Sugarcane Aphid as a Pest of Sorghum

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Macon Ridge Research Station
Winnsboro, LA
Melanaphis Task Force

• Formed in January 2013
• Consists of research and extension personnel from
  – Texas A&M University
  – Texas AgriLife Research & Extension
  – Louisiana State University
  – LSU AgCenter
  – USDA-ARS, Stillwater, OK
  – Oklahoma State University
• Purpose is to coordinate research and extension efforts
• This presentation contains a variety of information gleaned from this group

Courtesy of J. Beuzelin, LSU AgCenter
Emerging Pest for Gulf Coast Sorghum Producers

- Commonly found infesting sugarcane in Louisiana since 1999
- Observed infestations in sorghum beginning in mid-July, 2013
- One report of an infestation in sorghum in LA in 2008
- Also found in Johnson grass, sweet sorghum, sorghum-Sudan
- No observations on sugarcane, energy cane or Sudan grass
- Observed on corn in TX, but no colonization
- In LA was tentatively identified as sugar cane aphid, *Melanaphis sacchari* by Julien Beuzilen, supportive ID by Jeff Davis
- Additional confirmation as sugarcane aphid or closely related:
  - David Voegtlin, University of Illinois
  - Gary Miller, USDA-ARS, Beltsville, MD
Corn leaf aphid

Yellow sugarcane aphid

SA in August, Corpus Christi
G. Odvody/M. Brewer, AgriLife Research

SA: sugarcane/sorghum aphid

Greenbug aphid

SA in January, remnant sorghum, RGV
R. Villanueva, AgriLife Extension
• Detected in 38 counties and parishes of Texas, Louisiana, Oklahoma, and Mississippi
• Arkansas likely infested
• Found in one state in Mexico
• Globally, SA is a significant pest of sorghum in China, Taiwan, Japan, India South Africa, Botswana and Zimbabwe
Why the Shift to Sorghum?

- Not certain
- Well known sorghum pest in some parts of the world, but relegated to sugarcane in others
- But no reports in sorghum prior to 2013 outside of a single unsubstantiated incident 2008
- Interesting that where sorghum was heavily infest in 2013, nearby sugarcane was not
- Biotypic shift to a biotype (strain) that is an obligate sorghum feeder?
  - Scott Armstrong, USDA-ARS is investigating this aspect
- Sexual forms have been collected from sorghum

Courtesy of Melanaphis Task Force
Conditions necessary to induce the formation of sexual forms is not known

C. Guo et al. 2011
Typical Sugarcane Aphid Population Development

But may develop high populations during boot

- Highest population growth noted: morning (53°F / 94% RH): afternoon (86°F / 43% RH)
- Populations greater in irrigated sorghum

From S. Africa - Van Rensburg, N.J. (1973)
Injury to Sorghum

- Feed primarily on underside of leaves and stems
- Reported to feed in xylem some places, phloem others
- General desiccation of plant tissue
- If a toxin is involved it is not acute in nature
- Associated reddening, purpling and necrosis of plant tissue
- Exasperated by dry conditions
- Once grain is filled, direct yield loss is highly unlikely

Not common in aphids; question validity although some aphids feed in both

Courtesy of S. Armstrong, USDA-ARS, Stillwater, OK

Courtesy of D. Kerns, LSU AgCenter, R. Villanueva, Texas A&M AgriLife Extension
Area with aerial application error

Early boot stage

Courtesy of D. Kerns, LSU AgCenter
Factors Contributing to Direct Yield Loss

- Number of aphids necessary to cause yield loss depends on:
  - Plant growth stage
  - Plant moisture stress
  - Duration of the infestation

- Yield loss unlikely once sorghum is at the milk stage

- South Africa reports of yield losses 46-78%

Singh et al. (2004)
Near Harvest Issues

Accumulation of copious amounts of honey dew, sooty mold and the aphids themselves

• Exasperated by dry weather
• Interference with Glyphosate uptake and efficacy
• Re-treated with
  – Sodium chlorate (4.8 qt + 1% COC)
• Result
  – Delayed harvest
    • 0-14 days (7 days avg)
  – Additional application expenses
    • $9-17 per acre ($10/acre avg)
  – Moisture issues at the elevator

Courtesy of D. Kerns, J. Beuzelin, LSU AgCenter
Yield Loss and Harvest Efficiency

Honey dew, sooty mold and aphid covered leaves resulted:

- **Clogged screens**
  - Grain loss over screens
    - 10-50% (22% avg)
- **Slower harvest speed**
  - 0-66% reduction (27% avg)
- **Excessive belt wear, breakage, cleaning equipment**
  - $1000s spent on repairs
  - Cleaning 8-55 hrs (33.5 h avg)

Courtesy of LSU AgCenter, R. Villanueva, AgriLife Extension
Insecticide Selection and Efficacy

Currently labeled for aphids in sorghum

- Chlorpyrifos (Lorsban, Nufos, etc)
  - 30-60 day PHI
- Dimethoate
  - 28 day PHI
- Pre-mixes
  - Cobalt
    - Chlorpyrifos + Gamma-cyhalothrin
      - 30-60 day PHI
  - Stallion
    - Chlorpyrifos + Zeta cypermethrin
      - 30 day PHI

Other labeled and non-labeled possibilities

- Pyrethroids (variety)
  - 14-30 day PHI
- Malathion
  - 3 day PHI
- Intruder
  - Not labeled
- Imidacloprid
  - Not labeled
- Transform
  - Not labeled

Too long for late-season infestations
Winnsboro, LA
September 10, 2013

- Mature sweet sorghum
- Plots 4 rows x 30 ft
- RCB 4 replicates
- Counted aphids from 5 leaves per plot
- Applied at 10 GPA
- Averaging ~600 aphids per leaf at application
- Chart represents % control based on Henderson-Tilton’s equation
- Tukeys HSD $P < 0.05$
St. Joseph, LA
September 12, 2013

- Mature grain sorghum
- Plots 4 rows x 50 ft
- RCB 4 replicates
- Counted aphids from 5 leaves per plot
- Applied at 10 GPA
- Averaging ~400 aphids per leaf at application
- Chart represents % control based on Henderson-Tilton’s equation
- Tukeys HSD $P < 0.05$
Beaumont, TX
August 30, 2013

- Mature grain sorghum
- Plots 1 rows x 50 ft
- RCB 4 replicates

- Counted aphids from 10-20 leaves/plot
- Applied at 12 GPA
- LSD $P < 0.05$
Weslaco, TX
October 29, 2013

- Mature grain sorghum
- Plots 4 rows x 50 ft
- RCB 4 replicates
- Counted aphids from 10-20 leaves/plot
- Applied at 10 GPA
- LSD $P < 0.05$
Insecticide Summary

• Flared aphids or provided poor control
  – Chlorpyrifos
    • Too long a PHI
  – Pyrethroids
  – Malathion

• Inconsistent control
  – Dimethoate
    • Too long a PHI

• Non-labeled
  – Admire Pro (Imidacloprid)
    • Good where tested
    • 1 trial
  – Intruder (Acetamaprid)
    • Inadequate control
  – Transform (Sulfoxaflor)
    • Consistently highly efficacious
    • 4 trials
    • (0.75-1.0 oz/ac)

Best Option for Section 18

MUST HAVE PHI NO MORE THAN 14 DAYS
Natural Enemies

A number of predators and at least one parasitoid have been observed preying on sugarcane aphid in sorghum.

However, their ability to effectively mitigate a sugarcane aphid infestation is questionable based on current observations.

Insecticide applications targeting headworms and midge may be impacting the effectiveness of late-season aphid natural enemies.
What Does the Future Hold?

• Scenario #1
  – Non-issue
  – Doesn’t return to sorghum

• Scenario #2
  – Similar to 2013
  – Similar geographic distribution
  – Late-season infestation
  – Harvest issues

• Scenario #3
  – Infestation occurs earlier in the season
  – Distribution spreads to a larger area
  – Crop injury, direct yield loss and harvest issues

D. Kerns, LSU AgCenter
## Economic Impact - 2013

Based on Louisiana Sorghum Production

<table>
<thead>
<tr>
<th>Survey Case</th>
<th>Acres Impacted</th>
<th>Estimated % Yield Loss</th>
<th>% Harvest Speed Reduction</th>
<th>Increased Desiccation Costs ($)</th>
<th>Machinery Downtime (Hours)</th>
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<td>50</td>
<td>17.00</td>
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<td>Wt. Averages</td>
<td>1,372</td>
<td>27.80%</td>
<td>22.06%</td>
<td>$8.40</td>
<td>40.8 hrs</td>
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### Returns above Costs

<table>
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<th></th>
<th>SA control</th>
<th>No SA control</th>
<th>% change</th>
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<tr>
<td>Returns above Costs</td>
<td>$89.26</td>
<td>($29.03)</td>
<td>-132.52%</td>
</tr>
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</table>
Recommendations Going into 2014

- Don’t rely on seed treatments
  - We don’t know for sure how effective these are towards SA (need data)
  - Level and length of control is dependent on weather and the product
- If SA colonization is evident, treat to prevent desiccation and necrosis
  - Be more aggressive during dry conditions; especially with non-irrigated sorghum
- There are tolerant sorghum hybrids
  - TX2763 background
- Depending on Section 18 registration, Dimethoate or Transform are currently the products of choice
  - Transform is less toxic to many aphid natural enemies than Dimethoate
  - Long PHI renders Dimethoate useless
- TX has requested a Section 18 registration for Transform
- LA is requesting a Section 18 registration for Transform
  - LA will prohibit use during bloom to facilitate registration
  - Not sure for TX
- If Transform Section 18 registration is not granted
  - Work within Dimethoate PHI restrictions and try to prevent large SA population buildup
    - May not work
  - 14-18 days prior to harvest utilize a high rate of a sodium chlorate desiccant with 1% v/v COC
Research & Extension Activities

**Research**
- Surveys of sugarcane aphids and their natural enemies (TX, LA, OK; AR & MS?)
- Continued insecticide efficacy testing (TX, LA)
- Foliar curative insecticides
- Seed treatments
- Comprehensive evaluation of impact of harvest aids for crop desiccation to facilitate harvest when aphids are present (LA)
- Economic thresholds (TX, LA)
- Investigate biotypic status and host suitability (USDA-ARS, Stillwater, OK)
- Screening sorghum germplasm for resistance (TX, USDA-ARS, Stillwater, OK)

**Extension**
- Develop a regional Extension Bulletin/Fact Sheet (TX, LA, OK)
- Presentations at grower and commodity outreach events (TX, LA, OK)
- Presentations at national and regional professional and commodity based meetings

D. Kerns, LSU AgCenter
THANK YOU

Members of the Melanaphis Task Force and supporting organizations

- Louisiana
  - D. Kerns, S. Brown, J. Beuzelin, K. Guidry (LSU AgCenter)
  - Louisiana Department of Agriculture and Forestry
- Texas
  - Texas Department of Agriculture
- Oklahoma
  - T. Royer, K. Giles (Oklahoma State University)
  - S. Armstrong (USDA-ARS, Stillwater, OK)
- Supporting organizations
  - National Sorghum Producers
  - Texas Sorghum Producers
  - Louisiana Soybean & Grain Research & Promotion Board
  - United Sorghum Checkoff Program