Plains Pest Management

Integrated Pest Management Program

Hale, Swisher, and Floyd Counties

<u>2019 Annual Report</u>

Prepared by:

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TEXAS IPM

Partners with Nature

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2019 Plains Pest Management Newsletters available at: http://hale.agrilife.org/

Acknowledgements

A successful Extension IPM program hinges upon dedicated support, active participation, and a desire to advance and improve IPM practices from area producers, agribusiness, gardeners, and homeowners. Appreciation is extended to the participating members of the Plains Pest Management Association for their cooperation, support, and participation in the 2019 Plains Pest Management Program:

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Patricia Phillips	Plains Pest Management, Secretary

Plains Pest Management 2019 Advisory Committee

Ronald Groves	Mike Goss	Jerry Rieff
Jimie Reed	Jimmy Sagaser	Joe McFerrin

2019 In-Depth Field Scouting Education Plan

Blayne Reed, Extension Agent – IPM, Hale, Swisher, & Floyd Counties

Relevance

Agriculture is the foundation of the economies of Hale, Swisher, & Floyd Counties. Pests, both insects and weeds, continually threaten production agriculture and persistently develop resistance to overcome existing control measures. In recent years, bollworms have developed resistance to several Bt traits in cotton and corn and to longtime relied upon chemical control measures for several crops. Integrated Pest Management (IPM) is an affective and environmentally sound approach to pest management that uses a combination of evolving control practices to maintain economic and environmental stability in production agriculture. Field scouting, or the monitoring of pests in the field, is critical in IPM decision making and planning but has fallen out of favor in many production situations in recent decades. Scouting has been replaced with a reliance upon Bt traits in cotton and corn as preventative control measures for these pests. The time-consuming art of properly scouting production fields for pests and the latest in environmentally sound chemical control options are largely unknown by many younger producers and young agricultural career professionals. The Plains Pest Management IPM Program is an educational program that strives to educate the producers of Hale, Swisher, & Floyd Counties about the latest IPM principles and to help implement sound IPM control strategies into producer's operations in Hale, Swisher, and Floyd Counties.

Response

The Plains Pest Management Association, made up of 22 participating grower members and steered by a chairing committee and the IPM Agent, made educating producers and early career agricultural professionals in Hale, Swisher, and Floyd County on the latest IPM field scouting techniques in cotton, corn, and sorghum a priority. Several bollworm targeted locally conducted research projects involving the efficacy of bollworm control products and evaluations of field situations for various Bt trait situations were also an educational priority.

- Conducted 3 bollworm trials in 2019 and shared results rapidly through newsletters, blogs, radio programs, grower meetings, producer direct interactions, professional meetings, and field days (98 CEUs offered total).

- Hosted and presented 'how to scout' presentations at 2 regional field scouting schools and one Texas A&M AgriLife Agent Training. Hosted 6 field scout in-field training days that trained 22 field scouts and early career agricultural professionals with hands on field experience over the full growing season.

- Data generated from the PPM field scouting program, along with helpful tips on how to scout fields for specific pests were shared through the Plains Pest Management Newsletter weekly throughout the growing season and monthly during the offseason (16 issues, 524 subscribers).

Results

A retrospective post evaluation instrument was distributed online to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) and other social media outlets to interact with and respond to and participants in the field scout training days were polled for satisfaction following the conclusion of the season.

The 2019 online survey responders were made up of: **Ag Producers – 31.3% Independent Ag Crop Consultants –18.8%, Ag Industry –21.9%, Ag Retail – 9.4%, Homeowners & Horticulturalists – 12.5%, and Other –6.2%.**

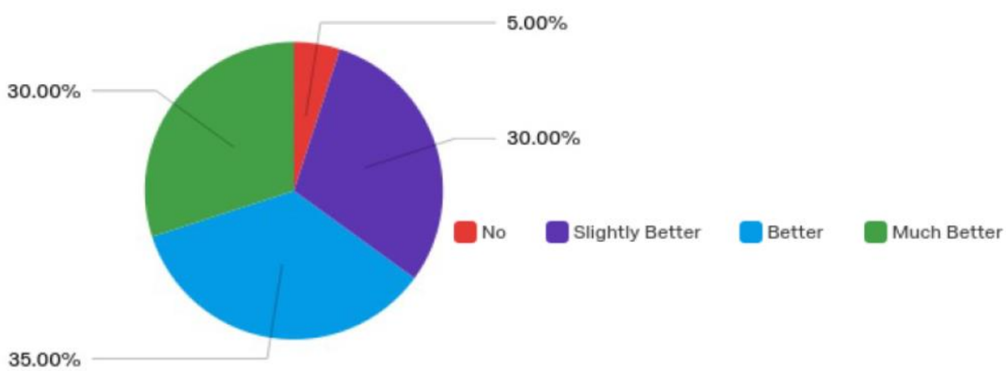
Responders were asked to assign a 0 to 100 value to each component of the Plains Pest Management Association's efforts and the information generated by those efforts?

The responder value assigned to the field scout educational efforts was 85.35.

Responders were then asked if they could assign a per acre crop production $ value to all the combined major efforts of the Plains Pest Management Association's IPM program in Hale, Swisher, & Floyd Counties, what would it be?

The average value response was $88.76 per crop acre for the 2019 growing season.

Responders were also asked, "Due to the IPM Unit's focused efforts in field scout training of early career agricultural professionals, do you feel the area is better prepared to meet cotton IPM challenges in the future?



100% of the field scout training day early career participants indicated that the trainings were worthwhile and that they intended to recommend the trainings continue in 2020 both for their colleagues and as a refresher for themselves.

Summary

Educational efforts in the evolving discipline of the latest field scouting methods will likely need to continue indefinitely. These results indicate a level of success this year by the Hale, Swisher, & Floyd IPM Unit in educating field scouts and early career agricultural professionals in modern field scouting. The results also seem to indicate that the PPM program should remain a central part of that education.

2019 Plains Pest Management Ag & Research IPM

Blayne Reed, Extension Agent – IPM, Hale, Swisher, & Floyd Counties

Relevance

Production agriculture is the foundation of the economies of Hale, Swisher, & Floyd Counties. Pests continually threaten production agriculture and persistently develop to overcome existing control measures. Integrated Pest Management (IPM) is an affective and environmentally sound approach to pest management that uses a combination of evolving control practices to maintain economic and environmental stability in production agriculture. The Plains Pest Management IPM Program is an educational program that strives to educate the producers of Hale, Swisher, & Floyd Counties about the latest IPM principles and to help implement sound IPM control strategies into producer's operations in Hale, Swisher, and Floyd Counties.

Response

The Plains Pest Management Association, made up of 22 participating grower members and steered by a chairing committee and the IPM agent, made informing the producers in Hale, Swisher, & Floyd Counties about the latest agriculture IPM principles, control methods and options a priority in 2019. During the year, the activities included:

- Weekly field scouting for insect, weed, and disease problems of the 22 participating grower member's fields (5,582.8 acres of all crops) were conducted over the 2019 growing season. Information from this weekly field scouting was shared, interpreted, and IPM solution recommendations given to the participating growers via scouting report and direct interaction.
- Data generated from the field scouting, along with pertinent IPM research and successful recommendations were shared through the Plains Pest Management Newsletter weekly throughout the growing season and periodically during the offseason. (16 issues, 524 subscribers).
- Locally conducted 14 independent agriculture IPM related research trials and assisted with district IPM research trials with all resulting data rapidly disseminated through newsletters, blogs, radio programs, and direct interaction.
- Gave IPM presentations at 10 grower meetings, 10 professional and peer meetings, 1 producer turn-row meeting, 3 Progressive Grower Meetings, and a Field Scout School where IPM was a topic (98 CEUs offered total). Made 2 Pest Patrol Hotline submissions summing a current pest situation nearing problem status area wide and gave IPM recommendations.
- IPM and its implementation, current pest pressure, emerging pests, and control recommendations were major topics for all 9 six-minute educational spots on 900 All Ag All Day, Floydada and 4 newspaper interviews.

Results

A retrospective post evaluation instrument was distributed to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) to interact with and respond to.

The survey responders were made up of **Ag Producers – 31.3%, Independent Ag Crop Consultants –18.8%, Ag Industry – 21.9%, Ag Retail – 9.4%, Homeowners & Horticulturalists – 12.5%, and Other –6.2%.**

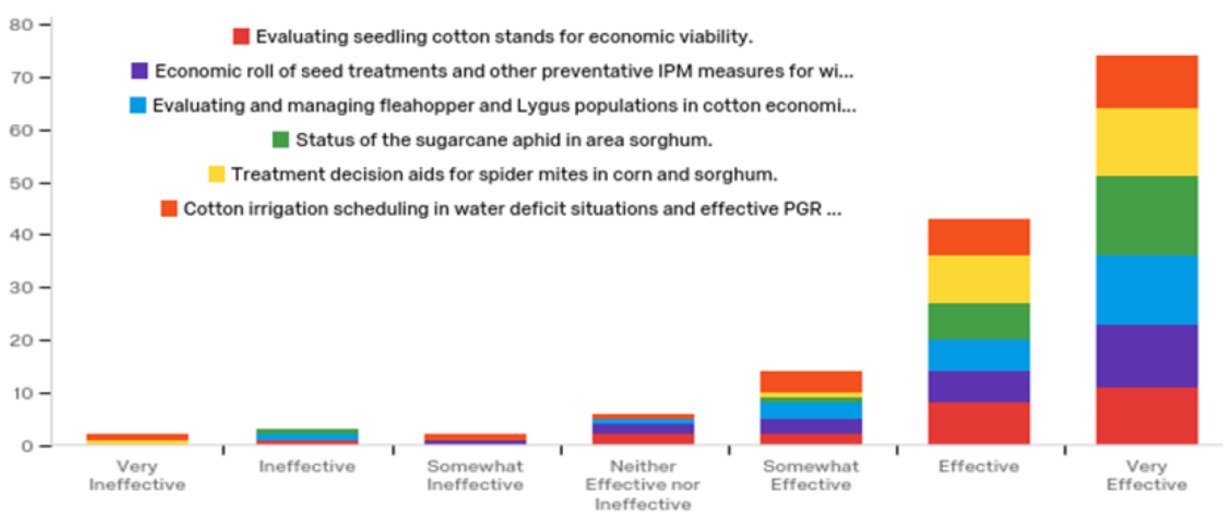
Responders were asked to assign a 0 to 100 value to each component of the Plains Pest Management Association's efforts and the information generated by those efforts, what would that value be?

Scouting Program	83.05	Research	84.72	Newsletter	87.28	Social Media	82.2	Grower Meetings	89.08
Professional Organizations	86.55	Field Scout Education	85.35	Mass Media	84.85	4-H & Youth	84.08	Urban IPM	80.29
								Total Program Value.	**89.64**

Responders were then asked if they could assign a per acre crop production $ value to all the combined major efforts of the Plains Pest Management Association's IPM program in Hale, Swisher, & Floyd Counties, what would it be?

- The average value response was $88.76 per crop acre.

Responders were also asked to select the column that best reflected how they feel the IPM Unit was at alerting and educating the regional ag industry during the 2019 season.



Summary

The IPM Program in Hale, Swisher, & Floyd Counties is proving to have real value and impact in the Hale, Swisher, & Floyd production agriculture economy. If the survey responder estimated **$88.76 per production acre estimate** of the value of the IPM Program is multiplied by **half of the irrigated cotton production acres in Hale, Swisher, & Floyd Counties, a $14,815,996 potential impact figure** emerges. Even if this purposely conservative survey-based estimate proved to be high, the Plains Pest Management Association is still not only important to the production agriculture economy in the Hale, Swisher, & Floyd area, but is a significant part of that economy's maintenance and function.

2019 General Horticulture, Homeowner, Gardening, & Youth IPM Education

Blayne Reed, Extension Agent – IPM, Hale, Swisher, & Floyd Counties

Relevance

Pests affect all aspects of human life. Pests continually threaten production agriculture, stored grain, human health, households, and even the stored foods in our pantries. Meanwhile, these same pests persistently develop to overcome existing pest control measures. Integrated Pest Management (IPM) has a thirty plus year history of proven environmentally sound and effective approaches to pest management by utilizing a combination of established principles and evolving specific control practices to maintain pest control. The Plains Pest Management IPM Program is an educational program that strives to educate the producers and citizens of Hale, Swisher, & Floyd Counties about the IPM principles and the latest IPM control methods to help implement IPM into our daily pest control strategies.

Response

The Plains Pest Management Association, made up of 22 participating grower members and steered by a chairing committee and the IPM Agent, made informing the general populace of Hale, Swisher, & Floyd Counties about IPM principles and implementation into our daily pest control habits one of the IPM Program's focus in 2019. The year's activities included:

- Made 121 direct customer IPM contacts via site visits, phone calls, emails, and office visits about invading honeybees, tree borers, garden pests, cockroaches, mosquitoes, ticks, fleas, elm leaf beetles, lawn pests, bed bugs, and head lice.

- Published 4 blog posts and 2 general IPM alerts and educational articles related to non-ag pests and management in the weekly Plains Pest Management Newsletter.

- Gave training on IPM Implementation and special pest control recommendations to Plainview ISD IPM Coordinator and Staff.

- Participation in the Hale County Ag Fair, delivering the entomology portion of the educational fair to 583 area Hale County 4th graders with presentation of "Entomology and You" which gave practical IPM education and hands on insect ID.

- Coaching of the Hale & Swisher 4-H Entomology ID Teams (4 teams, 12 youth) with 3 Teams advancing to the State Contest.

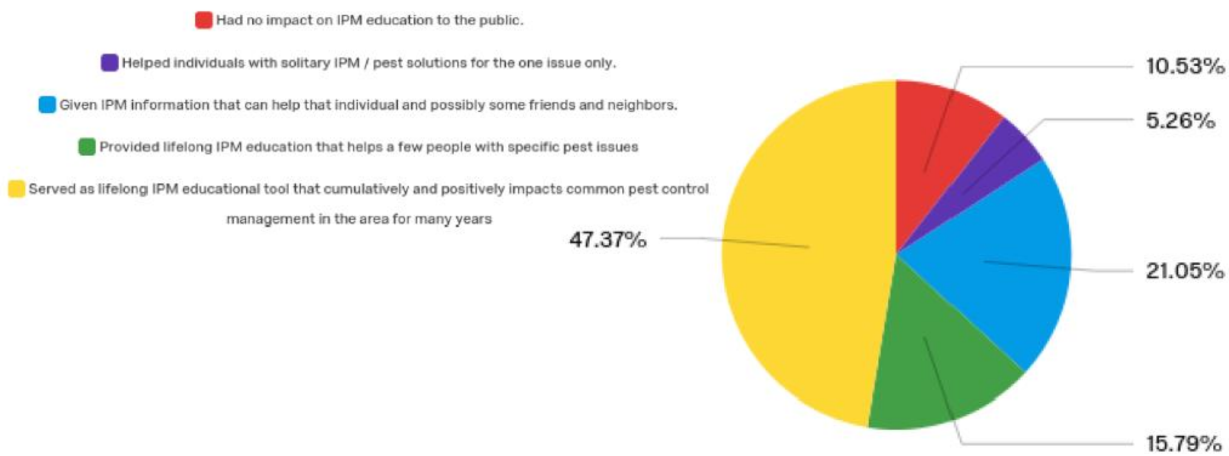
Results

A retrospective post evaluation instrument was distributed to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) to interact with and respond to.

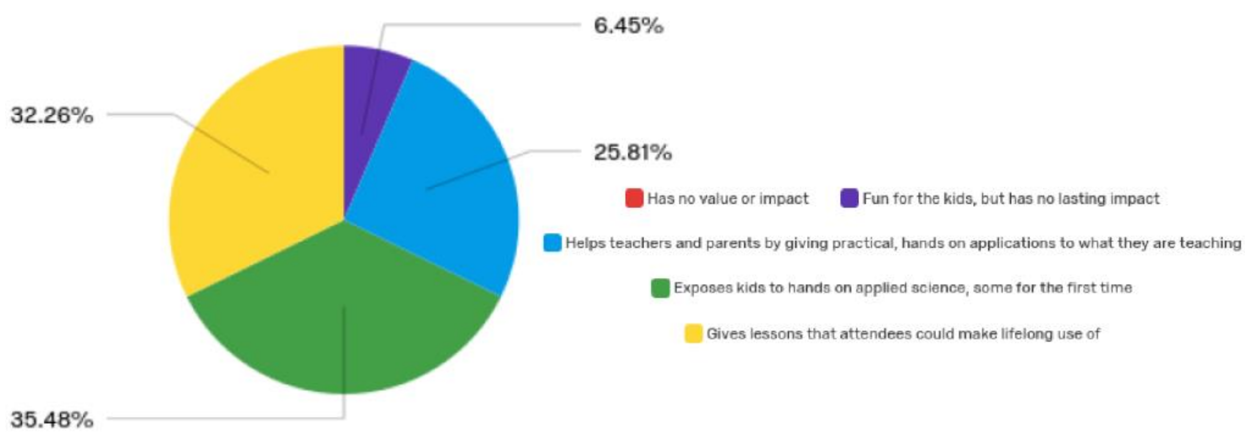
The survey responders were made up of: **Ag Producers – 31.3%, Independent Ag Crop Consultants – 18.8%, Ag Industry –21.9%, Ag Retail – 9.4%, Homeowners & Horticulturalists –12.5%, and Other – 6.2%.**

Responders were asked to assign a 0 to 100 value to each component of the Plains Pest Management Association's efforts and the information generated by those efforts, what would that value be? The responders rated the **Urban IPM at an 80.29 value**.

Survey responders were then asked what impact the IPM Program had through our one-on-one direct customer IPM contacts via site visits, phone calls, emails, and office visits had on IPM education for the area?



Responders were also asked what impact the IPM Unit's participation in the Hale County Ag Fair is to the education and the future of our children? **93.6% indicated a high value of this IPM educational effort as a practical educational opportunity offering exposure to an applied biological science for the youth of Hale County.**



Summary

The IPM Program's efforts in horticulture, homeowner, and gardening IPM education received not only high marks the more numerous agriculture sector responders but also from the noteworthy number of Homeowner and Horticulturalist responders. All survey responders placed a very high value on returns in the region for these IPM educational efforts and a strong conveyance to continue and expand these efforts.

2019 Educational Activities

Farm and Site Visits	2,075
Number of Newsletters Released	16
Newsletter Recipients	10,105
Direct Contacts	4,971
Radio Programs	15
Blog Releases	34
Ag Consultants, CEA, and Field Scouts Trained	126
Newspaper / Magazine / online Magazine articles (written or interviewed)	19
Research Trials Initiated	14
Research Trials Supported	13
Professional Presentations	10
Presentations / Programs / Field Days Made for Adults	17
Presentations Made to Youth	18
Pest Patrol Hotline Alerts	3
Articles for other blogs	2
Texas A&M AgriLife Publications Written or Revised	1
Professional Papers Authored or Co-Authored	3
Educational Videos Produced	1

Activity Highlights

Plains Pest Management Scouting Program
(5,582.8 acres)
Applied Research Projects
All Ag, All Day Radio Programs
Swisher Fall Ag Conference
Hale & Swisher 4-H Youth Entomology Projects
Horticulture IPM Spot Checks
Hale County Youth Ag Fair
High Plains Association of Crop Consultants
CEU training
Texas Pest Management Association
Agent Trainings
FOCUS on South Plains Agriculture
Newspaper Press Releases
Auxin Trainings
Early Professional Hands On Field Scout Training

Plains Pest Management Newsletter
Plains Pest Management Bugoshere (blog)
Hale & Swisher Ag Day
Swisher Fall AG Day
West Texas Ag Chemical Meeting
Hale County BLT Program Support
Progressive Growers Breakfasts
Entomological Society of America
Field Scout Schools
IPM Video Productions
Site Scouting and IPM Recommendations
Pest Patrol Hotline
Texas Sugarcane Aphid News
West Texas Ag Chemical Institute Advisory Board
4-H Entomology ID Teams

2019 at a Glance

The following is a brief overview of the 2019 growing season and pest populations in Hale, Swisher, & Floyd County agricultural crops. Copies of the Plains Pest Management Newsletters published in 2019 are available at http://hale.agrilife.org/ for a more in-depth look at specific pest pressure, weed situations, crop conditions, and environmental conditions at any given week of the growing season. One consistent for all crops and commodities for the 2019 season that can be mentioned broadly are the notably low prices in 2019.

Each growing season is unique, and the weather and pest of 2019 on the High Plains were no exception. A winter and early spring drought that left wheat, alfalfa, and other winter and spring crops struggling, concluded with weeks of cool, if not cold, wet and often violent weather from late April, the full month of May, and sporadically into June. This left a weak wheat crop even farther damaged and limited early hay cuttings short on quality. Very little wheat or oats were harvested for grain. The alfalfa weevil was noted to be a significant pest in area alfalfa with most fields requiring at least one treatment in March or April.

The summer crop planting season, typically in late April, through May, and early June, was marred by the excessively poor planting conditions caused by the weather. April and early May planted grain crops, all delayed some days to weeks due to lack of acceptable planting conditions, seemed to fair much better than the region's vast intended cotton acres. Soil temperatures at the 6-inch depth did not reach the needed 67°F for successful cotton establishment until May 29th. This left the vast majority of cotton planted several weeks late with limited frost-free days to develop a decent crop. Very few acres planted before the May 29th date successfully established. Around 95% of the area's cotton crop suffered from multiple ailments including cold shock, seedling disease, hail damage, water logging, with wind and sand damage. Regional wireworm populations added to the cotton's ailments form most fields with an expanding impact. Most fields not utilizing insecticidal seed treatments that help limit wireworm damage failed to establish with so many other factors already reducing the surviving Plant Per Acre stands. Failed cotton fields, which were already late, had no time for cotton replanting and little time for grain replanting. Many fields were left fallow and planted to wheat in the fall with winter cattle grazing and / or cover crop intentions high. Other popular replant options were late sorghum or hay crops with some wildcat cotton replanted.

Thrips pressure on the surviving fields was high from a Plainview north line and limited to moderate from a line south of Plainview. Insecticidal seed treatments were again helpful in high thrips pressure areas, but residual control typically ran out earlier in 2019 in terms of plant stage due to high rainfall amounts and slow developmental time in the cool temperatures. Almost all cotton fields north of Plainview required over the top treatments for thrips with only about 25% of those south of Plainview. These treatments typically went out with the first over the top herbicide applications in cotton utilizing the required by label auxin spray tips. The herbicide applications were more successful compared to recent seasons but the thrips control was found lacking in most cases. This is despite good control shown in local thrips product efficacy trials. The lack of coverage offered by the auxin herbicide tips are hypothesized to be the reason for the control disparity between the local efficacy trials and field observations. Trials testing this hypothesis are planned for the 2020 growing season to determine if a separate over the top treatment will be needed in the future to maintain thrips control for high pressure situations.

A high beneficial populations aided in most early season pest issues. This high beneficial population is hypothesized to be a response of the sugarcane aphid's arrival and annual infestation of area sorghum and an increased predator population surviving by following pest population peaks throughout the year, lessening each pest outbreak as they occur. Early season pest pressure in the grain crops was light with sporadic fall armyworms in the sorghum and corn. The fleahopper and Lygus populations in the area alfalfa, roadsides, weeds, CRP, and other pest host plant preferred areas where these plant bugs are not a pest issue, was excessively high. As these pests moved into cotton, they were followed by high beneficial populations lightening the surviving nymph pressure. As a result, only about 5% of the area cotton reached economic levels compared to the typical 25%.

As spring gave way to summer, the cool, wet weather conditions gave way to excessive drought and high heat. The last weather even of the summer occurred with severe violence in early July. This event was localized in severity and demolished the very few acres of area cotton that established well to that point, zeroing thousands of acres in minutes. No additional rainfall events would occur until late September or early October for the region. The peak of the summer heat and drought conditions impacted pollenating corn and blooming cotton alike. Stressed irrigation systems could not keep up with water needs during these critical times. Several factors including the early season cool, wet period, followed by the extreme heat and drought led to premature plant desiccation in most area corn fields. This desiccation was aided by 'lazy root syndrome" (Dr. Jordan Bell, District 1 Agronomist). In this situation, most area corn did not root very deeply early in the growing season due to water availability from early rains and early irrigations initiated by growers to build deeper soil moisture. Once the summer heat peaked and irrigation was not adequate to meet the corn's needs, most fields went into a rapid dry down that would only take a matter of days. For most fields, this desiccation occurred at early dent stage. The Banks grass mite populations were rising just as this desiccation began, but only about 20% of the area corn reached economic levels for the pest before the desiccation process completed.

Sorghum, being more drought tolerant, faired better during the peak drought conditions. Irrigated fields set and made decent to good yields while most dryland fields produced some to good grain loads. The sugarcane aphid did arrive in late July and reached ET at some point in August for later planted fields. The aphid on the High Plains was assayed in 2019 and found to be the most virulent population tested in the nation. Despite this the aphid was not considered a major pest during 2019. Most later planted fields were treated for the aphid. With most producers following the Texas High Plains Economic Threshold for the aphid, good control came from timely treatments aided by the high beneficial populations and sorghum harvest was successful. Much of the area sorghum fields were planted as early as the weather at the time permitted. Most of these fields matured before the aphid became economic and was harvested before any treatment was needed.

Cotton pests for the region thankfully remained light for the year. The crops two largest pests, the Lygus and the bollworm remained light for the summer. Even the later populations of Lygus were either controlled by the high beneficial population or were not attracted to the drought stressed cotton. With around 80% of the High Plains annual bollworm problem pest population migrating to the region from other areas, regional producers were braced for the problems the majority of cotton producing areas were having with the bollworm in 2019. These issues never materialized as the moths never migrated to the area due to lack of weather systems carrying them into the area. The few ‘native’ or overwintered bollworms already on the High Plains dispersed to the area corn where they are not an economic pest. The highest bollworm population in cotton recorded by the Plains Pest Management field scouting program was only 1,289 bollworms per acre with 8,000 to 10,000 being the ET.

As the cotton crop moved into September and October, there were concerns about the late planting date and lint developmental time. Fears escalated when a prolonged cool, wet period returned for several weeks. The first rain the region had seen in nearly 3 months brought several inches area-wide. The rain came too late to help any of the summer crops. The heat and drought conditions of summer had caused heat units to accumulate at a higher daily rate than usual. This forced many fields to reach absolute cut-out stage 'on time'. This did cap area yield potential in the cotton. The late rainfall did not stimulate late re-growth from the crop but did hinder the last bolls with lint development by a loss of late season heat units.

The wet early season and high heat and drought conditions of 2019 did seem beneficial to one area crop. Cucumbers, grown for small pickles, have an exceptionally short growing season. The early season provided some moisture for the cucumbers to establish while the dry conditions provided no hinderance to timely harvests of the appropriately sized cucumber. Yields of the 2019 cucumber crop seemed good with never before seen timeliness for harvest.

The rainfall of September and October did provide moisture for early planted wheat with providing cattle adequate grazing before the freeze date. A return of drought conditions for the duration of the 2019 year left late planted 2019-2020 wheat without moisture until January, when much of the late planted dryland wheat finally germinated.

The 2019 corps, with cucumbers and most sorghum aside, were expected to be off 20% from average yields. Final harvest data indicated most yields were 20% below that with some localized exceptions.

2019 Applied Research and Demonstration Projects

2019 Population Monitoring of Adult Bollworms in Hale, Swisher, & Floyd Counties

2019 Bollworm, *Helicoverpa zea*, - Pyrethroid Resistance Survey in Hale, Swisher, & Floyd

Monitoring Bollworm, Helicoverpa zea, Resistance to Bt Technologies in Cotton Genotypes in the Texas High Plains 2019

2019 Cotton Insecticidal Seed Treatment Economic Impact Study

2019 West Texas Auxin Herbicide Drift Evaluation Trial and Demonstration

2019 Gowan Experimental Miticide Efficacy at Low Volume Applications for Banks Grass Mite Control in Corn

Spidermite in Sorghum Product Efficacy Trial 2019

Evaluating the BASF Experimental Insecticide, Sefina, for Sugarcane Aphid, *Melanaphis sacchari*, Control in Sweet Sorghum

Evaluating Sivanto In-Furrow at Planting for Control of the Sugarcane Aphid, *Melanaphis sacchari*, in Texas High Plains Sorghum

Study of the Economic Impact of an Early Treatment for Sugarcane Aphid Control in West Texas Grain Sorghum

2019 Population Monitoring of Adult Bollworms in Hale, Swisher, & Floyd Counties

Texas A&M AgriLife Extension Service

Hale, Swisher, & Floyd Counties

Cooperators: Mike Goss, Wayne Johnson, Shane Berry

Blayne Reed EA-IPM Hale, Swisher, & Floyd and Dr. David Kerns

Summary

The data generated from this effort indicated that the 2019 bollworm population in all three counties was far below what average season's pressure. It was suspected that a lack of migratory worms to the region were due to weather patterns and possibly better management of the bollworms by producers in other regions. Our field data generated by the Plains Pest Management scouting program confirms this light population for 2019 with a complete lack economic problems caused by the bollworm during the growing season.

Adult Lepidopteron pest monitoring is not a guarantee of pest presence or economic problem predictability, trends can be noted and timely alerts for potential egg lay and volume of the area bollworm pest populations can be extrapolated. Assumptions based upon known pest biology combined with this effort can infer aspects about general adult bollworm movement, immigration, and emergence. In an effort to help monitor for this major pest of multiple crops the information generated from this effort was shared with district and regional researchers, crop consultants, agribusiness, and area producers through the Plains Pest Management Newsletter, discussions on our radio programs, and freely shared independently as requested. If compiled with similar efforts completed in the past, historical trends for the bollworm might be established. Three trapping sites were utilized, one for each county served. The Swisher trap was in central Swisher along the Middle Tule Draw, the Hale trap was in southwestern Hale near Cotton Center, and the Floyd trap was in northwestern Floyd. Traps were counted weekly and species-specific pheromone lures changed bi-weekly.

Objective

This effort was made to monitor the adult bollworm (corn earworm, sorghum headworm) population trends throughout the summer growing season in Hale, Swisher, & Floyd County both for immediate and historical use.

Materials and Methods

Standard wire-framed Lepidopteran cone traps and *Helicoverpa zea* specific pheromone lures were utilized in this effort. Traps were suspended upon rebar posts at a height of roughly 4 ½ feet to the top of the trap. Traps were checked, moths counted, recorded, and traps emptied weekly, and pheromone was changed bi-weekly.

Figure 1. Hale County moth trap on its peak population date in September with 257 moths.

Three trapping sites were utilized, one for each county served. The Swisher trap was in central Swisher along the Middle Tule Draw on the Mike Goss Farm (34 26 29.65N -101 44 27.33W) to capture overwintering moths and moths migrating from the east up the Caprock escarpment. The Hale trap was in southwestern Hale near Cotton Center on Shane Berry Farm (33 59 43.59N -101 58 31.39W) to capture overwintering moths and immigrant moths moving from the south. The Floyd trap was in northwestern Floyd on Wayne Johnson's farm (34 18 29.31N -101 28 08.81W) to capture overwintering moths and migrant moths in a traditional bollworm trouble area. Traps were counted weekly and species-specific pheromone lures changed bi-weekly. All traps were set during the first week of June centering on 7 June and concluded the first week of October centering on 4 October.

Results and Discussion

The population for all three counties started slightly higher than an average year. The population then quickly dropped below 'average' levels and remained low until early fall, well past the economic concern timeframe for bollworms in West Texas.

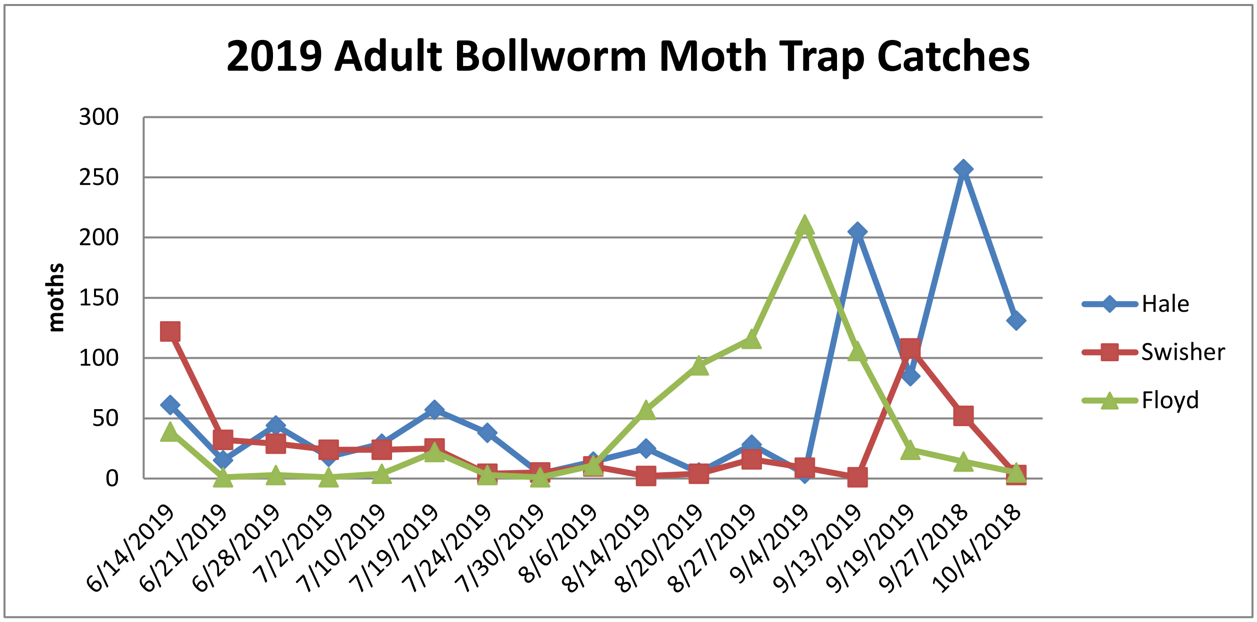


Figure 2. Bollworm moth catches by county per week over time.

The population peak for Floyd county occurred earliest of all traps on 4 September with 211 moths but still after the peak timeframe of crop susceptibility. The Hale trap peaked last and highest with 257 moths the week of 27 September. Swisher's peak occurred during the first week of trapping on 14 June with 122 moths, but a second peak occurred on 19 September with 109 moths following the pattern of the other traps.

Conclusions

The early season peak for all three counties likely consists of 'native' or bollworms that overwintered on the Texas High Plains. This is consistent with contemporary resent seasons indicating an increase in 'native' worms. This is likely due to the increase in no-till and reduced tillage agricultural practices in the region. While the percentage of bollworms overwintering locally has increased, this early peak remains sub-economic as of 2019. The vast majority of the bollworm populations that cause economic concerns are still migratory and arrive later in the season and during peak crop susceptibility timeframes.

The only substantial peaks in the bollworm moth populations in 2019 occurred too late in the season to be of economic concern for the region. These peaks were also far below levels where the population has proven to be bollworm troublesome seasons. The peak population of any of the three trapping sites was only 257 moths trapped over a 7-day period. Compared to historical data, this population peak would be little more than half the level of a minimal concern population for a 7-day trap period.

In recent years, the bollworm had been an issue during the 2018 growing season when numbers in Floyd County were over 400 moths for a sustained 4 out of 6 consecutive weeks with a population peaks nearing 500 and lulls over 300. During peak bollworm run years during the early 1990’s and late 1980’s bollworm trap numbers would regularly average 400 to 1200 per week sustained for 3 to 7 weeks.

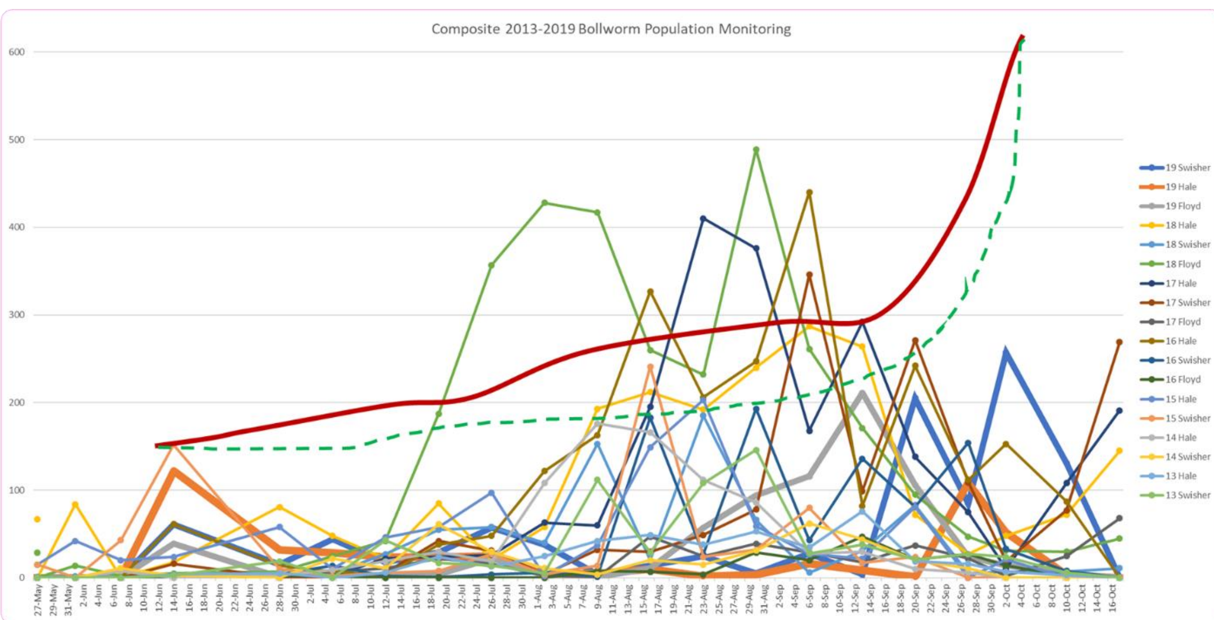


Figure 3. Composite bollworm moth catches per week by year over time from 2013-2019. Red line indicates levels where bollworms could be of economic concern for the region. Green line showing were bollworms might be a concern in a few fields.

The reasons for the missing or light bollworm populations in 2019 are not fully understood. Plausible hypotheses do exist that might lend some help with predictions about near future populations. Experience, historical data, and flight behavioral patterns indicate a possible link to weather patterns during July. These weather patterns, typically in the form of a few dates with SE winds from the Gulf Coast region that typically bringing moths, and moisture into the West Texas area were missing altogether. Other possible factors could include better understanding and management of pyrethroid and Bt resistant bollworm populations via alternate and newly developed methods by producers in the heavier bollworm pressure areas (the source for the High Plains migratory bollworms). These better management techniques, utilized in mass, could have lessened the number of bollworms available for migration in 2019. Of these factors, only the improved management techniques can be somewhat predicted and relied upon for the 2020 season. If the better management of the bollworm is impacting the bollworm population elsewhere, these techniques need to be well understood locally for seasons when bollworms do migrate into the region in larger numbers.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Mike Goss, Shane Berry, and Wayne Johnson for cooperating with us to gather this data. I would like to thank Dr. David Kerns and the Texas A&M Department of Entomology for moth trapping supplies and the 2019 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nicole Kiem, Jerik Reed, Denise Reed, and Meredith Stanford. Thank you all.

2019 Bollworm, *Helicoverpa zea*, - Pyrethroid Resistance Survey in Hale, Swisher, & Floyd

Texas A&M AgriLife Extension Service / Cotton Incorporated
Hale, Swisher, & Floyd Counties
Cooperators: Mike Goss, Wayne Johnson, Shane Berry
Blayne Reed EA-IPM Hale, Swisher, & Floyd and Dr. David Kerns

Summary

This study is one location of several *Helicoverpa zea* pyrethroid resistance study sites across Texas sponsored by Cotton Incorporated. Traps from the 2019 Hale, Swisher, & Floyd bollworm adult population study were utilized in catching live male moths for this study. Three trapping sites were utilized, one for each county served. Moth exposure vials utilized were 20 mL Scintillation Vials for the product exposure or moth survival test. All moth testing vials were prepared by Dr. David Kern's lab in College Station in groups of 99. All test vials were pre-treated with one of three treatment levels, an untreated check, 5 ug cypermethrin, or 10 ug cypermethrin. All vials were color coded according to treatment levels for ease of trial procedural routine. Due to a light bollworm population during the 2019 growing season, only 1 site, on one date yielded enough moths to test.

The moth population that survived 24-hour vial-treatment exposure was adjusted using Abbotts Formula to adjust for the health of the moth population and calculate true resistance and dominant resistance levels.

These results indicate that we should only expect at best about **50% control from any pyrethroid** application to this population of bollworms on the Texas High Plains. They also show that 40% of the bollworm population present in 2019 will pass dominant resistance genetic traits on to the next generation of bollworms. In conclusion, a pyrethroid should not be considered the best option for a first-choice economically triggered bollworm treatment on the Texas High Plains in 2019 or the near future.

Objective

Evaluate the level of pyrethroid resistance present within a typical bollworm population prevailing in Hale, Swisher, and Floyd Counties as a portion of a larger, State-wide survey to re-asses the value and level of control offered by this class of insecticides in pest control.

Materials and Methods

This study is one location of several *Helicoverpa zea* pyrethroid resistance study sites across Texas sponsored by Cotton Incorporated. Traps from the 2019 Hale, Swisher, & Floyd bollworm adult population study were utilized in catching live male moths for this study. The traps were standard wire-framed Lepidopteran cone traps and *Helicoverpa zea* specific pheromone lures were utilized in this effort. Traps were suspended upon rebar posts at a height of roughly 4 ½ feet to the top of the trap. Traps were checked, moths counted, recorded, and traps emptied weekly, and pheromone was changed bi-weekly.

Three trapping sites were utilized, one for each county served. The Swisher trap was in central Swisher along the Middle Tule Draw on the Mike Goss Farm (34 26 29.65N -101 44 27.33W) to capture overwintering moths and moths migrating from the east up the Caprock escarpment. The Hale trap was in southwestern Hale near Cotton Center on Shane Berry Farm (33 59 43.59N -101 58 31.39W) to capture overwintering moths and immigrant moths moving from the south. The Floyd trap was in northwestern Floyd on Wayne Johnson's farm (34 18 29.31N -101 28 08.81W) to capture overwintering moths and migrant moths in a traditional bollworm trouble area. Traps were counted weekly and species-specific pheromone lures changed bi-weekly. No kill strips were used to maintain optimum moth health.

Figure 4. Hale County Trap during the 2019 peak bollworm flight.

Due to a light bollworm population during the 2019 growing season, only 1 site, on one date yielded enough moths to test. On 27 September, only 44 moths were collected from the Hale County site in the 24 hour period.

Moth exposure vials utilized were 20 mL Scintillation Vials for the product exposure or moth survival test. All moth testing vials were prepared by Dr. David Kern's lab in College Station in groups of 99 and shipped across the State to cooperating agents and specialist including this site. This location received 2 groups of treated vials for the completion of this survey but only 44 vials were used. All test vials were pre-treated with one of three levels of cypermethrin, an untreated check, 5 ug cypermethrin, or 10 ug cypermethrin. All vials were color coded according to treatment levels for ease of trial procedural routine. Untreated vials remained clear, 5 ug vials were tainted white across the bottom of the vial and 10 ug vials were tainted red across the bottom. Untreated vials were used to test the overall health of the moth population while the 5 ug rate represented a maximum field rate of cypermethrin and survivors would represent a resistant population that would survive a labeled field treatment. The 10 ug rate would represent a 2X rate of cypermethrin and survivors should represent a dominant resistant trait within the moth population. All vials following moth transfer were left slightly loose to ensure air transfer for the moths.

The moth population that survived 24-hour vial-treatment exposure was adjusted using Abbotts Formula to adjust for the health of the moth population and calculate true resistance and dominant resistance levels.

Results and Discussion

The overall health of the only tested bollworm population was weak with only 66.7% of the moths surviving 24 hours in untreated vials. The surviving 5 µg treatment 10 µg then adjusted for the health of the population, the number of resistant bollworms becomes 50% and the number of bollworms likely to pass the resistant trait to the next generation becomes 40%.

Hale County - Cotton Center

Bollworms

Date Collected: 9/27/2019
Date Read: 9/28/2019

Treatment	Rate	Vial color	# collected	Alive	Dead	% survival		Abbott's Adjustment
Check	0 µg	Clear	15	10	5	66.7		
Cypermethrin	5 µg	White	15	5	10	33.3		50.00%
Cypermethrin	10 µg	Maroon	14	4	10	28.6		40.00%

Conclusions

While the population available for testing in 2019 was light, the results are startling. The poor health of the population indicates that these moths likely migrated a great distance, experienced hardships and limited food along the way, were exhausted upon arrival, and had little food available this late in the growing season. It is possible that the moths capable of surviving the UTC vials were among the strongest worms, with that strength relating to resistance and survivability from pyrethroid treatment.

The results show that during 2019, only **50 % control would result from any pyrethroid application to this population of bollworms**. They also show that 40 % of this bollworm population will pass dominant resistance genetic traits on to the next generation of bollworms. This is not outside the results of this trial conducted in other areas of the State but rather the norm. In conclusion, a pyrethroid should not be considered the best option for a first-choice economically triggered bollworm treatment on the Texas High Plains in 2019 or the near future.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Mike Goss, Shane Berry, and Wayne Johnson for cooperating with us to gather this data. I would like to thank Cotton Incorporated for sponsorship of this work, Dr. David Kerns and the Texas A&M Department of Entomology for moth trapping supplies and the 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Jerik Reed, Nicole Kiem, Denise Reed, and Meredith Stanford. I would also like to thank the Ryan and Cynthia Waldon as youth volunteers who donated time to the data collection of this trial. Thank you all.

<u>Monitoring Bollworm, *Helicoverpa zea*, Resistance to Bt Technologies in Cotton Genotypes in the Texas High Plains 2019</u>

Texas A&M AgriLife Extension Service / Fibermax Cotton
Hale County
Bobby Byrd, Hale Center, Texas
Blayne Reed, EA-IPM Hale, Swisher, & Floyd and Tim Culpepper, BASF

<u>Summary</u>

A Fibermax Sentinel Plot Trial in central Hale County belonging to Bobby Byrd was utilized for this analysis. A non-Bt line, FM 3222 GL, a TwinLink (**Cry1Ab+Cry2Ae**) line, FM 1911 GLT, and a TwinLink Plus (**Cry1Ab+Cry2Ae+Vip3A**) line, FM 2398 GLTP, a Bollguard III (**Cry1AC+Cry2Ab+Vip3A**), NG 3956 B3XF, and a WideStrike 3 line (**Cry1Ac+Cry1F+Vip3A**), PHY 330 W3FE were selected to be representative of their respective Bt technology for the analysis. Data collection began with weekly counts during the first week of bloom and continued weekly for eight weeks ending just past absolute cut-out stage. 50 Plants were randomly selected per count date from each Bt technology's large plot Sentinel plot. These plants were inspected using the whole plant inspection method in groupings of 5 and 10 continuous row plants. Then 50 of each fruiting stage were randomly inspected for bollworm damage from each plot to obtain percent fruit damage. No bollworm populations were treated with any additional insecticide in the trial area leaving the only bollworm control method being the present Bt traits expressed. No harvest data was collected for the purposes of this data as agronomic differences between lines were likely to be a larger influencer than Bt technology under lightly economic bollworm pressure. All number of fruit damage and live bollworms per 50 whole plant inspections were analyzed utilizing ARM ANOVA CRBD with 3 replications with significance being at least P=0.05.

Resulting bollworm pressure was unusually light in the High Plains during 2020 with few regional fields ever reaching ET. Only 1,203 bollworms per acre were found in the non-Bt line, well below the ET of 8,000 to 10,000, and no living worms were found in any Bt line. Some damage was found in all treatments with the non-Bt line showing more damage, but no significant differences were found. Due to the lack of pressure, we are left to assume that the field efficacy of the varying Bt traits are similar to lab results for 2019, much like they were confirmed to be for the region in 2018.

<u>Objective</u>

Evaluate efficacy and level of economic return of non-Bt and all Bt trait technologies on bollworms in West Texas commercial cotton and compare these results to other Bt/bollworm resistance studies across the US Cotton Belt for any clues regarding potential regional differences and resistance hotspots.

Materials and Methods

Data collection began with weekly counts during the first week of bloom and continued weekly for eight weeks ending just past absolute cut-out stage. The first count date occurred on 23 July and the last on 3 September. 50 Plants were randomly selected per count date from each Bt technology's large plot Sentinel plot. These plants were inspected using the whole plant inspection method in groupings of 5 and 10 continuous row plants. This method was selected to find and analyze lower bollworm populations that often occur on West Texas cotton at a far sub-economic level by gathering more detailed and locally relevant data. For all fruiting stages, squares, blooms, and bolls, 50 sites were inspected in each plot for damage to obtain percent bollworm fruit damage. The number of live bollworm data were recorded and reported to corporate sponsors on a per 50 whole plant inspection format. Damage to fruiting sites were recorded as percent bollworm damage for each fruiting stage.

Results and Discussion

Bollworm pressure and egg lay was very light for the region. As a result, very few bollworms appeared in the trial. The peak bollworm count for the trial season was 1,203 bollworms per acre in the non-Bt variety with no live worms found in any Bt line.

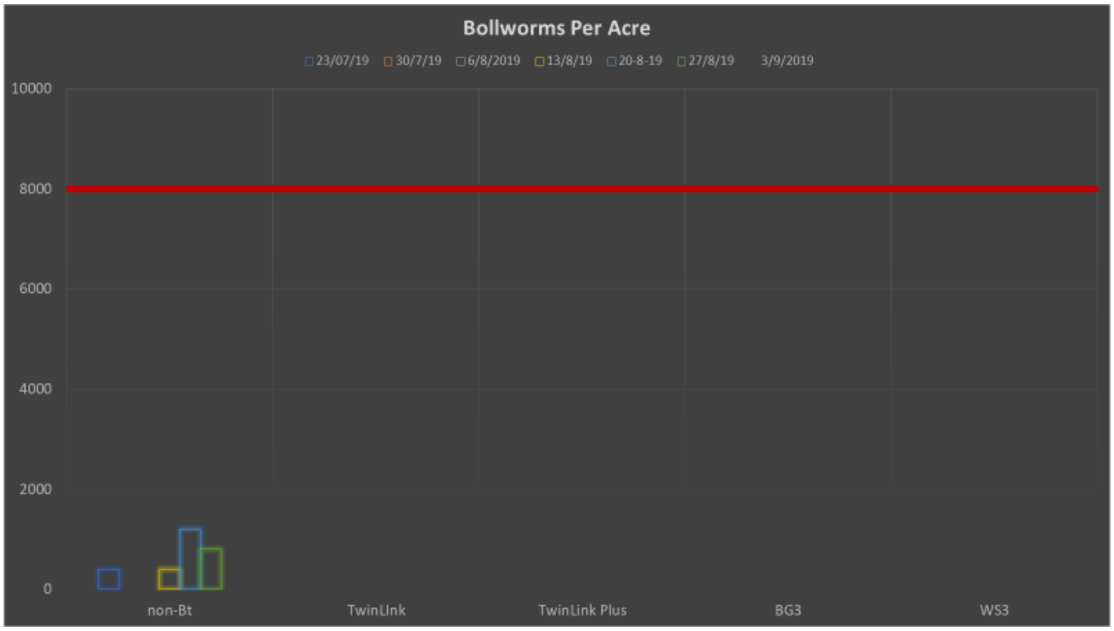


Figure 5. Bollworms found per acre with ET level shown in red. No live worms were found in any Bt line.

The percent fruit damage was also fairly light. Heavier and more consistent damage was recorded in the non-Bt line, but no significant differences were found between treatments with pressure so low.

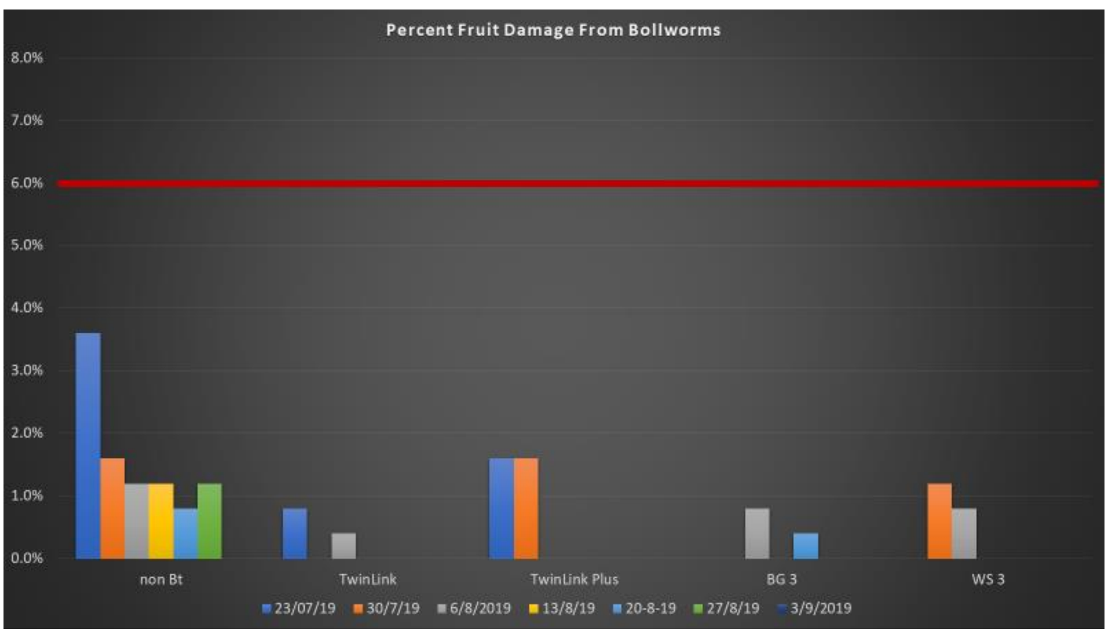


Figure 6. Percent fruit damage by Bt Type with the ET level shown in red. There were no significant differences between treatments.

Conclusions

Very little can be drawn directly from this trial in terms of understanding the level of Bt resistance that bollworms will exhibit in Texas High Plains cotton. What little data presented here does indicate that all of the Bt toxins are still exhibiting some level of control. It can also be assumed that that level of control would be proportionate to the level of control exhibited in lab studies and other cotton producing areas with more bollworm pressure, very similar to our field results in 2018.

We can also infer from these results that bollworms will not be an annual economic cotton pest on the Texas High Plains. Most areas of the cotton belt are adopting new economic thresholds for bollworms in response to Bt resistance, which include chemical preventative treatments triggered simply by egg lay for all Bt except lines with the Vip 3A trait. These results show that the High Plains does not consistently have enough bollworm pressure to adopt these extreme measures of prophylactic chemical treatments. Instead, the High Plains likely should extend the existing economic threshold of 8,000 to 10,000 bollworms per acre or 6% harvestable fruit damage to all Bt lines due to the likelihood of some level of resistance.

Figure 7. Bollworm in bloom tag, bollworm egg, and Assassin bug in bloom.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to , for cooperating with us to complete this trial, Fibermax and Tim Culpepper for sponsoring and partnership of this trial, the 2019 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Jerik Reed, Nicole Kiem, Denise Reed, Jerik Reed, and Madeline Stanfield. Thank you all.

2019 Cotton Insecticidal Seed Treatment Economic Impact Study

Texas A&M AgriLife Extension Service / Cotton Incorporated
Swisher County
Mike Goss, Cooperator
Blayne Reed, EA-IPM Hale, Swisher, & Floyd and Dr. Suhas Vyavhare, District 2 Cotton Entomologist

Summary
The five principle cotton seed treatments commercially available on the Texas High Plains for cotton producers were used in this trial. Included was an untreated check (UTC), Gaucho 600 at 0.375 mg AI/seed, Cruiser 5FS at 0.34 mg AI/seed, Aeris at 0.375 mg AI/seed, and Avicta Elite at 0.865 mg AI/seed. The treatments were organized into a CRBD with 4 replications within a commercial drip irrigated cotton field in Swisher County and planted on 22 May. A 0-5 damage rating system was utilized to rate all plots for thrips damage at cotyledon stage, 1st true leaf, 2th true leaf, 3rd true leaf and at 4th true leaf stages. On all rating dates, 10 randomly selected plants from each plot were harvested and directly placed into labeled and individual plot mason jars containing 75% alcohol. At Dr. Suhas Vyavhare's lab at the Lubbock Center the thrips captured in the jars were be filtered out of the solution, cleaned, counted, and species identified under microscope for the purpose of species population monitoring in the region. Yield data could not be taken due to a July hailstorm eliminating the field.

All indicators taken for this trial indicate that seed treatments in cotton show benefits. No yield data could be gathered from this trial, but the fact that the UTC failed to establish at an economic level due to heavy wireworm pressure, with the known and again proven thrips control, should give an edge to the use of seed treatments in cotton.

Objective
To evaluate the economic benefit, if any, of commercially available seed treatments designed for early season thrips control in seedling cotton and to take occasion to survey the thrips species complex in the region compared to historical population dynamics for a pest thrips species shift. This site was one of seven locations across the State designed to reach these stated objectives locally, regionally, and across the State.

Materials and Methods
The five cotton seed treatments selected to participate in the trial were the principle treatments commercially available on the Texas High Plains for cotton producers. Included was an untreated check (UTC), Gaucho 600 at 0.375 mg AI/seed, Cruiser 5FS at 0.34 mg AI/seed, Aeris at 0.375 mg AI/seed, and Avicta Elite at 0.865 mg AI/seed. The treatments were organized into a CRBD with 4 replications.
A commercial drip irrigated cotton field in Swisher County belonging to Mike Goss Farms was selected to host the trial. This 2019 field had as a reliable source for migrating thrips to emerge from drying wheat to the West and North. On 22 May the field was planted with Mr. Goss' field planter with boxes

removed so that random plot placement of treatments could be made via manually hand dribbling of seed at a target rate of 1 seed per 3-inches. Plots were organized as 8-rows by 40-feet long.

Figure 8. The 0-5 thrips damage rating scale visualized with examples of damage at these levels.

All protocol guidelines set forth by Cotton Incorporated were adhered to for the trial. These included using a 0-5 damage rating system was utilized to rate all plots for thrips damage at cotyledon stage, 1st true leaf, 2nd true leaf, 3rd true leaf, 4th true leaf stage, and at 5th true leaf stages.

On all rating dates, 10 randomly selected plants from the Southern 4 rows of each plot were harvested by cutting at the soil level and directly placed into labeled and individual plot mason jars containing 75% alcohol. These jars were transported to Dr. Suhas Vyavhare's lab at the Lubbock Center where any thrips captured in the jars would be filtered out of the solution, cleaned, counted, and species identified under microscope following the conclusion of the growing season for the purpose of monitoring species population distributions in the area.

Wireworm and false wireworm pressure were present in field and the opportunity was taken during emergence to rate the treatments' level of wireworm control on a 0-10 rating scale. Plant stand counts were also taken to capture value of the seed treatments on wireworm damage as it impacts stand establishment. From each plot, 3 1/1000-acre areas were counted, averaged and compared for differences.

Harvest was intended for the trial, however a violent weather even including large hail destroyed the plots and surrounding field in early July.

Results and Discussion

Wireworm and false wireworm pressure was high during germination. The established cotton seedlings did not show significant differences in wireworm damage at the cotyleden stage, but all the insecticidal seed treatments showed a numeric trend of imporvement compared to the UTC.

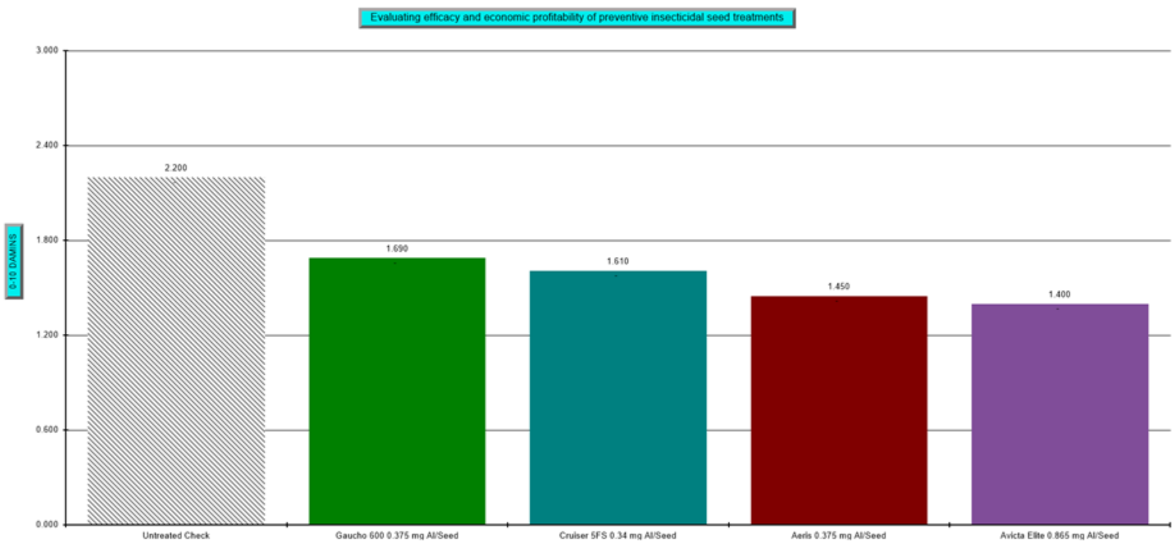


Figure 9. Wireworm damage to established cotton seedlings at cotyledon stage.

There were large and significant differences in plant per acre stand counts between the treatments as a result of seedling death from wireworm damage.

Table 1. Cotton Seedling Per Acre at Cotyledon stage surviving wireworm pressure.

Treatment	Plants Per Acre
UTC	18,750 b
Gaucho 600	31,033 a
Cruiser 5FS	30,675 a
Aeris	31,249 a
Avicta Elite	32,084 a

Thrips pressure was also high for the duration of the trial. In terms of the 0-5 damage ratings, at cotyledon stage, all treatments performed significantly better than the UTC. These differences dissapeared under continuous new infestation pressure for the 1st and 2nd true leaf damage ratings but returned by the 3rd true leaf stage and remained for the rest of the trial. By the 4th and 5th true leaf stage ratings, all treatments remained superior to the UTC with the Aeris treatment performing significantly better and the Cruiser and Avicta Elite treatments seperating from the Goucho treatment.

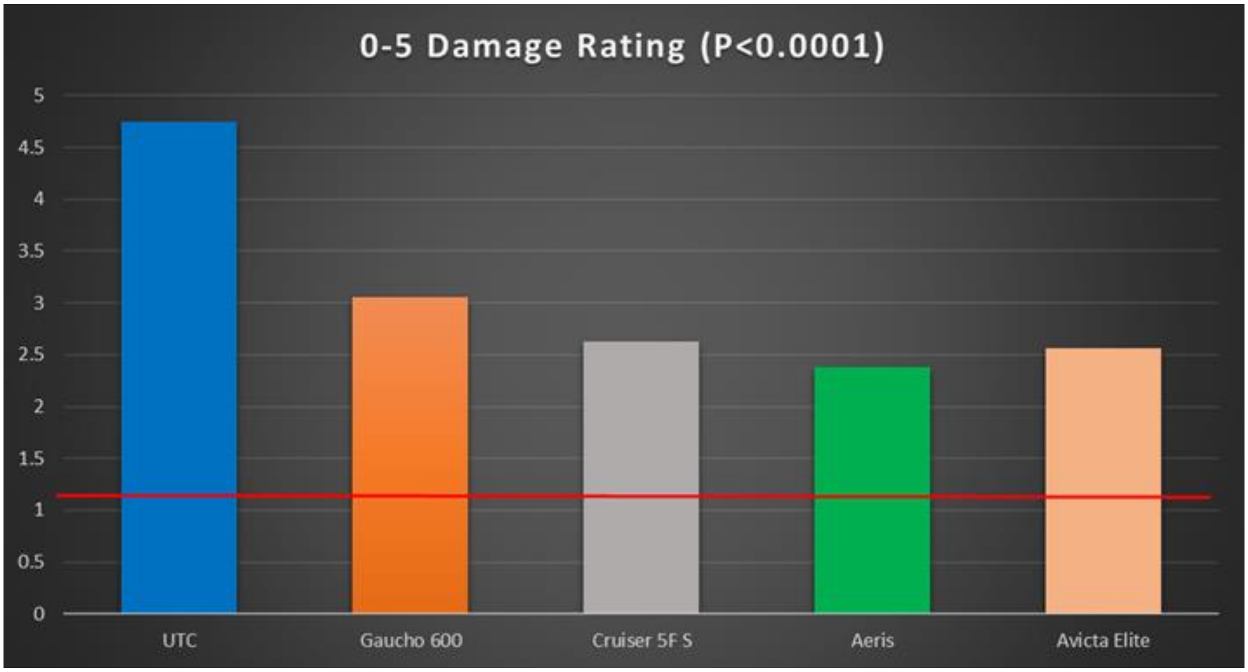


Figure 10. Damage Ratings at the 5th true leaf stage with the red line indicating ET.

Actual thrips counts showed all seed treatments were outperforming the UTC during the 1st through 3rd true leaf stages at varying levels. At about the 4th leaf stage, residual control from the seed treatments appeared to be depleted with larva, adult, and total thrips populations increasing above economic levels, at a rate similar to the UTC, but still significantly lower with less damage accumulated.

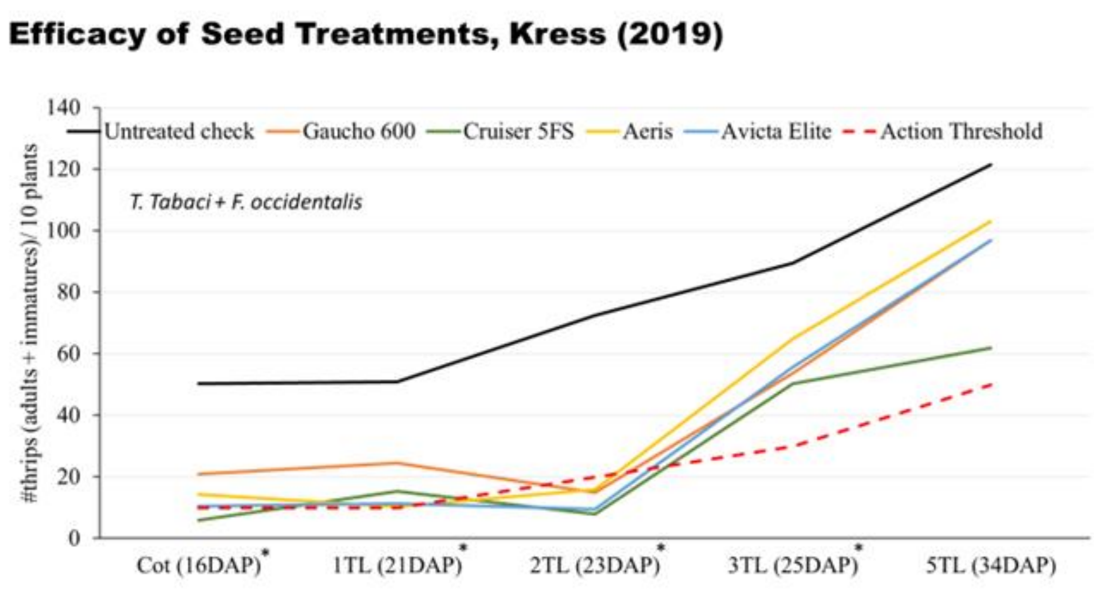


Figure 11. Total number of thrips per 10 plants per plot with red dotted line representing ET.

Conclusions

For this trial this season, all indications taken show a clear benefit to the use of seed treatments. Noting the plant per acre establishment alone shows that the field would not have emerged with enough viable plants to maintain profitability without the seed treatments limiting the wireworm impact. The differences in thrips numbers and damage ratings are also clearly in favor of the use of seed treatments. This season there was no harvest and yield data to prove these differences.

This is often the case for these seed treatment trials that seed treatments regularly help cotton early in the growing season. However, if the field is given time late in the season, the early damaged plants will make up differences in yield and money returns. What is stark from this trial is that the field would not have established without the seed treatments due to the heavy wireworm pressure.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Mike Goss for cooperating with us to complete this trial, Cotton Incorporated for sponsoring and partnership of this trial, the 2019 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Jerik Reed, Nicole Kiem, Denise Reed, Jerik Reed, and Madeline Stanford. Thank you all.

2019 West Texas Auxin Herbicide Drift Evaluation Trial and Demonstration

District 2 and District 7 AgriLife Extension

Halfway Experiment Station/Wall

Blayne Reed, Texas A&M AgriLife Extension, Plainview, TX and Dr. Reagan L. Noland, Texas A&M AgriLife Extension, San Angelo, TX

Introduction

Recent years have seen a major increase in the use of auxin-tolerant cotton varieties in West Texas and Texas High Plains Cotton production, primarily for the purpose of combating glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*). Crop sensitivity to damage from 2,4-D and dicamba herbicides have made producers hesitant to fully accept or properly adapt to using the corresponding auxin herbicides in Enlist Cotton and XtendFlex Cotton, despite improvements in formulations limiting volatility. Off-target movement remains a major concern for regional producers, despite recommended practices and performance demonstrations from company sources. Independent trials from other cotton growing regions have proven effective in answering producer concerns over proper use and application of these herbicide technologies. This trial was conducted in the unique West Texas and High Plains cotton-production regions to demonstrate potential and limitations of these products and address technical aspects of possible off-target movement to facilitate proper stewardship of the technologies in area cotton production.

Methods

The trial was conducted at two locations. The High Plains location was at the Halfway Experiment Station in Hale County while the West Texas site was near Wall, TX in Tom Green County. Two blocks were planted with cotton at each location. One block consisted of Enlist Cotton, PHY 350 W3FE, and the other of XtendFlex Cotton, DP 1820 B3XF. At the Halfway site, the blocks were planted in the two inside pivot towers of the research farm's irrigation pivot with 48 rows per block for each cotton line. At the Wall site, each block was 60 x 60 ft square in a dryland production field. Each site was managed with commonly accepted local agronomic and entomological inputs applied except for any large scale over the top auxin herbicide treatments.

Figure 13. Aerial view of plot areas at Halfway, TX.

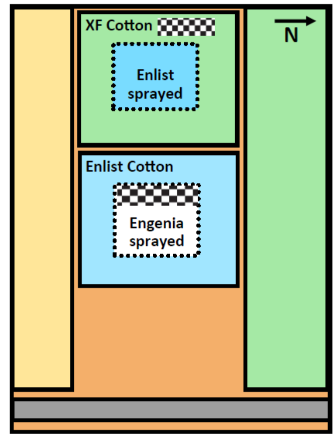


Figure 12. Illustration of plot layout at Wall, TX.

Within each planted block a plot area was designated for treatment application and subsequent data collection. Plots at Halfway were 8 40-inch rows wide by 40-feet in length, and plots at Wall were 6 40-inch rows wide and 20 feet long. Within treated areas the opposing or wrong auxin herbicide was sprayed at the maximum labeled rate in a tank mix with Roundup (32 oz/acre). Auxin rates were as follows: 1) Xtend cotton treated with Enlist One (32 oz/acre), and 2) Enlist cotton treated with Engenia (12.8 oz/acre). At Halfway, the treated areas were sprayed via backpack CO_2 sprayer on 16 July at 16.2 GPA in 8 mph SSW winds. At Wall, the treated areas were sprayed on 8 August with the Enginia treatment at 17 GPA and the Enlist at 15 GPA (due to different/separate spray boom configurations) in 9 MPH SSE winds. All label restrictions and nozzle requirements were followed for all treatments (except for the direct treatment of a susceptible crop) and cross-contamination was avoided through clothing, tank, hose, nozzle, and boom rotations.

Prior to plot treatments, plants from within each treatment area, adjacent row plants, and plants downwind at 13.3 feet, 30 feet, and 60 feet were shielded and covered completely from having direct spray or direct physical spray drift. These coverings were removed 30 minutes after each application to monitor for any post-application volatilization of the auxin herbicides. At Halfway, there were additional plants within each treated area and on adjacent rows that were shielded but not completely covered (cut-open milk jugs not sealed or covered at the base) from the direct spray to evaluate any potential dangers of shielded sprays of the herbicides. All shielded or covered plants were marked for subsequent damage ratings (due to secondary movement) and were contrasted by data gathered from neighboring plants that would have additionally been exposed to physical drift.

14Figure 3. Application and wind speed measurement at Halfway.

Figure 15. Resulting undamaged completely shielded and covered cotton plant in the Enlist plot at Wall

Potted plants, conventional cotton and soybeans at Halfway and tomatoes at Wall, were also placed within the treated plot areas and downwind at 13.3 and 30 feet 30 minutes after application for additional volatility detection from either product. The potted plants were left and cared for in their designated areas for 3 days when they were moved to a greenhouse or protected area. Ratings were collected from the potted plants at 3, 7, and 10 DAT.

Damage ratings were recorded at Halfway from the shielded and covered, shielded and area plants for all marked locations at pretreatment, 3, 10, 23, 36, and 50 DAT and at Wall at pretreatment, 3, 7, 14, 22, and 28 DAT. All data from covered and shielded plants, shielded plants, potted plants, and exposed plants from all assigned areas were rated on a 0-10 auxin herbicide damage scale. On this scale, 0 represents no damage, 10 represents dead plants, and economic or fruit damage begins at 2.

Figure 16. Photo of completely shielded and covered plants at Halfway.

With inadequate replicates, all data should be viewed for comparison and demonstration value only, as no statistical analyses were performed. Both locations served as a demonstration for area producers at 3 different field days, 2 at Halfway and 1 at Wall.

Figure 17. Photo of milk-jug covered plants at Halfway showing slight opening at bottom.

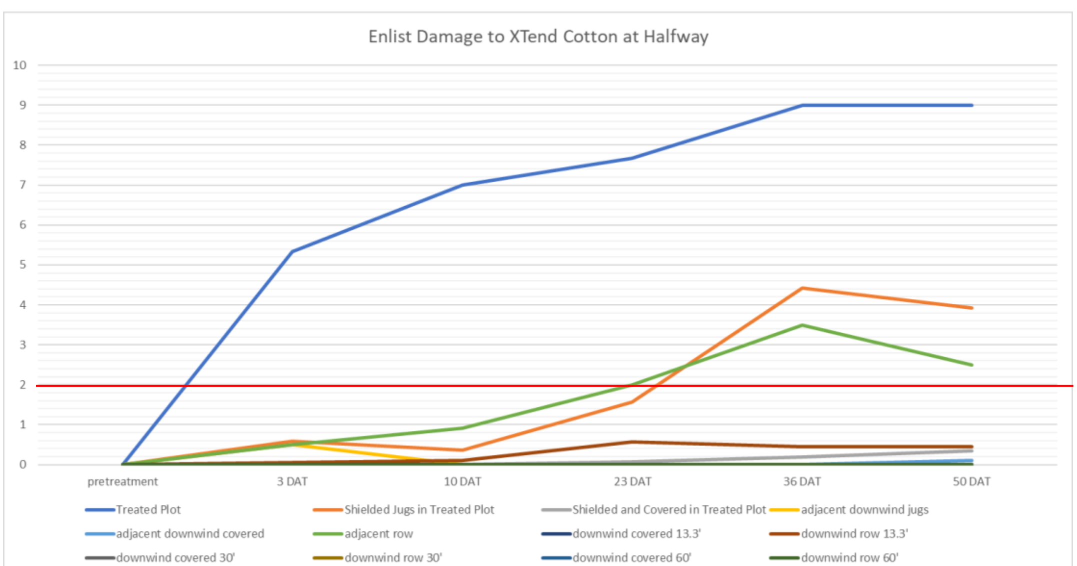
Results

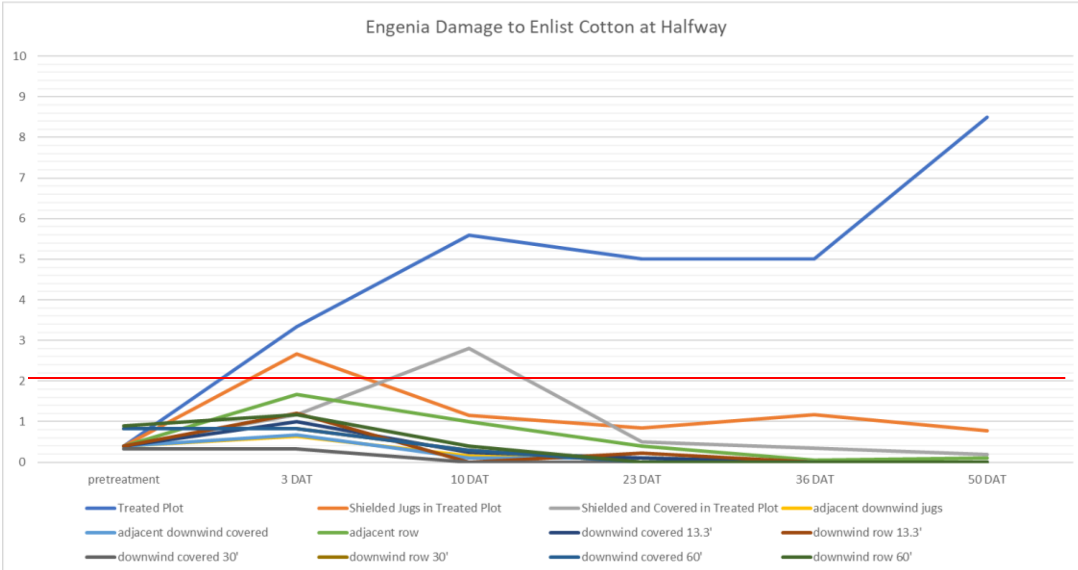
All Enlist cotton plots and conventional potted plants for both locations experienced pretreatment and posttreatment dicamba drift damage from off site. This damage was minor in all cases and was not considered economic but does appear in early damage ratings for the Enginia treatment until the damage could be differentiated from the intended treatment damage. No other damage to note was recorded on the potted plants, therefore no further data from these plants is reported.

Halfway, TX Results

Damage to all exposed plants in both the Enlist and Enginia treatment areas was severe and increased with time with the Enlist damage being more severe early resulting in eventual death of most plants and the complete loss of fruit of any surviving plants while the Enginia damage mostly resulted in the loss of all fruit production from the many surviving plants. Physical drift for both the Enlist and Enginia treatments was measured on the adjacent row (40-inches) and to a lesser extent at 13.3-feet while no drift for either product was noted at the 30 and 60-foot marks. All physical drift damage from the Enginia treatment recovered over time with negligible effects as did the damage from the Enlist drift at 13.3-feet with more pronounced and bit longer lasting leaf strapping impact. Damage from Enlist physical drift to the adjacent row increased over time with all affected plants showing heavy leaf strapping at all growing points for the duration of the data-collection period.

The Enlist treatment showed no damage to the sheltered and covered plants in the treated area or at any point downwind from the Enlist application. This indicates that volatilization did not occur in levels detectable by plant response from the Enlist treatment. The Enginia treatment did show some minor volatility damage at 3 DAT and at the 10 DAT but damaged plants quickly grew out from the damage. Plants covered only by milk jugs received slight damage for both the Enlist and the Enginia treatments. The Enginia-damaged milk-jug-covered plants recovered over time similarly to the Enginia downwind adjacent row but the Enlist-damaged milk-jug-covered plants continued to show severe leaf strapping for the duration of the trial, affecting all new growing points and resulting in the loss of all fruit developed post-treatment.

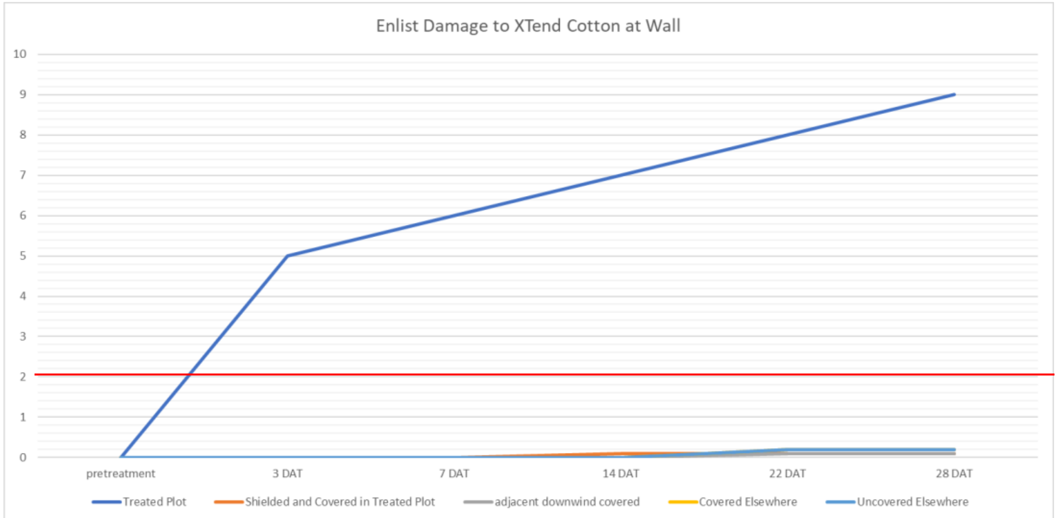


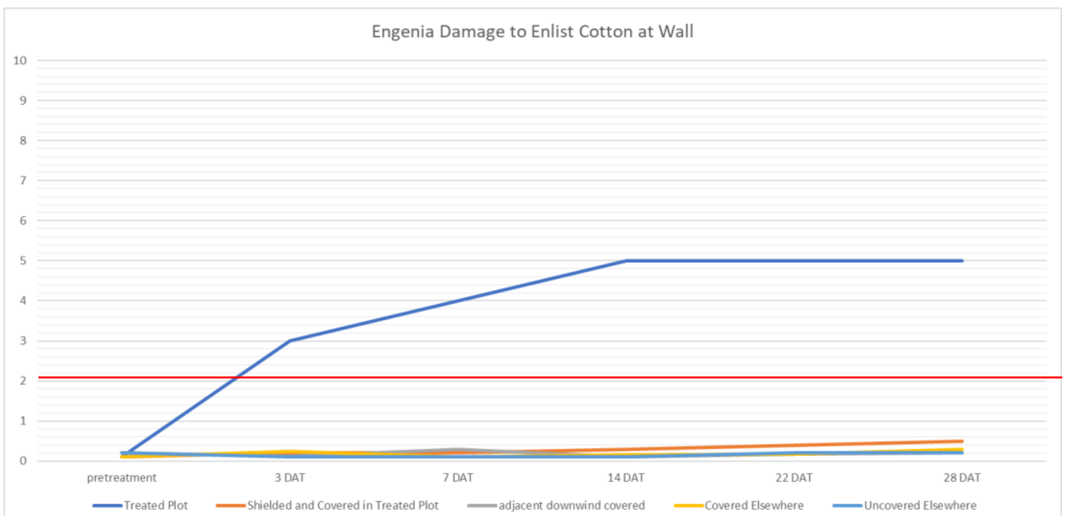


Wall, TX Results

Results at Wall were very similar to Halfway, with severe damage to exposed plants for both the Enginia and Enlist. Ultimately Enlist resulted in death of most plants and fruit-loss for all surviving plants, and Enginia resulted in fruit loss but general plant survival. No physical drift for either treatment was recorded past the adjacent downwind row at Wall. Drift damage to adjacent-row plants was observed in both treatments, and some square abortion occurred with Enlist drift, but overall drift damage was considerably less than at Halfway.

Overall, no evidence of appreciable secondary movement (via volatilization or otherwise) was observed in either technology. Similar to Halfway, no injury was observed on covered plants in the Enlist treatment area or downwind. Very slight dicamba injury existed in the Enlist cotton prior to treatment applications. Extremely minor foliar damage was recorded for covered plants in the Engenia treatment, however this cannot be attributed to secondary movement of the applied treatment, as some level of dicamba exposure had occurred prior. Ultimately, no moderate or severe foliar symptoms or damage to fruit was observed in plants protected from direct spray or physical drift.





<u>Conclusions</u>

Plant-detectable secondary movement of these herbicides (including volatilization) was negligible under the conditions of these experiments in the West Texas and High Plains environments. These findings indicate that physical drift is more likely to cause issues of off-target movement from either Enlist or Engenia. However, the severity of cotton damage from slight Enlist drift (adjacent row), and from exposure to extremely low amounts of Enlist in the milk-jug-covered plants at Halfway demands careful, drift-conscientious applications. The same conclusion applies for Engenia if applications are made in an area with plants or crops more susceptible to the dicamba than cotton.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Casey Hardin, Farm Manager at the Halfway Station, for cooperating with us to gather this data, our cooperators at Wall, and the 2019 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Jerik Reed, Madeline Stanfield, Nicole Kiem, and Denise Reed. Thank you all.

2019 Gowan Experimental Miticide Efficacy at Low Volume Applications for Banks Grass Mite Control in Corn

Texas A&M AgriLife Extension Service / Gowan
Cooperator: Craig Klepper
Blayne Reed, EA-IPM Hale, Swisher, & Floyd, Dr. Craig Sandoski, Gowan, Andrew Dunlap, EA-Crops, Hale, Lamb, & Castro

Summary

Nine numbered compounds of miticide treatments including an UTC were applied to an economic population of Banks Grass Mites in a commercial corn field in a small plot CRBD with four replications at 5 GPA. BGM populations were supplemented artificially and flared within the plot treatment areas prior to trial establishment. Per leaf BGM data was taken at pre, 7, and 14 DAT and 0-10 damage ratings were taken at 14 DAT. No data collection was possible past the 14 DAT mark due to field desiccation and environmental conditions. All data were compared using ANOVA and LSD.

The BGM populations in all treatments started low in the pre-treatment counts and increased for both the 7 and 14 DAT counts. No treatment, for any data collection date, lowered any population of BGM. All of the treatments did significantly slow the BGM population increase compared to the UTC at some point in the trial. Results indicate that higher GPA applications are beneficial whenever possible and that mite treatments should be made before emergency treatment situations are needed due to modern miticides efficacy patterns.

Objective

Evaluate numbered and experimental Gowan miticides for Banks Grass Mite Efficacy in West Texas Field Corn under low volume application rate situations of 5 GPA.

Materials and Methods

Nine numbered compounds of miticides, experimental chemistries, and mixes of compounds from GOWAN along with an untreated check were organized for this trial. All treatments were organized into a small plot CRBD with four replications. Plot sizes were 6-30-inch rows wide by 43-feet long with the middle two rows of each plot being the treated area of the plot and the remaining rows being a buffer to prevent chemical drift between plots and to provide a source for re-infestation both from beneficials and additional mites for superior residual measurement of the products.

Image 18. The PPM Interns applying the flaring treatment on 27 July.

A commercial corn field enrolled with the Plains Pest Management field scouting program in southwestern Swisher County belonging to Craig Klepper was selected for the trial. Some light pockets of Banks Grass Mites (BGM) were noted by the Plains Pest Management field scouts in mid-July. Plots were lain out on 26 July in one of the stronger pockets of BGM available in the field. This population was augmented with additional mites harvested from other BGM pockets in other PPM corn fields in Hale and Swisher Counties. Within each plot's two treated rows, 3 additional BGM infested leaves were evenly placed around the treated rows at the zero leaf. Shortly following artificial BGM infestation, the treated areas of all plots were sprayed with Karate at 2.4 oz. / acre and Headline at 14 oz. / acre via CO2 backpack sprayer with overhead boom attachment at 16.2 GPA. This was done in an effort to temporarily remove all mite predators and mite fungal pathogens so that economic populations of BGM would develop in the plot treated areas.

Image 2. Harvesting ear leaves from corn plots to be taken to lab and counted for BGM/leaf counts.

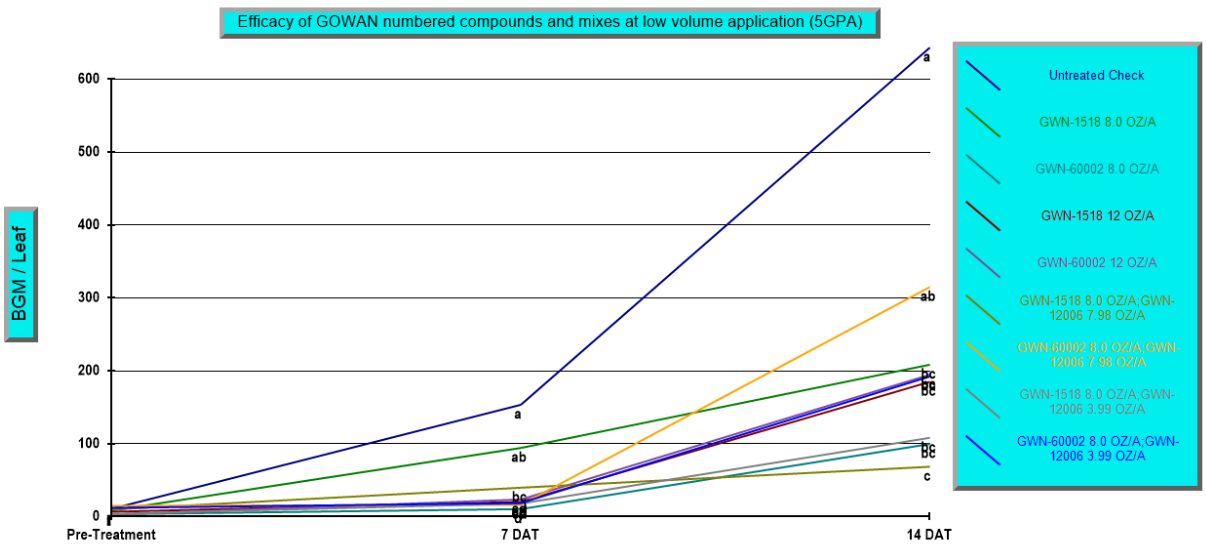
On 7 August the treated areas of the plots were deemed economic and treatable for BGM and all treatments were applied. All treatments were made with the CO2 backpack sprayer with the overhead boom attachment. For the trial treatments, the GPA was calibrated for a low volume application of 5 GPA. Data on mites per leaf were recorded pre-treatment, 7, and 14 DAT with a mite damage rating taken at 14 DAT. After the 14 DAT data collection date and shortly after full dent stage, the field went into rapid desiccation from drought stress. No additional data collection dates were possible.

For the mite per leaf counts, five randomly selected ear leaves were harvested from each plot on count dates and taken to the Plains Pest Management Insect Lab in Plainview were mites per leaf were counted under magnification. No differentiation was made about mite life stage as all living mites were counted. All data were recorded in ARM and following trial completion compared using ANOVA and LSD. Mite damage ratings were rated on the Texas A&M AgriLife standardized corn-mite damage rating 0-10 scale.

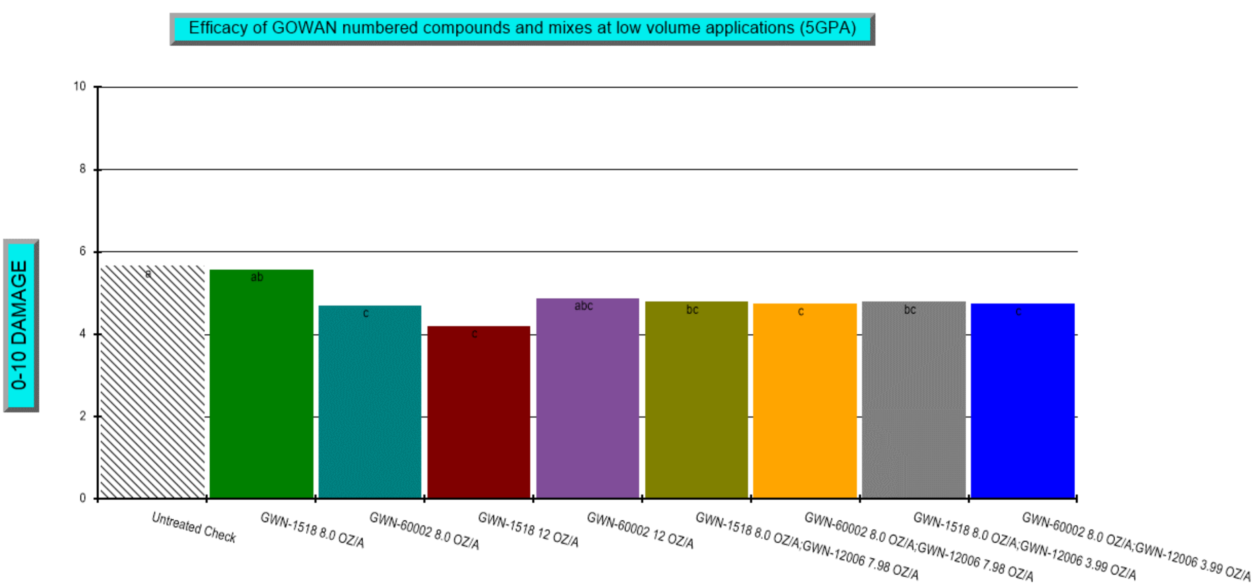
Image 3. PPM Intern Madeline Stanfield taking a damage rating in a plot.

Results and Discussion

The BGM populations in all treatments started low in the pre-treatment counts and increased for both the 7 and 14 DAT counts. No treatment, for any data collection date, lowered any population of BGM. All of the treatments did significantly slow the BGM population increase compared to the UTC at some point in the trial. At the 7 DAT date, all treatments except treatment 2, GWN-1518, had significantly fewer BGM. By the 14 DAT date, all treatments except treatment 7, GWN-60002 mixed with GWN-12006 were significantly lower than the UTC.



The BGM damage ratings taken at 14 DAT were no less difficult to discern superior treatments through. All treatments except 2, GWN-1518, and 5, GWN-60002 were significantly different from the UTC but only a few treatments were significantly different from each other, and just barely so.



Conclusions

The conditions of corn and this field during August 2019 should be noted. The field was in an extreme drought conditions and the irrigation system could not keep up with the corn's water demands.

Shortly following dent stage, the field, along with most area fields, began rapid desiccation followed by plant death and substantial yield loss to lack of kernel fill. No data collection past the 14 DAT was possible. For most modern miticides, efficacy does not start to show until after 10 DAT and fully differentiate until 17 DAT. It should also be noted that the results that were collected fell along a similar numerical pattern to the results of other trials applied at a higher GPA volume but not nearly as well defined. These results indicate that higher GPA applications are beneficial whenever possible.

These results, with all treatments increasing in BGM numbers per leaf for all treatment dates, indicate that the drought and mite flaring treatment were still impacting the trial. This also highlights the fact that there are no existing miticides, labeled or experimental, that can stop and decrease an economic BGM population in full flare. All BGM modern mite treatments in corn must be made before the mite population increases too high, too rapidly. The various miticides attack the mite's life cycle in different ways. This takes time to develop and have an impact on the overall mite populations. These modern miticides are all very predator friendly and rely upon help from the beneficials to fully and eventually control the mites. Extra care should be made in protecting beneficial populations and preventing the mites from flaring so that they can be managed once economic levels are neared.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Gowan and Craig Sandoski for sponsoring and partnership of this trial, Craig Klepper for Cooperating and hosting this trial, and the 2019 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Jerik Reed, Nicole Kiem, Denise Reed, and Madeline Stanfield. Thank you all.

Spidermite in Sorghum Product Efficacy Trial 2019

Texas A&M AgriLife Extension
Hale, Swisher, & Floyd County
Jimmie Sagaser - Cooperator
Blayne Reed, EA-IPM Hale, Swisher, & Floyd and Dr. Craig Sandoski, Gowan

Summary

In a commercial seed milo field in central Hale County, a CRBD with 4 replications was placed in an economic pocket of BGM. All sorghum labeled chemical treatments were included in the trial, an UTC, Onager at 12 oz., Comite II at 1.5 Pt., and Dimethoate at 1 Pt. By the 4 DAT count date, only the Onager treatment was significantly different from the UTC (*P*=0.0316). The Comite II and Dimethoate treatments were statistically similar to both the Onager and UTC treatments with a slightly higher number of BGM per leaf count. A sugarcane aphid treatment to the field caused a shift in predator feeding to the BGM and only numeric trends remained in BGM per leaf counts and damage ratings for the remainder of the trial. These numeric trends hinted at good control offered from Onager, adequate control from Comite II, and some knockdown control from Dimethoate that would be hard to sustain without the aid of predators with the products harshness to predators considered if treated over a full field.

Objective

Evaluate the efficacy of all sorghum labeled miticide products on naturally occurring economic populations of Bank Grass Mite in West Texas Sorghum Crops.

Materials and Methods

On 29 July a Plains Pest Management scouting program seed milo field belonging to Jimmie Sagaser was found with pockets of economic Banks Grass Mites (BGM). It was confirmed that the field in central Hale County contained a pocket suitable to place an all-encompassing labeled product efficacy A standard CRBD trial with 4 replications was established.

The treatments included an untreated check (UTC), Onager at 12 oz., Comite II at 1.5 Pt., and Dimethoate at 1 Pt. Plots were 6 30-inch rows wide by 44-feet long with the middle two rows being treated and the remaining 4 rows providing a buffer to prevent product drift and a source for pest re-infestation to best measure residual activity.

The trial was placed and treated on 30 July. Treatment was made by CO2 backpack sprayer with hi-boom attachment at 16.2 GPA. BGM per leaf counts were made pre-treatment, 4, 10, and 17 DAT. Leaf counts were made by randomly selecting 5 +2 desiccation (2nd green leaf above uppermost desiccated leaf) leaves per plot. Selected leaves were harvested and brought back to the Plains Pest Management lab in Plainview for BGM counting under magnification. Plots were rated on the Texas A&M AgriLife 0-10 BGM damage rating system at the 17 DAT date.

Trt	Code	Description
1	CHK	Untreated Check
2		Onager 12 FL OZ/A
3		Comite II 1.5 PT/A
4		Dimethoate 1 PT/A

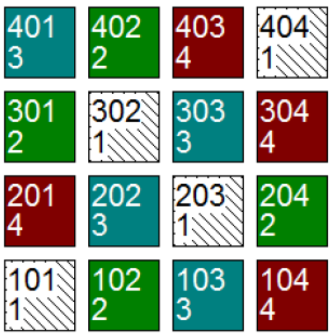


Figure 19. Plot map for the 2019 trial.

Figure 20. Photo of the treatments being made for the trial.

Co-existing with the BGM were sugarcane aphids. Shortly following the 4 DAT counts, the aphids reached economic levels across the field and required treatment. All plots were treated with Sivanto at 6 oz. per acre. The treatment had no impact on the BGM, it did leave high predator numbers that soon only had BGM to feed upon.

Results and Discussion

Pretreatment counts of the BGM were confirmed to be economic and standardized between treatments with no significant differences found. By the 4 DAT count date, only the Onager treatment was significantly different from the UTC (P=0.0316, LSD=21.02 @ .05). The Comite II and Dimethoate treatments were statistically similar to both the Onager and UTC treatments with a slightly higher number of BGM per leaf count.

Shortly following the 4 DAT count, the Sivanto treatment for economic sugarcane aphids that left high populations of predators, caused the predators to focus solely on the BGM, which had been largely neglected by the predators. The numbers of BGM in most plots, including the UTC, dropped

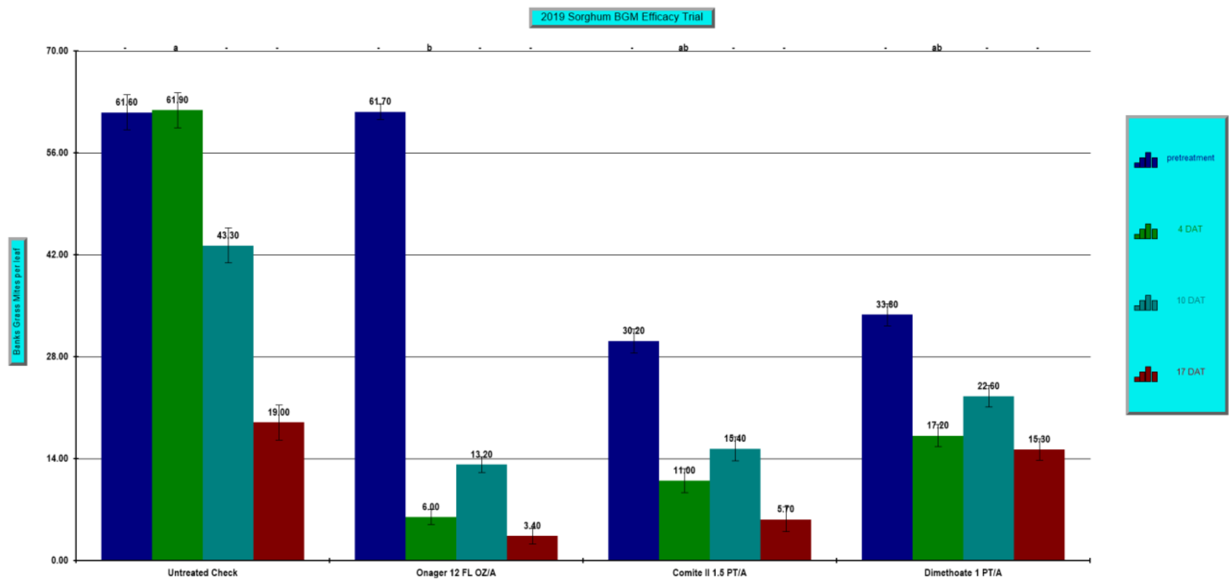


Figure 21. Per leaf BGM counts by treatment over time. Significant differences only at the P=0.05 level or greater and shown by letter sequence.

accordingly with the exception of the Dimethoate treatment, which showed little change. No other leaf count dates show significant differences.

There were no significant differences in the 0-10 BGM damage ratings collected at the 17 DAT date. There were numerical trends that hint toward an advantage of all treatments over the UTC with Onager having advantage over the other treatments.

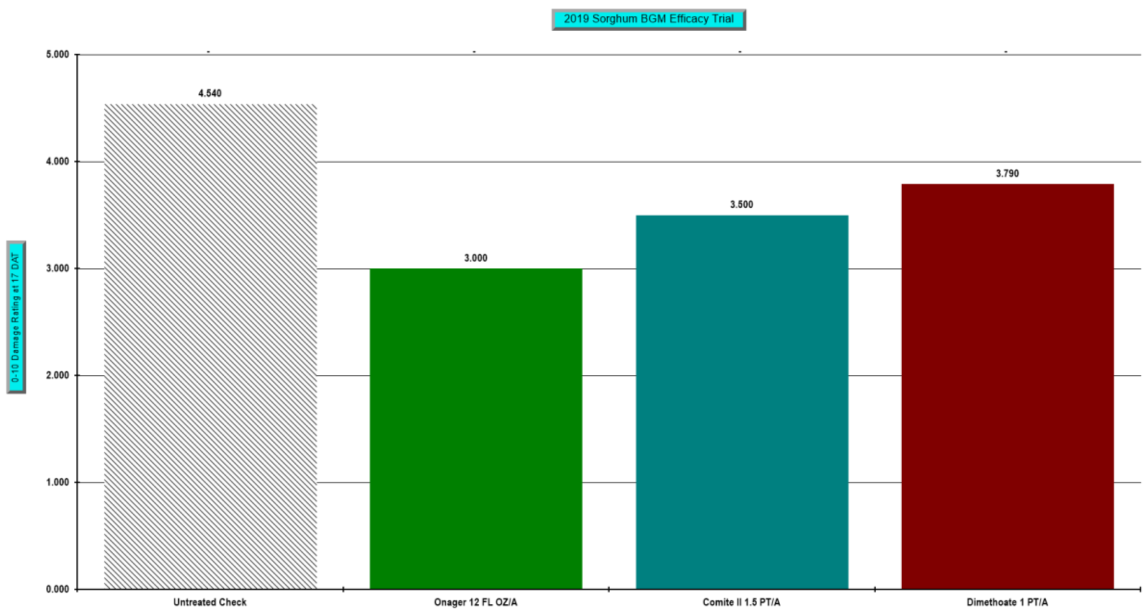


Figure 22. BGM 0-10 damage rating at 17 DAT.

Conclusions

By achieving statistical significance at the 4 DAT date, Onager proved to be a valuable tool that exhibits some fairly quick knockdown for economic BGM control in sorghum crops. The numeric trend indicated in the later leaf counts and the damage rating indicate that this level of control should remain significant without the extreme influence of the predators in this trial. While the Comite II and Dimethoate treatments did not achieve any significant differences with the UTC by the 4 DAT, they also maintained similarities with the Onager treatment. This indicates some level of knockdown from both treatments. Had the predators not shifted focus and intensely controlled the BGM, the trends indicate that Comite II could have proven significant control by the 10 DAT counts. The numeric trends shown in the trial from both the per leaf counts and the damage ratings indicate that the Dimethoate

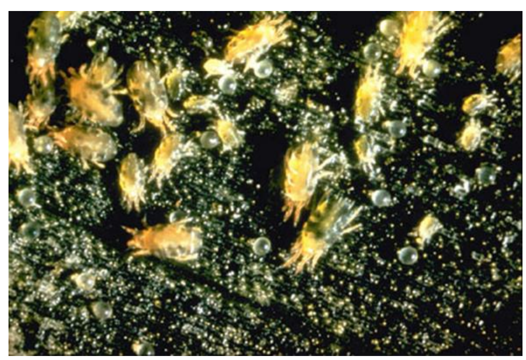


Figure 23. BGM photo showing all life stages.

treatment was again proven harsher on predators than the other two chemical options. The Dimethoate treatment did hint that it still contained some BGM knockdown but likely would have lost control quickly had the influx of predators not been so massive or if the entire field had been treated leaving no source for the predators to return so quickly from to rescue the treatment.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Jimmie Sagaser, for cooperating with us to complete this trial, GOWAN and Dr. Craig Sanosdki for sponsoring and partnership of this trial, the 2019 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Jerik Reed, Nicole Kiem, Denise Reed, and Madeline Stanfield. Thank you all.

<u>Evaluating the BASF Experimental Insecticide, Sefina, for Sugarcane Aphid, *Melanaphis sacchari*, Control in Sweet Sorghum</u>

Texas A&M AgriLife Extension Service
Hale, Swisher, & Floyd County
Texas A&M AgriLife Experiment Station - Halfway
Blayne Reed, EA-IPM Hale, Swisher, & Floyd, Adam Hixon, BASF, Pat Porter, District 2 Entomologist, Suhas Vyavhare, District 2 Cotton Entomologist, Andrew Dunlap, EA-Crops, Hale, Lamb, Castro, Jacob D. Reed, BASF

<u>Summary</u>

Six treatments, an untreated check (UTC), Sefina at 3 oz. / acre with Agri-Dex at 0.5 V/V, Sefina at 6 oz. / acre with Agri-Dex at 0.5 V/V, Sefina at 6 oz. / acre with Agri-Dex at 0.125 V/V, Transform at 1.5 oz. / acre with Agri-Dex at 0.5 V/V, Sivanto at 5 oz. / acre with Agri-Dex at 0.5 V/V were arranged in a small plot CRBD with 4 replications were made into a sweet sorghum field at the Halfway Experiment Station. SCA per leaf counts were made at 3, 10, and 18 DAT and damage ratings were taken at 18, 24 and 31 DAT. Yield, in terms of tons vegetation per acre, was collected. Transform controlled the SCA best early in the trial, but the aphids quickly recovered and rebuild only remaining superior to the UTC. The higher rates of Safina and the Sivanto treatment held less damage than the other treatments for the duration of the trial. The Sivanto treatment, and all three of the Sefina treatments yielded higher than the Transform treatment, which out yielded the UTC.

The results of this trial in the extremely tall, lush canopied sweet sorghum was very similar, if not identical to similar trials conducted in grain sorghum. Sivanto was again proven to be a solid SCA product, the experimental product Sefina again proven to be a solid product that should be moved forward in the labeling process, and Transform has proven good knockdown control. It is recommended that Sefina be approved for labeling in other types of sorghums, such as sweet sorghum, silage sorghums, and taller hay sorghums and that once labeling is achieved, that Sefina be counted among reliably tested and recommended products.

<u>Objective</u>

To evaluate the experimental sugarcane aphid control product Sefina from BASF for efficacy on alternate types of sorghums for efficacy, labeling, and informational needs. In this case, sweet sorghum for sorghum molasses was tested. These results should be transferable to silage sorghums, hay sorghums, or any sorghum exhibiting an extreme height and an extremely dense canopy.

Materials and Methods

A CRBD trial with 4 replications was placed into a block planted field of sweet sorghum at the Halfway Experiment Station. The field was planted on 21 June and plots marked 1 July. Plot sizes were 6, 40-inch rows wide by 42 feet long. The middle two rows were utilized at treated rows with all rows in-between acting as a drift buffer and a source of re-infestation for optimum residual measurement. All agronomic needs of the field were managed by the Halfway Experiment Station Personnel and the field was monitored for insect, weed, and disease pests by the Plains Pest Management Field Scouting Program weekly. On 24 July, an establishing population of sugarcane aphids (SCA) were detected in all trial plots. On 10 August, this population reached economic threshold (ET) and treatments were made on 15 August.

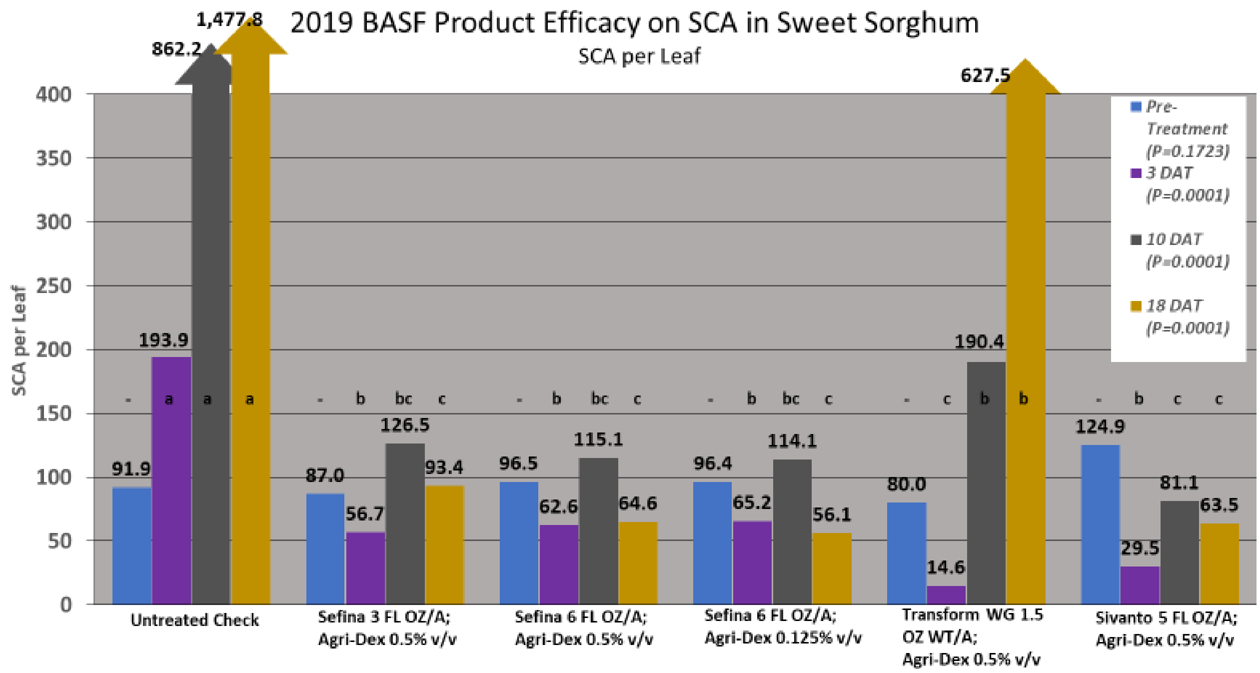
Figure 24. The SCA counting crew emerging from the sweet sorghum after their counts.

Six treatments were selected for this trial, and untreated check (UTC), Sefina at 3 oz. / acre with Agri-Dex at 0.5 V/V, Sefina at 6 oz. / acre with Agri-Dex at 0.5 V/V, Sefina at 6 oz. / acre with Agri-Dex at 0.125 V/V, Transform at 1.5 oz. / acre with Agri-Dex at 0.5 V/V, Sivanto at 5 oz. / acre with Agri-Dex at 0.5 V/V. Treatments were made via CO2 backpack sprayer with overhead boom attachment at 16.2 GPA with a walking speed of 2.5 MPH. Sugarcane aphid per leaf counts were made weekly following treatment by selecting ten random plants from the 'first' row of the two treated rows. From each selected plant, an upper (1^{st} or 2^{nd} leaf below flag or whorl), and a lower (1st or 2nd leaf above desiccated leaf) leaf were counted. Plants from the 'second' treated row were reserved for visual damage ratings and yield data collection without leaf loss damage.

Per leaf aphid counts were made pre-treatment, 3 DAT, 10 DAT, and 18 DAT. Whole plot damage ratings were taking using the Texas A&M High Plains SCA 0-10 damage rating system at 24 DAT and 31 DAT. Yield data was collected at 49 DAT by hand harvesting whole plants from 10 randomly selected row-feet of from the second treated row. These whole plant samples were weighed and calculated to a ton per acre figure. No molasses quality data could be collected with West Texas available equipment. All data was analyzed via ARM ANOVA with a $P<0.05$ or less.

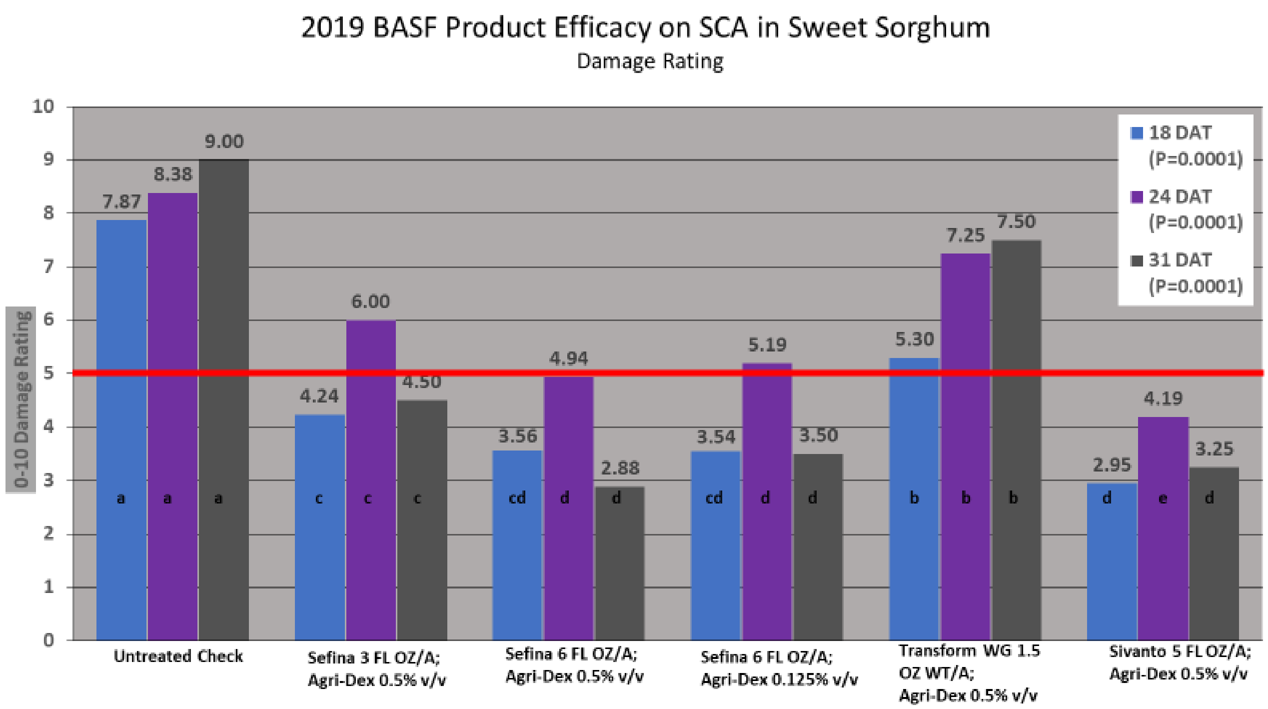
Results and Discussion

In the dense canopy of the extremely tall sweet sorghum, coverage did not reach the lowest leaves and aphid per leaf counts were higher as a result of surviving aphids on the lower leaves. Despite a high number of surviving aphids on the lowest leaves, significant differences in aphids per leaf quickly emerged by the 3 DAT counts. At that time, all treatments separated from the UTC and the Transform treatment performed significantly better. By the 10 DAT counts the Transform treatment began slipping while all other treatments held aphid numbers per leaf in place. At the 18 DAT count all other treatments were still holding and superior to the Transform treatment, which was still significantly better than the UTC, but was numerically increasing exponentially.

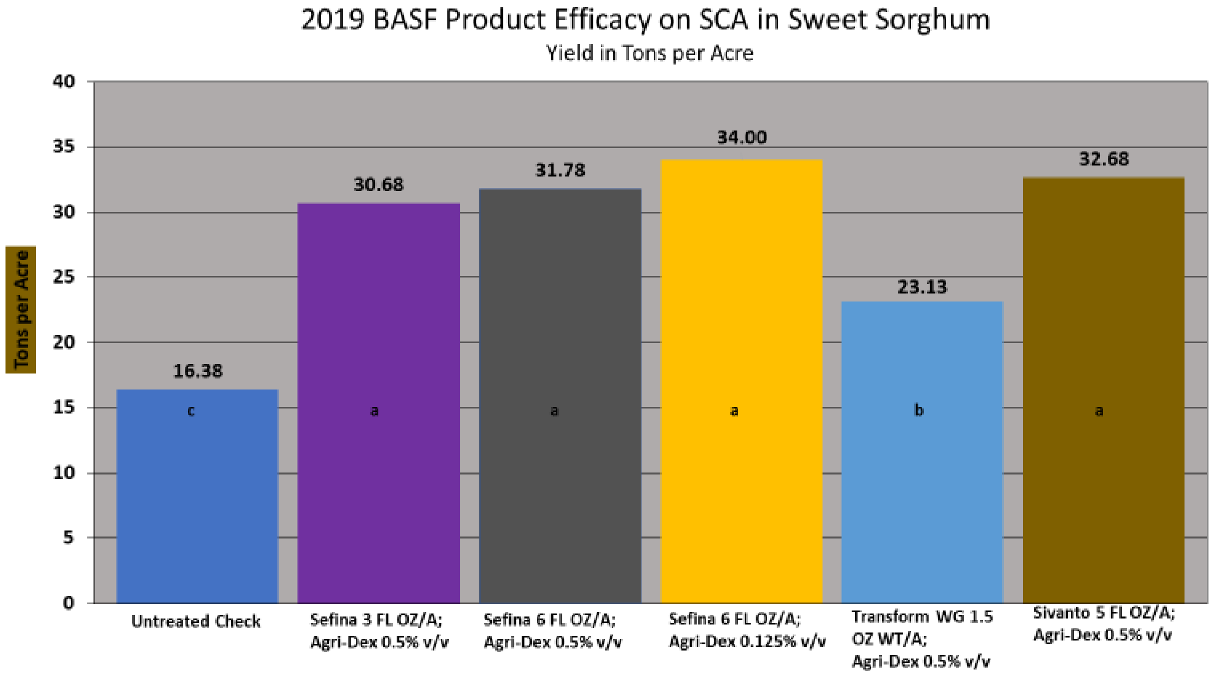


On the 18 DAT damage rating date, all treatments were superior to the UTC, all other treatments were superior to the Transform treatment, and the Sivanto treatment was superior to the light rate Sefina treatment. Damage for all treatments increased between the 18 DAT date and the 24 DAT date. The Sivanto treatment and the high rate Sefina, with the higher volume of Agri-Dex surfactant treatment, were the only treatments that were numerically below the High Plains SCA late season re-treatment threshold with the Sivanto treatment remaining significantly superior to all other treatments. Also, at the 24 DAT rating date all treatments were statistically different from each other except the two high rate treatments of Sefina, which were similar despite the higher surfactant rate being the only one below the re-treatment threshold. By the 31 DAT date, the SCA population crashed. At that point, only the Transform and UTC treatments continued to experience an increase in damage from the short time the aphids were still active. All other treatments dropped in damage once the aphids were removed from the areas they were feeding on with the Sivanto, and both high rates of

Sefina ranking superior to all other treatments, the low rate of Sefina being superior to the Transform treatment, and the Transform treatment better than the UTC.



In terms of tons vegetative matter per acre, all three Sefina treatments and the Sivanto treatment were superior with over 30 tons per acre yield and the Transform treatment with 23 tons per acre yield were superior to the UTC at a 16 ton per acre yield.



Conclusions

The results of this trial in the extremely tall, lush canopied sweet sorghum was very similar, if not identical to similar trials conducted in grain sorghum. Sivanto was again proven to be a solid SCA product, the experimental product Sefina again proven to be a solid product that should be moved forward in the labeling process, and Transform has proven good knockdown control. It is recommended that Sefina be approved for labeling in other types of sorghums, such as sweet sorghums, silage sorghums, and taller hay sorghums and that once labeling is achieved, that Sefina be counted among reliably tested and recommended products. Since the higher rates regarding the Sefina treatments performed better, it is recommended that the 6 oz. / acre rate of Sefina should be used. Based upon the higher rates of Sefina being superior to the lower rates it is recommended that only the higher 6 oz. / acre rate be considered. Based on a slight numeric improvement in SCA control for a few data subjects, it is suggested that a higher rate of oil type surfactant be used with Sefina on the Texas High Plains.

Acknowledgements
This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to the staff at the Halfway Experiment Station and the Farm Manager Casey Hardin for cooperating with us to complete this trial, BASF and Adam Hixon for sponsoring and partnership of this trial, the 2019 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nicole Kiem, Denise Reed, Jerik Reed, and Madeline Stanford. Thank you all.

Evaluating Sivanto In-Furrow at Planting for Control of the Sugarcane Aphid, *Melanaphis sacchari*, in Texas High Plains Sorghum

Blayne Reed 1, Suhas Vyavhare 2, Russ Perkins 3 and Patrick Porter 4, 1)Texas A&M University, Plainview, TX, 2)Texas A&M AgriLife Research and Extension Center, Lubbock, TX, 3)Bayer, Idalou, TX, 4)Texas A&M AgriLife Extension, Lubbock Texas

Summary

In 2017 and 2019 Sivanto was evaluated as applied in-furrow, at planting for sugarcane aphid control efficacy. Both trials were conducted as a RCBD with 4 replications. In 2017 a 4 oz./acre rate was compared to an UTC and 5 seed treatments. In 2019, two rates of Sivanto was compared to an UTC and a standard OVT at threshold treatment. The 2017 in-furrow treatment outperformed all seed treatments but lost economic control at 81 DAP and required a second treatment to maintain season long control. In 2019 the Sivanto in-furrow treatments experienced a rate response. The lighter 4 oz./acre rate again showed signs of loosing control at about the 80 DAP date while the higher 5 oz./acre rate continued to offer control. The population of sugarcane aphid collapsed soon after and it is not known how long the higher rates of Sivanto in-furrow would last. All Sivanto treatments, in-furrow and OVT performed statistically the same in terms of yield protection (P=0.0003). Without additional testing to evaluate the full length of control offered by higher rates of Sivanto in-furrow, it should not be recommended for sugarcane aphid control in grain sorghum as a stand-alone treatment. It should be recommended for sorghum type hay and silage crops that should reach harvest readiness by a 90 to 100 DAP date

Objective

Evaluate Sivanto for sugarcane aphid efficacy in grain sorghum and sorghum type hay crops when applied at planting, in-furrow.

Materials and Methods

Field experiments were conducted during the 2017 and 2019 growing seasons at the Texas A&M research farm in Halfway, TX. The field trials were conducted as a RCBD with 4 replications. The 2017 trial compared a UTC and Sivanto in-furrow at 4 oz. per acre to existing and experimental seed treatments. An OVT (over-the-top) treatment of Sivanto at 6 oz. per acre was needed at 88 DAP once treatments lost efficacy to guarantee yield for all treatments in the trial.

The 2019 trial tested Sivanto in-furrow at 4 oz/ac and 5 oz/ac with standard over-the-top (OVT) Sivanto at 7 oz. per acre rate applied at threshold.

Trial Year	2017	2019
Replications	4	4
Treatments	7 (1 UTC, 5 seed treatments, 1 in-furrow)	4 (1 UTC, 2 in-furrow rates, 1 OVT at threshold)
Plot Size	4-40" Rows X 35'	4-40" Rows X 38'
Sorghum Variety	DK37-07 (Tolerant)	KS 585 (Susceptible)
Planting Date	19-Jun	21-Jun
OVT Made	All Treatments at 88 DAT	OVT Treatment Only at 52 DAT
SCA Detection Date	27-July (38 DAP)	25-July (33DAP)
Harvest Date	15-Nov	17-Oct

Chart 1. Agronomic information and Methods for both 2017 and 2019 trials.

Aphid counts began at first detection in both trials. Damage ratings on a 0-10 leaf damage rating scale were used for late season data collection.

Results and Discussion

2017

In-furrow application of Sivanto at 4 fl oz/a resulted in significantly fewer sugarcane aphids per leaf than all other treatments during 45 to 88 DAP (Fig. 1) ($P<0.05$). By 80 DAP the Sivanto in-furrow treatment lost economic control of the aphid and had to be treated OVT at 88 DAP to maintain control.

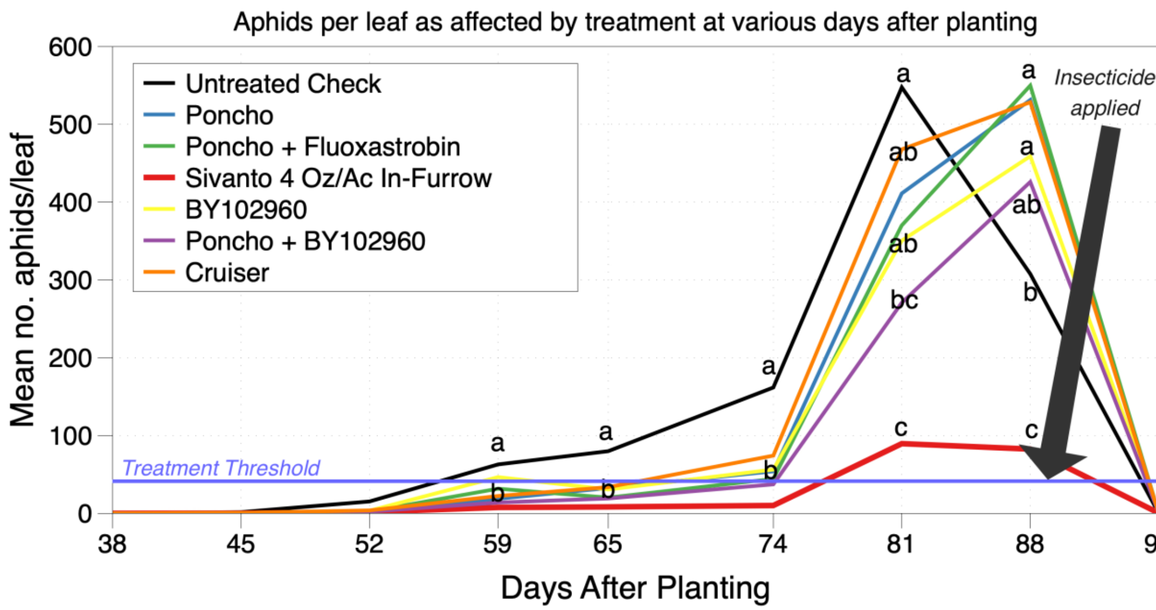


Fig. 1. Impact of insecticide seed treatments and at-plant in-furrow application of Sivanto on sugarcane aphid infestation levels in sorghum, 2017.

2019

At 48 DAP, both Sivanto in-furrow treatments separated from the untreated treatments. Following the OVT treatment at 52 DAP, the OVT treatment separated from the UTC and became similar to the lower 4 oz. in-furrow rate treatment while the higher 5 oz. in-furrow rate remained superior to all treatments.

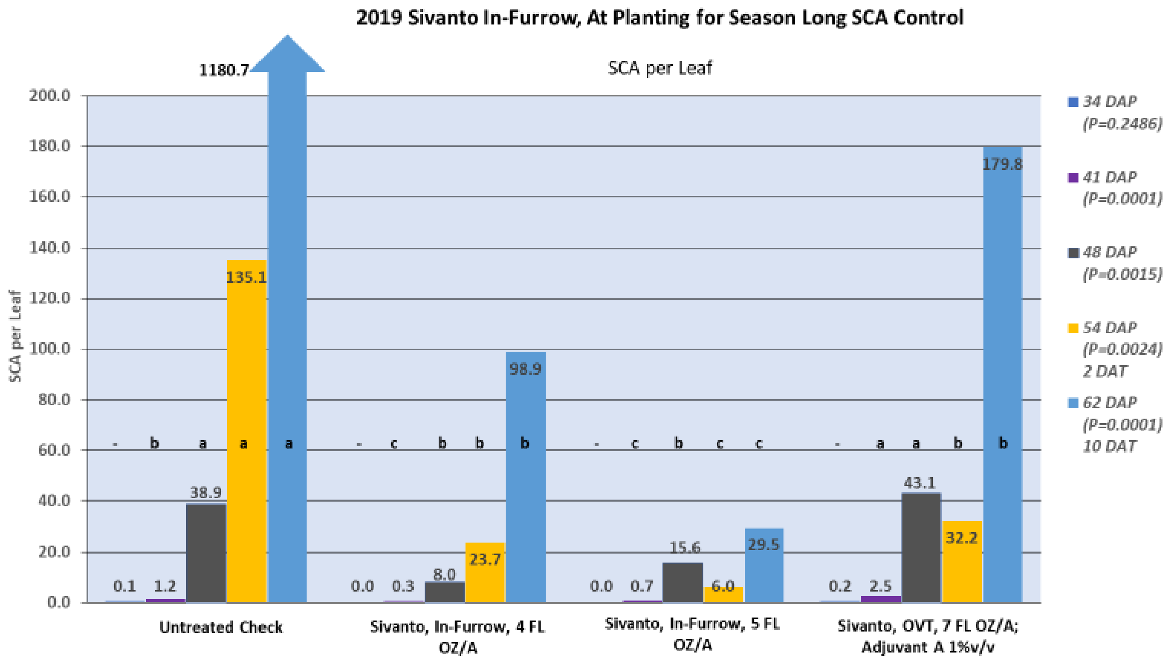


Fig. 2. 2019 SCA per leaf data, detection through 62 DAP.

This trend continued with the leaf damage ratings until the final 83 DAP (31 DAT) rating date when the 7 oz. OVT treatment became similar to both in-furrow treatments. The 4 oz/ac in-furrow treatment began losing control at 76 DAP while the 5 oz/ac treatment remained steady in control. By the 83 DAP / 31 DAT date, all aphid populations crashed and any further differentiation between treatments became impossible.

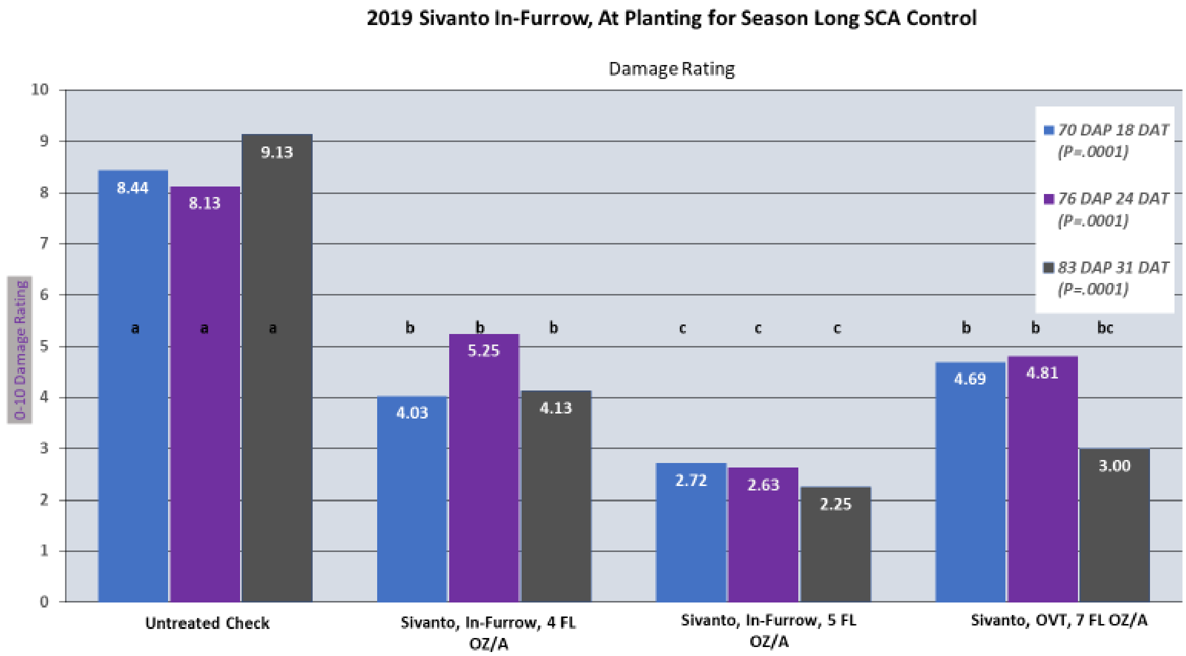


Fig. 3. Sugarcane aphid leaf damage rating across treatments, 2019

Grain yield was significantly higher in insecticide treated plots compared to the untreated check in 2019 (Fig. 4) (*P*=0.003). Yield did not differ significantly among insecticide treatments

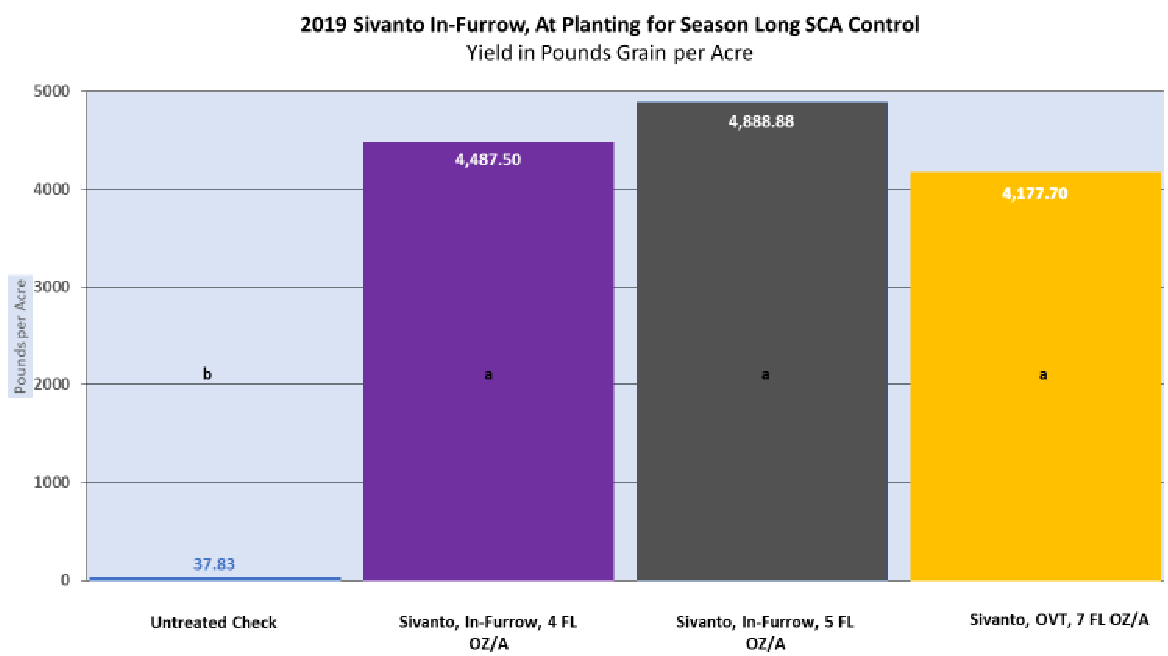


Fig. 4. Treatment impact on grain yield, 2019 (*P*=0.0003).

Conclusions

These results indicate that Sivanto applied in-furrow at planting offers control against sugarcane aphid in sorghum. The economics of grain sorghum production in West Texas allow for one insecticide application only, with more applications commonly being unprofitable based upon the grain price. For Sivanto applied in-furrow to practically be considered as this lone application, control needs to be proven out to about 120 DAP for grain production. In both the 2017 and 2019 trials, the 4 oz/ac rate proved insufficient with aphid control being lost at about 80 DAP. There was a significant rate response in level of control from the higher 5 oz/ac rate in the 2019 trial. The 5 oz/ac in-furrow rate provided at least 83 days of control, but it is not known how many more days could be had due to the decimation of the aphid population. This rate and length of control might be long enough for sorghum type hay and silage crops that would be harvested in a 90 to 100 DAP time frame. Additional research is needed to document the increased rate of Sivanto treatment's length of control before this rate could be recommended for this application technique in grain sorghum.

Acknowledgements

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Study of the Economic Impact of an Early Treatment for Sugarcane Aphid Control in West Texas Grain Sorghum

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Summary

A CRBD trial with 4 replications and 4 treatments which included an UTC, low rate Sefina, high rate Sefina, and standard rate of Sivanto was placed into a grain sorghum field at the Halfway Experiment Station. Treatments were made at sugarcane aphid detection and per leaf aphid counts began. By 7 DAT and continuing until 20 DAT, all treatments were significantly better than the UTC. 0-10 plot damage ratings began at 28 DAT and continued through 49 DAT when the aphid population crashed. Treatments remained significantly better than the UTC with the exception of a few dates for the light rate of Sefina and significantly different from each other with the high rate of Sefina performing well and the Sivanto treatment performing best. This translated well into yield differences. However, it was plainly proven that treatment for SCA at detection is not feasible for the High Plains grain sorghum with all treatments exceeding ET in aphids per leaf by the 20 DAT date and the High Plains late season ET by the 36 DAT date. While not included in the trial, adjacent trials where SCA were treated roughly 14 days later, yielded almost twice as much as the best performing treatment from this trial with application made at detection.

Objective

Evaluate sugarcane aphid in sorghum control offered when treatment is applied at aphid detection as a single treatment option for season long control with variable rates of the BASF experimental product Sefina and a standard rate of Sivanto.

Materials and Methods

A CRBD trial with 4 replications was placed into a block planted field of KS 585 grain sorghum at the Halfway Experiment Station. The field was planted on 21 June and plots marked 1 July. Plot sizes were 6, 40-inch rows wide by 36 feet long. The middle two rows were utilized at treated rows with all rows in-between acting as a drift buffer and a source of re-infestation for optimum residual measurement. All agronomic needs of the field were managed by the Halfway Experiment Station Personnel and the field was monitored for insect, weed, and disease pests by the Plains Pest Management Field Scouting Program weekly. On 24 July, an establishing population of sugarcane aphids (SCA) were detected in all trial plots and the trial was initiated on 25 July, with per leaf pre-treatment leaf counts made and all treatments applied in good order.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Untreated Check
2		BAS 44001 3 FL OZ/A;AGRI-DEX 0.5 % V/V
3		BAS 44001 6 FL OZ/A;AGRI-DEX 0.5 % V/V
4		Sivanto 4 FL OZ/A;AGRI-DEX 0.5 % V/V

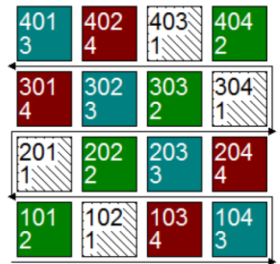


Figure 25. Trial Plot Map and treatment list.

Four treatments were selected for the trial including an untreated check (UTC), Sefina at 3 oz./ acre with Agri-Dex at 0.5 V/V, Sefina at 6 oz. / acre with Agri-Dex at 0.5 V/V, and Sivanto at 4 oz. / acre with Agri-Dex at 0.5 V/V. Treatments were made via CO_2 backpack sprayer with overhead boom attachment at 16.2 GPA with a walking speed of 2.5 MPH. Sugarcane aphid per leaf counts were made weekly following treatment by selecting 10 random plants from the 'first' row of the two treated rows. From each selected plant, an upper (1st or 2nd leaf below flag), and a lower (1st or 2nd leaf above desiccated leaf) leaf were counted. Plants from the 'second' treated row were reserved for visual damage ratings and yield data collection without leaf loss damage.

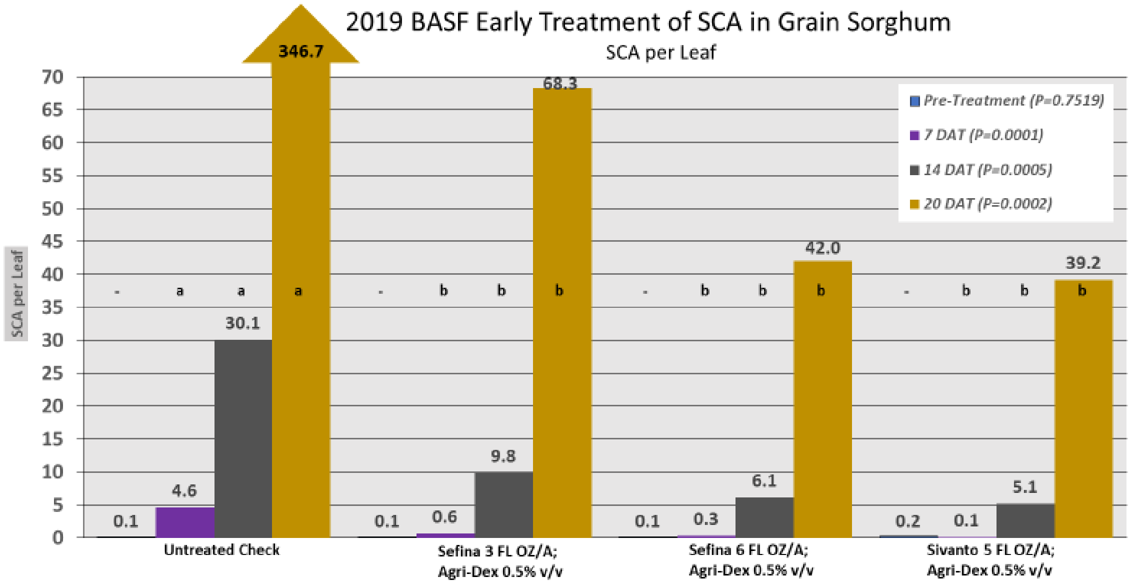
Figure 26. Backpack CO2 sprayer with boom attachment in use in 2019.

Weekly SCA per leaf counts continued until 28 DAT when whole plot damage ratings were taking using the Texas A&M High Plains SCA 0-10 damage rating system. Weekly damage ratings continued until the SCA population crashed at about 49 DAT or 18 September. On 17 October, all harvest data was taken. Ten row-feet were randomly selected, and hand harvested into sample bags. Samples were promptly threshed via trailer mounted Haldrup research grain thresher on site. Grain moisture and bushel weight measurements were collected on a Dickey-john Mini GAC Plus grain moisture analyzer. Grain samples were weighed in terms of grams per 10 row feet and converted to grain yield in pounds per acre. All data was analyzed via ARM ANOVA with a $P<0.05$ or less.

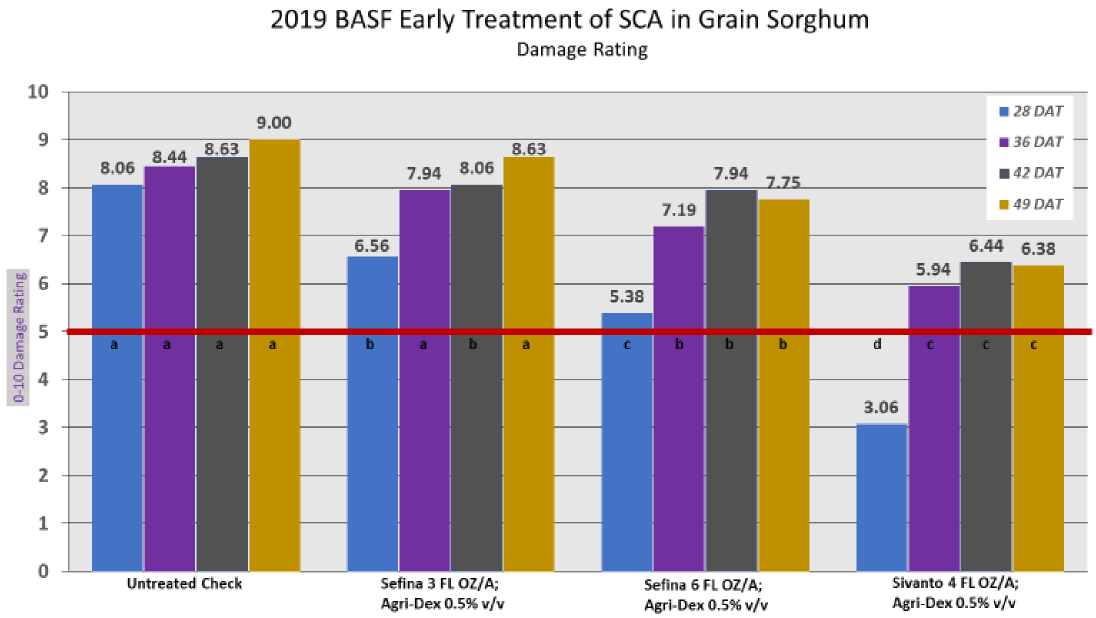
Figure 27. Threshing the Trial on site at the Halfway Station, October 17, 2019.

Results and Discussion

By the 7 DAT SCA per leaf count date, all treatments had significantly fewer SCA per leaf and all chemical treatments were similar to each other. The UTC still held only 4.6 SCA per leaf while all chemical treatments had held SCA below 1 per leaf. This trend of all chemical treatments remaining similar and significantly different from the UTC continued through the 14 and 20 DAT leaf counts while total numbers of SCA steadily increased. By the 14 DAT count date, the UTC SCA exceeded the ET but by the 20 DAT date, all chemical treatments were above the High Plains ET for SCA with the light rate of Sefina numerically higher.

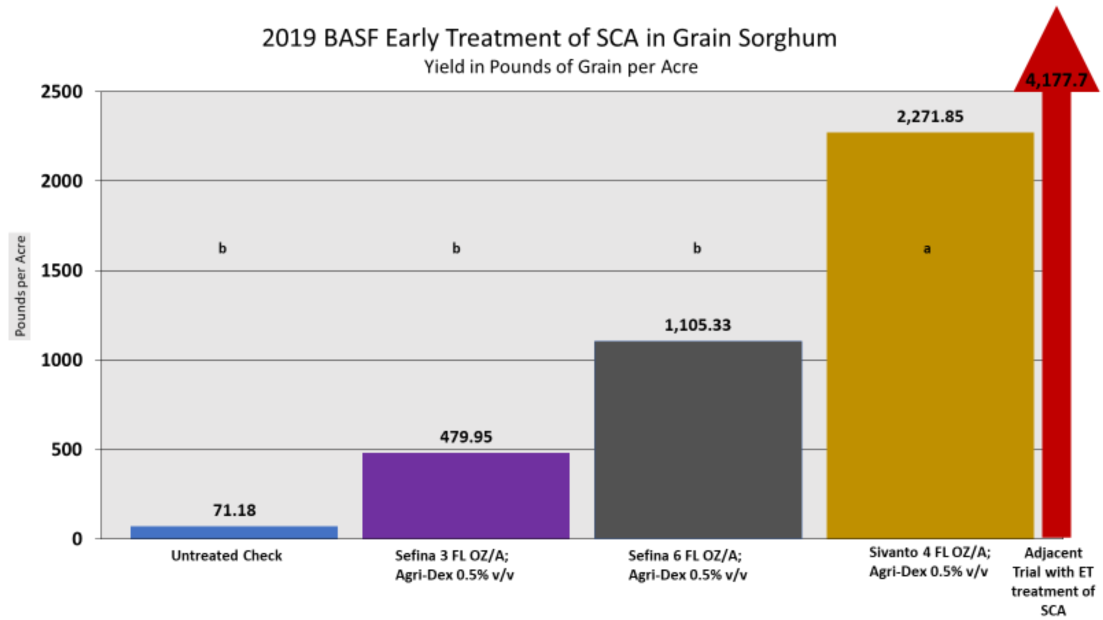


The weekly damage ratings, which began at 28 DAT, separated all treatments from each other with the UTC showing the highest damage, the light rate of Sefina showing significantly more than the other chemical treatments, the higher rate significantly better than the light rate and UTC, and the Sivanto treatment being significantly better than all treatments. This trend generally continued with the exception of the light Sefina treatment loosing significant difference from the UTC at the 36 DAT and regaining it by 42 DAT then loosing it again by 49 DAT. Despite all significant differences, all treatments increased in damage exceeding the late season, second SCA threshold of a 5-damage rating by the 36 DAT date and continued to worsen until the aphid population crashed about the 49 DAT date.



Significant differences were also found in yield in terms of pounds of grain per acre with Sivanto outperforming all other treatments. Both Sefina treatments were similar with the UTC and each other with the higher treatment holding a large numerical advantage over both, the light rate a large numerical advantage over the UTC and the UTC barely producing grain at all.

While outside the trial parameters, other SCA trails directly adjacent to this trial with successful SCA treatments made at the High Plains ET, yielded almost 2,000 pounds grain per acre more than the best performing Sivanto treatment.



Conclusions

While large and significant differences were found in this study, the main question answered was that it is not economically feasible to treat SCA in grain sorghum at detection of the pest as a stand-alone treatment for the season. None of these treatments or practices should be recommended for season long sugarcane aphid control.

It is fair to evaluate the various chemical treatments for standard efficacy and longevity of control given the uniqueness of this situation. It should be noted that treatments were applied at detection when aphid counts were less than 1 aphid per leaf and while heavy infestation was ongoing. The trial area was subjected to continuous infestation for several weeks post treatment while the buffer rows offered a steady source for additional infestation for the trial period. While the residual control of Sefina standardly is longer than Sivanto, these results also show the value of superior control at the time of treatment, even in this situation.

Acknowledgements

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