2016 Hybrid Evaluations for Resistance to the Sugarcane Aphid
Fort Bend County

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Introduction

Sugarcane aphid management on sorghum has been primarily through use of economic thresholds and insecticide applications. A few commercial hybrids designated as resistant or 'highly-tolerant' have been used to minimize damage caused by sugarcane aphid. Commercial sorghum hybrids resistant to sugarcane aphid continue to reach the market with little confirmation of resistance from academia. Research and extension entomologists in the United States have established sorghum screening trials to verify SCA resistance previously reported by various seed companies. Here, we evaluated eight hybrids (seven purported to be resistant and one known susceptible) for resistance to sugarcane aphid.

Objective

The objective of this study was to quantify sugarcane aphid resistance or tolerance in commercial grain sorghum hybrids and determine the yield benefit of treating sugarcane aphid resistant grain sorghum hybrids using differential performance trials.

Material and Methods

The trial was initiated on May 5, 2016. The late planting date was selected to improve the probability of sugarcane aphid establishment on sorghum prior to head emergence. Eight hybrids (SP 7715-Sorghum Partners, BH4100-BH Genetics, AG 1203-Alta, GS 725-NuTech, BH XPS 1630-BH Genetics, W7051-Warner, and 399x430) were planted using a two-row Almaco cone planter with John Deere Max Emerge Plus units on 38-inch spacing. Seeding rate was 63,153 seeds/acre.

Entries were arranged in a split-plot design with hybrids as whole plots and SCA control (chemically) strip applied to sub-plots with four replications. Whole plot was 8 rows wide, split into two, four-row subplots. The center two rows of one four-row subplot were assigned for treatment with insecticide when the mean SCA count per leaf exceeded 50 (mean of 10 upper and 10 lower leaves. Threshold for selected plots was met June 2 and June 9 and plots were sprayed on June 3 and June 10, respectively, with Sivanto Prime at 4 fl oz/acre.

Atrazine (1 qt/a), Roundup (24 oz/a), and Sharpen (1 oz/a) were applied at planting for weed management. Pre-plant fertilizer was subsurface banded in the side of each row using 500 lb/acre of 32-0-0. Plots were sprayed for sorghum Midge on July 1 and July 7 using Karate at 4 fl oz/acre. Plots were sprayed for headworms on July 12 using Prevathon at 12 fl oz/acre. All other management practices followed standard AgriLife recommendations.

Data was analyzed using SAS 9.4 for a split-plot design with hybrid as the main plot arranged in a randomized block design and insecticide treatment as the subplot. Error term for main plots was specified as hybrid*blk. SCA count data was analyzed separately by date. Main effects were used to compare hybrids and insecticide subplot when no interaction (hybrid*subplot) was significant. If interaction was present, subplot levels were compared by hybrid for each date as needed. Hybrid or subplot levels were considered significantly different at $p<0.05$ using LSD method.

Results

Weekly counts of SCA began on June 2, 28 days after planting, when SCA were detected in all plots and were already at threshold in 399x430 and GS 725. On June 2, significant differences ($p=0.041$) in mean SCA per leaf between hybrids was observed. The susceptible check (399x430) and GS 725 had mean aphid counts per leaf of 62 and 61, respectively. DKS 37-07 (48 aphids per leaf) was not significantly different from Tx399 x Tx430 or GS 725. By June 9, all other hybrids were above threshold levels, with mean SCA per leaf from 63 to 237 (Figure 1). All hybrids were in the vegetative growth stage when insecticide treatments were applied.

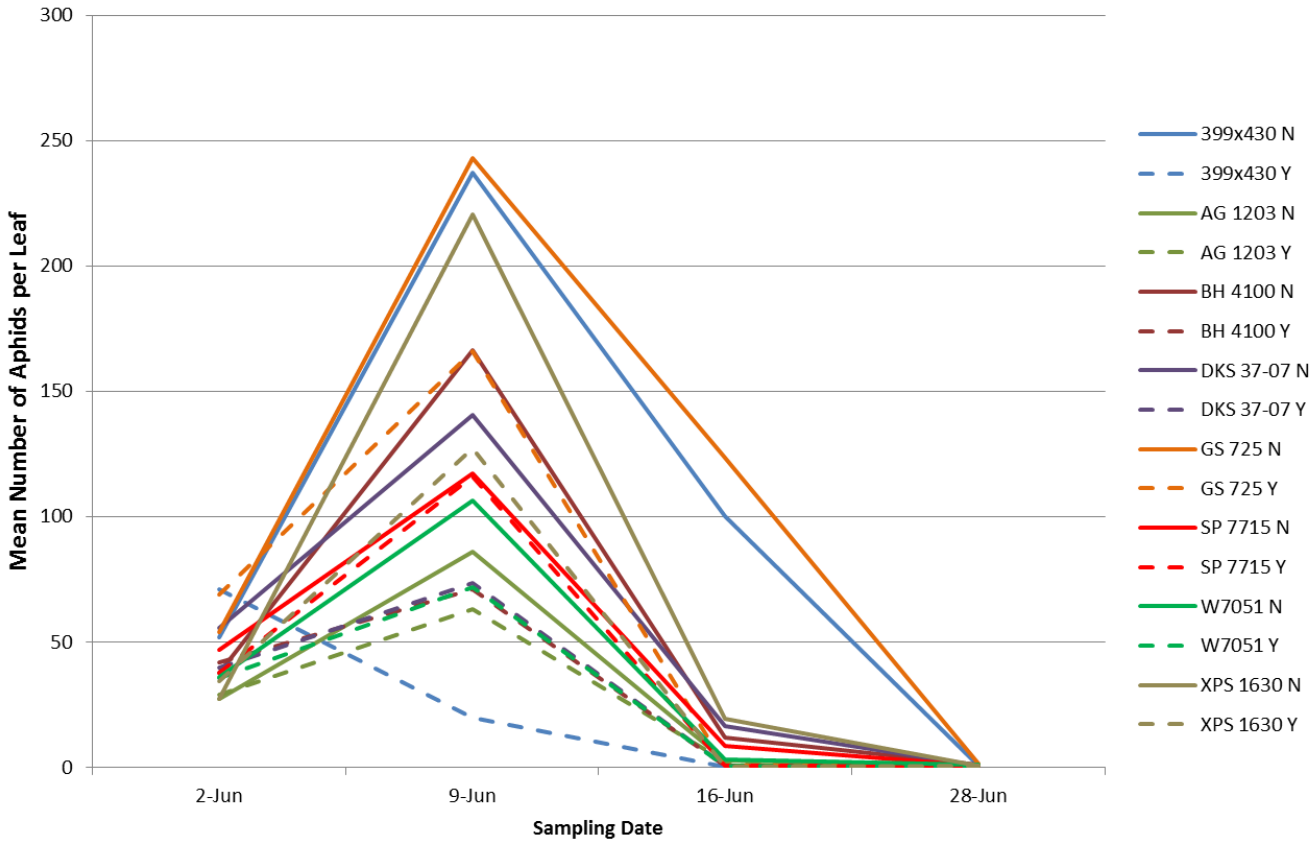

Figure 1: Mean sugarcane aphids per leaf for hybrids with and without insecticide application from June 2 through June 28. Y indicates treatment with Sivanto Prime at 4 oz/acre (dashed lines), N indicates no insecticide treatment (solid lines).

Following insecticide application (Sivanto, 4 oz/acre) to subplot A for hybrids 399 x430 and GS 725, a significant interaction was observed between hybrid and subplots on June 9 ($p=0.028$) and June 16 ($p=0.019$).

By June 16, aphid populations declined and only unsprayed plots of GS 725 and 399x430 had mean SCA numbers over the 50 aphid/leaf trigger threshold (123 and 100 aphids/leaf, respectively).

One week after treatment with Sivanto Prime at 4oz/acre, mean SCA per leaf was 71 to 91 % lower than treatments without insecticide application. Population reduction was not followed more than one week after treatment as populations collapsed across all sorghum hybrids shortly after the June 16 assessments.

There was not a hybrid by subplot interaction (*P*=0.4724), suggesting that aphid populations were not sufficient to cause a yield reduction in hybrids not treated with an insecticide when compared with yield from the insecticide treatment (Figure 2). Therefore, yield for each hybrid was averaged across insecticide treatments. There was a statistical yield response (*P*=0.0121) among hybrids in this trial (Figure 3). W 7051 and SP 7715 yielded higher than AG 1203, DKS 37-07, 399x430, and BH 4100. GS 725 and XPS 1630 were not different from W 7051 and SP 7715.

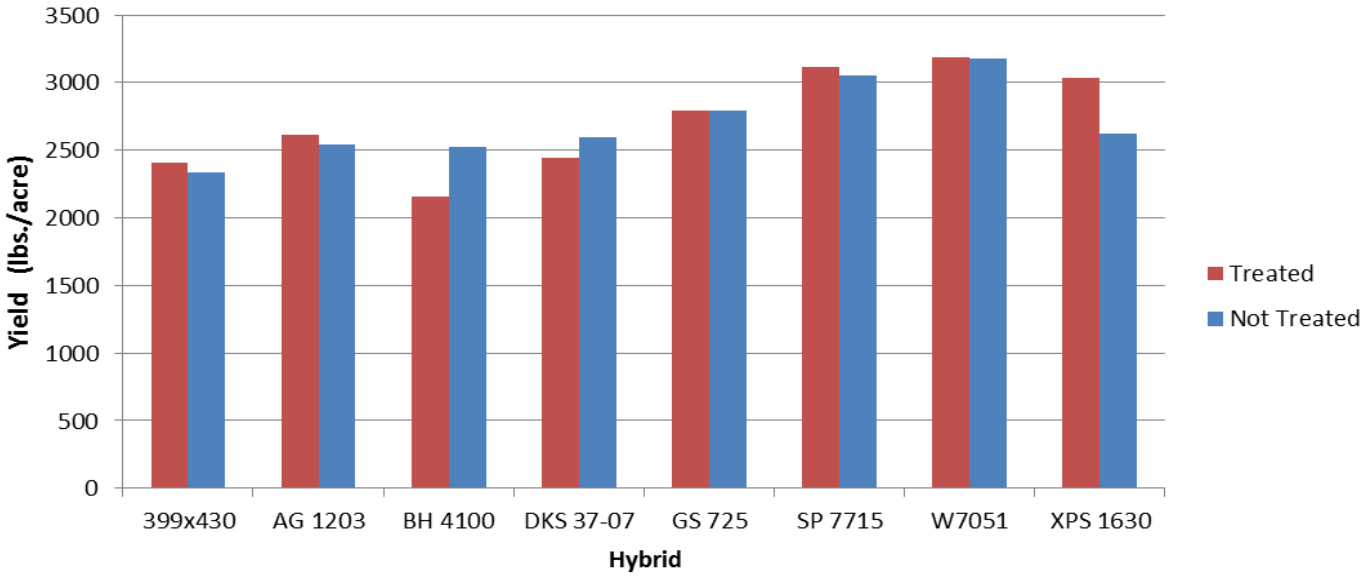

Figure 2: Mean hybrid yield by insecticide treatment with Sivanto Prime at 4 oz/acre. No hybrid demonstrated a difference in yield between treated and not treated subplots (*P*=0.05).

Conclusions

DKS 37-07, AG 1203, BH4100, SP7715 and W7051 demonstrated lower levels of SCA numbers per leaf over time (mean sca per leaf did not exceed the upper threshold of 125 per leaf for AG 1203, SP7715, or W7051) compared to 399x430, GS 725 and XPS 1630. However, at this location, all hybrids experienced aphid populations above the spray threshold of 50 aphids per leaf. Despite this pressure, yield for the susceptible GS 725 was not different from resistant hybrids SP 7715 and W 7051. Sorghum hybrids SP7715 (Sorghum Partners) and W7051 (Warner) are full season hybrids and likely benefitted from optimal growing conditions. Similarly, GS 725 is a full season hybrid and, although it experienced the highest mean aphid load, it still yielded well, again likely due optimal growing conditions and a short period of aphid pressure. AG 1203, BH 4100, and DKS 37-07 showed reduced aphid numbers, compared to GS 725, but because of their lower overall yield potential, conditions did not permit SCA tolerant hybrids to yield better relative to full-season non-tolerant hybrids.

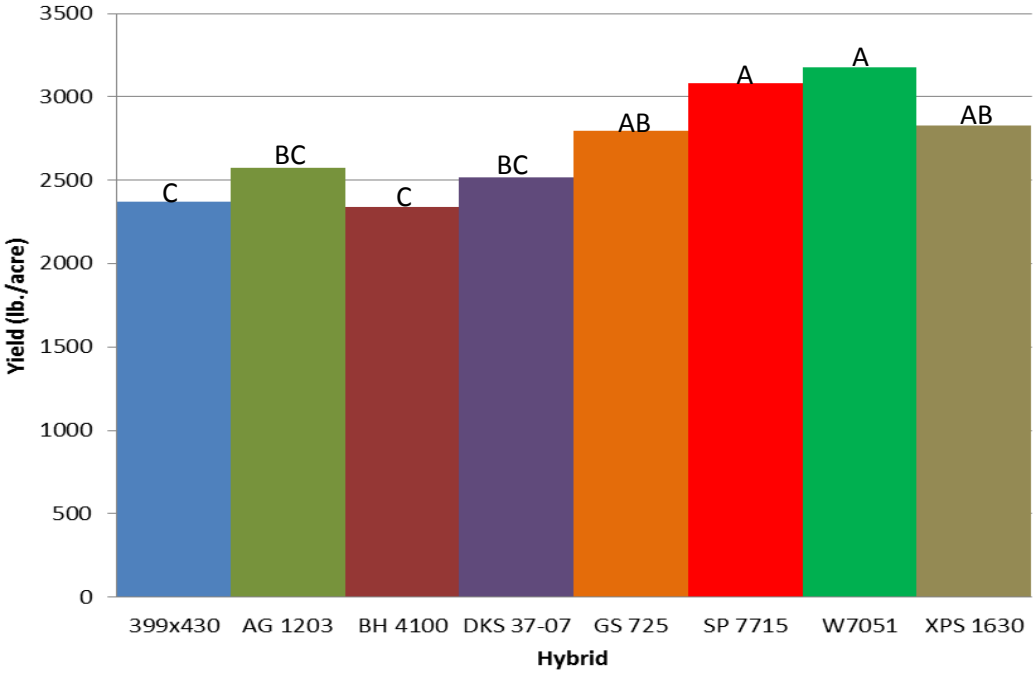

Figure 3: Mean pooled hybrid yield. Columns with different letters indicate significantly different yield at *P*=0.05.

Weekly scouting is still recommended for first detection and monitoring of aphid populations in both resistant and susceptible hybrids. The current suggested economic threshold ranges 50 to 125 aphids per leaf. The more conservative threshold is recommended when scouting weekly or when an insecticide application may be delayed for several days. The more relaxed threshold may be used if scouting more often or if insecticide treatment can be made immediately. Because of the potential for susceptible hybrids to compensate for aphid pressure, particularly when aphid pressure is early and short-lived as demonstrated here, producers should consider available soil moisture and other factors when determining insecticide treatment.

Acknowledgements

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