Small Plot Evaluation of Sugarcane Aphid Tolerance in Sorghum

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Summary

A growing number of company-designated sugarcane aphid (SCA)-tolerant sorghum hybrids are reaching the market. Sorghum producers may be hesitant to use SCA-tolerant sorghum because published research is lacking that documents SCA tolerance and product performance. The current demonstration attempts to document the value of commercial sorghum hybrids designated as 'Highly Tolerant' to SCA in limiting aphid growth and protecting yield potential in these hybrids. The current demonstration evaluates 15 hybrids for tolerance to SCA in a production field near Robstown, TX. Results of small plot evaluations showed sorghum hybrids SP7715, BH4100, AG1203, GX15484, and M60GB31 (Fig. 1A) had the fewest number of SCA supporting company designations of these hybrids as highly SCA tolerant.

Introduction

A growing number of company designated sugarcane aphid (SCA) tolerant sorghum hybrids are reaching the market. These products may offer sorghum producers a cost-effective strategy to manage SCA in-lieu of insecticides. SCA tolerant sorghum complements other IPM strategies such as cultural control and biological control. Insecticides can be used with tolerant sorghum hybrids if SCA populations reach economic populations. Sorghum producers may be hesitant to use SCA tolerant sorghum because published research is lacking to document SCA tolerance and product performance. The objective of this demonstration was to document the value of commercial sorghum hybrids designated as 'Highly Tolerant' to SCA in limiting aphid growth and protecting yield potential in these hybrids.

Materials and Methods

Seeds of 15 hybrids from five commercial seed companies were provided for this demonstration (Table 1). Seed was treated with Concept III, a fungicide, and an insecticide seed treatment. The demonstration was planted on February 20, 2016 in a commercial sorghum production field near Robstown, TX. The previous crop was sorghum and the field, a Victoria clay, was fertilized with 400 lbs. of 25-5-0, and Outlook® (BASF) herbicide at 12.5 oz. was applied to manage weeds. Each hybrid was planted at a rate of 44,000 seeds per

acre in 8-30 in. x 120' long rows. Hybrids that had a clumped distribution of SCA were split into two small plot locations where one plot was aphid free and the other plots had large aphid populations. Hybrid assessments included SCA populations, leaf damage ratings (Table 2), test weight, and yield. Thirty consecutive plants from the second row of each plot were evaluated for SCA leaf injury. The percentage yield reduction and monetary loss was determined by comparing performance in aphid free and aphid infested plots.

Results

Sorghum hybrids SP7715, BH4100, AG1203, GX15484, and M60GB31 (Table 3) had the fewest number of SCA which supports company designations of these hybrids as 'Highly Tolerant' to SCA. Conversely, SP70B17, SP68M57, GX16667, M77GB52, and M75GB47 appeared to be susceptible based on SCA populations and plant injury observed in this demonstration (Table 3). Other entries showed moderate to and high tolerance to SCA (Table 3). Numerical differences in yield and test weight were observed among the hybrid entries, but it was not possible to determine if differences were, in part, from SCA or inherent for each hybrid (Table 3). The exceptions were susceptible hybrids in small plots infested with large populations of SCA that caused substantial injury to plants. SCA-induced damage reduced yields by 12% or more and potential income reductions by $30.00/acre or more (Tables 3 and 4).

Discussion

SCA tolerance by sorghum hybrids SP7715, BH4100, and AG1203 were consistent with several replicated trials in south and north central TX. Hybrids designated as having moderate to high SCA tolerance was based on comparisons of SCA populations on all hybrids in this demonstration. These hybrids could certainly be characterized as 'Highly Tolerant' to SCA due to the low number of aphids through the assessment time.

There were differences in SCA-induced plant injury among hybrids in this demonstration. Susceptible hybrids in small plots infested with large SCA populations resulted in moderate to severe leaf injury. Yield from these plots was reduced by 12 to 22% when compared with adjacent plots not infested with SCA (Table 4). Yield loss associated with SCA damage reduced income be approximately 30.00 to 45.00 dollars per acre depending on hybrid and the amount of plant damage (Table 4). Highly tolerant sorghum hybrids in this trial had small to no SCA and no visible injury by SCA (Table 3).

In this demonstration, 'Highly Tolerant' sorghum hybrids protected yield potential from damaging populations of SCA. The traits expressed by these hybrids prevented development of economic SCA populations thereby eliminating the need for and insecticide application ($12.00 to $18.00/a or more) and prevented economic injury observed in the susceptible hybrids ($30.00 to $45.00/a). These hybrids will offer producers an option to insecticides for SCA management in their sorghum.

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Table 1: Sorghum hybrids used in this demonstration and associated companys supplying seed

Variety	Company
SP68M57	Sorghum Partners
SP70B17	
SP7715	
DG GX 16667	dyna-Gro
DG M75GB47	
DG GX 15484	
DG GX 15371	
DG M77GB52	
DG 766B	
DG M 60GB31	
RV 9562	Terral
RV 9924	
RV 9782	
BH 4100	B&H Genetics
AG 1203	Alta

Table 2: SCA leaf injury rating and corresponding description of injury.

Plant Injury Rating Number	Description of Leaf Injury
1	No apparent damage
2	Up to 10% of the foliage with signs of sugarcane aphid activity or injury including honeydew, sooty mold, and leaf spotting
3	Up to 10% of the foliage with signs of sugarcane aphid activity or injury including honeydew, sooty mold, and leaf spotting
4	From 21 to 40% of the foliage with signs of sugarcane aphid activity or injury
5	From 41 to 50% of the foliage with signs of sugarcane aphid activity or injury including honeydew, sooty mold, and leaf spotting
6	From 51 to 60% of the foliage with signs of sugarcane aphid activity or injury
7	From 61 to 70% of the foliage with signs of sugarcane aphid activity or injury including honeydew, sooty mold, and leaf spotting
8	From 71 to 80% of the foliage with signs of sugarcane aphid activity or injury including honeydew, sooty mold, and leaf spotting
9	From 81 to 90% of the foliage with signs of sugarcane aphid activity or injury
10	Greater than 90% of the foliage with signs of sugarcane aphid activity or injury

Table 3: In-field assessments of sorghum hybrids to SCA infestations in Banquete, TX (2016).

Response to SCA	Hybrid	Plant Injury Rating*	Test Wt. (lbs/a)	Yield
Susceptible	SP68M57§	7	57	3486
	SP68M57	1	55	4486
	DG GX 16667	1	51	3495
	DG GX 16667§	4	52	3038
	DG M 77GB52	4	53	3249
	DG M 75GB47	1	54	4449
	DG M 75GB47§	6	56	3909
	SP70B17	1	55	4478
	SP70B17§	6	57	3575
Moderate to Highly Tolerant	DG CX 15371	1	55	4026
	DG 766B	1	56	4545
	RV 9562	1	57	4422
	RV9924	1	57	5184
	RV9782	1	56	5259
	RV9782	2	55	4587
Highly Tolerant	SP7715	1	58	3606
	BH4100	1	51	3775
	AG1203	1	54	3125
	DG GX 15484	1	55	4380
	DG M 60GB31	1	56	3632

Table 2: In-field assessments of yield reduction associated with SCA damage to sorghum (Banquete, TX 2016).

Hybrid	Yield	Yield Reduction by SCA Damage (%)	Economic Loss (dollars/a)*
SP68M57	4486	22	44.50
SP68M57	3486		
DG GX16667	3495	13	29.49
DG GX16667	3038		
DG M75GB47	4449	12	35.22
DG M 75GB47	3909		
SP70B17	4478	20	38.89
SP70B17	3575		

*Based on sorghum market price of $6.45/cwt (Ag Market News Service, Amarillo, TX).