Pest Management Strategies to Control Sugarcane Aphid in Grain and Forage Sorghum

Michael Brewer
Texas A&M AgriLife Research
Department of Entomology
mjbrewer@ag.tamu.edu
http://ccag.tamu.edu/entomology/
http://ccag.tamu.edu/sorghum-insect-pests/
I. Insecticides and Application Technology
   R. Bowling, Extension; J. Gordy (Ph.D./county agent)
   Link: Sugarcane aphid regional group
   (TX, OK, KS, NM, LA, MISS, AL, TN, GA, SC, NC, MO)

II. Decision-making: thresholds, hybrids, mixed species
   M. Brewer, J. Gordy (Ph.D), M. Way, Research, R. Bowling, A. Knutson, Extension
   Link: B. Rooney, G. Peterson, Research;
   N. Elliott, ARS, D. Kerns, LSU; N. Seiter, U. Arkansas;
   D. Buntin, U. Georgia, T. Royer (OK)

III. Economics and outreach
   R. Bowling, A. Knutson, L. Russell, M. Young, S. Biles, Extension
   M. Brewer, M. Way, J. Gordy, Research
Outline

I. Background: The Aphid, Plant Damage & Distribution
II. First steps to management (Grain & Forage Sorghum)
   Identification, detection, and sampling
   Insecticides: Efficacy & Registration
III. Management in Grain Sorghum
   Thresholds
   Insecticide application
   Commercial hybrid sensitivity/resistance
IV. Management in Forage Sorghum
   Insecticide efficacy
   Cultural options
   Host plant range of the aphid
Financial supporters (Funding and in-kind)

**Texas Grain Sorghum Board**

*USDA Step-up Training, Undergrads (TAMU Kingsville, Del Mar College)*

*USDA NIFA Southern IPM Center*

*USDA NIFA Crop Protect & Pest Manage., Applied Res. & Dev.*

*United Sorghum Checkoff Program*

*TAMU COALS Fellowships, Grads*

*Monsanto/Syngenta, harvesting, equipment*
I. Background: The Aphid, Plant Damage, Distribution

Grasses where nymphs & adults were observed: Sorghum, johnson grass, Sorghum-sudan Other sorghum forages

No observations on sugarcane (other strain) Observed on corn, but no/little reproduction

Some sorghums are great hosts Underside of leaves & stems, Bottom to top of plant

G. Odvody/M. Brewer, AgriLife Research
Which is sugarcane aphid?

Which is tolerable injury and which is economic damage?
Which is tolerable injury and which is economic damage?

250 Aphids/Leaf  50 Aphids/Leaf  500 Aphids/Leaf

Quick Aphid Checker

Estimate the number of sugarcane aphids (SCA) per leaf to help time foliar insecticides for SCA control on sorghum. Each photo represents an estimate from the table. For example, photo A shows about 12 aphids.

<table>
<thead>
<tr>
<th>Photo</th>
<th>Range</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1-25</td>
<td>12</td>
</tr>
<tr>
<td>B</td>
<td>26-50</td>
<td>38</td>
</tr>
<tr>
<td>C</td>
<td>51-100</td>
<td>75</td>
</tr>
<tr>
<td>D</td>
<td>101-500</td>
<td>300</td>
</tr>
<tr>
<td>E</td>
<td>501-1000</td>
<td>750</td>
</tr>
<tr>
<td>F</td>
<td>&gt;1000</td>
<td>1500</td>
</tr>
</tbody>
</table>

Field Average = Total of All Estimates / Total # of Leaves Examined

Learn more about sugarcane aphids at http://txcan.blogspot.com

Photos courtesy of Travis Abreu, Mike Brewer, and Pat Potter. Funding provided by the Texas Grain Sorghum Producers Board and the USDA NIFA Southern IPM Center and Crop Protection and Pest Management Program.

Educational programs of the Texas A&M AgriLife Extension Service are open to all people without regard to race, color, sex, religion, national origin, age, disability, genetic information, or veteran status.

8000 copies - New
Things happen fast, but the plant doesn’t die immediately

Pre-flowering arrival/increase

Less grain/
No heads

Aphids/honeydew at harvest

Asexual reproduction, required green host primarily Sorghum sp.
Plant damage caused by general plant decline, head emergence problems
Honeydew and aphids reduce harvest effectiveness
Coastal Bend growers, IPM officials meet on sugarcane aphid problems.

2013 Sugarcane Aphid Occurrence in Sorghum

Aug/Sept

2012: Spots detects in South Texas

Geographic Range

Video Links

Brewer, Way, Villanueva, Kerns, Armstrong

Counties with Sugarcane Aphid in Sorghum

Lead: Robert Bowling
AgriLife Extension
Occurrence of Overwintering Sugarcane Aphid in Texas

April 24, 2015
## Grain Sorghum Impact in 2014

<table>
<thead>
<tr>
<th>State</th>
<th>Acre Infested by Sugarcane Aphid</th>
<th>Sorghum Production Losses from SA Infestations</th>
<th>Monetary Loss in production from SA</th>
<th>Sorghum Acres Treated for SA Infestations</th>
<th>Cost for Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA</td>
<td>100%</td>
<td>15% (1.8mm bu)</td>
<td>$7.2mm</td>
<td>75%</td>
<td>$1.1 mm</td>
</tr>
<tr>
<td>AL</td>
<td>100%</td>
<td>20% (0.22mm bu)</td>
<td>$0.88mm</td>
<td>75%</td>
<td>$0.20 mm</td>
</tr>
<tr>
<td>OK</td>
<td>10%</td>
<td></td>
<td></td>
<td>10%</td>
<td>$0.39 mm</td>
</tr>
<tr>
<td>GA</td>
<td>90%</td>
<td>15% (0.3mm bu)</td>
<td>$1.2mm</td>
<td>80%</td>
<td>$0.56mm</td>
</tr>
<tr>
<td>AR</td>
<td>90+%</td>
<td>15% (1.9mm bu)</td>
<td>$7.7mm</td>
<td>70%</td>
<td>$0.42mm</td>
</tr>
<tr>
<td>MS</td>
<td>100%</td>
<td>15% (0.87mm bu)</td>
<td>$3.5mm</td>
<td>70%</td>
<td>$1.1mm</td>
</tr>
<tr>
<td>TX</td>
<td>60%</td>
<td>5% (6.4mm bu)</td>
<td>$34.8mm</td>
<td>35%</td>
<td>$10.5mm</td>
</tr>
<tr>
<td>South TX</td>
<td>100%</td>
<td><strong>15%</strong> (8.7mm bu) w/o management: Up to 50%</td>
<td><strong>$25.6mm</strong></td>
<td>60%</td>
<td><strong>$8.1mm</strong></td>
</tr>
<tr>
<td>South TX 2015</td>
<td>50-75%</td>
<td></td>
<td><strong>$30-120mm</strong></td>
<td>30-40%</td>
<td></td>
</tr>
</tbody>
</table>
Management: feasible & challenging

+ Limited in landscape: *Sorghum* spp.
+ Damage from general decline, no acute toxicity
+ Not a vector, or only a potyvirus
+ Grain value
+/- Forage value
- Asexual, rapid reproduction
- Monitoring challenge:
  Wind-aided movement
  Aphids are small / leaves are green

G. Odvody/M. Brewer, AgriLife Research, T. Ahrens, Del Mar College
M. Way/M. Brewer, AgriLife Research
Coastal Bend growers, IPM officials meet on sugarcane aphid problems

I. Background: The Aphid, Plant Damage & Distribution
II. First steps to management (Grain & Forage Sorghum) Identification, detection, and sampling
   Insecticides: Efficacy & Registration
III. Management in Grain Sorghum Thresholds
    Insecticide application
    Commercial hybrid sensitivity/resistance
IV. Management in Forage Sorghum
    Insecticide efficacy
    Cultural options
    Host plant range of the aphid

http://ccag.tamu.edu/sorghum-insect-pests/
II. First steps to management:

➢ Proper ID

➢ Divide sampling effort
  ▪ Focus weekly **Fast Detection** for first detection in many fields
  ▪ Focus 2X weekly **Quick Aphid Checker** (aphid estimates) in infested fields
  ❖ Following up to a 2 month window after detection is critical

http://ccag.tamu.edu/sorghum-insect-pests/
Effective Insecticides & Registration Status
Early bloom, 15 GPA, Hand-held CO2 sprayer
Sinton, Texas 2015, Cooperator: Charles Ring

![Graph showing the effectiveness of different insecticides over time.](chart.png)
Transform Treatment

No apparent aphid injury

Untreated Check

Severe plant injury caused by SCA

56% Yield Reduction

Delayed maturity
No benefit of adjuvants added to Primary Insecticide
Early bloom, 15 GPA, Hand-held CO2 sprayer
Sinton, Texas 2015, Cooperator: Charles Ring

![Graph showing aphid population with different treatments and time points.](image-url)
Sivanto:
Full label for sorghum (grain and forage)

Transform:
On Friday, November 13th 2015:
• All labels for sulfoxaflor vacated (court ordered, EPA complied)
• Existing ON-FARM stocks can be used according to the label.
• All stocks in retail outlet facilities cannot be delivered or sold.
• Application is underway for Section 18 on sorghum for SCA management, unknown effects of court order
Future Work:

Improving penetration
  Spray tips: hollow cone, flat fan, dual fan
Harvest safeguards
  Insecticide with harvest aid
Mixed species management
  Tank mixes at critical times
Coastal Bend growers, IPM officials meet on sugarcane aphid problems

I. Background: The Aphid, Plant Damage & Distribution
II. First steps to management (Grain & Forage Sorghum)
   Identification, detection, and sampling
   Insecticides: Efficacy & Registration
III. Management in Grain Sorghum
    Thresholds
    Insecticide application
    Commercial hybrid sensitivity/resistance
IV. Management in Forage Sorghum
    Insecticide efficacy
    Cultural options
    Host plant range of the aphid

http://ccag.tamu.edu/sorghum-insect-pests/
III. Management in Grain Sorghum
Threshold Experiment for susceptible grain sorghum hybrids

2014  LGC: Corpus Christi, TX
      NLA: Winnsboro, LA

2015  LGC: Lower Gulf Coast (Brewer) Planted: May 1 (2nd planting)
      UGC: Upper Gulf Coast (Gordy) Planted: July 16 (3rd planting)
      OK:    Oklahoma (Royer) Planted June 4 (2nd planting)
      NLA:  North LA (Kerns) Planted: May 29 (2nd planting)
      AR:    Arkansas (Seiter) Planted June 9 (2nd planting)
      GA:    Georgia (Buntin) Planted June 15 (1st planting)

Early Planting
Escaped damage
LGC, UGC, OK, NLA, RA

Late Planting
Aphids arrived pre-boot

A. Reyes, C. Stanton, AgriLife Research
Sorghum ‘S’ Hybrids: Threshold Experiment

Plot size: 40 ft by 4 rows, data taken on inner two rows
Action triggers for foliar insecticide
(0 GA only), 50, (100 to 125), 250 & 500 aphids/leaf & UTC
Transform (sulfoxaflor) 1.0 oz per acre, 10-15 GPA

First aphids arrived at 5-6 leaf, pre-boot

Sorghum Hybrids:

2014
LGC: RTX430, 1 spray max
NLA: RTX430, 2 sprays max

2015
LGC: Dekalb DKS 53-67, 1 spray max
UGC: Dekalb DKS 53-67, 4 sprays max
OK: DK53-67, 1 spray max
NLA: TX430, irrigated, 2 sprays max
AR: P83P99, irrigated, 3 sprays max
GA: SS800A, 3 sprays max

Measurements: weekly
Aphid density (aphid/leaf)
20 leaves per plot,
10 top-half, 10 bottom-half
used quick aphid checker
(5-10 min per plot)

Yield
2014, 2015 Results in Pictures, Susceptible (TX430, DKS 53-67)

50/100 (S)
Few aphids 7-14 DAT, no injury, no yield loss, natural enemies reduced

LGC: 1 spray
UGC: 4 sprays
NLA: 2 sprays
GA/AR: 3 sprays

250 (S)
Few aphids 7-14 DAT, sooty mold detected, no yield loss, abundant natural enemies

LGC: 1 spray
UGC: 3 sprays
NLA: 1 spray
GA/AR: 1 or 2 sprays

UTC & 500 (S)
High aphids 7-14 DAT, damage visible, yield loss, natural enemy zoo

LGC/UGC: 0 spray
NLA: 0 spray
GA/AR: 0 or 1 spray
2015 Yield (Susceptible hybrid)—Max Aphid Load Regression

2015 Yield Loss estimates in lbs/acre (and % yield reduction) for every 100 aphids/leaf

The plant:

Why the Yield Loss response
Courtesy of David Buntin

Fewer Heads
Less Grain on remaining

USB Sugarcane Aphid Threshold Study,
Sorghum Grain yield (±SE), Georgia 2015

Means with the same letter are not significantly different (PROC GLIMMIX, α=0.05)

USB Sugarcane Aphid Threshold Study,
Percentage (±SE) of plants with grain heads,
Georgia 2015

Means with the same letter are not significantly different (protected LSD, α=0.05)
Values in a feasible IPM management zone, here ET = 0.7*EIL

2015 ET variation 30—135 aphids per leaf
2014 ET variation 50—125 aphids per leaf

### 2015 Example

<table>
<thead>
<tr>
<th>Market Value</th>
<th>Location</th>
<th>EIL</th>
<th>ET</th>
<th>Control Cost $15/acre Aphids/leaf</th>
<th>EIL</th>
<th>ET</th>
<th>Control Cost $20/acre Aphids/leaf</th>
<th>EIL</th>
<th>ET</th>
<th>Control Cost $25/acre Aphids/leaf</th>
<th>EIL</th>
<th>ET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$3.50/bushel $6.25/cwt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OK</td>
<td>209</td>
<td>146</td>
<td>279</td>
<td>195</td>
<td>348</td>
<td>244</td>
<td>195</td>
<td>348</td>
<td>244</td>
<td>195</td>
<td>348</td>
</tr>
<tr>
<td></td>
<td>UGC</td>
<td>167</td>
<td>117</td>
<td>223</td>
<td>156</td>
<td>278</td>
<td>195</td>
<td>156</td>
<td>278</td>
<td>195</td>
<td>156</td>
<td>278</td>
</tr>
<tr>
<td></td>
<td>LGC</td>
<td>111</td>
<td>78</td>
<td>148</td>
<td>104</td>
<td>186</td>
<td>130</td>
<td>104</td>
<td>186</td>
<td>130</td>
<td>104</td>
<td>186</td>
</tr>
<tr>
<td></td>
<td>AR</td>
<td>80</td>
<td>56</td>
<td>107</td>
<td>75</td>
<td>134</td>
<td>94</td>
<td>75</td>
<td>134</td>
<td>94</td>
<td>75</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>NLA</td>
<td>71</td>
<td>50</td>
<td>95</td>
<td>66</td>
<td>119</td>
<td>83</td>
<td>66</td>
<td>119</td>
<td>83</td>
<td>66</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>62</td>
<td>43</td>
<td>82</td>
<td>57</td>
<td>103</td>
<td>72</td>
<td>57</td>
<td>103</td>
<td>72</td>
<td>57</td>
<td>103</td>
</tr>
<tr>
<td>$5.00/bushel $8.93/cwt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OK</td>
<td>146</td>
<td>102</td>
<td>195</td>
<td>137</td>
<td>244</td>
<td>171</td>
<td>137</td>
<td>244</td>
<td>171</td>
<td>137</td>
<td>244</td>
</tr>
<tr>
<td></td>
<td>UGC</td>
<td>117</td>
<td>82</td>
<td>156</td>
<td>109</td>
<td>195</td>
<td>136</td>
<td>109</td>
<td>195</td>
<td>136</td>
<td>109</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>LGC</td>
<td>78</td>
<td>55</td>
<td>104</td>
<td>73</td>
<td>130</td>
<td>91</td>
<td>73</td>
<td>130</td>
<td>91</td>
<td>73</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>AR</td>
<td>56</td>
<td>39</td>
<td>75</td>
<td>53</td>
<td>94</td>
<td>66</td>
<td>53</td>
<td>94</td>
<td>66</td>
<td>53</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>NLA</td>
<td>50</td>
<td>35</td>
<td>66</td>
<td>46</td>
<td>83</td>
<td>58</td>
<td>46</td>
<td>83</td>
<td>58</td>
<td>46</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>43</td>
<td>30</td>
<td>57</td>
<td>40</td>
<td>72</td>
<td>50</td>
<td>40</td>
<td>72</td>
<td>50</td>
<td>40</td>
<td>72</td>
</tr>
<tr>
<td>$6.50/bushel $11.60/cwt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OK</td>
<td>113</td>
<td>79</td>
<td>150</td>
<td>105</td>
<td>188</td>
<td>131</td>
<td>105</td>
<td>188</td>
<td>131</td>
<td>105</td>
<td>188</td>
</tr>
<tr>
<td></td>
<td>UGC</td>
<td>90</td>
<td>63</td>
<td>120</td>
<td>84</td>
<td>150</td>
<td>105</td>
<td>84</td>
<td>150</td>
<td>105</td>
<td>84</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>LGC</td>
<td>60</td>
<td>42</td>
<td>80</td>
<td>56</td>
<td>100</td>
<td>70</td>
<td>56</td>
<td>100</td>
<td>70</td>
<td>56</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>AR</td>
<td>43</td>
<td>30</td>
<td>58</td>
<td>40</td>
<td>72</td>
<td>51</td>
<td>40</td>
<td>72</td>
<td>51</td>
<td>40</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>NLA</td>
<td>38</td>
<td>27</td>
<td>51</td>
<td>36</td>
<td>64</td>
<td>45</td>
<td>36</td>
<td>64</td>
<td>45</td>
<td>36</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>33</td>
<td>23</td>
<td>44</td>
<td>31</td>
<td>55</td>
<td>39</td>
<td>31</td>
<td>55</td>
<td>39</td>
<td>31</td>
<td>55</td>
</tr>
</tbody>
</table>

From Pedigo’s method $EIL = \frac{C}{(V*I*D*K)}$, $C =$ control cost, $V =$ $\$ value of grain
$K$ set at 0.95 as the proportion of the insect population controlled (taken from efficacy studies)
$I*D$ is loss estimate estimated from the slope of yield—aphid/leaf regression
Use of these thresholds

✓ ID, sampling, and estimating aphid load critical

✓ ? Insecticide use within same or few days
✓ ? Excellent insecticides available

http://ccag.tamu.edu/sorghum-insect-pests/
Picking a specific threshold for you:

2015 ET variation 30 — 135 aphids per leaf
2014 ET variation 50 — 125 aphids per leaf

One responsible approach: choose an ET in the lower part of the range and adjust as you get more information.

Location, insecticide cost, grain value

Sampling once (↓ ET) or twice (↑ ET) weekly

Is hybrid very susceptible (↓ ET) or less susceptible (↑ ET)??

Is it hot and dry (↓ ET) or rains and natural enemies (↑ ET)??
Threshold adjustments: hybrid sensitivity

Suspect resistance R  TX2783 (2014/2015)
Dekalb DKS 37-07 (2015)

Lower Gulf Coast

2014, Corpus Christi

<table>
<thead>
<tr>
<th>Action Levels for Spray (days after spray data taken)</th>
<th>Resistant Hybrid</th>
<th>Non-resistant Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTC 50, 100, 250, 500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yield (bu/A)</td>
<td>Resistant</td>
<td>Non-resistant</td>
</tr>
<tr>
<td>0, 20, 40, 60, 80</td>
<td>Resist.</td>
<td>Suscept.</td>
</tr>
<tr>
<td>100</td>
<td>Resist.</td>
<td>Suscept.</td>
</tr>
<tr>
<td>2X, 1X</td>
<td>Resist.</td>
<td>Suscept.</td>
</tr>
</tbody>
</table>

Northern Louisiana

Winnsboro, LA 2014

<table>
<thead>
<tr>
<th>Action threshold</th>
<th>UTC 50, 100, 250, 500</th>
<th>Yield (bu/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0, 20, 40, 60, 80</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>2X, 1X</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>never treated</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
a never treated
b a X 1X 2X
Hybrid Resistance (2016 expected commercially available)  
(Oct 2015, courtesy B. Bean, United Sorghum; D. Kerns, LSU)

### Hybrid Maturity Approach Source

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Maturity</th>
<th>Approach</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pioneer 83P17 (SE)</td>
<td>Med-Full</td>
<td>--</td>
<td>S</td>
</tr>
<tr>
<td>Pioneer 83P56</td>
<td>Med-Full</td>
<td>--</td>
<td>S</td>
</tr>
<tr>
<td>DeKalb 37-07</td>
<td>Med-Early</td>
<td>A, B</td>
<td>S, P</td>
</tr>
<tr>
<td>DeKalb Pulsar</td>
<td>Med-Early</td>
<td>A, B</td>
<td>S, P</td>
</tr>
<tr>
<td>Sorghum Partners SP7715</td>
<td>Med-Full</td>
<td>A, B</td>
<td>S, P</td>
</tr>
<tr>
<td>Sorghum Partners SPX17414</td>
<td>Med-Full</td>
<td>--</td>
<td>S</td>
</tr>
<tr>
<td>Sorghum Partners SPX17514</td>
<td>Med-Full</td>
<td>A</td>
<td>S, P</td>
</tr>
<tr>
<td>Richardson RS260E</td>
<td>Med-Full</td>
<td>B</td>
<td>S, P</td>
</tr>
<tr>
<td>Richardson Sprint WG</td>
<td>Med-Early</td>
<td>B</td>
<td>S, P</td>
</tr>
<tr>
<td>Richardson Jower I</td>
<td>Full</td>
<td>B</td>
<td>S, P</td>
</tr>
</tbody>
</table>

### Approaches
- A. Seedling greenhouse
- B. Full season field
- C. Characterize resistance
- D. Identify genetics

### Source
- S. Seed company
- I. Independent private
- P. Public sector (Univ.)
Field Evaluation of Sorghum Hybrids for Susceptibility to Sugarcane Aphid

Courtesy of John Gonzales, David Kerns, Julien Beuzelin, Sebe Brown
Louisiana State University Agricultural Center
Integrated management

Natural Enemies + Host Plant Resistance + Good Rains =

Less damaged sorghum and higher thresholds (↑ ET)?

250 Aphids/Leaf
DK 53-67

Lady bugs, Hover flies, Parasitoids

70 Aphids/Leaf
DK 37-07
Break for Questions?

I. Background: The Aphid, Plant Damage & Distribution
II. First steps to management (Grain & Forage Sorghum)
   Identification, detection, and sampling
   Insecticides: Efficacy & Registration
III. Management in Grain Sorghum
   Thresholds
   Insecticide application
   Commercial hybrid sensitivity/resistance
IV. Management in Forage Sorghum
   Insecticide efficacy
   Cultural options
   Host plant range of the aphid

*Aphelinus sp. varipes* group (Aphelinidae)
adults (left) and live and mummified aphids (right)
IV. Management in Forage Sorghum

Sugarcane Aphid Insecticide Efficacy Trial, *Sorghum almum*
Early bloom, 10 GPA, Hand-held CO2 sprayer
La Granage, Texas 2015, Cooperator: Andrew Srubar

Also effective:
Sivanto 4 oz/A
Nufos 1 qt/A (Chlorpyrifos)

Courtesy: Robert Bowling
AgriLife Extension
Cultural Options: Natural enemies,
Courtesy of E. Maxson, J. Woolley, M. Brewer, AgriLife Research

Lady Beetles (Coccinellidae)

- Coleomegilla maculata
- Harmonia axyridis
- Olla v-nigrum (light form)
- Coccinella septempunctata
- Cycloneda sanguinea
- Hippodamia convergens
Green Lacewings (Chrysopidae)

Cereaochrysa sp.

Brown Lacewings (Hemerobiidae)

ysoperla carnea

Hemerobius sp.
Hoverflies (Syrphidae)

Pseudodorus clavatus (syn. Dioprosopa clavata)

Allograpta obliqua

Unknown species
Parasitoids

Aphelinus sp. varipes group (Aphelinidae)
adults (left) and live and mummified aphds (right)

Lysiphlebus testaceipes
adult and mummies (Braconidae)

Syrphophagus sp.
(Encyrtidae)
Hyperparasitoid of Aphelinus sp.

Image courtesy of X. Shirley
Image courtesy of T. Ahrens
Image courtesy of James Woolley
## Seasonal Aphid and Natural Enemy Abundance

<table>
<thead>
<tr>
<th>date</th>
<th>plant stage</th>
<th>aphids total</th>
<th>aphids/leaf</th>
<th>mummies-Aphelinus</th>
<th>mummies-Braconid</th>
<th>lady beetle adult</th>
<th>lady beetle juv</th>
<th>Scymnus adult</th>
<th>Scymnus juv</th>
<th>hoverfly juv</th>
<th>lacewing adult</th>
<th>lacewing juv</th>
<th>spider</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-May-15</td>
<td>V5</td>
<td>1</td>
<td>0.01</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>28-May-15</td>
<td>V6</td>
<td>144</td>
<td>0.90</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2-Jun-15</td>
<td>V7</td>
<td>1512</td>
<td>9.45</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>10-Jun-15</td>
<td>V8</td>
<td>3992</td>
<td>24.95</td>
<td>60</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>16-Jun-15</td>
<td>V9</td>
<td>746</td>
<td>4.66</td>
<td>23</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>24-Jun-15</td>
<td>Boot</td>
<td>3375</td>
<td>21.09</td>
<td>59</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>2</td>
<td>8</td>
<td>17</td>
<td>1</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>30-Jun-15</td>
<td>Bloom</td>
<td>5800</td>
<td>36.25</td>
<td>79</td>
<td>0</td>
<td>3</td>
<td>14</td>
<td>0</td>
<td>23</td>
<td>21</td>
<td>1</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>8-Jul-15</td>
<td>Mild</td>
<td>4751</td>
<td>29.69</td>
<td>135</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>8</td>
<td>57</td>
<td>35</td>
<td>4</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>15-Jul-15</td>
<td>Soft dough</td>
<td>2741</td>
<td>17.13</td>
<td>174</td>
<td>42</td>
<td>1</td>
<td>13</td>
<td>8</td>
<td>35</td>
<td>8</td>
<td>0</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>21-Jul-15</td>
<td>Soft dough</td>
<td>3171</td>
<td>19.82</td>
<td>177</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>37</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>29-Jul-15</td>
<td>Hard dough</td>
<td>1622</td>
<td>10.14</td>
<td>261</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>21</td>
<td>19</td>
<td>3</td>
<td>6</td>
<td>11</td>
<td>26</td>
</tr>
<tr>
<td>5-Aug-15</td>
<td>Hard dough</td>
<td>130</td>
<td>0.81</td>
<td>32</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>17</td>
</tr>
</tbody>
</table>

Total number of aphids (also aphids/leaf) and natural enemies (adults and juveniles) across 8 sorghum plots (DKS 37-07 and 53-67).

Same sampling effort across time.

Texas A&M Agrilife Research and Extension Center at Corpus Christi, TX College Station data in preparation, from late season regrowth.
Host plant range of the aphid

Grasses where nymphs & adults were observed: Sorghum, johnson grass, Sorghum-sudan, S. almum (all in genus *Sorghum*)

No observations on millet, alfalfa, wheatgrasses
Observed on corn, but no/little reproduction

G. Odvody/M. Brewer, AgriLife Research
Management in Forage Sorghum: Summary

Sugarcane Aphids in Forage Sorghum:
• Use information on grain sorghum infestations to time inspection
• Know what mixed pests are present: grasshoppers, fall armyworm
• Short stature forage sorghums (such as Sorghum almum) will benefit from Insecticide treatment (Sivanto, Transform, Chlorpyrifos)
• Coverage issues may result in poor suppression in taller sorghum such as sudangrass and other forage sorghums
• General recommendation is to harvest early when tall forages are heavily infested with sugarcane aphid (presence of heavy honeydew accumulation and sooty mold ¼ to ½ way up the plant as a guideline)
• Sooty mold and honeydew will not deter cattle from consuming the hay.
• Sooty mold will not harm livestock at levels encountered
• Effect on hay quality by dense aphid populations and moderate damage not known.
• Light aphid densities have no effect on hay quality.
Outreach

In-season: Turn-Row, Crop Tours Grower/trade meetings TPPA, Ag. Tech., Seed Trade Ongoing: Maps, TDA, Webinars

Robert Bowling, Robert.Bowling@ag.tamu.edu
Allen Knutson, a-knutson@tamu.edu
Mike Brewer, mjbrewer@ag.tamu.edu
http://ccag.tamu.edu/sorghum-insect-pests
You can do it: ID, detect, sample, and compare to threshold

Use of these thresholds
Values are in a feasible IPM management zone
2015 ET variation 30—135 aphids per leaf
2014 ET variation 50--125 aphids per leaf
ID, sampling, and estimating aphid load
Insecticide use within 2 days: Possible in large production
Excellent insecticides available
And the future looks promising for Integrated management
Natural Enemies + Sorghum Resistance + Good Rains =

Less damaged sorghum/ less susceptible to aphid (↑ ET)?

250 Aphids/Leaf

Lady bugs, Hover flies, Parasitoids

70 Aphids/Leaf