge in 45 of the 53 counties in North Dakota from early June through mid-September

Soybean Gall Midge

Season Final, 2022

• Absence   ▲ Presence
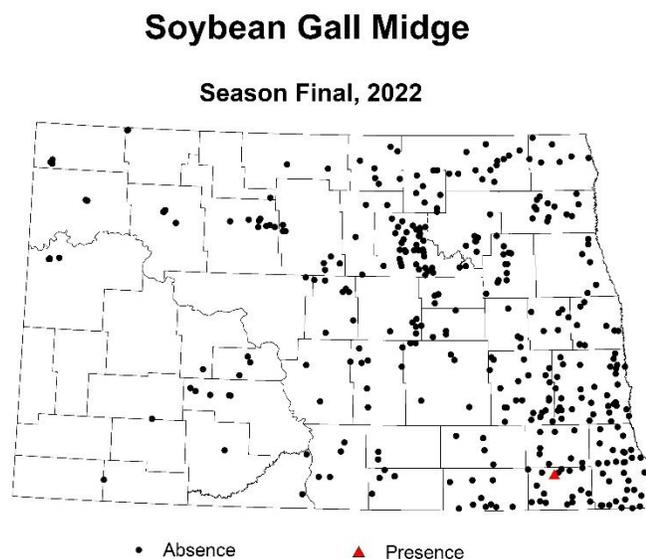
Figure 1. Survey of soybean gall midge in soybean fields 2022.

2022 (Fig. 1). The most intense survey effort was in the southeastern part of the state. The only counties that were not surveyed were Dunn, Billings, Golden Valley, Slope, and Bowman (Fig. 1).

Brandon Schulzetenberg, Centrol Crop Consulting, originally reported a suspect soybean gall midge and sent us a photo (Fig. 2) showing two bright orange-reddish larvae on a soybean stem lesion on 16 August 2022. We visited the field to collect larvae for DNA typing the next day. After scouting for a total of 8 hours, we finally found one stem with a lesion on the field edge that had about 10 tiny white to orange-reddish larvae. The infestation was obviously very low due to the difficulty in finding one midge-infested stem. The lesion was located mid-plant,
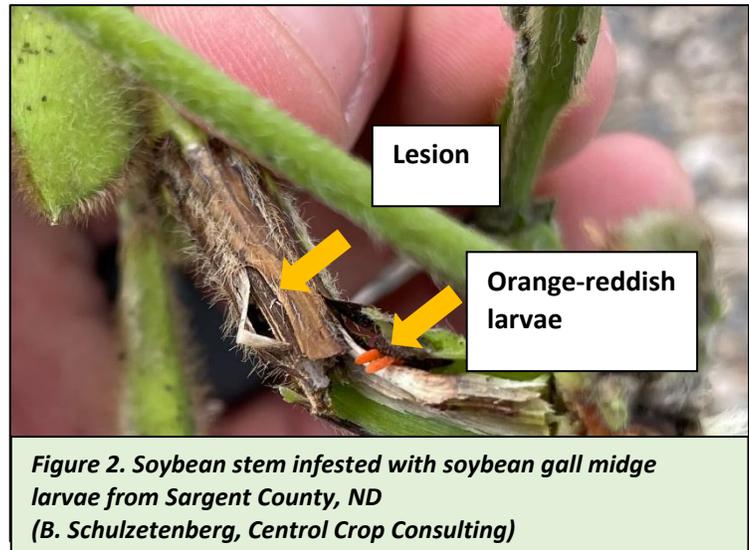
Figure 2. Soybean stem infested with soybean gall midge larvae from Sargent County, ND (B. Schulzetenberg, Centrol Crop Consulting)

which suggests that this was the second generation of soybean gall midge. Larvae were collected and carefully placed in a 95% alcohol vial, and then sent to Dr. Justin McMechan's laboratory at the University of Nebraska for DNA testing on whether it is a positive match for soybean gall midge or white-mold gall midge. The DNA results recently confirmed its identification, **and this is the first soybean gall midge detected in North Dakota**. DNA tests for the white-mold gall midge were also conducted and were 100% negative. White-mold gall midge is a common gall midge in North Dakota soybean fields infected with *Sclerotinia* white mold. Next year, we plan to continue surveying soybean fields to detect soybean gall midge presence in new locations and to determine its distribution in North Dakota soybeans.

Survey field data were mapped using ArcMap to show soybean gall midge presence and absence. Maps were posted weekly on the NDSU Extension IPM website – Soybeans and presented at soybean extension and commodity meetings and field days. Results from the soybean gall midge survey (Objective 1) were published in the NDSC reports, The North Dakota Soybean Grower magazine (June 2023), the Soybean Research & Information Network (SRIN) and NDSU Extension's *Crop & Pest Report*.

Objective 2: To develop extension outreach material on soybean insect pests for the NDSC, soybean farmers, crop consultants, IPM scouts and the soybean industry.

A large banner of major soybean insect pests is being developed that includes cutworms, bean leaf beetle, foliage-feeding caterpillars (green cloverworm, thistle caterpillar), potato leafhopper and soybean gall midge. The soybean insect banner is used for entomology outreach at the ND Corn & Soybean Expo in Fargo and other extension meetings, field days and activities. The *Soybean Insect Diagnostic Series* will require more time due to the amount of work and people involved. It will cover IPM of the major insect pests including soybean aphids, spider mites, foliage-feeding

caterpillars, bean leaf beetles, grasshoppers and soybean gall midge. It is expected to be completed this winter. These materials will be used to educate North Dakota soybean farmers, crop consultants, IPM scouts and the soybean industry.

Benefits to ND Soybean Farmers and Industry:

For Objective 1, an intensive survey was conducted in North Dakota to determine if the invasive soybean gall midge is present and at what level of infestation. Currently, no pest management recommendations are available for control of this yield robbing gall midge in soybeans. While it is concerning for soybean farmers that it was detected in Sargent County in 2022, the good news is that our survey efforts indicate that soybean gall midge has not been detected anywhere else in North Dakota, and that it is not well established in Sargent County.

Objective 2 will provide educational outreach materials (banner and publication) on soybean insect pests for soybean farmers, crop consultants, IPM scouts and the soybean industry.

An Integrated Pest Management (IPM) approach will benefit the North Dakota soybean industry by properly identifying insect pests, minimizing soybean pest damage, and being proactive to detect new insect pests, thereby reducing risks and improving soybean productivity.