ABSTRACT
Since introduction in 2013, the sugarcane aphid, Melanaphis sacchari (Zehntner) has become an annual pest of sorghum in all sorghum production regions of the U.S. Because this pest can cause significant economic injury to sorghum, it is necessary to evaluate different integrated pest management tactics, including use of tolerant hybrids, as a means of minimizing damage. Replicated large-plot trials were performed near Corpus Christi, Rosenberg, and Gainesville, Texas to evaluate tolerance in select commercial sorghum hybrids. Eight hybrids (seven purposedly resistant hybrids and one known susceptible hybrid) were planted in a randomized complete block, replicated four times, and aphid populations were allowed to grow unmanaged. Each plot was divided into three 1/1000th acre subplots where aphid populations were monitored weekly. The 1/1000th acre subplots were hand harvested and evaluated for aphid-yield loss. At Corpus Christi and Rosenberg, there were accompanying small plot trials with the same hybrids arranged in a split-split plot design. Each hybrid was planted in eight continuous rows with four rows left unmanaged and four rows sprayed with insecticide to keep aphid populations near zero. In the small plot experiment, the susceptible hybrid produced a similar aphid-yield loss relationship as in previous experiments, equating to ~25% yield reduction in non-treated versus insecticide treated subplots. In resistant hybrids, populations of aphids did not reach threshold levels used for susceptible hybrids and yield/aphid regressions did not indicate damage. These data do not currently support a specific threshold level for highly resistant hybrids as aphid populations did not reach damaging levels under our experimental conditions.

INTRODUCTION
Grain sorghum, Sorghum bicolor L., is an important crop in Texas and the southern United States. Since its first detection in 2013, sugarcane aphid (Melanaphis sacchari) has expanded to all of the sorghum growing regions in the U.S. and has caused economic loss due to direct damage and harvest related issues (Brewer et al. 2017, Bowling et al. 2016). Pest resistant or tolerant germplasm of any given crop can be an important component of an effective integrated approach to management of a pest, and the sugarcane aphid – grain sorghum dynamic is no different. Some grain sorghum hybrids with greenbug resistant traits as well as additional sources of resistance show reduced damage when infested with sugarcane aphid (Armstrong et al. 2015, Mbulwe et al. 2015). While a threshold of 50-75 aphids per leaf has been supported for susceptible hybrids, the aphid population – damage relationship in resistant hybrids has not been determined. The goal here was to evaluate several commercially available sorghum hybrids to identify economic injury level and suggest a threshold for sugarcane aphid on resistant sorghum hybrids.

MATERIALS and METHODS
Studies were performed at the Corpus Christi Research and Extension Center and in commercial grain sorghum fields near Corpus Christi, Rosenberg, and Gainesville during the 2017 production year (Plate 1).

Large Plots With 1/1000th Acre Subplots
Locations: Corpus Christi, Rosenberg, and Gainesville, Texas
Design: Randomized Complete Block
Plot Size: Corpus Christi and Rosenberg - Six Rows of >600 feet per plot Gainesville – Four rows of >600 feet per plot
Subplots: Three 1/1000th acre subplots per strip (12 total per hybrid)
Aphid Measures: Semiweekly counts of 20 leaves (10 plants, one upper and lower leaf) per plot. Aphids were not managed with insecticide
Harvest: 1/1000th acre subplots were hand harvested and threshed
Large plots were harvested with grower equipment (not reported here)

Data Analyses: Linear Regression (ProcReg in SAS 9.4) was used to determine aphid population–damage relationships and determine economic injury, based on 1/1000th acre aphid and yield data

RESULTS

Figure 1 A-D. Selected hybrids from small plots visible in yellowing. Hybrid A, known susceptible Dekalb 53-67, exhibits visible yellowing and sooty mold in non-treated (A-1) versus healthy plants in insecticide-treated (A-2) subplots. Hybrids B, C, and D – all purposedly resistant hybrids – exhibit little or no difference between non-treated (-1) and insecticide-treated (-2) subplots.

Table 1. Regression results and maximum aphid load for small split plots in Corpus Christi and Rosenberg and 1/1000th acre subplots for Gainesville.

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<tr>
<th>Hybrid</th>
<th>SCA Sun. Res.</th>
<th>Location</th>
<th>Year</th>
<th>Experimental Design</th>
<th>Highest Plot Mean</th>
<th>Max Aphid/Leaf</th>
<th>Mean Aphid/Leaf</th>
<th>Y- Int.</th>
<th>Y-Slope</th>
<th>R²</th>
<th>Intercept</th>
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<td>0.57</td>
<td>0.095</td>
<td>0.435</td>
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<td>0.363</td>
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<td>Rosenberg</td>
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<td>2.0</td>
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<td>0.095</td>
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Figure 2. Mean Yield of insecticide-treated and non-treated subplots in Rosenberg

Figure 3. Mean maximum number of aphids observed in insecticide-treated and non-treated subplots in Rosenberg

REFERENCES

ACKNOWLEDGMENTS
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Additional information is available at: http://ccag.tamu.edu/sorghum-insect-pests