***Soybean Gall Midge: Surveying the North Central Region,***

***Adult Monitoring and Host Plant Resistance***

***Final Report: October 2019 – January 2021***

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Kansas: Sarah Zukoff, Brian McCornack, Holly Davis,|Michigan: Chris Difonzo|Missouri: Kevin Rice

Minnesota: Bob Koch and Bruce Potter|Nebraska: George Graef, Tom Hunt, Bob Wright|North Dakota: Janet Knodel|Ohio: Kelley Tilmon|South Dakota: Adam Varenhorst|Wisconsin: Bryan Jensen

Project Goal/Objectives

**Note:** The progress towards the goals, objectives, and deliverables in this project are for the final report but only reflect 2 of 3 years of this project as it was merged with another multi-state NCSRP project with Kelley Tilmon.

1. Determine the distribution and severity of soybean gall midge across the north-central region

Extensive field surveys of soybean gall midge were conducted across nine states (ND, MN, SD, IA, NE MO, KS, and IL) in 2020. Three additional states (IN, OH, and MI) could not conduct field surveys due to Covid-19. A total of 1,745 fields were surveyed across 267 counties for the presence of soybean gall midge. Results from the survey found that there were no new state records; however, soybean gall midge was found in new counties in all five of the existing states, with a total of 19 new counties. The greatest number of new counties was NE(8), followed by IA(5), SD(3), MN(2), and MO(1). In Nebraska, significant and extensive sampling took place across the east and central part of the state, with 257 fields sampled. Results showed that larval number per plant and injury was concentrated to the east-central portion of the state. An initial analysis of potential factors for larval presence and plant injury shows that distance from last year’s soybean field, the proximity to dense vegetation along field borders, and the percent soybean in an area around the sample were the leading causes.

In 2021, no funding was available to detect soybean gall midge in new states through field surveys; however, tens of thousands of postcards were sent out to several states as a result of Michigan redirecting its funding towards awareness. In the existing states, efforts were made to continue to document the presence of soybean gall midge. In total, 26 new counties were identified with the greatest number of new counties occurring in MN(13), NE(8), IA(4), and SD(1). In NE, an increased understanding of the biology of soybean gall midge combined with the use of USDA CropScape greatly enhanced the likelihood of finding it in low frequency. This technique will be applied to other states for surveys in 2022. Maps for the detection of soybean gall midge were updated at frequent intervals on the soybeangallmidge.org website. In the last two years, over 3,780 people have viewed the distribution page on the website.

The results of the past two years combined with reports back to 2018 found that soybean gall midge is present in 140 counties across five midwestern states. This area encompasses approximately 16 million acres of soybean. However, only a small portion of this area is under significant threat from soybean gall midge, although its distribution and severity vary between years.

1. Determine the emergence timing and source of adult soybean gall midge.

Extensive efforts have been made to document the timing and source of soybean gall midge adult emergence. Over the past two years, a total of 64 sites across four states were monitored for adult emergence of soybean gall midge. At two sites in Nebraska, field sites have had a large number of cages placed in the field and surrounding area to determine the source of soybean gall midge overwintering adults. Both years showed the same result, that the vast majority (>98%) of adults emerged from last year’s soybean field with a very small portion from the field border. No detection of adults occurred from fields that were corn the previous year (soybean two years prior). In total, 10,394 adults were collected over the two seasons with 5,118 in 2020 and 5,276 in 2021. First emergence of soybean gall midge has typically occurred in mid-June for the last couple years (2019: June 14 and 2020: June 10); however, the emergence network collected adults on May 31in 2021. Emergence timings and duration of soybean gall midge has provided critical insights in the difficulties of managing this new pest with the overwintering duration increased from 25 days in 2020 to 36 days in 2021. This long duration of overwintering emergence implies that it will be difficult to control soybean gall midge with any single foliar application.

1. Screen soybean varieties for resistance or tolerance to soybean gall midge.

After two years of testing, a total of four of the eight environments resulted in significant pressure for soybean gall midge. Three of the four sites had two layers of data relating to the presence or absence of larvae and a rating on the proportion of dead or dying plants. An analysis of these three sites, which had greater than 98% of plots infested, was that there was a wide range of injury scores, indicating differential response to infestation from soybean gall midge. Of the 713 genetically diverse accessions from the USDA Soybean Germplasm Collection, approximately 40 accessions had less than 6% dead plant, 114 accessions had 12% dead plants, 350 accessions had 25% dead plants, and 15 had 60% of greater dead plants. This distribution shows the predominance of more resistant reactions to soybean gall midge. The Manhattan plot from GWAS shows that significant SMP was identified on all soybean chromosomes except 1, 3, and 12. These results are very promising but further data will be needed. As the project moves towards the identification of commercial germplasm with resistance, there will be a need to evaluate lines for yield. To date, evaluations have been based on differences in mortality of plants; additional steps will be needed to determine if yield losses occur without mortality from soybean gall midge feeding.

1. Disseminate information to stakeholders on current information and management for soybean gall midge.

A broad array of technology and platforms have been used to disseminate information on soybean gall midge using both traditional and innovative tools. Over the past two years, approximately 100 talks have been given in either virtual or in-person format to over 7,600 participants. Additional dialogue was created through the use of a roundtable with clientele and a regional soybean gall midge webinar series, both of which received very positive reviews. Traditional dissemination was done through the release of three extension guides (NE, ND, and IA) as well as numerous articles during the season. In addition, a seminal publication on soybean gall midge was accepted in the Journal of Integrated Pest Management. Rapid dissemination for management of soybean gall midge was achieved through the use of an alert system in conjunction with a new website, soybeangallmidge.org. This system has been very successful and well-received by clientele which is evident with a 40% increase in participants for the alert system in a year and over 5,000 visitors to the website.

Deliverables

* Realtime map updates were provided through soybeangallmidge.org and sent to 470 participants through the alert network, as well as, twitter updates, three extension guides (NE ND, and MO), several presentations, and a McMechan et al. 2021 publication.
* Data generated on the presence and severity of soybean gall midge has provided soybean farmers and ag professionals across eight states with an understanding of the risk and awareness of this new pest
* Over 70,000 postcards were printed and distributed to increase awareness of soybean gall midge
* 2000 knives with the NCSRP logo and QR code for soybeangallmidge.org were made and distributed
* Soybeangallmidge.org website was built to share information with cliente with 5,065 unique visitors and 11,010 pageviews from participants in 44 states within the US as well as 48 countries.
* Blackboard connect system built to deliver real time information to clientele with 470 participants from 8 states and Canada which grew by an average of 40% each year for 2020 and 2021.
* Critical data on the source, timing and duration of soybean gall midge adult emergence which has helped guide growers and ag professionals on the management
* NebGuide G2331 on Soybean Gall Midge was produced in April 2021 in NE with the latest information on its biology and management; extension guides also created in ND and MO
* Tested over 18 different commercial insecticides as well as several experimental products for control of soybean gall midge and results showed limited potential leading to a reduction in overuse of these tactics for soybean gall midge.
* Potential sources of genetic resistance to soybean gall midge were identified through three sites with exceptionally high pressure and injury from soybean gall midge.
* Preliminary analysis and literature from other related pests suggest that a model for adult emergence is unlikely due to significant variability in emergence between cages within a field. Better methods, such as pheromones, will be needed.
* A roundtable discussion was held in 2020 with 96 participants representing NE, IA, and SD that give critical feedback and direction on the needs for future research
* Since October 2019, 100 presentations have been given on soybean gall midge to over 7,600 participants, along with a multi-state webinar series with 380 registered, with questions lasting 30-40 minutes beyond the presentations for each of the three series.

Presentations (Speaker that are PI on project in bold)

***2021: 42 total***

**McMechan, A. J.**, T. Hunt, R. Wright. E. W. Hodgson, B. Koch, and B. Potter. Soybean gall midge: Understanding Risk and Management Options. Nebraska Soybean Day and Machine Expo, Wahoo, NE. [55 people} 16 December 2021.

**Potter, B**. 2021. "Invertebrates in your cover crops"  - 2021 Soil health management summit. Dec. 14, 2021. Mankato, MN. Cover crop project and possible implications for insect management

**Potter, B**. 2021. Sometimes you need a hammer instead of pliers. Corn rootworm management. 2022 Crop management seminar. December 10, 2021.

**Potter, B**. 2021. Some Insect and disease issues for 2021. Brown County Corn and Soybean Growers Annual Meeting. Sleepy Eye, MN. November 22, 2021.

**Potter, B.** 2021. Some Insect and disease issues during 2021. United Ag Tech Annual Meeting. Sleepy Eye, MN. November 18, 2021.

**McMechan, A. J.**, T. Hunt, R. Wright, E. W. Hodgson, B. Koch, and B. Potter. Soybean gall midge: Understanding a new and emerging pest of soybean. Annual Entomological Society of America Meeting.[38 people] 2 November 2021.

Montenegro V. and **A.J. McMechan**. Soybean gall midge: evaluating the efficacy of insecticide timing relative to adult emergence. Annual Entomological Society of America Meeting. [22 people] 1 November 2021.

Kaur, R., A. Velez, and **A.J. McMechan.**Soybean gall midge: characterizing the geographic and host plant range distribution. Annual Entomological Society of America Meeting [35 people] 1 November 2021.

**McMechan A. J.**, T. Hunt, and R. Wright. Soybean gall midge: An update from the 2021 season. Midwest Soybean Production Clinic, UNL. [32 people] 26 August 2021.

**McMechan A. J.** T. Hunt, and R. Wright. Strategies for Managing Soybean Gall Midge and Insect Management in Cover Crops. Soybean Management Field Days, Arlington, NE. [81 people] 13 August 2021.

**McMechan A. J.** T. Hunt, and R. Wright. Strategies for Managing Soybean Gall Midge and Insect Management in Cover Crops. Soybean Management Field Days, Rising City, NE. [73 people] 12 August 2021.

McMechan A. J. **T. Hunt**, and R. Wright. Strategies for Managing Soybean Gall Midge and Insect Management in Cover Crops. Soybean Management Field Days, Elgin, NE. [73 people] 11 August 2021.

Potter, B. 2021. “Plot tour” 2021 Ag lenders conference. Lamberton, MN. August 10, 2021. 55 bankers

**McMechan, A. J.**, T. Hunt, R. Wright. E. W. Hodgson, B. Koch, and B. Potter. Soybean gall midge: observations and challenges from the 2020 season. North Central Branch Entomological Society Meeting. [Poster Online] 21 June 2021.

**McMechan, A.J.** Soybean Gall Midge: An overview of a new pest in soybean. Nebraska Department of Ag, Lincoln, NE. [12 people]. 28 April 2021.

**McMechan, A.J.** Soybean Insect Pests. Crop Scout Clinic. Eastern Nebraska Research and Extension Center, Mead, NE. [23 people]. 21 April 2021.

**Varenhorst, A. J.,** P. Rozeboom, and P. Wagner. 2021. Insecticide safety and current insect pests. Virtual Private Applicator Recertification Training, April 8, 2021. 219 attendees

**McMechan, A.J.** Soybean Insect Pests. AGRO 308: Management of Crop Insects Class. UNL, Lincoln, NE. [12 people]. 6 April 2021.

**McMechan, A.J.** Soybean gall midge: Managing and understanding a new pest of soybean. AMVAC Product Meeting. Dordt University. Sioux City, IA. [32 people] 31 March 2021.

**Varenhorst, A. J.,** P. Rozeboom, and P. Wagner. 2021. Insecticide safety and current insect pests. Virtual Private Applicator Recertification Training March 26, 2021. 420 attendees.

**McMechan, A.J.** Soybean gall midge: Hail interactions and the biology of a new pest of soybean. CITI Rain and Hail Training [263 participants online]. 24 March 2021.

**McMechan, A.J.** Soybean gall midge: scouting, biology, and management of a new pest in the Midwest. Great Plains Diagnostic Network [18 participants online]. 17 March 2021.

**McMechan, A.J.** Soybean gall midge: Insights on a new pest of soybean. Syngenta Western and Eastern Iowa Sales Team Training. Online [26 participants online]. 8 March 2021.

**McMechan, A,J.** Soybean gall midge: A new pest in the midwest. NeABA Mid-Winter Conference. Online [40 people] 2 March 2021.

**Potter, B.** 2021. Some Insect and disease issues for 2021. Virtual Meeting. February 26, 2021.

**McMechan, A,J.** Key Pests in Corn, Wheat and Soybean. WinField United Agronomy Conference. Online [272 people] 23 February 2021.

**Potter, B.** Can scouting crops for pests pay? Winter Crops and Small Grains Update. Slayton, MN. February 20, 2021.

**McMechan, A.J.** Soybean gall midge: an uphill road to management. GrowMark Agronomy Virtual Agronomy Monthly. Online [28 people] 16 February 2021.

**McMechan, A.J.** Soybean gall midge: understanding a new threat to the midwest. NW Missouri CCA Conference. [124 participants] 19 January 2021.

**McMechan, A.J.** Understanding a new pest in the midwest. Wisconsin Agribusiness Classic. Online [230 participants] 13 January 2021

**McMechan, A. J.,** T. Hunt and R. Wright. Soybean gall midge: battling a new pest of soybean. UNL Crop Production Clinics Online. [225 participants] 7 January 2021, 14 January 2021, 21 January 2021.

**Hodgson, E. W.**, M. Helton, and J. McMechan. Soybean gall midge efficacy evaluations. Soybean gall midge discussion series. . Soybean Gall Midge Brown Bag Series. Virtual Delivery. [216 live views; 157 on-demand views] 19 January 2021

**McMechan, A.J.,** E. W. Hodgson, T. Hunt,. B. Potter, R. Wright and A. Varenhorst. Soybean gall midge management. Soybean gall midge discussion series, Virtual Delivery. [216 live views; 157 on-demand views] 19 January 2021

Montengro V., A. J. McMechan, E. W. Hodgson, and Vilma Montenegro. Soybean gall midge ecology and plant injury. Soybean gall midge discussion series, Virtual Delivery. [216 live views; 157 on-demand

views] 12 January 2021

**McMechan, A J**., T. Hunt, E. W. Hodgson, B. Koch, and B. Potter. Soybean gall midge biology,

distribution, sampling tips, and look-alikes. Soybean gall midge discussion series, Virtual Delivery.

[195 views live; 98 on-demand views] 5 January 2021

**Potter,B.** “Guidance for insecticide-resistant soybean aphids, soybean gall midge and …” 2021 Commercial, non-commercial ag pesticide applicator training. Note: there were several of these across southern MN. Recorded presentation.

**Varenhorst, A. J.,** P. Rozeboom, and P. Wagner. 2021. Insect Update and insecticide safety Category 1B. Commercial Applicator Recertification Training. Virtual on TrainingHouse: 996 attendees.

**Varenhorst, A. J. 2021.** Major soybean insect pests. SDSU Extension Crop Hour Webinar Series.

**Varenhorst, A. J. 2021**. Major soybean insect pests. SDSU Extension 2021 Virtual IPM Field School

**Varenhorst, A. J. 2021.** Soybean gall midge sampling. SDSU Extension Crop Hour Webinar Series.

**Varenhorst, A. J. 2021.** Current insect pests. Northeast Research Farm Field Day.

**Varenhorst, A. J. 2021.** Current insect pests. Southeast Research Farm Field Day.

***2020: 49 total***

**McMechan, A. J.**, T. Hunt, R. Wright. E. W. Hodgson, A. Varenhorst and B. Potter. The dreaded soybean gall midge – what we learned in 2020. Nebraska Soybean Day and Machine Expo, Wahoo, NE. Virtual [82 people} 17 December 2020.

**Potter, B.** Old problems return, and new problems persist 2020 SD ag Business Crop Management Conference. Sioux Falls, SD. Dec. 17, 2020.

**McMechan, A,J.** Soybean gall midge: a new and emerging pest in the midwest. Indiana CCA conference. Online [205 participants] 15 December 2020.

**McMechan, A. J.**, T. Hunt, R. Wright. E. W. Hodgson, B. Koch, and B. Potter. Soybean gall midge: surveying the north central region, adult monitoring, and host plant resistance. North Central Soybean Research Program Meeting. Virtual [33 people} 11 December 2020.

**Potter, B.** Upcoming Insect and disease issues for 2021. 2020 Crop Management Input Seminar, Hutchinson, MN. December 4, 2020. (virtual meeting)

**Hodgson, E. W.,** and A. Dean. Soybean pest updates. Iowa State University Extension and

Outreach CropsTV, Virtual Delivery. [115 live views; 758 on-demand views] 1 December 2020

**Hodgson, E. W.** Video: Thistle caterpillar and soybean gall midge updates. Nationwide Insurance

Pesticide Applicator Training Program. January - December 2020.

**McMechan, A. J.**, T. Hunt, R. Wright. E. W. Hodgson, A. Varenhorst and B. Potter. Soybean gall midge: multi-state field observations from the 2020 season. Virtual [45 people} 16 November 2020.

Montenegro, V. and A. J. McMechan. Soybean gall midge: understanding larval abundance on soybean plants during the growing season. Annual Entomological Society of America Meeting. 16 November 2020. Online.

Helton, M., E. Hodgson, A. J. McMechan and N. Tinsley. Injury severity to yield loss relationship for soybean gall midge. Annual Entomological Society of America Meeting. 16 November 2020. Online.

**Hodgson, E. W.** Video: Soybean gall midge management update, Iowa State University.

November 2020

**Hodgson, E. W.** Research and management update for soybean gall midge. Iowa Soybean

Research Center Annual Meeting, Ames, IA. [25 people] 18 September 2020

**McMechan A. J.**, T. Hunt, and R. Wright. Soybean gall midge: An update from the 2020 season. Midwest Soybean Production Clinic, UNL. Recorded. 26 August 2020.

**McMechan A. J.** T. Hunt, and R. Wright. Soybean gall midge: research update on a new pest. Soybean Management Field Days, Recorded. [213 views] 6 August 2020.

**McMechan, A.J.** Soybean gall midge: A new and emerging pest. CITI Rain and Hail Training [310 participants online]. 19 March 2020.

**McMechan, A.J.** Soybean Insect Pests. AGRO 308: Management of Crop Insects Class. UNL, Lincoln, NE. [15 people]. 12 March 2020.

**Potter, B.** Can scouting crops for pests pay?Winter Crops Update. Fairmont, MN. March10, 2020.

**McMechan, A.J.** Soybean gall midge and dectes stem borer.Wilbur Ellis Seed Meeting, Plattsmouth, NE. [80 people]. 4 March 2020.

**McMechan, A.J.** Soybean gall midge: An overview of a new pest of soybean. Soybean Gall Midge Roundtable [96 people]. 2 March 2020.

**McMechan, A.J.** Soybean gall midge: understanding a new pest of soybean. Winfield United Regional Conference. Mankato, MN [130 people]. 26 February 2020, Brookings, SD [79 people]. 27 February 2020.

**Potter, B.** Webinar: “Strategic Farming: The soybean gall midge in Minnesota: We May have to use IPM. February 2020.

**Hodgson, E. W.** Soybean gall midge and thistle caterpillar management. Jacobsen Annual Seed

Meeting, Wall Lake, IA. [35 people] 19 February 2020

**McMechan, A.J.** Soybean gall midge: understanding a new threat to soybean production. Nebraska Independent Crop Consultant Association. Grand Island, NE [38 people]. 17 February 2020

**Hodgson, E. W.** Midges, rootworms and corn borer management. MaxYield Cooperative Annual

Winter Meeting, West Bend, IA. [35 people] 13 February 2020

**Potter B.** Pest management in a changing economic and biological landscape UM Southwest Research and Outreach Center Winter Crops and Soils Day. Lamberton, MN and Luverne, MN. February 5, 6 2020.

**McMechan, A.J.** Soybean gall midge: A new pest. Wilbur Crop Clinic. Wilber, NE [72 people]. 7 February 2020.

**McMechan, A.J.** Soybean gall midge: Understanding a new pest. Pioneer Agronomy Leadership Conference [96 people]. Johnson, IA. 29 January 2020.

**Potter, B.** The soybean gall midge-Another pest of Minnesota soybeans. Ag Expo. January 23, 2020. Mankato MN. Display presentation.

**Potter, B.** Guidance for insecticide-resistant soybean aphids, soybean gall midge and …” Commercial, non-commercial ag pesticide applicator training. January 21, 2020. Note: there were several of these across southern MN.

**Potter, B.** Keeping ahead of insect and disease pests UM Southern Research and Outreach Center Winter Crops Day. Waseca, MN and Rochester, MN.  January 17, 2020

Montezano, D. and A.J. McMechan. Soybean gall midge: what we learned in 2019. Successful Farmer Series. Lincoln, NE. [43 people] 17 January 2020

**McMechan A. J.**, T. Hunt, and R. Wright. Soybean gall midge: what we learned in 2019. Beatrice, NE [110 people] 8 January 2020, York, NE [210 people] 14 January 2020, Mead, NE [80 people] 15 January 2020,

**Potter, B**. Soybean gall midge Q&A. Centrol of Marshall Crop Consulting Q/Q meeting. Morton, MN. January 8. 2020. Crop consulting firm.

**Hodgson, E. W.** Video: Thistle caterpillar and soybean gall midge updates. Nationwide Insurance

Pesticide Applicator Training Program. January - December 2020.

**Varenhorst, A. J.** 2020. Insects and Resistance Management. CHS Winter Agronomy Meeting. Mitchell, SD.

**Varenhorst, A. J.** 2020. Insects and Resistance Management. CHS Winter Agronomy Meeting. Brookings, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Brookings, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Huron, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Pierre, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Aberdeen, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Mitchell, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Sioux Falls, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Yankton, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Watertown, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Sioux Falls, SD.

**Varenhorst, A. J.** and P. M. Wagner. 2020. Commercial Agriculture Recertification: Category 1B. Presented at Aberdeen, SD.

**Varenhorst, A. J.** 2020. Soybean gall midge update. Pest and Crop Q and A Webinar Series. SDSU Extension.

**Varenhorst, A. J.** 2020. Early season insect pests. Pest and Crop Q and A Webinar Series. SDSU Extension.

2019: Oct-Dec. 9 talks

**Hodgson, E. W.** Video: Soybean gall midge. PSEP Program, Iowa State University. January -

December 2019.

**McMechan, A. J.**, T. Hunt, R. Wright. E. W. Hodgson, A. Varenhorst and B. Potter. The dreaded soybean gall midge – what we learned in 2019. Nebraska Soybean Day and Machine Expo, Wahoo, NE. [120 people} 19 December 2019.

**McMechan, A.J.** Soybean gall midge: understanding a new pest of soybean. Winfield United Regional Conference. Kearney, NE [114 people]. 17 December 2019,

**Potter, B.** The soybean gall midge in MN: We may have to use IPM. 2019 CPM Short Course. December 11, 2019.

**Potter, B.** 2019 in review: Impacts on 2020”. County soybean grower annual meetings. Sleepy Eye, Olivia, MN. December 3,4,16, 2019.

**Potter, B.** 2019 in review: Impacts on 2020”. Trimont, Mankato, Willmar, MN. December 2,3,4, 2019. (Consultant and industry-sponsored meetings)

**McMechan, A.J.** Soybean gall midge: ecology and potential management strategies. Integrated Crop Management Conference. Ames, IA [334 people]. 4 December 2019.

**McMechan, A.J.** Cover crops and soybean gall midge. Nebraska Independent Crop Consultant Association. Lincoln, NE [47 people]. 3 December 2019.

**McMechan, A.J.** Soybean gall midge. York Ag Update [44 people]. 22 November 2019.

Extension Pubs

**J. McMechan** and T. Hunt 2021. Soybean Gall Midge Identified in Eight Additional Nebraska Counties. University of Nebraska CropWatch. September 1st.

Potter, B. 2021. Soybean gall midge update. August 23, 2021. Minnesota Crop News. University of Minnesota Extension.

Potter, B. 2020. Updated video: Late season scouting for soybean gall midge. August 13, 2020. Minnesota Crop News. University of Minnesota Extension.

Hanson, A., B. Potter and R. Koch. 2020.How to distinguish soybean gall midge from white mold gall midge. August 4, 2020. Minnesota Crop News. University of Minnesota Extension.

**McMechan, J.**, T. Hunt, R. Wright, E. Knoell, N. Luhr, V. Montenegro, R. Kaur, N. Umezu, J. Schroeder de Souza, M. da Silva Lima, and E. Agpawa. 2021. Soybean Gall Midge Emergence at several sites in Nebraska. University of Nebraska Crop Watch. June 10th.

Potter, B., and R. Koch. 2020. Soybean gall midge: Spring 2020 update. June 6, 2020. Minnesota Crop News. University of Minnesota Extension.

**McMechan J.**, T. Hunt, R. Wright. 2021. Soybean Gall Midge Updates and Tools for 2021. University of Nebraska Crop Watch. March 17th.

Potter, B. 2020. Soybean gall midge – a new pest of Minnesota Soybeans.2020 MN Ag Expo. Mankato, MN. January 23, 2020. Display presentation.

**McMechan, J.**, T. Hunt, D. Montezano, V. Montenegro, and T. Possebom. 2020. First Emergence of Soybean Gall Midge in Cass County, Nebraska. University of Nebraska Crop Watch. June 11th.

Koch, R. L., and B. D. Potter. 2019. Soybean gall midge in Minnesota soybean. Minnesota Crop News. University of Minnesota Extension.

Kurle, J., R. Koch, D. Malvick, and Bruce Potter. 2019. A second species of gall midge associated with widespread white mold in Minnesota soybean fields: Factors that favored both. October 7, 2019. Minnesota Crop News. University of Minnesota Extension.

Koch, R. L., J. Kurle, D. Malvick, and B. D. Potter. 2019. Soybean gall midge not only small orange fly larvae in Minnesota soybean fields: Another species associated with white mold. October 2, 2019. Minnesota Crop News. University of Minnesota Extension.

***Posters: 12 total***

da Silva Lima, M. and **A.J. McMechan**. Larval distribution of soybean gall midge from infested soybean plants. Annual Entomological Society of America Meeting. Poster. 1 November 2021.

Umezu, N. and **A.J. McMechan**. Soybean gall midge: evaluating planting date and seed treatment as a management strategy. Annual Entomological Society of America Meeting. Poster. 1 November 2021.

Kolbe, B., **A.J. McMechan**, and **E. W. Hodgson.** Tillage effects on soybean gall midge overwintering populations. Annual Entomological Society of America Meeting. Poster. 1 November 2021.

Schroeder de Souza, G. Carmona, and **A.J. McMechan**. Soybean gall midge: estimating spatial severity of plant injury and yield loss. Annual Entomological Society of America Meeting. Poster. 1 November 2021.

Apawa, E. and **A.J. Mcmechan**. Soybean gall midge: understanding adult emergence through artificial rainfall and physical barriers. Annual Entomological Society of America Meeting. Poster. 3 November 2021.

Montenegro, V., Robinson, E. and **A.J. McMechan.** Soybean gall midge: understanding seasonal larval abundance. North Central Branch Entomological Society Meeting. [Poster Online] 21 June 2021.

Kaur R., A. Velez and **A.J. McMechan.** Soybean Gall Midge: Characterizing the population structure of newly emerged pest across its geographic range and host plants. North Central Branch Entomological Society Meeting. [Poster Online] 21 June 2021.

Possebom, T., D. Montezano, J. Knodel, K. Anderson, M. Harris, V. Montenegro, T. Hunt and **A.J. McMechan.** 2020. The distribution of soybean gall midge (*Resseliella maxima)* larval cocoons in soil from infested soybean fields. Annual Entomological Society of America Meeting. November. Online.

Vogel, T. P. Rozeboom, **A.J. McMechan**, and A. J. Varenhorst. 2020. Evaluating the distribution of soybean gall midge in South Dakota. Annual Entomological Society of America Meeting. November. Online.

Montenegro, V., **A.J. McMechan**, R. Wright, and D. Montezano. 2020. Soybean Gall Midge: Evaluating the efficacy of insecticide timing relative to adult emergence. North Central Branch Meeting. April 20th. Online.

Helton, M. VanNostrand, G. **A.J. McMechan,** and E. Hodgson. 2019. Insecticide efficacy evaluation for soybean gall midge. Entomological Society of America Meeting, St. Louis, MO

Turabawe G., Montenzano D., and **A.J. McMechan.** 2019. Evaluating the movement and infestation potential of soybean gall midge larvae. Entomological Society of America Meeting, St. Louis, MO

***Benefits to Farmers***

Field surveys have provided soybean farmers with an estimation of the level of risk for injury in their area. Newly identified areas that are found to be infested with soybean gall midge provide an opportunity to engage farmers and their retailers to make them aware of the pest and the potential resources to manage it. By documenting the presence and pressure in historical areas, growers gain awareness of the insects persistence between years. In addition, such data would allow us to better understand what factors are important for the presence and severity of soybean gall midge. By understanding these factors, growers can adjust the risk for different fields to utilize different management practices.

Tracking soybean gall midge adult emergence has created a foundation of information that is critical for understanding and testing management practices. The connection of adult emergence information with the alert network has allowed farmers to take advantage of the information b implementing border spray applications, tillage treatments, and mowing vegetation around the field in an effort to mitigate losses. \Results from pesticide applications made relative to adult emergence show that such management practices are not reliable. The loss of these stand-alone tactics is difficult, but it also reduces the likelihood of secondary pest issues or a lack of return on investment. Almost every current management practice being tested in the field relies on information on adult emergence to gain a better understanding of those management practices

To date, no commercial soybean varieties have been identified as resistant to soybean gall midge. The results of this project suggest that such lines may be available in the near future. Significant progress was made over the last two years that will likely be used by farmers in the next few years. These results could drastically reduce the impact of soybean gall midge, however, continued studies will be needed to understand the extent, durability, and source of resistance.

The platform established for disseminating information on soybean gall midge is unique in that it serves clientele that have different methods or means of accessing information. As long as clientele have a phone number, we were able to provide them up-to-date information on soybean gall midge. Combining this with a website has allowed for near real-time information to be delivered to farmers from a trusted, research-based source to make management decisions. The idea of this platform is being explored and utilized in other areas of pest management, such as the corn rootworm IPM regional working group.