Evaluation and economic assessment of multiple insecticide strategies for managing pest complexes in sorghum, *Sorghum bicolor* (L.) Moench.

Robert Bowling[1], Michael Brewer[2], Levi Russell[3],and Mac Young[3]
[1]Texas A&M Agrilife Extension Entomology, [2]Texas A&M Agrilife Research Entomology, [3]Texas A&M Agrilife Extension Economics

ABSTRACT: Sorghum is a low-input, low risk crop making it an attractive companion to cotton and corn, especially in water-limited environments. Arthropods may challenge sorghum as a production option, especially when multiple insecticide applications are needed to manage pests. We evaluated performance of selected insecticides to control several pest complexes occurring on sorghum during head development. Results and economic evaluations of treatments are reported. Results and economic evaluations of treatments are reported.

INTRODUCTION: Sorghum production in Texas accounts for 35% of harvested acres and 32% of production in the United States. In 2013, a new aphid pest, the sugarcane aphid (SCA), *Melanaphis sacchari* (*Zehntner*) was found damaging sorghum near Beaumont, TX. The aphid quickly expanded its range to include all sorghum production in TX as well as sorghum production across other sorghum production regions in the United States.

SCA adds to the list of potential economic pests of sorghum. Managing multiple pests individually reduces profitability. As a traditional low-input crop, addressing the pests in combination is desirable whenever possible.

Research is needed to evaluate profitability of sorghum when multiple pest complexes puts at risk potential yield. The objective of this research is to evaluate the effectiveness of multiple insecticides used to manage insect complexes on sorghum.

SCIENTIFIC METHOD: The sorghum hybrid REV7982 (Terral Seed) was planted at 55,500 seeds per acre with a 6-row JD6100 planter. The row spacing was 38" and individual plots were 6 rows-wide x 150' long. Fertility included 104 lbs./ac. N, 64 lbs./ac. P2O5, and ZN at 3 lbs./ac. Weed management included atrazine at 1 qt./ac. and Dual II Mag at 1.3 pts./ac. The trial was planted on April 7, 2015 and harvested August 6.

Insect pests were routinely scouted and treatment decisions were based on economic thresholds. Insects scouted for this trial were the yellow sugarcane aphid, *Sipha flava* (Forbes), greenbug *Schizaphis* graminum (Rondani), sugarcane aphid, *Melanaphis sacchari* (*Zehntner*), sorghum midge, *Stenodiplosis sorghicola* (Coquillett), rice stinkbug, *Oebalus pugnax* (Fabricius), and sorghum headworms fall armyworm, *Spodoptera frugiperda* (J.E. Smith**)**, and sorghum headworm, Helicoverpa zea (Boddie). Insecticides and application rates are presented in Table 1.

The experimental design was a randomized complete block with four replicates per treatment. Data were analyzed with PROC MIXED and means separated with PDIFF.

Table 1: Insecticide treatments and rates. These rates were used in tank mix combinations and stand-alone treatments

Common Name	Trade Name	Rate	Registered Trademark of:
spinosad	Blackhawk	2 oz/a	Dow AgroSciences
sulfoxaflor	Transform	1oz/a	Dow AgroSciences
chlorantraniliprole	Prevathon	14 oz/a	DuPont
methomyl	Lannate	8 /oz/a	Dupont
dimethoate		8 oz/a	Cheminova (FMC)
cyfluthrin	Baythroid	2.4 oz/a	Bayer CropScience

Results: Scouting revealed only the head infesting insects sorghum headworm (0.8 medium and large worms/head) exceeded economic thresholds and rice stinkbug (22,500 per acre) were at a sub-economic threshold. Insecticides and rates evaluated for these two pests are presented in Table 1.

Insecticide treatments did not reduce stinkbug populations below those on the untreated check at 7-days post-treatment (df=8, 24; F-Value=1.35; P=0.2672) or 14-days (df=8, 24; F-Value=1.42; P=0.2383 post-treatment (Fig. 1).

Insecticide treatments did effect sorghum headworm populations at 7-days post treatment (df=8,24; F-Value=2.77; P=0.0255). Fewer headworm were observed on insecticide seed treated sorghum, except for the tank mixed combination of Baythroid and Transform, when compared with the untreated check. Sorghum headworm populations on insecticide treated sorghum did not differ from those on the untreated sorghum at 14-days post-treatment.

Yield response to insecticides was not detected in this study (df=8, 24, F-Value=2.23, P=0.0611).

Discussion: Scouting revealed no aphid infestations on vegetative or reproductive stage sorghum. Rice stink bug never reached an economic threshold but it was evaluated for this test. Insecticide treatments did not significantly impact rice stink bug populations when compared with the untreated check. However, there was a numerical response for fewer stink bugs on sorghum when Transform was tank mixed with most other insecticides. The only exception was chlorantraniliprole tank mixed with cyfluthrin.

Head infesting worm complex generally referred to as headworm did reach economic threshold in this study. Most insecticide combinations suppressed headworm populations below the untreated check with the exception of cyfluthrin and Transform as a tank mix.

Yield of insecticide treated sorghum was similar to that of the untreated check. Yet, there does appear to be a trend toward increased yield when Transform was tank mixed with another insecticide when compared to the stand alone application of these insecticides. Although these responses were not statistically different, they may warrant further investigations to document the consistency of this observation.

Application of the least expensive insecticide option provided insect suppression and yield protection comparable to other more costly insecticides or insecticide combinations under our testing conditions. Although this may be true in marginal insect pressure and only a couple of insect complexes, these results may have been quite different under increased pressure from the head infesting insects in the current research or in conjunction with other insect pests of sorghum. This research will be conducted in 2016 for further evaluation of managing insect complexes in sorghum.

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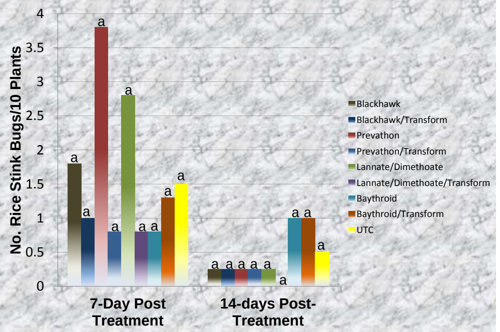

Fig 1. Response by rice stink bug to combinations of insecticide treatments.

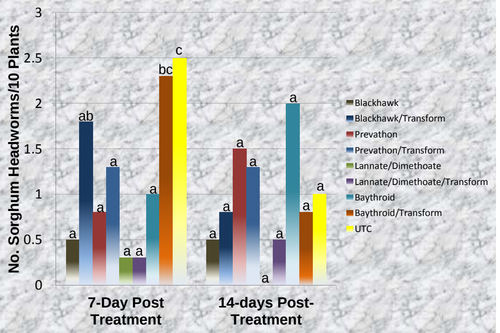

Fig 2. Response by sorghum headworm to combinations of insecticide treatments.

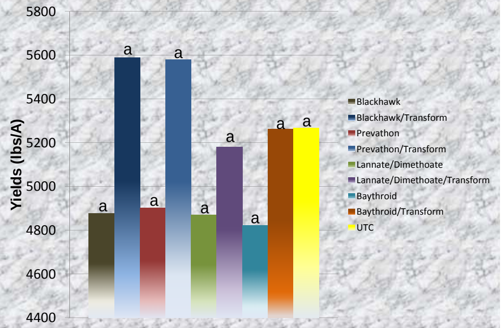

Fig 3. Sorghum yield when treated with different combinations of insecticides for head infesting insect pests.