Soybean Gall Midge

*Resseliella maxima* Gagné

What We Learned in 2019

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Soybean Gall Midge

History

2011
- Isolated fields in northeast Nebraska
- Found on previously injured or diseased plants

2015
- Documented in South Dakota

2016
- Documented in Iowa / East-Central Nebraska

2018
- Widespread early infestation with significant injury in IA, NE, and SD, found in MN
- Identified as a new species (Gagné et al. 2019)
Soybean Gall Midge

Field Injury
Soybean Gall Midge

Field Injury
Soybean Gall Midge Scouting

- Corn-soybean interface
- Areas next to dense vegetation
- Early planted soybean fields
- Greater likelihood of detection during R3-R5 stage
Soybean Gall Midge

Related Species

- **Genus Resseliella**
  - Worldwide: 56 species
  - United States: 16 species
  - No species have been reported on soybeans in US

- Very diverse host range
  - Many species found under bark or in flower heads
  - Others species span 29 genera and 23 plant families

- Host plant not known for 13 species

- Nine new species discovered since 2003
Soybean Gall Midge

Alternative Hosts

- Two alternative hosts identified
  - Sweet clover
  - Alfalfa
- ID: larval morphology, sequencing, and adult reared from sweet clover
- Ecological role of hosts isn’t clear
- Low numbers of adults per plant
Soybean Gall Midge Distribution

2019 season:

+1 States
+31 Counties

Currently found in:

5 States
92 Counties

2020 Grant
Survey all 12 states
Misidentification

Karshomyia caulicola

Koch et al. in review, Jensen 2019, Hamilton 2019, Gavloski & Bajracharya 2016
Soybean Gall Midge
Adult Collection
Soybean Gall Midge
Adult Monitoring Network

North Central IPM Center

- no adult soybean gall midge observed
- soybean gall midge collected and cumulative number observed

Field Edge
10 ft
100 ft
Soybean Gall Midge
Alert Network

- Approximately 200 registered
- Sent alerts on:
  - Adult soybean gall midge emergence alerts
  - Current suggestions for management practices
  - Links to resources in different states

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SGM Adult Emergence

1\textsuperscript{st} Emergence Date

- Emergence cage locations
SGM Adult Emergence

1st Emergence Date

- Emergence cage locations
- First adult capture date lacks geographic trend
SGM Adult Emergence

1st Emergence Date

- Emergence cage locations
- First adult capture date lacks geographic trend
- Wide variation in total number of overwintering adults captured per site
SGM Adult Emergence

Duration of Emergence

- Duration of overwintering emergence varied considerably between sites
- Range: 3 to 23 days
SGM Adult Emergence

Duration of Emergence

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- Range: 3 to 23 days
SGM Adult Emergence
East-Central Nebraska

[Graph showing the emergence of SGM adults over time in East-Central Nebraska, with peaks in June and July, and a note about overwintering generation.]
SGM Adult Emergence
Symptomology Timeline

0 day
SGM adults captured

+9 days
Black stem, white larvae

+12 days
Larvae transition to orange

+20 days
Plants shows signs of wilting
SGM Adult Emergence
Source for SGM Adults

March 2019
98% emerged from last year's soybean field

2% from grass border along field edge

SGM Adult Emergence
Source for SGM Adults

~98% of adults
Determining days between generations:
- Emergence of overwintering adults
- Emergence from this year’s soybean
SGM Adult Emergence

**Days between Generations**

- **Adult Emergence and Crop Development Stage**: 28-32 days between generations.

**Graph**

- Bars represent the number of days between generations for different locations: Eagle, Ceresco, E. Ceresco, S. Ithaca, Mead, Fremont, Pilger, Randolph, Belden, and Avg.

**Diagram**

- Life cycle stages: Eggs, 1st Instar, 2nd Instar, 3rd Instar, Adult, Pupae.
Soybean Planted

Eagle, NE

30 days

SGM Adult Emergence

Plant Development and Infestation
Evaluate the impact of planting date on soybean gall midge infestation and injury to soybean
Soybean Gall Midge
Planting Date Study

RCBD – 5 replications

Five planting dates (PD)

• PD 1: May 1st
• PD 2: May 14th
• PD 3: May 31st
• PD 4: June 15th
• PD 5: July 1st

Soybean-soybean rotation
High risk of SGM infestation
Soybean Gall Midge

**Planting Date Study**

Three major components:

- Adult activity

- Soybean plant development

- Larval infestation
Plots were evaluated for infestation:

- July 12 - 24 days after emergence
- July 26 - 40 days after emergence
- Larval infestation assessment
  - 20 plants from 2 rows
  - % of infested plants
Planting Date

July 1st

June 15th

May 31st

May 15th ~V3

May 1st ~V3

Overwintering Generation

1st Eval.

Number of SGM Adults

<table>
<thead>
<tr>
<th>Date</th>
<th>SGM Adults</th>
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<tbody>
<tr>
<td>May 1st</td>
<td>12</td>
</tr>
<tr>
<td>May 14th</td>
<td>9</td>
</tr>
<tr>
<td>May 31st</td>
<td>7</td>
</tr>
<tr>
<td>June 15th</td>
<td>5</td>
</tr>
<tr>
<td>July 1st</td>
<td>3</td>
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Infested Plants (logit)

<table>
<thead>
<tr>
<th>Date</th>
<th>Infested Plants</th>
</tr>
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<tbody>
<tr>
<td>May 1st</td>
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</tr>
<tr>
<td>May 14th</td>
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</tr>
<tr>
<td>May 31st</td>
<td>0.1</td>
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<tr>
<td>June 15th</td>
<td>0.05</td>
</tr>
<tr>
<td>July 1st</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Overwintering Generation

50% 25% 10% 3%

July 12th p-value = <.0001 F(4,16) = 43.91
Planting Date

July 1st

June 15th

May 31st

May 15th, ~V3

May 1st, ~V3

Overwintering Generation

1st Generation

Number of SGM Adults

Overwintering Generation

1st Generation

1st Eval.

2nd Eval.
Soybean Gall Midge Movement

- May be due to result of a small plot
- 1st generation emerging from PD1 and PD2 infested PD3 and PD4
Soybean Gall Midge

Movement

Pressure would only occur from 1st generation
May reduce the frequency of infested plants
Soybean Gall Midge

Planting Date Study Summary

- Limit the overwinter generation to infest soybean fields
  - Further planting date and SGM ecology and biology
  - Provide stakeholders with an understanding of the value of planting date as a part of an integrated pest management program for SGM
Cultural Control Strategies
Spring Tillage and Overwintering Adult Emergence

Site 1

Adult Emergence
Tillage: 18
No-Till: 27

Site 2

Tillage: 25
No-Till: 39
Cultural Control Strategies
Mowing Field Border Study

- Grass waterway was mowed just prior to adult emergence
- Evaluated for proportion of infested plants
- Hand collected yields
Cultural Control Strategies

Mowing Field Border Study

SGM Infestation

% of Plants Infested with SGM

Distance from Field Edge

2018 Soybean

2019 Soybean

100ft Mowed

20ft Unmowed
Cultural Control Strategies
Mowing Field Border Study

Yields

Distance from Field Edge (feet)

Yield (kg/hectare)

- Unmowed
- Mowed

Soybean 2018
Soybean 2019

Mowed
Unmowed

100ft
20ft
Soybean Gall Midge

Summary

- Distribution: 91 counties, 5 states
- New species causing significant injury to soybean
- Symptoms within 9 days of adult emergence
- Look for dark discoloration at the base of the plant
- Scout field edges, next to last year soybean field
Soybean Gall Midge

Summary

- Adult emergence
  - First emergence in mid-June
  - Three periods of activity
  - Extended overwintering emergence period (3—23 days)
  - Emerged from last year’s soybean field
Soybean Gall Midge
Summary

- **Adult emergence**
  - First emergence in mid-June
  - Three periods of activity
  - Extended overwintering emergence period (3—23 days)
  - Emerged from last year’s soybean field

- **Stage dependent infestation**

- **Management is difficult, no product or tactic provides complete control**
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Questions?  

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