INFLUENCES OF PLANTING POPULATION ON SUGARCANE APHID (MELANAPHIS SACCHARI)

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Abstract

In 2013, the sugarcane aphid, *Melanaphis sacchari* (Zehntner), was discovered on grain sorghum in several states. When the sugarcane aphid was first discovered on grain sorghum no control options were available. Currently there is only one labeled foliar insecticide recommended for sugarcane aphid. Because of the limited availability of effective insecticides, incorporating cultural practices will be important in reducing pest densities and reliance on one insecticide to delay resistance. This study was conducted at the Mississippi State University R.R. Foil Plant Science Research Center to evaluate the influence of planting population and insecticide seed treatment on sugarcane aphid densities. Planting populations from 40,000-160,000 plants/acre of Pioneer 84P80 were evaluated with and without treatment for aphids. Treated plots were treated with a seed treatment and a foliar insecticide at current threshold. Control plots were completely untreated. As planting population increased aphid densities decreased. There was also a significant difference in the yield due to treatment. Untreated plots yielded significantly lower than treated plots. This data confirms that incorporating multiple insect control strategies for managing sugarcane aphids can possibly reduce reliance on foliar sprays.

Introduction

Sorghum is one of the top five cereal grains grown in the United States. In 2015, there was over 8 million acres grown in the U.S. with Kansas planting more acres than any other state (NASS, 2016). In Mississippi, there was 115,000 acres grown in 2015 which has decreased to 20,000 acres likely due to the lack of control for the sugarcane aphid and low commodity prices (Larson, 2016). The first report of the sugarcane aphid was in 1896 in Hawaii on sugarcane. More recent findings were in 1994 in Florida and 1999 in Louisiana. The first report of the sugarcane aphid on grain sorghum in the U.S. was in 2013 (Bowling et al., 2016). They are distinguished from other aphid species by their yellow color and black cornicles and tarsi (Bowling et al., 2016). The sugarcane aphid can be alate or apteran, parthenogenic, and are viviparous (Singh et al., 2004). They take 4 days to fully mature and can live up to 28 days (van Rensburg, 1973a, Bowling et al., 2016). When infestations occur during pre-bloom stages such as head initiation, flag leaf and boot stages, yield losses can be severe if left uncontrolled. Uncontrolled infestations during this time can cause reduced grain weight, delayed head emergence, reduced grain quality, uneven heading, or necrosis of the plant (Singh et al 2004). Uneven heading in grain sorghum can make it challenging to manage other pests such as sorghum midge (Cronholm et al., 1998). When the sugarcane aphid was first found in sorghum, no insecticidal control options were available. A section 18 for sulfoxaflor was allowed followed by a section 3 for flupyradifurone (EPA website, 2016). Aphids are known to become resistant very quickly to insecticides so there is a need to test cultural practices for additional control options in conjunction with chemical controls (Bowling et al., 2016). In this study we assessed the influence of planting population and insecticide treatment on sugarcane aphid densities.

Materials and Methods

Experiments were implemented in a randomized complete block design with a factorial arrangement of treatments replicated 4 times in 2015 and 2016. Factor A was planting population which ranged from 40,000-160,000 plants/acre and factor B was treated or untreated control plots. Treated plots consisted of a thiamethoxam seed treatment and foliar insecticide applications of sulfoxaflor at the current Mississippi threshold. Data were analyzed with regression analysis and analysis of covariance was used to compare the slopes. Aphid counts were taken weekly during infestations by examining 15 upper leaves and 15 lower leaves and estimating the total number of aphids on each leaf. The two center rows of the 4 row plots were mechanically harvested and adjusted to 13% moisture.

Results and Discussion

In treated plots across 2015 and 2016, there was a significant relationship between plant population and numbers of aphids on bottom leaves and numbers of total aphids. As plant populations increased, a decrease of 2 total aphids per 1000 plant increase was observed and a decrease 1.5 aphids on bottom leaves per 1000 plant increase was observed (Figure 1). In both years, the average aphids on the total (bottom + top) plant significantly decreased as plant population increased (Figure 2). In 2015, the aphid densities decreased by 3 aphids per 1000 plant increase and in 2016 aphids densities decreased by 1 aphid per 1000 plant increase in population. In the untreated plots across 2015 and 2016, there was a significant relationship between plant population and the number of aphids on top leaves and total aphids (Figure 3). As population increased, a decrease of 2.5 aphids per 1000 plant increase was observed and a decrease of 1 aphid on top leaves per 1000 plant increase was observed. In 2015, the average aphids on the total (bottom + top) plant significantly decreased as plant population increased (Figure 4). In 2016, there was not a significant relationship between plant population and aphid densities. There was a significant positive relationship between plant population and grain sorghum yields for both treated and untreated plots in 2015 (Figure 5). As population increased yield increased. Additionally, yields were significantly greater in treated plots than in untreated plots. In 2016 there were no relationships between plant population and grain sorghum yields for the treated or untreated (Figure 6). There was a significant difference in yield due to treatment in 2016.

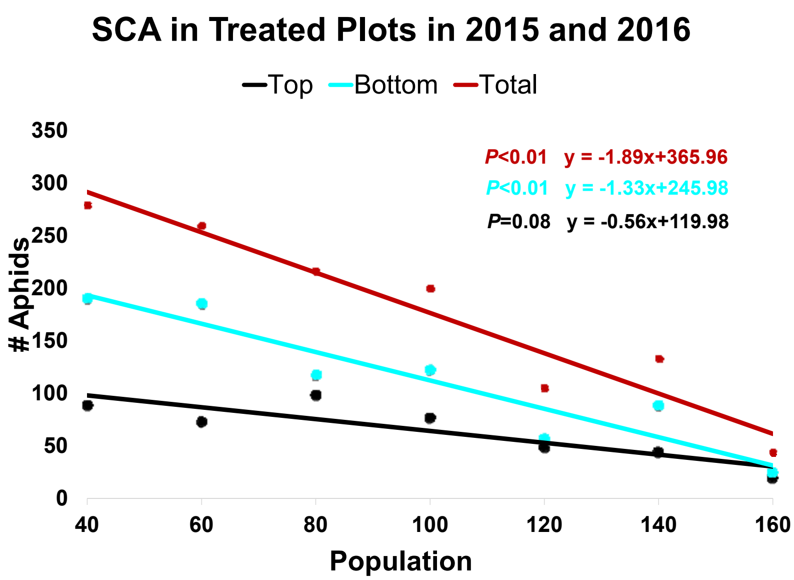

Figure 1. Sugarcane aphid in treated plots in 2015 and 2016. Top and bottom leaves and total leaf aphid numbers per population.

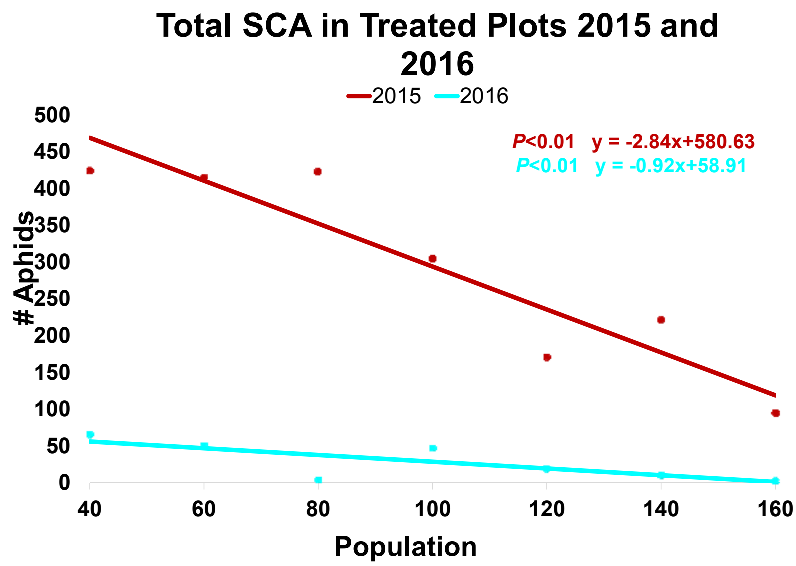

Figure 2. Total sugarcane aphid in treated plots per planting population broken out by year.

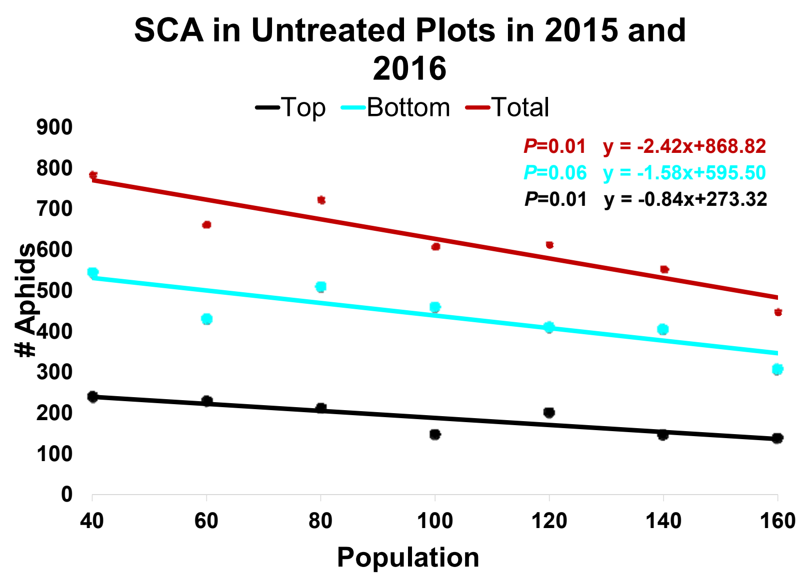

Figure 3. Sugarcane aphid in untreated plots in 2015 and 2016. Top and bottom leaves and total leaf aphid numbers per population.

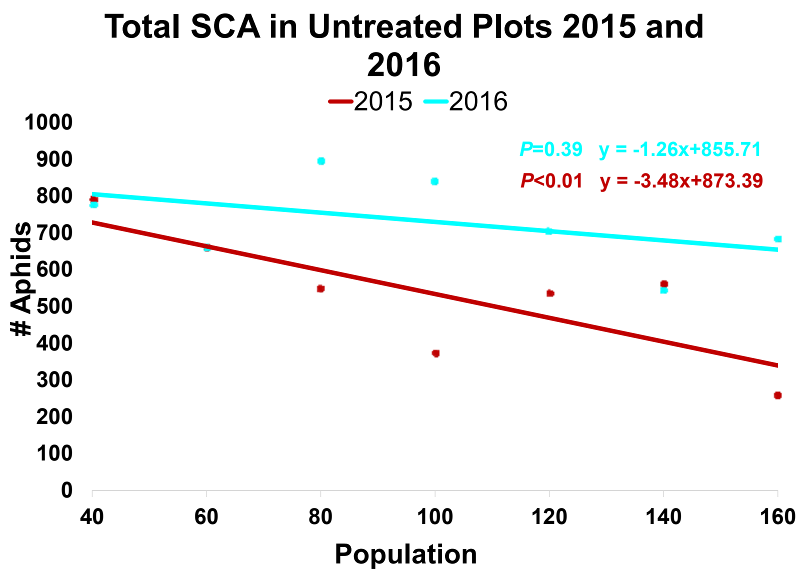

Figure 4. Total sugarcane aphid in untreated plots per planting population broken out by year.

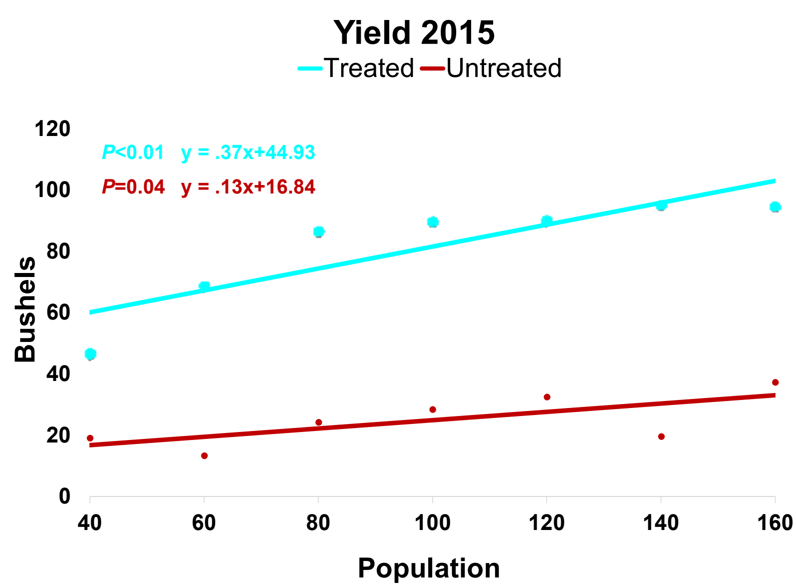

Figure 5. Yield for 2015 per planting date represented in bushels.

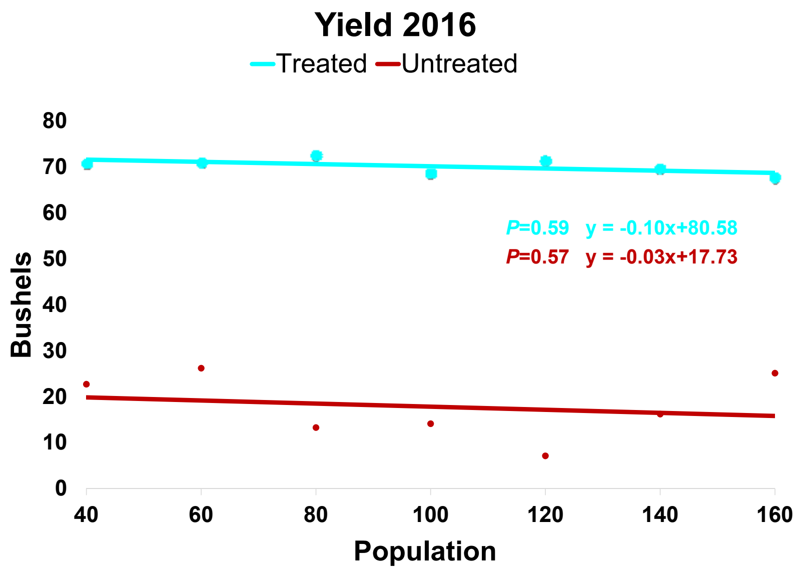

Figure 6. Yield for 2016 per planting date represented in bushels.

Summary

In summary, we observed a negative relationship between aphid numbers and planting population. As plant population increased aphid densities decreased. Bottom leaves consistently had higher aphid numbers than top leaves. There was a positive relationship between plant population and yield. As planting population increased, we observed an increase in yield. In 2016, there were no relationships between plant population and yield but there were significant differences in yield between treated plots and untreated plots.

References

Bowling, R. D., M. J. Brewer, D. L. Kerns, J. Gordy, N. Seiter, N. E. Elliott, G. D. Buntin, M. O. Way, T. A. Royer, S. Biles, and E. Maxson. 2016. Sugarcane Aphid (Hemiptera: Aphididae): A New Pest on Sorghum in North America. J. Int. Pest Mgmt., 7: 12 1-13.

Cronholm, G., A. Knutson, R. Parker, G. Teetes, and B. Pendleton. 1998. Managing insect and mite pests of Texas sorghum. Agricultural Communications, the Texas A&M University System. Ent. Agr. 15-2.

Environmental Protection Agency. Accessed November 2016. https://www.epa.gov/sites/production/files/2015-11/documents/final_cancellation_order-sulfoxaflor.pdf

Larson, E. Personal Communications. September 6, 2016.

National Agricultural Statistics Services. Accessed on November 2016. http://usda.mannlib.cornell.edu/usda/current/Acre/Acre-06-30-2016.pdf

Singh, B. U., P. G. Padmaj, and N. Seetharama. 2004. Biology and management of the sugarcane aphid *Melanphis sacchari* (Zehnter) (Homoptera: Aphididae), in sorghum: a review. National Research Center for Sorghum. Crop Prot. 23: 739-755.

van Rensburg, N. J. 1973a. Notes on the occurrence and biology of the sorghum aphid in South Africa. J. Entomol. Soc. S. Afr. 36: 293-298.