# Distribution of sugarcane aphids and their predators on Kansas sorghum

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## Abstract

Sugarcane aphids (SCA) can have a severe impact on Kansas sorghum grain yields due to their high reproductive capacity and the copious amounts of honey dew they produce. There are many predatory species in Kansas that feed on SCA and help to reduce their impact on the sorghum plants. To understand how these predators affect the behavior of SCA on sorghum plants, we examined a sorghum field that was heavily infested with SCA and recorded the distributing and species of aphids and predators present. Overall, the aphids preferred to be in a semi-clumped distribution on the leaves when higher numbers of predators were present. Syrphid larvae were the most abundant predator and were almost always found within aphid clumps.


Fig. 1. Aphid predators commonly encountered in grain sorghum fields with sugarcane aphids. A) Syrphid fly larvae, B)Ladybug adult, C)Ladybug larvae, D) Green lacewing larvae.

## Introduction

Sugarcane aphids (SCA), *Sipha flava,* are a new invasive species in both forage and grain sorghum in the U.S. Since its arrival in Texas in 2013 it has migrated from southern Texas to Kansas every year (Bowling, 2016. So far, Nebraska and southern Iowa is the northern most range it has migrated to (Myfields.info). Even though this species is invasive to sorghum, it has occurred on sugarcane in the U.S. for decades. It is speculated that the SCA in sorghum came over in a sand storm from Africa in 2013 and not that the SCA in sugarcane switched hosts (Zukoff Personal communication). Although this aphid is new to our area, our usual aphid predators recognize SCA as potential prey which will speed up our ability to manage this invasive (Colares, 2015).

The interactions of the SCA colonies in response to the predators has yet to be documented in Kansas in sorghum. To better understand their behavioral interactions we measured SCA and predator abundance and distribution, on sorghum plants in a field setting.


Fig. 2. Sugarcane aphid distribution categories used in the study.

## Questions and Hypotheses

Question:1. How do predators affect SCA distribution on a leaf?
2.Will more mobile predators be found outside clumps of SCA?

Hypothesis:1. Predators will affect the distribution of the SCA.
2. More mobile predators will likely to be found outside of clumps of SCA, while less mobile predators will be found inside of clumps of SCA.

## Methods and Experimental Design

The study was done at the KSU Southwest Research Center in Garden City. The grain sorghum field used was 30.5m long x 9.15m wide with a natural infestation of sugarcane aphids and predators at the time the study was conducted. This field had been continuous sorghum and was planted in a susceptible variety in 2017 growing season. For measuring each sample we used a 0.5 m x 0.5m quadrant and this encompassed 3-4 tillers from the sorghum plants. This study was a randomized complete block study with 15 replicated plots. We recorded aphid numbers and the distribution on the leaves, predator species, and the number of predators inside of aphid clusters. We categorized the aphids as clumped, partially clumped, and random (Fig. 2). We also noted any other addition aphid species present as well as every stage of predators observed. Observations were done in the morning when it was ~ 75°F. Because of the freeze the following week, we were only able to make observations once. Dead leaves were not included in our observations. We used optivisors to count and identify the SCA and their predators. Population arrived in the study field in early September and the field had an even infestation across it.

## Results

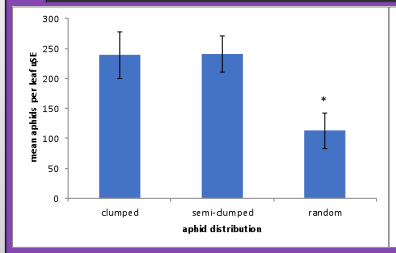


Fig. 3. The mean SCA aphids per leaf for each of the types of aphid distribution categories observed (clumped, semi-clumped or random).

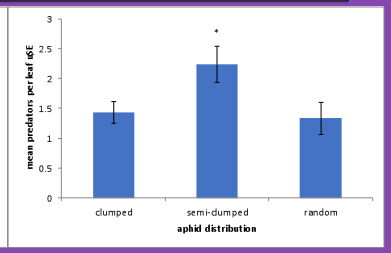


Fig. 4. The mean predators per leaf for each of the types of aphid distribution categories observed (clumped, semi-clumped or random).


Fig. 5. Sugarcane aphids (SCA) are a new pest of sorghum in the U.S. (adult female)

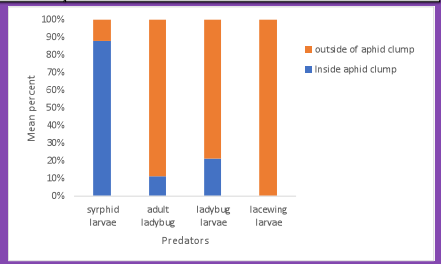


Fig. 6. The mean percent of each predator found inside or outside of an aphid clump per leaf on the sorghum plants observed.

## Results and Conclusions

The results of our study showed that predators do affect the distribution of sugarcane aphids on leaves of sorghum plants. Sugarcane aphids were observed significantly more in semi-clumped formations on leaves when there are 1.75 or more predators (Fig. 5.). If there are less predators per leaf than this, there was no significant difference in whether the aphids could be found in a fully clumped or random formation. The number of aphids per leaf did significantly affect the distribution on a leaf as well with leaves having less than 125 having a more random distribution (Fig. 3). Leaves having greater than 125 showed either a clumped or semi-clumped formation. However, there was no difference between the clumped and semi-clumped formations when greater amounts of SCA were present (Fig. 3).

Predators were categorized as being located in one of two places on leaves, either within a clump of aphids or outside of a clump of aphids. If aphids are closely surrounding the predator of at least three sides it was considered to be located within a clump. We found that syrphid fly larvae were the most abundant predator in our study plot. And that lacewing larvae were the least abundant (data not shown.

Although we were only able to make one observation we did see significant differences in the distribution of both the aphids and predators. Overall predators do affect the distribution of the SCA and more mobile predators will be found outside of the clumped aphids. In this case the predators seem to drive the way the pests behave on the leaf yet the sheer numbers of aphids in semi-clumped formations may help to deter predation.

## Future Directions

Future research may focus on taking more samples over time to get a better understanding of the fluctuations in both the SCA and predators over time during the growing season. Taking samples in more than one location across Kansas would also be interesting.

## References

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