Plains Pest Management

Integrated Pest Management Program

Hale, Swisher, and Floyd Counties

<u>2018 Annual Report</u>

Prepared by:

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Extension Agent-IPM

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2018 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 2017 Plains Pest Management Program:

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Christina Safford	Plains Pest Management, Field Scout

Plains Pest Management 2017 Advisory Committee

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

2018 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 21 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 2018. During the year the activities included:

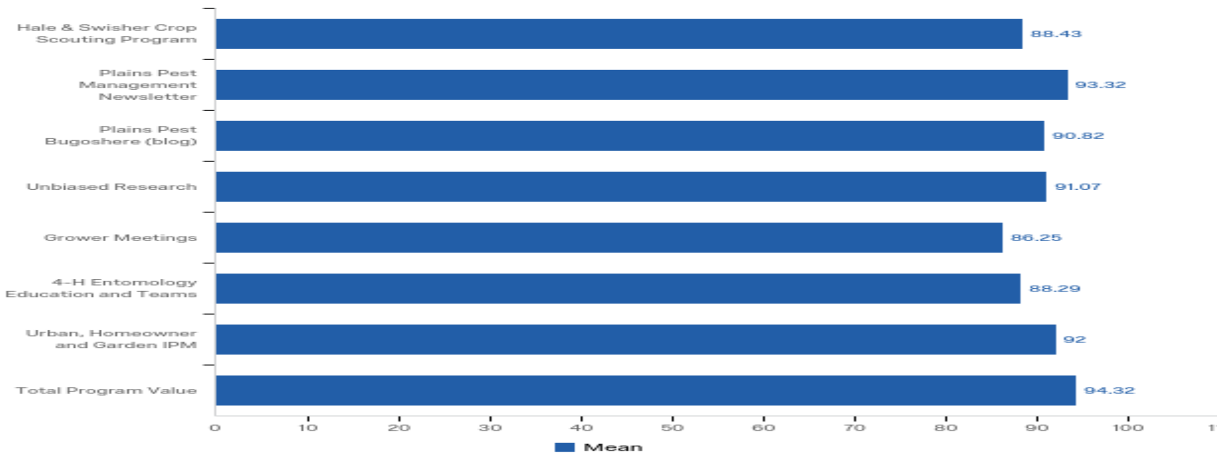
- Weekly field scouting for insect, weed, and disease problems of the 21 participating grower member's fields (6,484.2 acres of all crops) were conducted over the 2018 growing season. Information from this weekly field scouting was shared, interpreted, and IPM solution recommendations given to the participating 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. (14 issues, 427 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 14 grower meetings, 5 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 3 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 12 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 – 52% Independent Ag Crop Consultants –12%, Ag Industry –16%, Ag Retail – 16%, Homeowners & Horticulturalists – 4%, and Other –0%.**

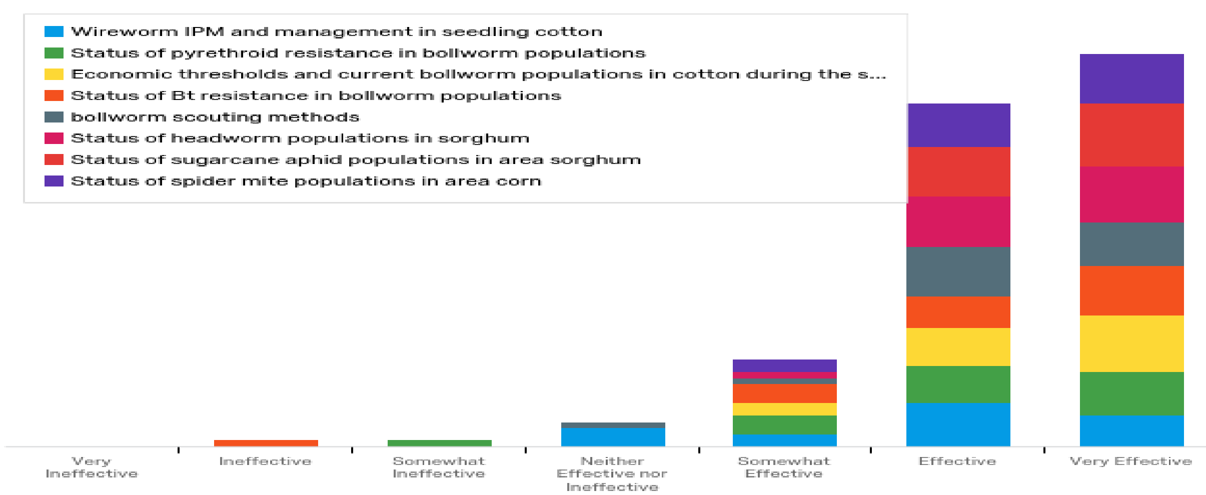
Responders were asked to assign a 0 to 100 value to each component of the Plains Pest Management Association's efforts and the information generated by those efforts, what would that value be?



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 $ 66.42 per crop acre.**

Responders were also asked to rate how well for major each issue faced by the IPM Unit in 2018 was able to disseminate educational education to customers?



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 **$66.42 per production acre estimate** of the value of the IPM Program is multiplied by **half of the irrigated cotton, corn, and sorghum production acres in Hale, Swisher, & Floyd Counties, a <u>$17,866,980.00 potential impact figure</u>** 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.

2018 In-Depth Sorghum Insect Study and IPM Education

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

Relevance

Agriculture is the foundation of the economies of Hale, Swisher, & Floyd Counties. Corn and sorghum are two of the main commodities grown in this diverse production agriculture system while pests of these crops remain a constant threat to profitability and the stability of our food supply.

Response

The Plains Pest Management Association, made up of 21 participating grower members and steered by a chairing committee and the IPM agent, made refreshing producers on proven IPM management and field scouting techniques in cotton, conducting needed research to update efficacy standards and thresholds, and to inform the producers in Hale, Swisher, and Floyd Counties about the latest management techniques, pest status, and share any resulting improved thresholds.

- Conducted 5 independent and locally conducted IPM related sorghum insect trials over 2018 and shared results rapidly through newsletters, blogs, radio programs, grower meetings and direct interaction. Gave sorghum insect pest control or how to scout presentations at scouting school meetings, 11 grower meetings, 3 professional meetings, and held 3 Progressive Grower Meetings where sorghum IPM was a topic (48 CEUs offered total).

- Weekly field scouting and crop consulting of the participating grower member's corn and sorghum fields was conducted over the full 2018 growing season. Information from this field scouting was shared, interpreted, and IPM solution recommendations given to the participating growers via scouting report and other direct interaction.

- Data generated from the field scouting, along with pertinent weed IPM research and successful recommendations were shared through the Plains Pest Management Newsletter weekly throughout the growing season and monthly during the offseason (14 issues, 427 subscribers).

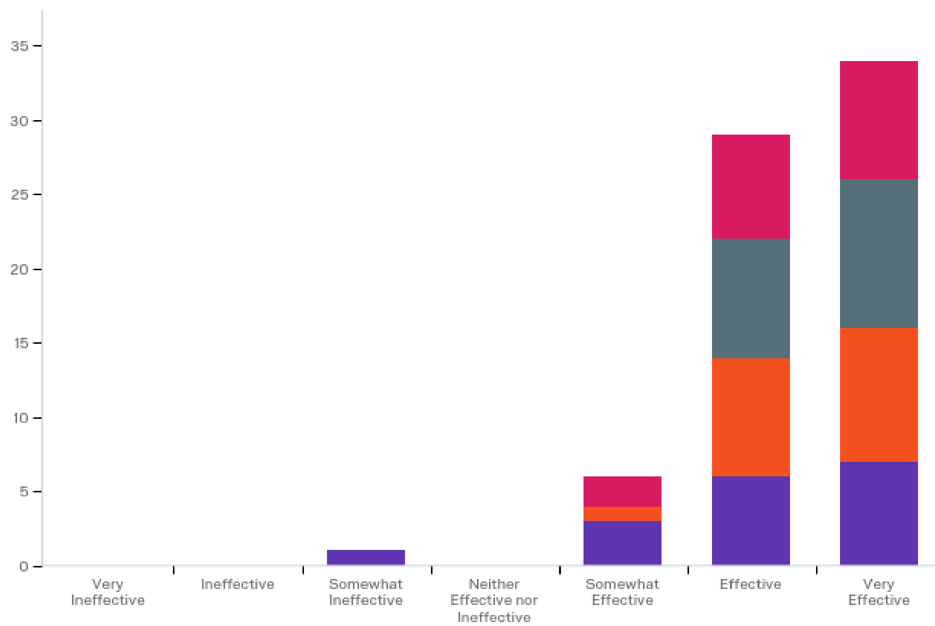
- Sorghum pest IPM, its evolving implementation, and pest status were topics for 7 six-minute radio spots through the AM 900 All Ag All Day Floydada radio programs, 1 KGNC Radio interview and 3 newspaper interviews.

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) to interact with and respond to.

The 2017 survey responders were made up of: **Ag Producers – 52% Independent Ag Crop Consultants –12%, Ag Industry –16%, Ag Retail – 16%, Homeowners & Horticulturalists – 4%, and Other –0%.**

Responders were asked to rate how well for each major pest each issue faced by the IPM Unit in 2018 was able to disseminate educational education to customers? Responses for only the encountered sorghum pests headworms, sugarcane aphids, spidermites and bollworm pyrethroid resistance are in the chart below.



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?

<u>**- The average value response was $ 66.42 per crop acre for the 2018 growing season.**</u>

Summary

These results indicate a level of success in both increasing awareness of potential sorghum IPM issues and a better understanding of implementation of practical IPM control measures by ag producers, ag industry, and independent crop consultants along with a high value attached to the information. If the survey responder estimated **$66.42 per production acre estimate** of the value of the IPM Program is multiplied by **half of the irrigated cotton, corn, and sorghum production acres in Hale, Swisher, & Floyd Counties, a $17,866,980.00 potential impact figure** emerges. If the same figure is applied to <u>**just acres of sorghum**</u> in the same three county area during the greatly reduced sorghum acre 2018 season, the estimate of <u>**positive impact still totals about $1,195,560.00 to the local sorghum industry.**</u>

2018 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 affective 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 County 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 21 participating grower members and steered by a chairing committee and the IPM agent, made informing the general populace of Hale, Swisher, & Floyd County about IPM principles and implementation into our daily pest control habits one of the IPM Program's focus in 2018. During the year activities included:

- Made 198 direct customer IPM contacts via site visits, phone calls, email, and office visits about invading honey bees, tree borers, garden pests, cockroaches, mosquitoes, ticks, fleas, elm leaf beetles, lawn pests, bed bugs, and head lice.

- Published 2 blog posts and 6 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.

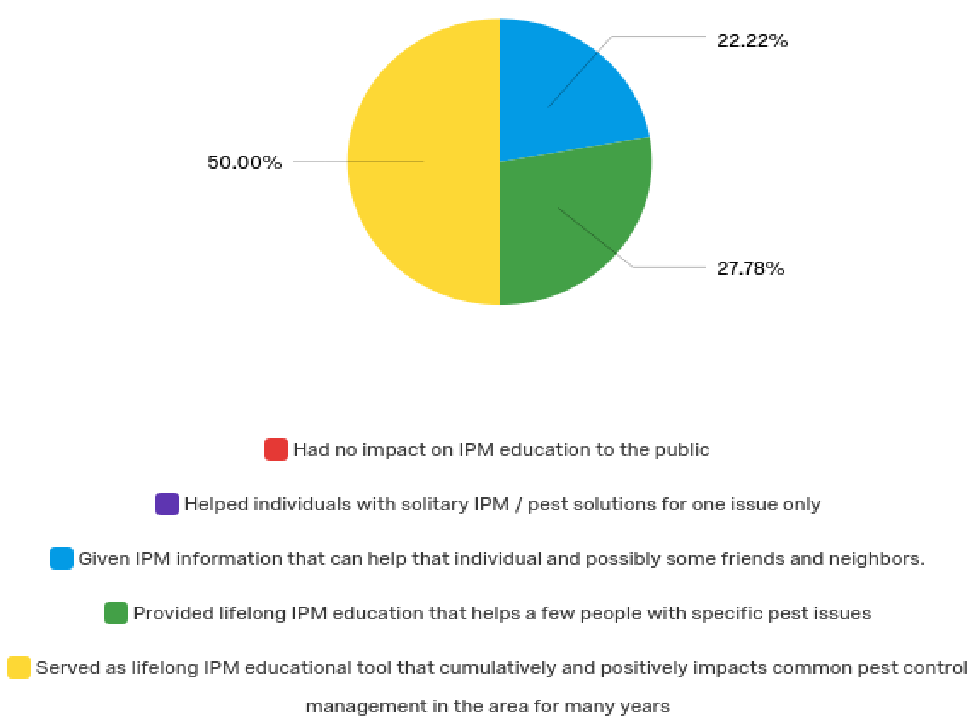
- Coaching of the Hale & Swisher 4-H Entomology ID Teams (4 teams, 12 youth) with 3 Teams advancing to the State Contest.

Results

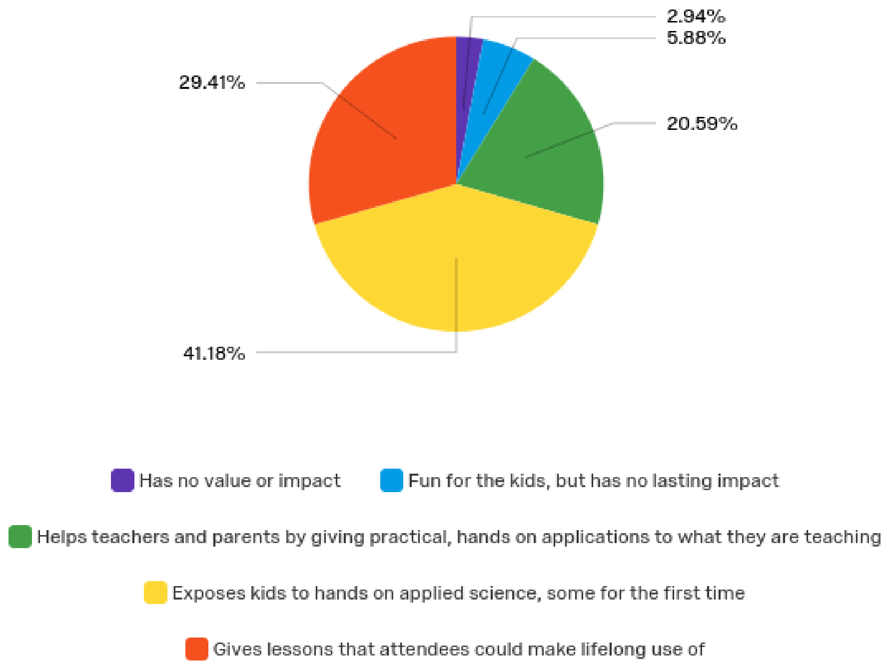
A retrospective post evaluation instrument was distributed to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) to interact with and respond to.

The survey responders were made up of: **Ag Producers – 52%, Independent Ag Crop Consultants –12%, Ag Industry –16%, Ag Retail – 16%, Homeowners & Horticulturalists – 4%, and Other –0%.**

Responders were asked what kind of impact they felt the IPM Unit's educational efforts in general IPM through direct customer interaction, site visits, group, radio, electronic, and print outlets had? **100% of the responders indicated that the efforts had positive impacts on the region of some level.**



Responders were asked how valuable do you feel the IPM Unit's participation in the Hale County Ag Fair is to the education and the future of our children? **91.2% 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 majority of responders to the retrospective post survey represented the various agricultural production sectors in Hale, Swisher, & Floyd Counties more than the general citizenry. The IPM Program's efforts in horticulture, homeowner, and gardening IPM education received not only high marks from these sectors but indicate also from the limited 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.

2017 Educational Activities

Farm Visits	2,128
Number of Newsletters Released	14
Newsletter Recipients	7,839
Direct Contacts	6,444
Radio Programs	25
Blog Releases	33
Ag Consultants, CEA, and Field Scouts Trained	94
Newspaper / Magazine / online Magazine articles written or interviewed for	22
Research Trials Initiated	14
Research Trials Supported	12
Presentations / Programs / Field Days Made for Adults	32
Presentations Made to Youth	14
Pest Patrol Hotline Alerts	3
Articles for other blogs	2
Texas A&M AgriLife Publications Written or Revised	2
Professional Papers Authored or Co-Authored	3

Activity Highlights

Plains Pest Management Scouting Program (7,629.2 acres)
Applied Research Projects
Ag 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

Plains Pest Management Newsletter
Plains Pest Management Bugoshere (blog)
Hale & Swisher Ag Day
Swisher Fall Cotton 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

2018 at a Glance

The following is a brief overview of the 2018 growing season and pest populations in Hale, Swisher, & Floyd County agricultural crops. Copies of the Plains Pest Management Newsletters published in 2018 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.

Each growing season is unique, and the weather and pest of 2018 on the High Plains were no exception. Heavy fall rains from the 2017 and difficulties in harvest had left much of that year's cotton crop still in the field to be harvested stretching well into early 2018. This left much of the field preparation and intended wheat plantings either late or missed. Following those heavy rain events concluding in early November 2017, the region entered a general drought period with little or no moisture being received across the area for extended periods of time. This, combined with very low market prices, impacted the already limited area wheat crop. The vast majority of the planted wheat acres were eventually utilized for purposes other than grain. These purposes included in perceived rank of popularity, terminated cover for intended summer crops, extended cattle grazing, silage, hay, and crop failure. The few wheat acres actually harvested for grain were generally light or poor with a few exceptions of high irrigation inputs or sparse and timely rainfall event. Most of the harvested for grain wheat went toward seed stock for 2018-2019. Insect pressure on this wheat was rarely economic while most pest species were present during the season with a higher than normal beneficial population helping greatly in keeping the pest populations down. This beneficial population likely carried over from the 2017 growing season and the sugarcane aphid population that developed on summer sorghum. A relatively high portion of the for grain harvested wheat were justly treated with fungicides for economic disease issues to salvage and ensure a solid seed stock for the next year. Several types of 'rust' were the primary culprits.

The drought situation lasted well into the summer crop planting season of late April, May, and early June causing difficult situations and poor planting conditions for most of the area. A few sparse and limited rainfall events did cross some of the area aiding dryland fields under no-till with standing stubble with germination but most area dryland fields were lost shortly after planting and irrigated acres were only able to establish with heavy irrigation inputs following planting.

Summer crop planting choices heavily favored cotton again during 2018 with market prices again being very weak for grain crops with replant options leaning toward hay crops where practical with a higher than usual local price support to feed an increased beef and animal production amount for 2018. Diminishing irrigation capabilities and some beef production support, 2018 also seen a slight but notable uptick in production land being converted back to grass or improved pasture. More grain and silage were planted and produced in 2018 compared to 2017 but these fields were a direct result direct beneficial contract situations with feedlots, dairies, or seed production companies and in some cases a desperate need to rotate to continue supporting long-term cotton production. This increase should still be viewed as far below an 'average' grain or silage crop planting for the area.

The late fall rains of 2017 and delayed field work also promoted heavy winter weed establishment and length of survivorship along with a heavy spring weed germination. Aside from the direct soil moisture and nutrient loss these weeds represent, they also inadvertently and ultimately supported a heavy wireworm and false wireworm population. As these weeds were eventually controlled by multiple methods shortly before the 2018 growing season, the resulting extreme wireworm larva population were still available and hungrily awaited summer crop plantings. This added considerable obstacles in establishing summer crops, primarily cotton. A safe estimate is that all cotton fields experienced a 5 to 60% reduction in population to these larva alone. This reduction was added to the already tough and droughty planting conditions with the area usually noted to be impacted at some level by these wireworm larva expanding across the region. Crop establishment suffered but final plant per acre populations suffered more with the area generally settling for a light plant stand. All commercially available insecticidal seed treatments were proven in fields and trials to still provide some benefit in aiding in cotton establishment but were again proven to be insufficient under the highest wireworm larva pressure.

Early season thrips on cotton pressure could be considered moderate with most cotton fields from a Plainview-north line requiring one additional over the top insecticidal treatment for control while only about 5% from Plainview-south required additional thrips control above seed treatments. Wireworm pressure was high enough in a few fields that even seed milo failed to establish, but all other early season grass crop pests were light to non-existent.

As cotton moved into squaring, a very heavy adult fleahopper population began to move into fields. This population included the rarely cotton feeding black fleahopper species. These black fleahoppers appeared to be heaviest near permanent pasture acres where an ample population of winter germinating Canadian thistle had established during the heavy fall rains of 2017. This Canadian thistle was suffering greatly through the drought conditions and pod and flower structures were desiccating quickly. The black fleahoppers likely after experiencing a population boom on the weeds through the winter and spring quickly found themselves without a food supply moved readily into cotton as a survival technique. Luckily, most of these adult fleahoppers of all species were followed closely by the heavier than ‘normal’ beneficial populations. This natural control, when allowed to continue naturally, aided greatly in keeping the fleahopper population from wholly establishing at an economic level. The resulting fruit loss from the area cotton was increased compared to most recent growing seasons for the pre-bloom cotton, it remained well below economic loss for all but about 8% of the area fields. Intense field scouting was need in finding the minority of fields that required economic fleahopper treatment and if they were not identified quickly heavy yield loss was accumulated. For fields treated in a timely manner, all labeled treatments worked well and yields were saved.

Moving into cotton's bloom stage and grain pollination stages, the drought conditions persisted. Some sections of the area received less than 1" rainfall between November 2017 and August 2018. In these areas irrigation systems were overtaxed and crops began to fade for lack of moisture. These sections thankfully had little to no pest insect pressure for the balance of the growing season but yields were very negatively impacted and water systems again dropped in future capacity. Most cotton fields under these conditions reached absolute cut-out stage of 3.5 NAWF during late July capping yield potential at about 800 pounds per acre or less.

Other areas received scant timely rains that aided the heavily worked irrigation systems. While these rain totals for the same November to August range did not total more than 4 to 8 inches of moisture, the high heat unit accumulation coupled with just enough moisture to set fruit without waisted vegetative growth resulted in better than average to highly superior yields of 1,200 to 2,200 pounds lint per acre.

These yields did have to be protected from pest pressure before all yields were set. Lygus populations were light, but bollworm, or corn earworm if you prefer, was very high with migrant moth populations arriving from other production areas in numbers rivaling pre-Bt development populations. If corn was an option as a host plant for these moths to lay eggs into, it was vastly preferred by both moths and producers as they are rarely capable of reaching economic levels in corn no matter the pest pressure due to the larva's cannibalistic nature on the ears. If corn was not a host plant option, or once corn reached maturity, cotton and sorghum were quickly shifted to. The beneficial population that had helped the region through pest issues all season continued to aid in bollworm control with as much as a 90% reduction from bollworm egg lay to surviving worms were recorded in some fields. Still this was not enough to fully evade a bollworm economic situation for most non-Bt fields that did receive some rainfall during the hot, summer months. Almost all non-Bt fields in this situation required an over the top treatment for bollworms, but despite documented resistance factors to most Bt types, Bt provided enough control, aided by the high beneficial populations, that only a handful of regional Bt cotton fields required additional treatment to maintain economic control. The treatment of choice for bollworm control in 2018 were products containing Chlorantraniliprole with pyrethroids being proven largely economically infective through bollworm resistance. This added considerable cost to control treatments.

The return to subsequent years of high numbers of bollworm moths returning to the area following a fairly long-period of limited bollworm pressure has largely been decided by entomologist and other research scientists the result of the bollworm's developed Bt resistance to most Bt types and the presence of those same Bt types in cotton and corn. This 'double selection' aided by strip and RIB refuge requirements in corn seem to have put too much selection pressure on the pest so that large numbers of worms are surviving, coming though these traited fields, from other agricultural production areas again to migrate to the High Plains. While local research trials have determined the level of resistance found here on the High Plains is equal to the level in these other production areas (in field terms ¼ to 1/3 of the non-Bt worm population will come through all Bt types excluding the VIP trait) it has also been found that the High Plains does not need to adopt the preventative egg lay threshold adopted by the rest of the Cotton Belt. Locally, we will not have the same level of intense pressure that lasts multiple months that those areas will while the High Plains can still count on a higher egg and small worm mortality rate compared to these other areas. It is henceforth recommended that the High Plains adhere to the established economic thresholds for field scouted bollworms but to fully expand those thresholds and full scouting measures to all Bt types of cotton.

For corn there were few additional pests for the duration of the summer save a handful of economic Banks grass mite fields. Despite the starting of a few rainy weeks in August lasting through mid-September corn diseases and fumonisin rates were much lower than in 2017 but not non-existent. While conditions again would have been advantageous for fumonisin outbreaks, a higher portion of planted fields were of resistant lines, the best control measure to control the issue.

The limited sorghum also had later season pest issues. Toward the end of July, the sugarcane aphid did again arrive and infest all but the earliest planted and maturing fields shortly after boot. The aphid did not appear as virulent as in years past. This could do due to the adaptation of the beneficial population that began on this pest in 2017 and worked from pest to pest and crop to crop throughout the full year to aid in and reduce many pest issues while surviving at high populations levels being 'readier' to deal with the aphid once they again arrived on area sorghum, or it could be the fact that producers are managing the pest better from an IPM standpoint, or there could have just been fewer sorghum fields in the area for the population to build on. For whatever reason, the pest's impact was reduced this year but was still potent enough to be the number one pest for sorghum and hay type sorghum crops in the region. The less virulent nature and control measures for and of this pest in 2018 at least held the pest in check until the bollworm arrived and began moving into sorghum fields also. Once there were two pests attacking at high levels in the few area sorghum fields the beneficial populations quickly fell behind and both required treatment. One mixed treatment was all that was required to control these pests in sorghum this year.

The rains that fell in August and September led to a few more rounds of weather events into October and November. Some of these events did come with damaging hail and the fall harvest was threatened with delays similar to 2017 but these threats faded. While the fall weather was similar to 2017 it was not as imposing. Harvest for all crops was completed for all but a handful of fields by the end of December. Quality was variable, but generally acceptable with wide ranging outliers. This was particularly true for our 2018 cotton acres. There were ample fields with disappointing quality grades, but many with surprisingly superior grades balancing the crop into a generally average quality rating that was far and away from the generally bottom dwelling 2017 crop.

The fall rains helped getting the 2018-2019 wheat crop off to a good start. While followed again by another drought period to finish out the 2018-year, wheat pests were again largely quieted so far by the same beneficial populations that seen us through all of 2018 as they continue to move from pest to pest in crop to crop. Hopefully, this trend will continue into 2019 as drought, pests, and tight market situations again seriously threaten the economic stability of ag producers.

2017 Applied Research and Demonstration Projects

2018 Population Monitoring of Adult Bollworms in Hale, Swisher, & Floyd Counties

2018 Bollworm, *Helicoverpa zea*, - Pyrethroid Resistance Survey in Hale, Swisher, & Floyd

2018 Cotton Insecticidal Seed Treatment Economic Impact Study

Monitoring Bollworm, Helicoverpa zea, Resistance to Bt Technologies in Cotton Genotypes in the Texas High Plains 2018

Evaluation of Varying Rates of Onager for Banks Grass Mite Control in Corn – 2018

Evaluating New Sivanto Formulation for Sugarcane Aphid Efficacy Comparisons in West Texas Grain Sorghum 2018

2018 BASF - Safina Experimental Sugarcane Aphid Product Efficacy Trial

Testing Transform Application Methods for Improved Sugarcane Aphid Efficacy in West Texas Grain Sorghum 2018

Sorghum Seed Treatment Efficacy and Sugarcane Aphid Control in West Texas Grain Sorghum 2018

2018 Hale County Phytogen Limited Irrigation Cotton Behind Cotton Variety Trail

2018 Swisher County Phytogen Cotton Variety Trail

2018 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

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.

The data generated from this effort indicated that the 2018 bollworm population in Hale and Swisher should be average to slightly higher than 'average' for several population peak dates in August and early September while the Floyd population was very high with some outbreak like extreme moth flights following a 'typical' moth migration curve. This concurred with what our scouting program and area crop consultants were finding via egg lay and young larva in our area crops fields soon afterwards, with many area paralleling corn fields experiencing corresponding pressure and area cotton and sorghum fields requiring corresponding treatments.

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.

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.

Results and Discussion

Early season moth populations, which may be considered those emerging from overwintering locally, seemed subdued for Swisher and Floyd while Hale experienced substantial early moth flights. For the Hale moth trap, catches remained steady through late July and then rose sharply in August and steadily increased before falling off in September. The Floyd population rose dramatically in July to out-break like peaks and remained very heavy for an extended period through August with an exceedingly high peak late in the month and gradually fell off through September. Swisher remained below average for the season with likely migratory peaks nearing average populations in August.

Figure 1. Floyd County Trap on August 21, 2018 with 489 moths.

All populations uncharacteristically surged slightly higher again in October with what was likely late migrations frustrated by lack of host plants for one more generation before the freeze date. This uncharacteristic late season surge in population were also more dramatically noted in 2017 but the reasons for these odd late season blips in moth flights so near killing freeze dates are not understood.

Figure 2. Hale County Trap on August 30, 2018 with 277 moths.

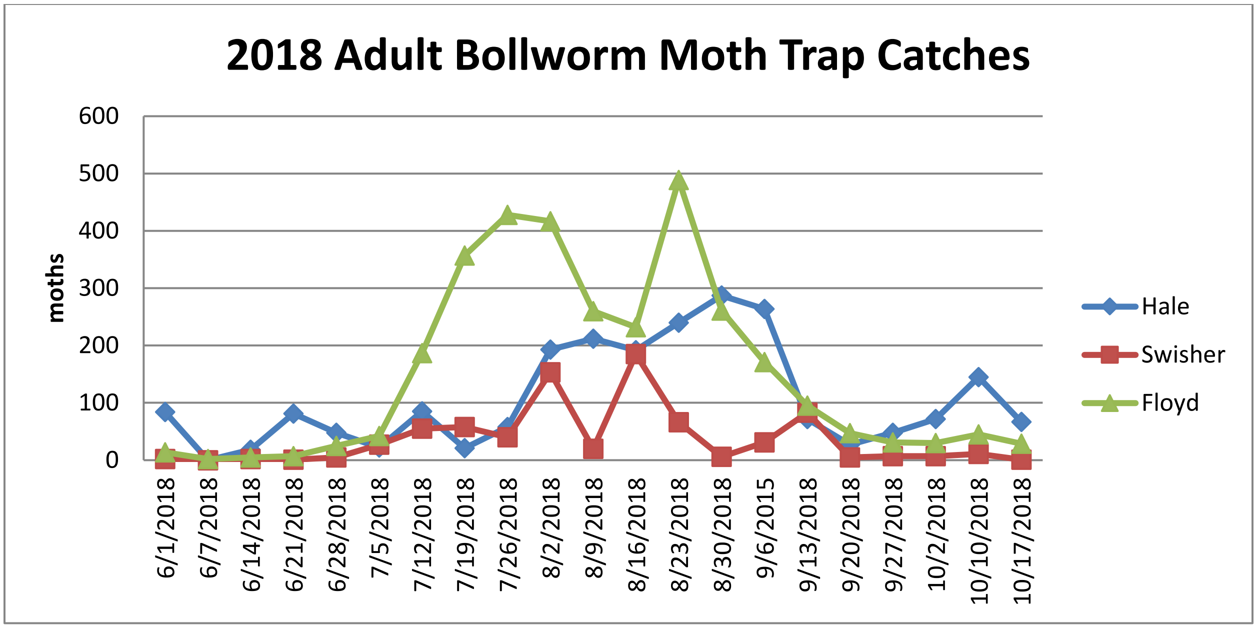


Figure 3. Bollworm moth populations for Hale, Swisher, and Floyd over the 2018 growing season.

Conclusions

The 2018 bollworm moth flight population followed a typical emergence and migrant pattern but was considered atypically high by cotton producers with ample economic bollworm concerns in field. Compared to historical perspectives of bollworm populations, 2018 could be considered average in size. Particularly when compared to long time historical moth patterns dating back to the 1970's, 1980's, 1990's and mid 2000's. This population was higher than noted for the most recent 10-year averages but was also 'in-line' with the most recent 2016 and 2017 moth population trends. These most recent 3-year moth and bollworm populations as a whole seem to hint toward a 'return to normal' moth population numbers for the High Plains area. These higher than recent bollworm populations have not led to the one time standard and widespread economic treatments in High Plains cotton as were typical of the 1970's, 1980's, and 1990's. The advent and wide use of Bt technology across the US Cotton Belt likely being one cause for the lack of bollworm populations both migrating into and emerging in the area since the mid-2000's. A faltering level of control from some Bt technologies and certain bollworm chemical controls could be responsible for this assumed 'return to normal' bollworm population trend. However, some levels of bollworm control are still exhibited from Bt technologies and alternate bollworm chemical controls are available. These factors, among others, likely aid in preventing the area-wide bollworm in cotton treatment events that were once historical normal. In

Figure 4. Swisher County Trap on August 1, 2018 with 153 moths.

2016 in-field bollworm pressure remained uneconomic locally in that season due to a large amount of late planted corn, a more preferred pest host, to absorb the egg lay and resulting larval populations. In 2017, no such alternate sink-host was available, and the bollworm was more of a widespread and economic pest in area cotton with some Bt and most non-Bt fields requiring treatment. For the 2018 growing season, beneficial insects and predator populations were very high, and aided in bollworm control and bollworm egg mortality. This combined with the levels of control offered by Bt left only non-Bt fields requiring treatment for economic bollworms in cotton for Hale, Floyd, and some areas of Swisher.

Acknowledgements

I would like to thank USDA/NIFA for salary funding of this and many other projects. 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 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, and Christina Safford. Thank you all.

2018 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. Traps from the 2018 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 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. On 11 July 78 moths were collected from the Floyd County site, 18 from the Swisher site, and only 3 from the Hale site. On 4 August the Floyd site had captured 39 live moths, Hale captured 51 live moths and Swisher did not capture any moths. Following capture, moths were transported directly to the lab and transferred into the treatment vials with equal numbers of moths placed into each treatment vial situation. Moth populations surviving 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 **60%-82% control from any pyrethroid** application to this population of bollworms on the Texas High Plains. They also show a substantial portion of the bollworm population present in 2018 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 2018 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. Traps from the 2018 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.

Figure 4. Image of Floyd County Trap on August 21, 2018 with 489 moths, after the trial period.

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

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. 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.

Figure 5. Image of Hale County Trap on August 30, 2018 with 277 moths, after the trial period.

During the week of 10 July, it was decided that adult moth trap collections were high and it was hoped that the population might be high enough to conduct a 24-hour capture to test a set of moths. On 11 July 78 moths were collected from the Floyd County site, 18 from the Swisher site, and only 3 from the Hale site. For each site, 1/3 of all moths were placed into the various treatments of the test vials and left overnight at room temperature and survival for each treatment were evaluated on 12 July.

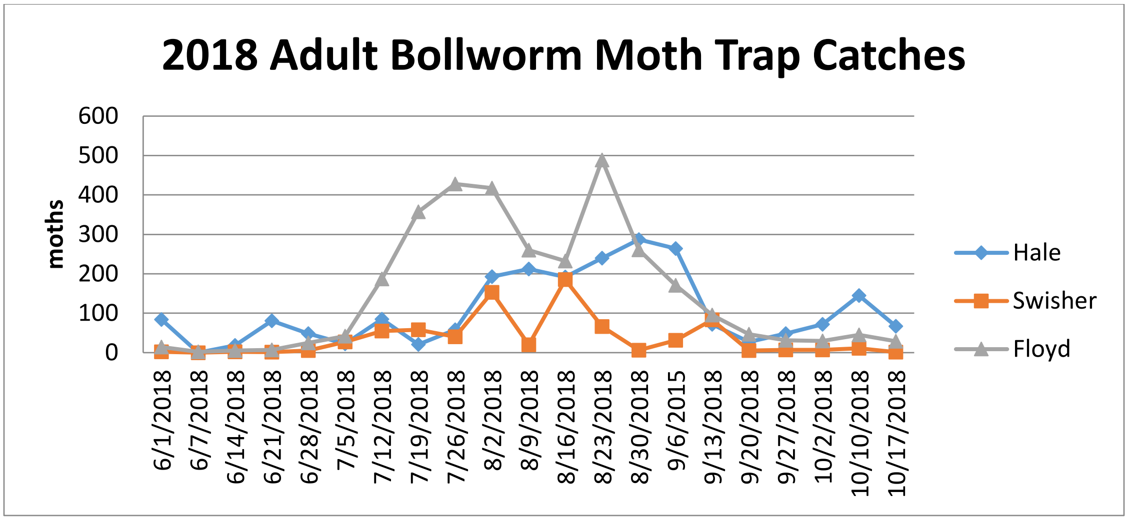


Figure 6. Bollworm moth populations for Hale, Swisher, and Floyd over the 2018 growing season. Dates utilized for the study were the week of 12 July, and 9 August.

On 3 August moth trap numbers looked again advantageous for another trial cycle and traps were reset for another 24-hour capture. On 4 August the Floyd site had captured 39 live moths, Hale captured 51 live moths and Swisher did not capture any moths. The Floyd and Hale moths were again placed into treatment vials evenly between the treatment vials and survival data was captured on 5 August.

Following moth collection from each location, moths were transported directly to the Plainview lab for vial transfer. Refrigerator chilling was utilized for safe and effective transfer of the moths into vials. For the survival evaluations, moths that flew at least 3 meters or more were considered alive, those that could not were considered dead. Surviving moth populations were adjusted using Abbotts Formula to adjust for the health of the moth population and calculate true resistance and dominant resistance levels.

Results and Discussion

For the 12 July survival data check date, results can be seen in the following 2 charts. Trap catches for Hale County on this date were not of sufficient size to be a viable population representation. The Abbott's Formula adjustment should be viewed as level of resistance within each population of bollworms.

Floyd County	***Bollworms***							
Date Collected:	7/11/2018							
Date Read:	7/12/2018							
Treatment	Rate	Vial color	# collected	Alive	Dead	% survival	**Abbott's Adjustment**	
Check	0 µg	Clear	26	21	5	80.8		
Cypermethrin	5 µg	White	26	6	20	23.1		**28.57%**
Cypermethrin	10 µg	Maroon	26	4	21	15.4		**19.05%**

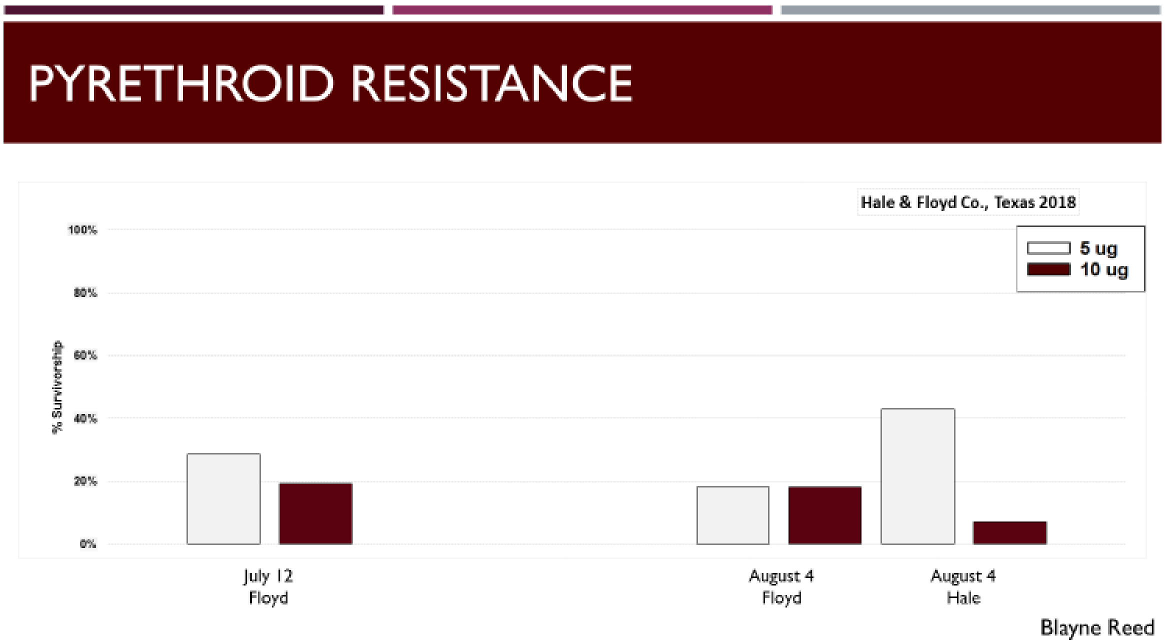
Swisher County	***Bollworms***							
Date Collected:	7/11/2018							
Date Read:	7/12/2018							
Treatment	Rate	Vial color	# collected	Alive	Dead	% survival	**Abbott's Adjustment**	
Check	0 µg	Clear	6	5	1	83.3		
Cypermethrin	5 µg	White	6	1	5	16.7	**20.00%**	
Cypermethrin	10 µg	Maroon	6	2	4	33.3	**40.00%**	

For the 5 August survival data check date, results can be seen in the following 2 charts. Trap catches for Swisher County on this date were not of sufficient size to be a viable population representation. The Abbott's Formula adjustment should again be viewed as level of resistance within each population of bollworms.

Hale County	***Bollworms***							
Date Collected:	8/4/2018							
Date Read:	8/5/2018							
Treatment	Rate	Vial color	# collected	Alive	Dead	% survival	**Abbott's Adjustment**	
Check	0 µg	Clear	17	14	3	82.4		
Cypermethrin	5 µg	White	17	6	10	35.3	**42.86%**	
Cypermethrin	10 µg	Maroon	17	1	16	5.9	**7.14%**	

Floyd County	***Bollworms***							
Date Collected:	8/4/2018							
Date Read:	8/5/2018							
Treatment	Rate	Vial color	# collected	Alive	Dead	% survival	**Abbott's Adjustment**	
Check	0 µg	Clear	13	11	2	84.6		
Cypermethrin	5 µg	White	13	2	11	15.4	18.18%	
Cypermethrin	10 µg	Maroon	13	2	11	15.4	18.18%	

The following chart shows the same data in graph form in terms of survivorship or percent of the bollworm populations tested surviving the differing rates of cypermethrin. Due to the small size of the 12 July Swisher population captured, it has been dropped from this graph.



Conclusions

The bottom line of these results is that we should only expect at best about **60%-82% control from any pyrethroid application to this population of bollworms**. They also show a substantial portion of the bollworm population present in 2018 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 2018 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, Nik Clarkson, Nicole Kiem, Denise Reed, and Christina Safford. Thank you all.

2018 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 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 within a commercial drip irrigated cotton field in Swisher County and planted on 21 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.

All insecticidal seed treatments outperformed the UTC in terms of thrips damage but did not separate from each other indicating no differences between the quality of treatments. Wireworm damage data was similarly separated between the UTC and treatments but with no given superior treatment found. Differences in thrips and wireworm damage did not translate into improved lint yield per acre and thusly return on investment was not helped by the addition of any seed treatment in this trial. Under higher thrips pressure or with a shorter growing season, UTC plots may not have had time to recover from thrips damage.

The thrips species composition found in this trial was 80% onion thrips, confirming with the results from a similar 2017 study. What economic or other impact this species shift from wester flower thrips in the late 2000's may have on local cotton production is not known.

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 2018 field had as a reliable source for migrating thrips to emerge from drying wheat to the West and North. On 21 May the field was planted with Mr. Goss' field planter with boxes removed so that random plot placement of treatments could be made via hand dribbling of seed at a target rate of 1 seed per 3-inches. Plots were organized as 8-rows by 40-feet long.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Untreated Check
2		Gaucho 600 0.375 mg AI/Seed
3		Cruiser 5FS 0.34 mg AI/Seed
4		Aeris 0.375 mg AI/Seed
		Avicta Elite 0.865 mg AI/Seed

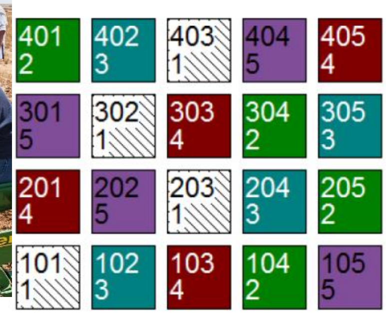


Figure 7. Seed treatments, plot map and at left photos of plot planting.

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, 2th true leaf, 3rd true leaf, and at 4th true leaf stages.

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

On all rating dates, 10 randomly selected plants from the Southern 4 rows of each plot were harvested and directly placed into labeled and individual plot mason jars containing 75% alcohol. This was made via scissors cutting the whole plant at the soil surface and placing the whole plant into the jar, capturing any thrips present on the plant at the time of collection. 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 monitoring of 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.

Harvest was conducted on 20 November via Mike Goss' 8-row cotton stripper with whole plot harvests. Each plot was dumped from the machine stripper onto Texas A&M AgriLife mobile boll buggy weight scales and weighed before grab samples from each plot were taken. Samples were then ginned at the Texas A&M AgriLife Research Cotton Improvement Program sample gin in Lubbock.

Figure 9. plot harvest and grab sample bags ready for sample ginning.

Results and Discussion

The first data collected from the trial were the wireworm damage ratings. Wireworm pressure was light to moderate but most insecticidal seed treatments still showed significantly less damage or a trend of control compared to the untreated check. These results agree with previous wireworm control trials indicating an aid in seedling emergence under light to moderately heavy wireworm pressure from the commercially available treatments that might be overcome under heavy or extreme wireworm pressure.

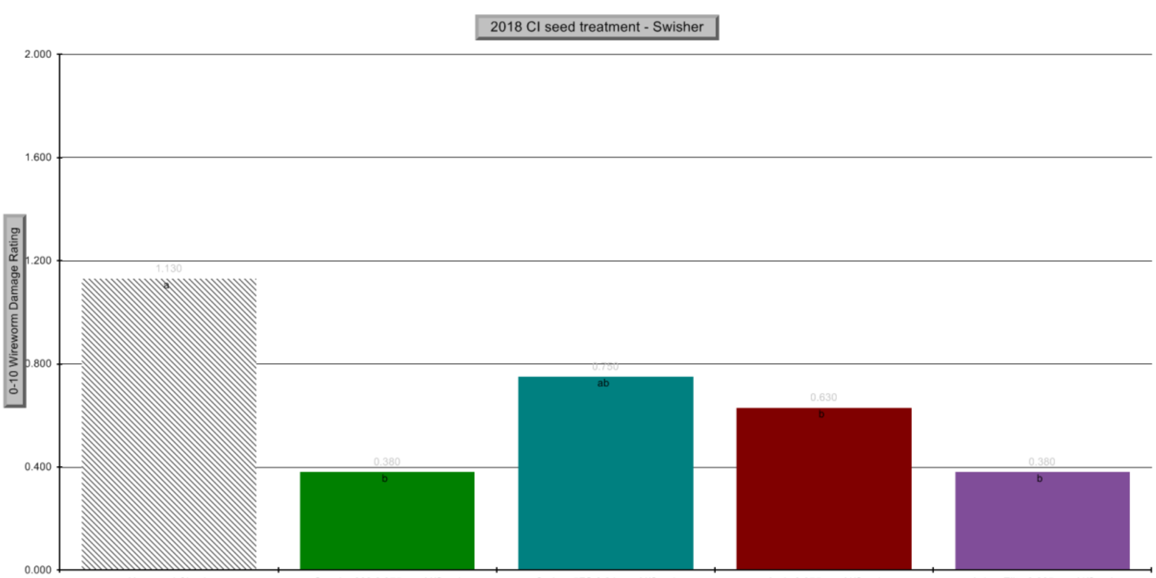


Figure 10. Wireworm damage at 11 DAP on a 0-10 rating scale. All plots established viable plant per acre populations.

Thrips pressure could be considered moderate for the duration of the thrips susceptible period for the cotton in this trial. Differences between treatment and the untreated check in thrips damage did not show until 18 days after planting (DAP) at the 2nd true leaf stage. At that time, all insecticidal seed treatments were significantly superior compared to the untreated check interms of thrips damage (*P*=0.0093) but not significantly different from each other. Thrips damage for all treatments increased by the 3rd leaf stage data collection at 24 DAP but the significant differences seperating all treatments from the untreated check remained (*P*=0.0202). Thrips damage and apparent pressure eased by the 4th true leaf stage data collection at 28 DAP and the general trend of significance between the untreated check and all treatments persisted with all of the insecticidal seed treatments actually showing plant health improvements (*P*=0.0167).

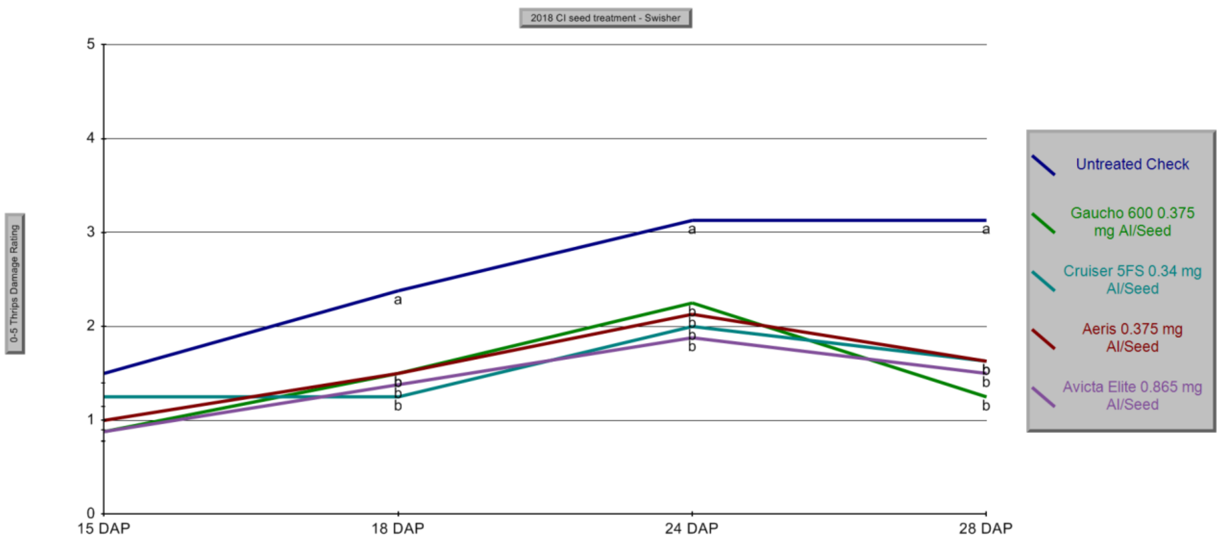


Figure 11. Thrips damage by treatment over time on the 0-5 damage rating scale.

Harvest lint yield per acre ranged between 1,387 to 1606 pounds with no significant differences in yield while percent turnout ranged between 33.83% to 35.90% also without significant differences or patterns (*P*=0.1587 & *P*=0.3514).

Laboratory species identification proved that the thrips species composition found in this trial was 80% onion thrips, with about 12% western flower thrips with the remaining 8% being primarily the rare tobacco thrips.

Conclusions

This trial found no differences between the different commercial insecticidal seed treatments in terms of thrips control. All treatments successfully outperformed the UTC. This trial shows no dominance offered by any particular insecticidal seed treatment over another and lower economic inputs might be sought after while still maintaining a standard level of thrips and wireworm protection.

This superiority in thrips and wireworm control did not translate into additional lint yield per acre and thusly return on investment in this case. It is likely that the lengthy growing season that 2018 offered gave the UTC a recovery period to recoup lost time for fruit development. Other thrips studies have found similar conclusions that either heavier thrips pressure or a more normally shorter growing season would better highlight any economic benefit to insecticidal seed treatments in cotton for the purposes of thrips control. In any case, this trial proves that insecticidal seed treatments solely for thrips control does not always return on investment in West Texas as plants can recover under some circumstances. Unfortunately, these circumstances cannot be predicted. There seems an even chance for high thrips pressure or a shorter growing season as light thrips or longer growing season.

An additional factor that could add to any potential return on investment come from some level of wireworm control. This too can also be over come from heavy or extreme wireworm populations. Field scouting of seedlings and early growth stage plants remains essential in determining if additional over the top treatments are required for thrips or replanting for wireworms, whether treated with insecticidal seed treatment or not.

With a surprise, the thrips species composition found in this trial was 80% onion thrips. This affirms the 2017 thrips regional species study results. This also represents a species shift from western flower thrips to onion thrips occurring sometime since older thrips species conducted in the area, the latest of which occurred in the early 2000's. What economic or other impact this species shift may have on local cotton production is not known.

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 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, Jerik Reed, and Christina Safford. Thank you all.

Monitoring Bollworm, Helicoverpa zea, Resistance to Bt Technologies in Cotton Genotypes in the Texas High Plains 2018

Texas A&M AgriLife Extension Service / Fibermax Cotton
Floyd County
Clay Golden Cooperating Crop Consultant, Lockney, Texas
Blayne Reed, EA-IPM Hale, Swisher, & Floyd and Tim Culpepper, BASF

Summary

An existing Sentinel Plot Trial in northwestern Floyd County under the care of Clay Golden, independent crop consultant, was utilized for this analysis. A non-Bt line, FM 1320 GL, a TwinLink (**Cry1Ab+Cry2Ae**) line, FM 1911 GLT, and a TwinLink Plus (**Cry1Ab+Cry2Ae+Vip3A**) line, BX 1971 GLTP, 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. 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 much lighter for this trial compared to similar analysis from across the Cotton Belt. The resulting data does show a similar trend in bollworm resistance and larval survivorship in two Bt traited lines (TwinLink) while any traited line that includes the VIP trait (TwinLink Plus) maintains better performance. The lower pressure historically present in the High Plains and noted in this trial indicate that the area does not need to adopt the automatic 20% bollworm egg lay threshold treatment, but rather needs to continue with the established 8,000 – 10,000 live worms per acre (the 6% harvestable fruit damage threshold works interchangeably in higher population situations) but the threshold does need to be expanded to all Bt technologies.

Objective

Evaluate efficacy and level of economic return of non-Bt, TwinLink (**Cry1Ab+Cry2Ae**), and TwinLink Plus (**Cry1Ab+Cry2Ae+Vip3A**) 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

An existing Sentinel Plot Trial in northwestern Floyd County under the care of Clay Golden, independent crop consultant, was utilized for this analysis. A non-Bt line, FM 1320 GL, a TwinLink (**Cry1Ab+Cry2Ae**) line, FM 1911 GLT, and a TwinLink Plus (**Cry1Ab+Cry2Ae+Vip3A**) line, BX 1971 GLTP, were selected from the varieties in the Sentinel Plot Trial to be representative of their respective Bt technology in measuring bollworm damage and field survivability provided by each technology in commercial West Texas cotton fields. All agronomic and pest management of this analysis and the Sentinel Trial were covered by Clay Golden and Golden Crop Care.

Figure 12. Christina with the PPM scouting crew conducting a whole plant inspection for the trial.

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 9 July and the last on 20 August. 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. Number of damaged bolls, damaged squares, damaged blooms and number of live bollworms were recorded for the 50 selected plants inspected per each Bt technology. The number of live bollworm data and all fruit damage data were recorded and reported to corporate sponsors on a per 50 whole plant inspection format.

For reporting purposes here, the number per fifty plant data for both live worms and damaged fruit have been converted to percent plants with damaged fruit or number of bollworms per acre. This format better matches the West Texas accepted economic threshold for bollworms stated as 8,000 - 10,000 live bollworms per acre. This was done so that local producers could better understand and relate the local data generated and apply it better to their production systems. Damaged fruit numbers were left in terms of percent plants with damaged fruit for additional reference to type of bollworm damage only. For best local understanding of data, number of bollworm eggs found for all whole plant inspections conducted each week were calculated. The Golden Crop Care field plants per acre counts of 33,500 were utilized in both the bollworm per acre calculations and bollworm eggs per acre calculations.

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.

In an effort to standardize the resulting data from this analysis with results from across the US Cotton Belt, number of harvestable fruit per plant for the 14 August date alone. Resulting data was recorded and converted to calculate percent fruit damage.

Results and Discussion

Bollworm pressure and egg lay was light for the first three weeks of the data collection period. During this early, light pressure period, both TwinLink and TwinLink Plus shown some sight advantages in percent plants with fruit damage. This slight advantage was not significate except for the 9 July date for damaged squares only (P=0.0474) when the non-Bt shown more bollworm damage compared to the two Bt technologies.

By the 30 July egg lay had begun to increase notably peaking on the 6 August date with nearly 80,000 bollworm eggs per acre. This indicated the potential for economic worm pressure to emerge soon, depending on surviving and resulting caterpillars.

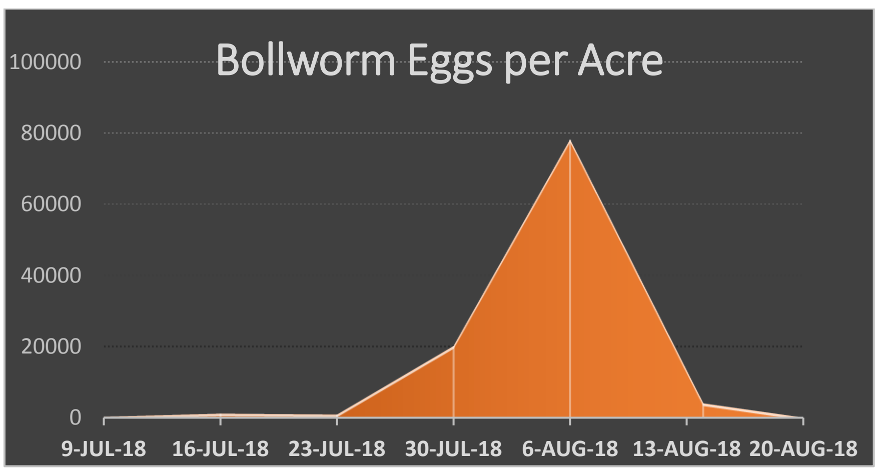


Figure 13. Bollworm eggs per acre as counted across all treatments for the entirety of the data collection period.

Beneficial populations were noted to be very high throughout the data collection period with many noted reductions in counted bollworm populations from counted egg lay previously. Some significant differences in living worms counted and fruit damage was noted on the 6 August date, it was only the resulting bollworm population from the 6 August egg lay that produced an economic population. On 14 August the non-Bt treatment had a population of bollworms counted and calculated to be 8,710 bollworms per acre with the TwinLink population was counted and estimated to be 2,680 bollworms per acre while the TwinLink Plus treatment had no surviving bollworms found. All three Bt traits were significantly different from each other at this date (P=0.0004). This population was left unchecked for the duration of the trial period. The number of bollworms per acre declined slightly in the non-Bt line to 8,040 per acre, increased in the TwinLink trait line to 4,020, and remained 0 in the TwinLink Plus line with all three treatments remaining almost significantly different from each other (P=0.0501).

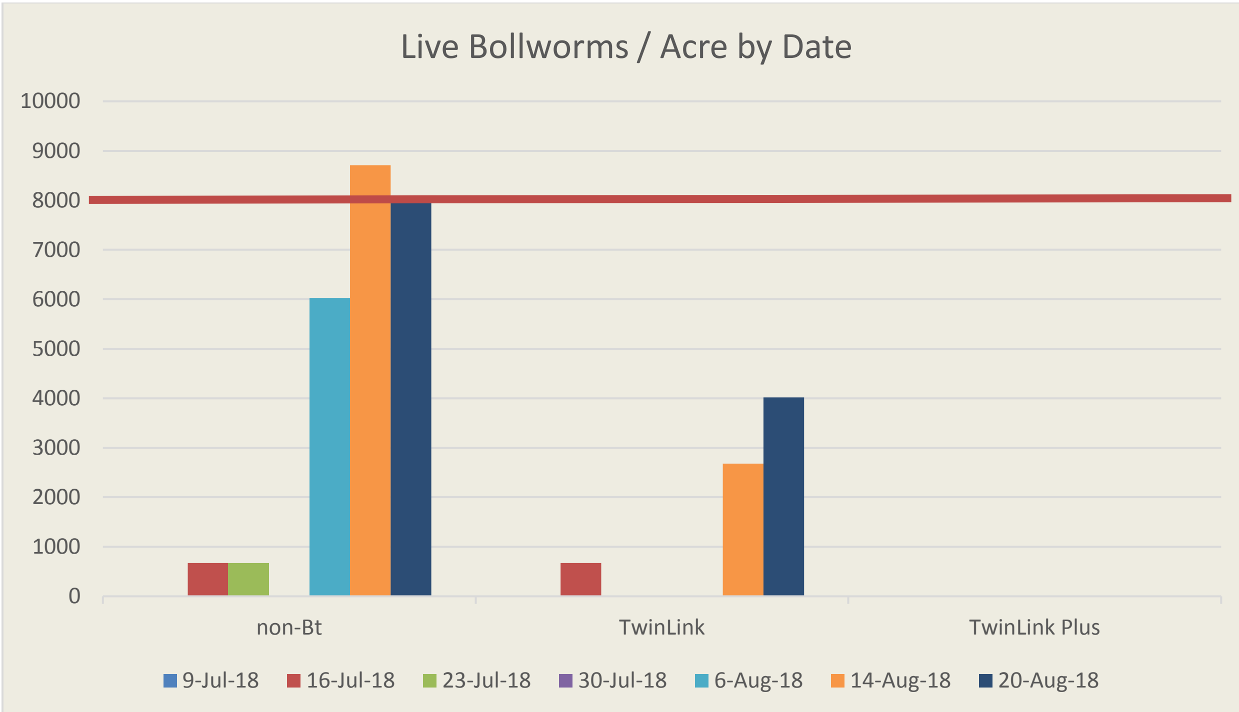


Figure 14. Live bollworm population for the trial by date and by Bt trait. The 14 August date and 20 August date, all three treatments shown significant control differences indicating variable levels of control offered for each technology.

Resulting fruit damage shows a similar and sometimes significantly differing level of control between the non-Bt line having consistently the most fruit damage for the duration of the trial. The TwinLink line and the TwinLink Plus line actually had similar fruit damage rates with the TwinLink rising consistently to a significant level above the TwinLink Plus only when the bollworm population increased to notable pressure for the 14 August date and the 20 August date.

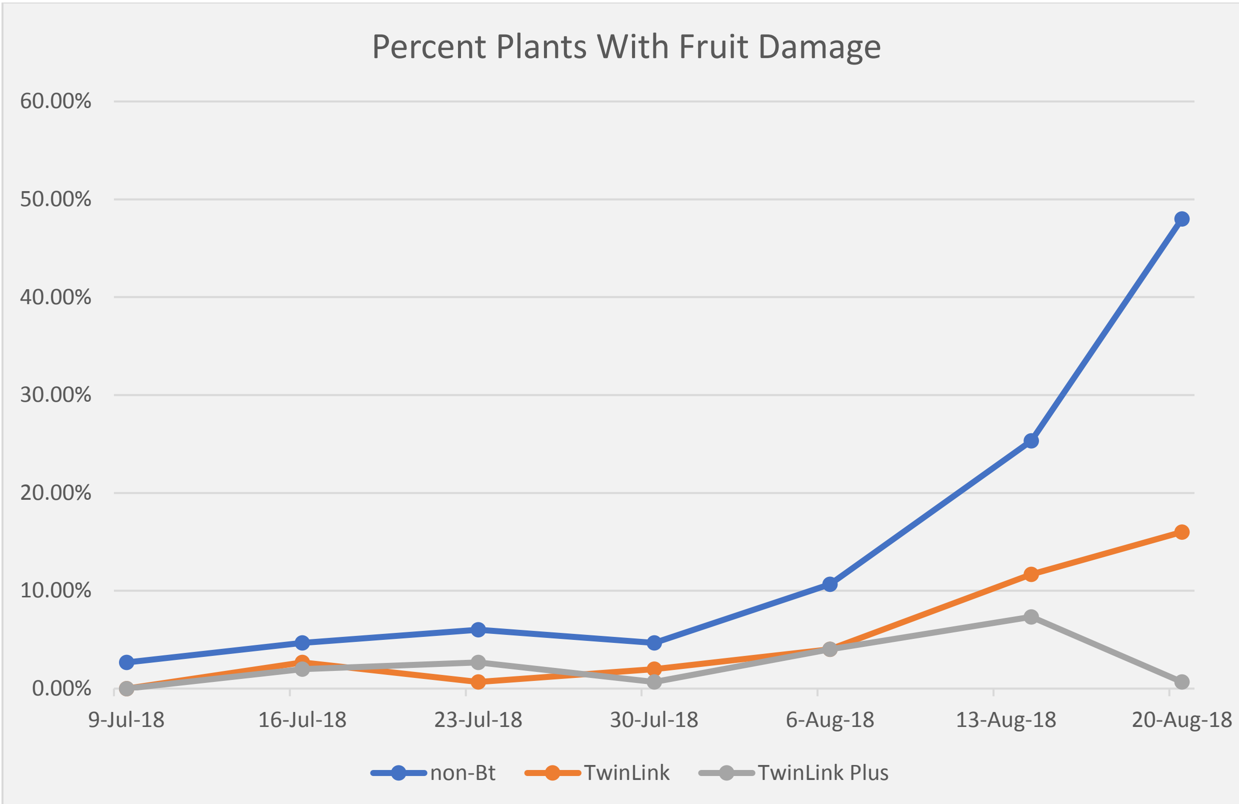


Figure 15. Percent plants with damaged fruit over time by Bt trait.

The resulting conversion of the 14 August date to percent harvestable fruit damage shows a resulting bollworm pressure being much lower at this site than other regions of the Cotton Belt, but a similar trend in level of control currently offered by the differing Bt technologies.

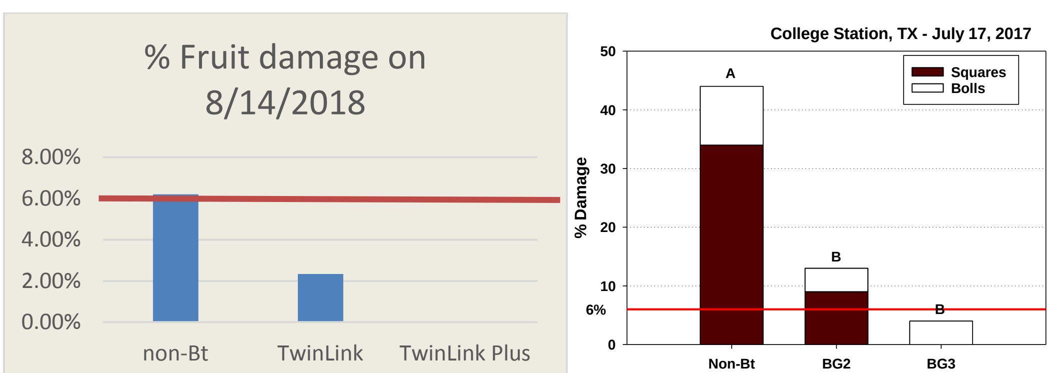


Figure 16. Data from the trial converted to the 6% harvestable fruit damage threshold compared to a similar trial in College Station. Note the trend similarities, ET line establishment, and large population pressure differences.

Conclusions

A quick glance at the percent fruit damage (figure 5) from this trial by trait, and a single date from a similar 2017 trial in College Station show a much lower resulting bollworm population for the Texas High Plains. More importantly**, a similar trend in resistance and larval survivorship is evident in two Bt traited lines from across the State while any traited line that includes the VIP trait maintains better performance**. Even listed in terms of the locally adopted economic threshold of bollworms per acre (figure 3), the same trend is evident indicating a slip in performance in recent years and a serious need to **scout all Bt types for economic bollworm issues** in season.

The disparity in pest pressure by location might not be so substantial as exhibited here season by season. It should be considered rare to experience a 90% reduction from egg lay to resulting bollworm larva, but a 30 – 50% reduction is considered a historic norm for the area. It is also well established that 70 - 90% of High Plains bollworms must migrate to the area in an unreliable route while the pressure across most of the Cotton Belt is much higher and more consistent for a much longer period of time from a locally developed population. **These results indicate that the High Plains does not need to adapt the 20% egg lay spray threshold** the balance of the Cotton Belt has adapted at this time. The High Plains will not have an automatic economic bollworm population for all fields, every year and should not spray insecticides automatically for eggs. The High Plains should continue (or return to) scouting all technology fields **and act upon established thresholds of 8,000 – 10,000 live worms per acre** (under higher pressure the 6% harvestable fruit damage ET could be used interchangeably).

Figure 17. Results indicate a need for the High Plains to scout all Bt types for bollworms but that bollworm thresholds should rely live bollworm per acre numbers found, beneficial considerations, and not automatic egg lay treatment triggers.

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 Clay Golden, Golden Agronomy, for cooperating with us to complete this trial, Fibermax and Tim Culpepper for sponsoring and partnership of this trial, the 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, Jerik Reed, and Christina Safford. Thank you all.

Evaluation of Varying Rates of Onager for Banks Grass Mite Control in Corn – 2018

Texas A&M AgriLife Extension Service / Gowan
Cooperator: Jimmie Sageser
Blayne Reed, EA-IPM Hale, Swisher, & Floyd / Dr. Craig Sandoski, Gowan

Summary

Nine miticide treatments were applied to an economic population of Banks Grass Mites in a commercial corn field in a small plot CRBD with four replications. The treatments included an untreated check, two rates of Onager, 12 and 16 oz. / ac. without surfactant, two treatments of the experimental compound GWN-10666 at 12 and 16 oz. / ac. without surfactant, and all treatments of Onager and the GWN-1066 treatment repeated with the addition of Crop Oil Concentrate at 1 pt./ac. Data on mites per leaf were recorded pre-treatment and at 3, 10, and 17 DAT with a mite damage rating taken at 17 DAT. All data were compared using ANOVA and LSD.

There were no significant differences between treatments in pre-treatment or by 3 DAT despite numeric trends following treatments. By the 10 DAT count, all treatments had significantly fewer mites per leaf compared to the UTC. By the 17 DAT date, all treatments, including the experimental, had significantly fewer mites than the UTC, but no treatment was superior to any other any longer. For the 17 DAT damage rating no treatment was significantly different from another but many select treatments were close and large numeric differences did exist with Onager at 12 oz., and Onager at 16 oz. showing less damage. These results show there should be no proven benefit to increasing rates of Onager to increase field mite control, and the compound GWN-10666 did not perform differently from Onager, and there was no significant improvement in control with the use of COC.

Objective

To answer concerns over Onager' potential resistance and continued efficacy on BGM at normal use rates in the region by evaluating Onager at normal and high labeled rates while evaluating the potential experimental miticide, and the potential benefit of adding COC as a surfactant to these treatments.

Materials and Methods

Image 1. Harvesting ear leaves from corn plots to be taken to lab and counted for BGM/leaf counts.

On 14 July an existing population of Banks grass mites were flared in prepared plots using a treatment of Warrior at 2.9 oz. / ac. to lower predator levels and ensure an economically damaging level of mites in the trial area. On 21 July, the mite population was recorded as economic and the trial was initiated with treatments being applied on that date. Treatments included an untreated check, Onager at 12 oz./ac., Onager at 16 oz./ac., GWN-10666 at 12 oz./ac., Onager at 12 oz./ac. plus Crop Oil Concentrate at 1 pt./ac., Onager at 16 oz./ac. plus Crop Oil Concentrate at 1 pt./ac., and GWN-10666 at 12 oz./ac. plus Crop Oil Concentrate at 1 pt./ac. All treatments were made via CO_2 backpack sprayer with corn boom attachment at 16.2 GPA and a walking ground speed of 2.5 MPH.

Data on mites per leaf were recorded pre-treatment and at 3, 10, and 17 DAT with a mite damage rating taken at 17 DAT. 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.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Untreated Check
2		Onager 12 FL OZ/A
3		GWN-10666 12 FL OZ/A
4		Onager 16 FL OZ/A
5		GWN-10666 16 FL OZ/A
6		Onager 12 FL OZ/A;COC 1 PT/A
7		GWN-10666 12 FL OZ/A;COC 1 PT/A
8		Onager 16 FL OZ/A;COC 1 QT/A
9		GWN-10666 16 FL OZ/A;COC 1 QT/A

401 9	402 2	403 4	404 3	405 6	406 5	407 8	408 1	409 7
301 2	302 1	303 9	304 6	305 5	306 7	307 4	308 3	309 8
201 7	202 5	203 2	204 4	205 9	206 8	207 1	208 6	209 3
101 1	102 4	103 5	104 7	105 3	106 2	107 8	108 9	109 6

Figure 1. Trial plot maps and treatment list

Image 2&3. The PPM team counting BGM/leaf in the lab.

Image 4. CO2 Backpack sprayer with boom attachment used in trial set for corn applications.

Results and Discussion

Mite populations proved to be significantly uniform in pretreatment counts. By the 3 DAT count date there were still no significant differences in mite populations compared to the untreated check (P=0.4684). By the 10 DAT count, all treatments had significantly fewer mites per leaf compared to the UTC with notable differences between treatments hinting that higher rates might be performing better ($P=0.0001$). By the 17 DAT counts, all treatments remained significantly better than the UTC, but all other treatments were similar erasing all hits of treatment variation in performance (P=0.0493). On the 17 DAT damage ratings, no treatments were significantly different at the 0.05 level, but indicated strong numeric differences (P=0.0619) that neared significance with the

Onager at 12 oz./ac. treatment and the Onager at 16 oz./ac. performing better than other treatments. Leading up to the 17 DAT date, it was noted that all mite populations were crashing with heavy beneficial pressure.

Image 5. Field photo of BGM colonies on the underside of a leaf in field corn.

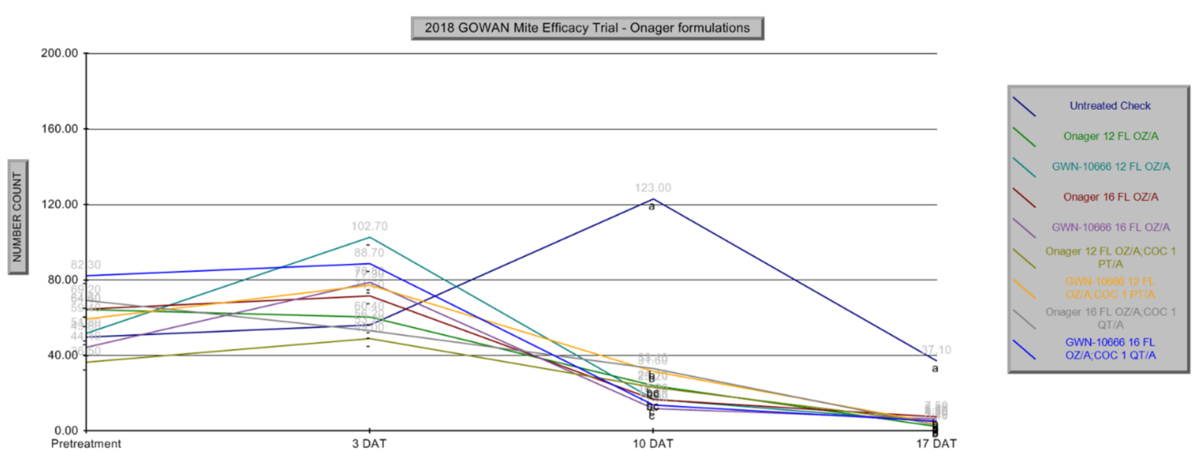


Figure 19. Banks Grass Mite populations by treatment for the duration of the trial by treatment.

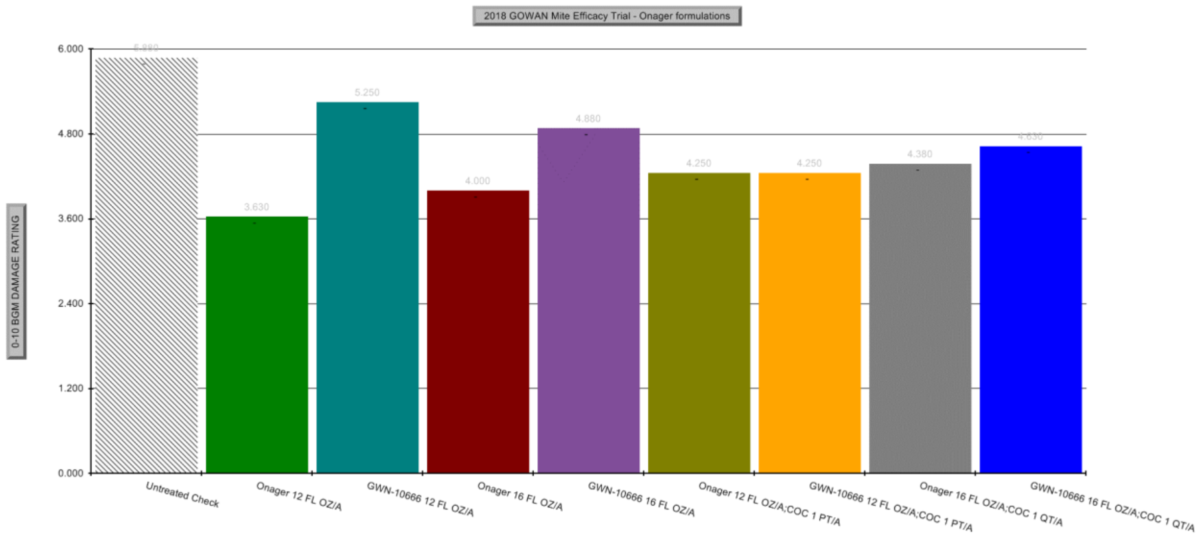


Figure 20. 17 DAT BGM 0-10 Damage Ratings (P=0.0619).

Conclusions

The existing concern for entomologists, producers, and company representative that higher rates of Onager might be needed in West Texas BGM control in corn look to be unfounded at this time. There should be no proven benefit to increasing rates of Onager to increase field mite control. The experimental compound GWN-10666 looked to perform as well as the Onager treatments while the addition of COC to any treatment looks unnecessary. It should however be noted that these applications were made via CO2 Backpack Sprayer, and not by air and lower water volumes where COC has proven beneficial in other trials of similar nature.

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 Kevin Harris for sponsoring and partnership of this trial, Jimmie Sageser for Cooperating and hosting this trial, and the 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, Jerik Reed, and Christina Safford. Thank you all.

Evaluating New Sivanto Formulation for Sugarcane Aphid Efficacy Comparisons in West Texas Grain Sorghum 2018

Texas A&M AgriLife Extension Service Hale County

Halfway Experiment Station

Blayne Reed, EA-IPM Hale, Swisher, & Floyd, Russ Perkins, Bayer Crop Science

Summary

Two rates of the new formulation of Sivanto, Sivanto HL, were compared to a rate of the existing, labeled Sivanto formulation, Sivanto Prime, and untreated check (UTC), and a standard rate of a competing labeled product Transform. All five treatments were organized into a complete randomized block design with 4 replications at the Halfway Experiment Station. On 2 August a naturally occurring economic population of sugarcane aphids were found in the trial area and pretreatment sugarcane aphid per leaf counts were taken and all treatments were applied. Aphid per leaf counts were made pretreatment, 5 DAT, 9 DAT, 14 DAT, and at 21 DAT. Plot sugarcane aphid damage ratings on the standard Texas A&M AgriLife 0-10 rating scale were also taken at the 21 DAT date. Harvest was conducted on 16 November and all data was analyzed via ARM ANOVA with a $P<0.05$ or less.

By the yield data (figure 7) the new formulation of Sivanto HL has proven to be at least equal in the economics of sugarcane aphid control in commercial grain sorghum to a higher rate of the older Sivanto Prime formulation. When we review the aphid per leaf numbers and the aphid damage ratings (table 1, figures 5 & 6) we see that that the new formulation Sivanto HL actually outperformed the older formulation Sivanto Prime, evermore at the higher rate of 3.5 oz per acre. This however did not equate to a higher economic return in yield, but should be noted, especially for earlier growth stage infestation situations when more damage could be accrued by similar aphid days.

Objective

Evaluate and compare the efficacy of a new formulation of Sivanto, Sivanto HL, at variable rates for sugarcane aphid control on commercial grain sorghum in West Texas to current labeled formulation rates and other labeled control products for product viability and labeling purposes.

Materials and Methods

Two rates of the new formulation of Sivanto, Sivanto HL, were compared to a rate of the existing, labeled Sivanto formulation, Sivanto Prime, and untreated check (UTC), and a standard rate of a competing labeled product Transform. All five treatments, an UTC, Sivanto Prime at 5 FL oz/a, Sivanto HL at 2.5 FL oz/a, Sivanto HL at 3.5 FL oz/a, and Transform at 1.5 oz wt./a were organized into a complete randomized block design with 4 replications. The agronomically fitting sorghum variety KS 585 was block planted at the Halfway Experiment Station on 5 June into a bulk planted section of a pivot irrigated field and plots were lain out with alleys cut into the sorghum on 22 June. Plot sizes were 6, 40-

inch rows wide by 38 feet long with only the middle 4 rows to be treated to prevent treatment drift between plots and to insure aphid re-infestation for ultimate product residual evaluation.

Field management was completed by the Halfway Station Farm Management Team with pest recommendation and other inputs from the weekly scouting from the Plains Pest Management scouting program. On 2 August a naturally occurring economic population of sugarcane aphids were found in the trial area and pretreatment sugarcane aphid per leaf counts were taken and all treatments were applied. Application was made via CO2 backpack sprayer at 16.2 GPA with a walking ground speed of 2.5 MPH. 1% COC was added to all insecticide treatment mixtures.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Untreated Check
2		Sivanto Prime 5 FL OZ/A
3		Sivanto HL 2.5 FL OZ/A;COC 1 % V/V
4		Sivanto HL 3.5 FL OZ/A;COC 1 % V/V
5		Transform 1.5 OZ WT/A

401 3	402 4	403 1	404 2	405 5
301 1	302 2	303 3	304 5	305 4
201 3	202 5	203 4	204 2	205 1
101 5	102 4	103 3	104 1	105 2

Figure 22. Treatment list and randomized plot layout.

Figure 23. Many trials were planted at the Halfway Station during 2018 requiring solid teamwork with the Halfway Farm team and the Plains Pest Management team and precision planning and planting.

Per leaf sugarcane aphid counts were made by counting one lower leaf (second green leaf above dead leaves) and one upper leaf (second leaf below flag) were removed and counted from 10 randomly selected plants per plot on each count date. For aphid counts, only the outside 4 rows of the 4-row treated area were counted with the middle 2 rows reserved for a physical damage free harvest data. Aphid per leaf counts were made pretreatment, 5 DAT, 9 DAT, 14 DAT, and at 21 DAT. Leaf counts were analyzed for aphid differences in numbers from upper leaves, lower leaves, and total per leaf. For convenience in manuscript writing, if there were no significant differences in upper or lower leaf populations separate or singularly from the total leaf population, only the total leaf population will be shared here. Plot sugarcane aphid damage ratings on the standard Texas A&M AgriLife 0-10 rating scale were also taken at the 21 DAT date. Harvest was conducted on 16 November by hand harvesting 10 row feet randomly selected from the middle 2 rows in each plot. Grain was 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 21. A typical view of sugarcane aphid leaf counts in a sorghum product efficacy trial.

Figure 4. The 2018 PPM making SCA applications with the CO2 backpack sprayer in sorghum.

Results and Discussion

Significant differences in total sugarcane aphid per leaf numbers began shortly after treatment application at the 5 DAT date with all treatments proving superior to the UTC, but also with the Sivanto HL 3.5 oz rate performing superior to the Transform at 1.5 oz rate and the Sivanto Prime rate of 5 oz and the Sivanto HL 2.5 oz rate only being superior to the Transform at 1.5 oz rate. This trend continued through to the 9 DAT and the 14 DAT dates but with almost all treatments being significantly different from each other. In order of performance at the 14 DAT date, The Sivanto HL at 3.5 oz held only 3.4 (d) aphids per leaf, the Sivanto HL at 2.5 oz held 7.5 (d) aphids per leaf, the Sivanto Prime at 5 oz held 23.9 (c) aphids per leaf, the Transform at 1.5 oz held 148.3 (b) aphids per leaf, while the UTC held 423.2 (a) aphids per leaf. These figures can be seen on the actual ARM ANOVA excerpt of the 9 DAT and 14 DAT results below complete with *P*value probabilities:

Table 2. ANOVA excerpt of 9 and 14 DAT analysis complete with LSD and Pvalues. Treatments with differing letter associations are at least significant to the 0.05 level.

Pest Type				I Insect	I Insect
Pest Code				RHOPSA	RHOPSA
Pest Name				Sugarcane aphid	Sugarcane aphid
Crop Name				Grain sorghum	Grain sorghum
Crop Variety				KS 585	KS 585
Description				Total leaves	Total leaves
Part Rated				INSLIV P	INSLIV P
Rating Date				Aug-11-2018	Aug-16-2018
Rating Type				COUNT	COUNT
Rating Unit				NUMBER	NUMBER
Sample Size, Unit				1 LEAF	1 LEAF
Reporting Basis, Unit				10 LEAF	10 LEAF
Days After First/Last Applic.				9 9	14 14
Trt-Eval Interval				9 DA-A	14 DA-A
ARM Action Codes				AL	AL
Trt No. Treatment Name	Rate	Rate Unit	Appl Code	9	12
1 Untreated Check			A	141.8 a	423.2 a
2 Sivanto Prime	5	fl oz/a	A	11.7 c	23.9 c
3 Sivanto HL	2.5	fl oz/a	A	3.7 d	7.5 d
COC	1	% v/v	A		
4 Sivanto HL	3.5	fl oz/a	A	1.5 e	3.4 d
COC	1	% v/v	A		
5 Transform	1.5	oz wt/a	A	31.1 b	148.3 b
LSD P=.05				2.15 - 66.55	7.16 - 262.46
Standard Deviation				0.18t	0.27t
CV				15.17t	17.48t
Grand Mean				1.17t	1.55t
Levene's F				0.25	0.419
Levene's Prob(F)				0.905	0.793
Friedman's X2				16.0	15.4
P(Friedman's X2)				0.003	0.004
Skewness				0.3796	0.1234
Kurtosis				-1.1333	-1.2601
Replicate F				0.832	1.261
Replicate Prob(F)				0.5016	0.3317
Treatment F				62.000	37.587
Treatment Prob(F)				0.0001	0.0001

By the 21 DAT count date, the Transform at 1.5 oz treatment had lost all residual control and actually held more aphids per leaf than all other treatments but only because the health of the UTC was by then so poor more aphids could not be supported. The remaining 3 Sivanto treatments continued to prove superior to the Transform at 1.5 oz treatment UTC but were not significantly different from each other despite a large numeric difference with the Sivanto HL at 3.5 oz treatment leading the other two by a large number.

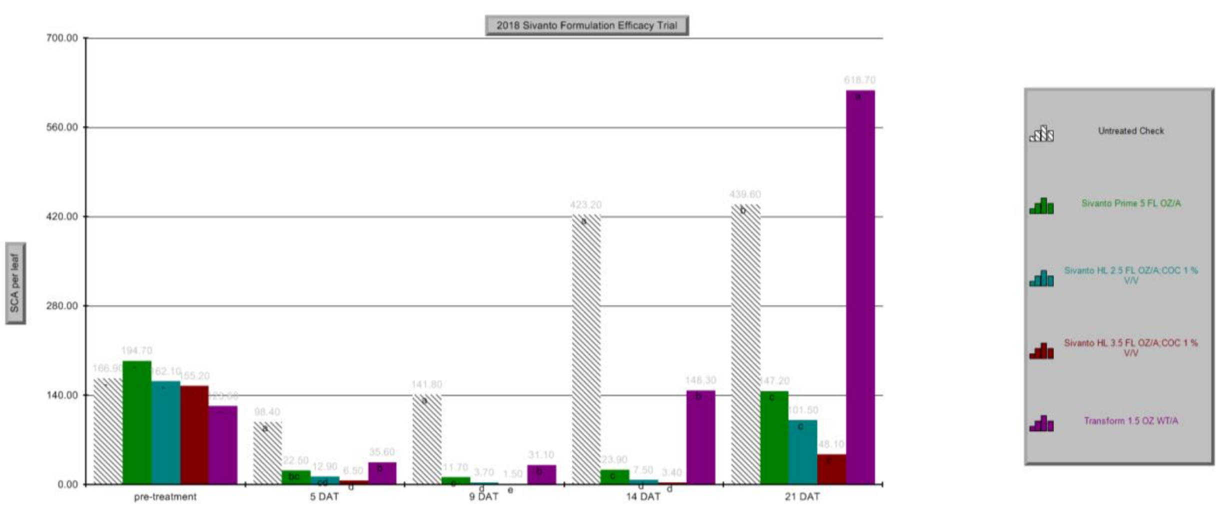


Figure 5. Total sugarcane aphid per leaf numbers by treatment by count date. Treatments with differing letter associations are at least significant to the 0.05 level.

Also, on the 21 DAT date, the 0-10 damage rating shown a very similar result to the aphid leaf count numbers. All treatments were superior to the UTC in damage and were all significantly different from each other with the Sivanto HL 3.5 oz rate outperforming all other treatments, the Sivanto HL 2.5 rate outperforming the older Sivanto Prime at 5 oz rate and the Transform at 1.5 oz rate, but still with the Sivanto Prime at 5 oz rate far outperforming the Transform at 1.5 rate.

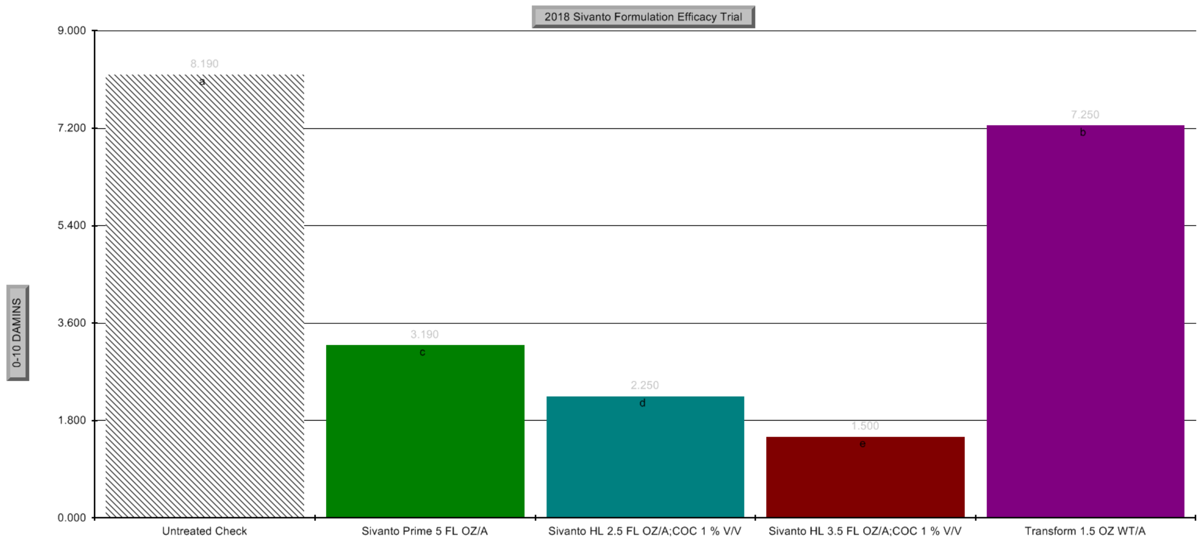


Figure 6. Sugarcane aphid damage ratings from the 21 DAT check date. Treatments with differing letter associations are at least significant to the 0.05 level.

Harvested yield data in terms of pounds grain per acre mirror in-season results with all treatments superior to the UTC, the 3 Sivanto treatments being superior to the Transform at 1.5 treatment but in this case, all of the Sivanto treatments of both formulations and rates were not significantly different from each other. None of the grain quality data were significantly different for any treatment but the UTC did show a numeric disadvantage in bushel weight.

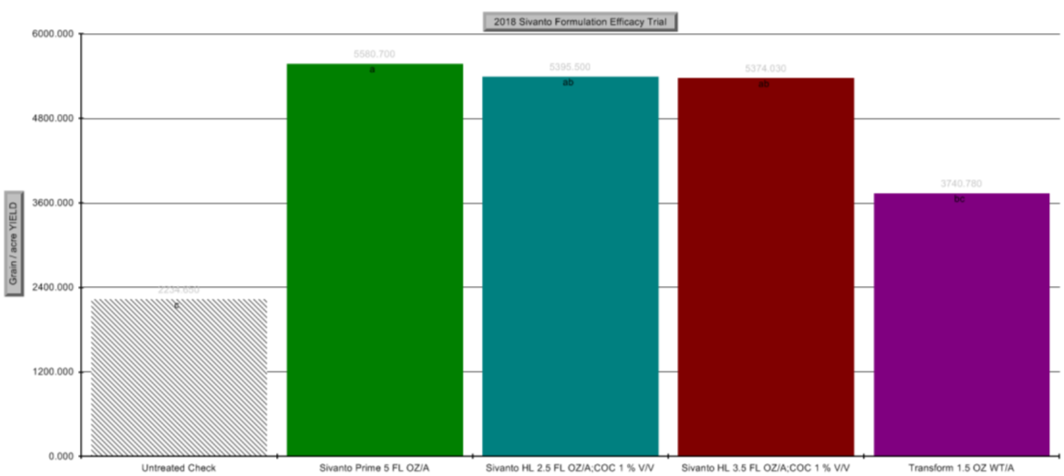


Figure 7. Harvest data in terms of pounds grain per acre. Treatments with differing letter associations are at least significant to the 0.05 level.

Conclusions

By the yield data (figure 7) the new formulation of Sivanto HL has proven to be at least equal in the economics of sugarcane aphid control in commercial grain sorghum to a higher rate of the older Sivanto Prime formulation. When we review the aphid per leaf numbers and the aphid damage ratings (table 1, figures 5 & 6) we see that that the new formulation Sivanto HL actually outperformed the older formulation Sivanto Prime, evermore at the higher rate of 3.5 oz per acre. This however did not equate to a higher economic return in yield, but should be noted, especially for earlier growth stage infestation situations when more damage could be accrued by similar aphid days.

Transform still outperformed the UTC and had knockdown similar to the Sivanto treatments (figure 5, 5 DAT) but could not hold in terms of length of control or residual control. The shortness of the Transform's residual is well documented particularly in situation and trials where a heavy re-infestation may occur as there were in this trial design. Transform has proven again that it is a reliable product worthy of consideration if a good field coverage is achieved and no source of re-infestation is readily available, especially in lieu of product resistance management with only two labeled products available for sugarcane aphid control in grain sorghum.

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, Bayer Crop Science and Russ Perkins for sponsoring and partnership of this trial, the 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, Jerik Reed, and Christina Safford. Thank you all.

2018 BASF - Safina Experimental Sugarcane Aphid Product Efficacy Trial

Texas A&M AgriLife Extension Service Hale County
Halfway Experiment Station
Blayne Reed, EA-IPM Hale, Swisher, & Floyd and Jacob Reed, BASF

Summary

Six first and second labeled treatment option combinations were evaluated on economic populations of sugarcane aphids on Texas High Plains grain sorghum. These treatments were organized into a small plot CRBD with four replications. These treatments included a completely untreated check, Safina at 5.5 oz./ac. followed by Sivanto at 5 oz./ac., Sivanto at 5 oz./ac. followed by Safina at 5.5 oz./ac., Safina at 5.5 oz./a. followed by Safina at 5.5 oz./ac., Transform WG at 1.5 oz./ac. followed by Safina at 5.5 oz./ac., and Sivanto at 5 oz./ac. followed by Transform WG at 1.5 oz./ac. All Safina treatments were accompanied by the addition of Agri-Dex surfactant at the rate of 0.5% v/v. Plot sizes were enlarged to encompass a middle-treated section and an enlarged untreated area to ensure treated area re-infestation that would economically promote the need for a second treatment requirement. First treatment application began when a naturally occurring sugarcane aphid population in a simulated commercial grain sorghum field located at the Halfway Experiment Station. The second or follow up treatment was made 14 DAT 1 to the economically rebuilding sugarcane aphid population.

There were no product interactions, product hinderance, or phytotoxicity noted between any first and second treatment combinations. All first treatments effectively lowered sugarcane aphids below the UTC by 5 DAT A with all other first treatment options separating from the Transform treatment. This separation significance continued until the 14 DAT when the Transform treatment no longer separated from the UTC. By the 14 DAT A date, aphids began reestablishing economic populations in all plots and treatments initiating the second application. At the 7 DAT B/21 DAT A date, all treatments were again superior to the UTC, which was having a tough time supporting aphid populations any longer due to damage accumulation. By the 14 DAT B/28 DAT A date, all aphid populations crashed and few aphids were found in any plot. At the 14 DAT B/28 DAT A date, 0-10 aphid damage ratings were taken and at 77 DAT B/91 DAT A harvest data was taken. Damage and yield data confirmed superior performance for all treatments compared to the UTC. Differences between treatments were also found with all treatments performing superiorly to the Transform first treatment. These results indicated a key significance for the first treatment being an affective one, relegating any second treatment's importance to an only if re-infestation becomes economic.

Objective

Independently evaluate the efficacy, any phytotoxicity, and any potential detrimental interactions with the BASF experimental BASF insecticide compound Sefina and its unique mode of action as a first and subsequent second economic sugarcane aphid treatment option in cooperation with itself and the existing labeled compounds Sivanto and Transform on economic Texas High Plains in grain sorghum and record results for both labeling purposes and future production use.

Materials and Methods

On 5 June a commercial simulating block of an agronomically suitable grain sorghum line, KS 585, was planted at the Halfway Experiment Station on a section of a research pivot to house this study. All locally accepted agronomic and entomologic practices were followed for all input needs and pests except for the sugarcane aphid. The field was monitored by the Plains Pest Management Scouting Program throughout the growing season. On 31 July a naturally occurring economic population of sugarcane aphids were confirmed and plot layout and pretreatment counts were initiated on 2 August. Plots for six treatments were lain out into a small plot CRBD with four replications.

means producing a crop first. Making sure make sure the plot size is planted as planned and still grows properly from the start.

Plot sizes were enlarged with some extra area to encompass a middle-treated section and a source untreated area surrounding the treated areas of each plot to ensure all plot treated areas would be re-infested with an economic population of aphids to ensure the need for a second application. Six first and second product treatment option combinations were selected for evaluation. These treatments included a completely untreated check, Safina at 5.5 oz./ac. followed by Sivanto at 5 oz./ac., Sivanto at 5 oz./ac. followed by Safina at 5.5 oz./ac., Safina at 5.5 oz./a. followed by Safina at 5.5 oz./ac., Transform WG at 1.5 oz./ac. followed by Safina at 5.5 oz./ac., and Sivanto at 5 oz./ac. followed by Transform WG at 1.5 oz./ac. All Safina treatments were accompanied by the addition of Agri-Dex surfactant at the rate of 0.5% v/v.

Figure 2. The Plains Pest Management team making the last treatment for the trial.

Applications were made via CO2 backpack sprayer with high boom attachment at 16.2 GPA with a walking groundspeed of 2.5 MPH. Counts for sugarcane aphids per leaf were made at 5 DAT A, 9 DAT A, 14 DAT A, 7 DAT B/21 DAT A, and 14 DAT B/28 DAT A were made. Leaf counts consisted of 10 upper and 10 lower randomly selected leaves per plot. Lower leaves were considered two leaves about the uppermost desiccated leaf and upper leaves were considered one leaf below flag leaf. Sugarcane aphid per leaf data was analyzed for differences in lower, upper, and total aphid number per leaf.

On the 14 DAT B/28 DAT A date, treated plot areas were rating for aphid damage utilizing the Texas A&M AgriLife 0-10 sugarcane aphid damage rating system and scale. All plots were harvested by hand harvesting 10 row feet per treated plot area from each plot. Grain was 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 aphid leaf data, damage ratings and harvest data were analyzed utilizing ARM ANOVA at a *P*=0.05 level.

Results and Discussion

There were no product interactions, product hinderance, or phytotoxicity of any measurable amount noted between any first and second treatment combinations at any date.

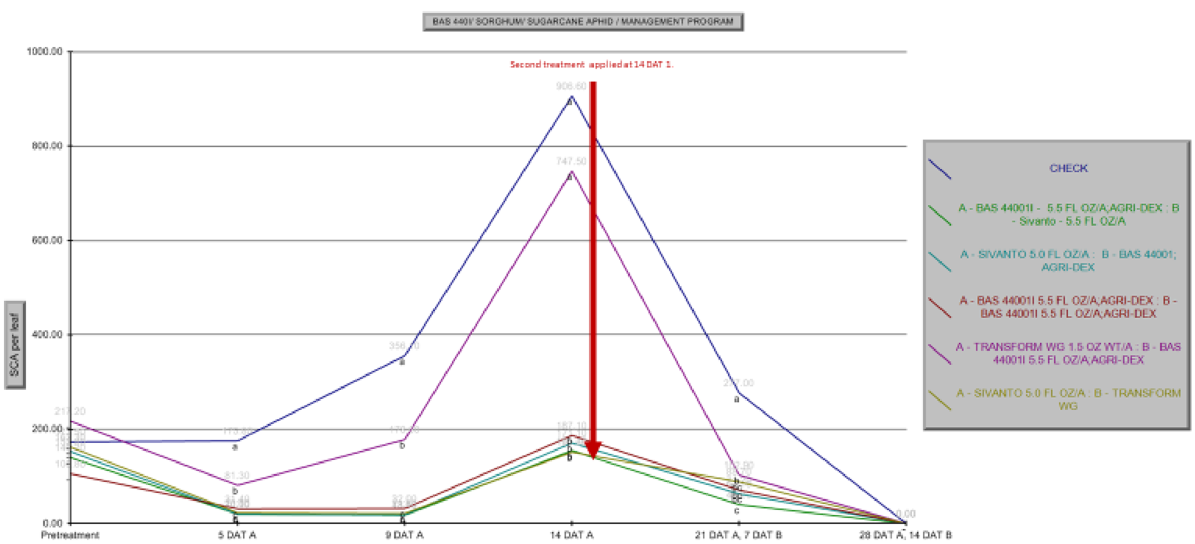


Figure 3. Total sugarcane aphid per leaf counts by treatment by count date. Significant differences of at least *P*<0.05 in treatments by date are denoted by differing lettering accompanying treatment and date.

Sugarcane aphid control from the first applications of all treatments defined all results of the trial with damage ratings and harvest yield data following conversely aphid per leaf data until the 14 DAT A date. All treatments by the 14 DAT A did require the planned second application due to the aphid reinfestation rate from the larger untreated portion of each plot. While all treatments were significantly better than the UTC following the first applications, the Transform first treatment did not perform as well as all other treatments at the 5 DAT A, 9 DAT A, and 14 DAT A. The documented short residual of

Transform and the test induced high reinfestatin rate caused this weakening of control compared to the other first treatment applications. If the reinfestation rate were to be reduced by a widespread and affective first application, Transform has proven to be of equal value to the other products tested in aphid knockdown. The efficacy of the second treatments being so similar at the 7 DAT B/21 DAT A highlight the equality of all product efficacy in knockdown. All other products were similar and not significantly different in first or second treatments. With a high aphid reinfestation situation, Transform would have required the second treatment much sooner to maintain equal yield and profit potiential.

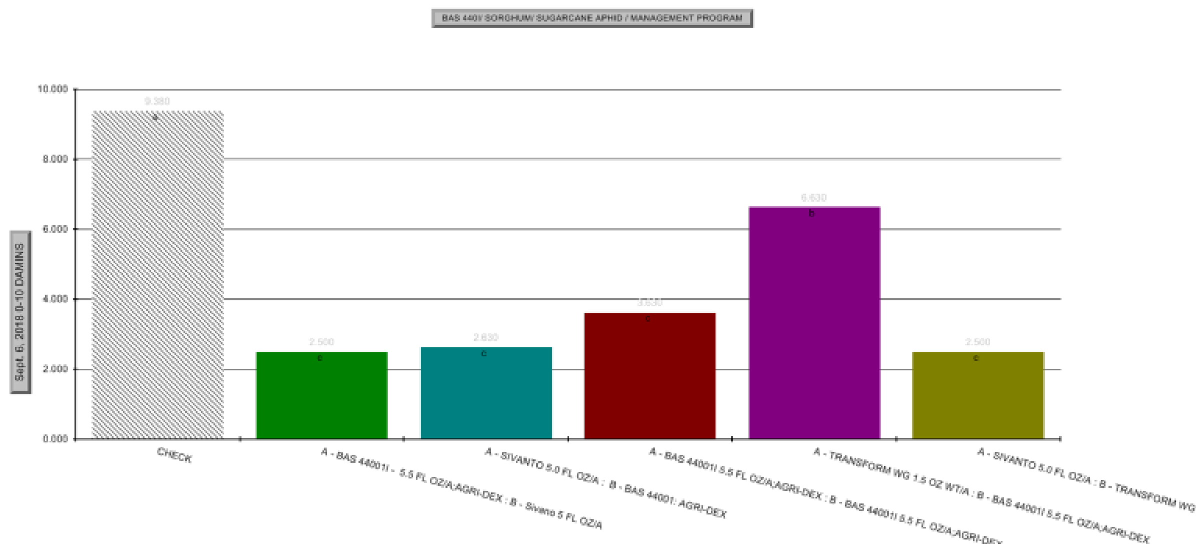


Figure 4. Sugarcane aphid damage ratings at the 14 DAT B/ 28 DAT A date on the 0-10 Texas A&M AgriLife sugarcane aphid damage rating scale. Significant differences of at least *P*<0.05 in treatments by date are denoted by differing lettering accompanying treatment.

All aphid populations crashed naturally between the good control offered by all products by the second treatment and the 14 DAT B/28 DAT A count date. No plot experienced any additional aphid pressure for the remainder of the trial.

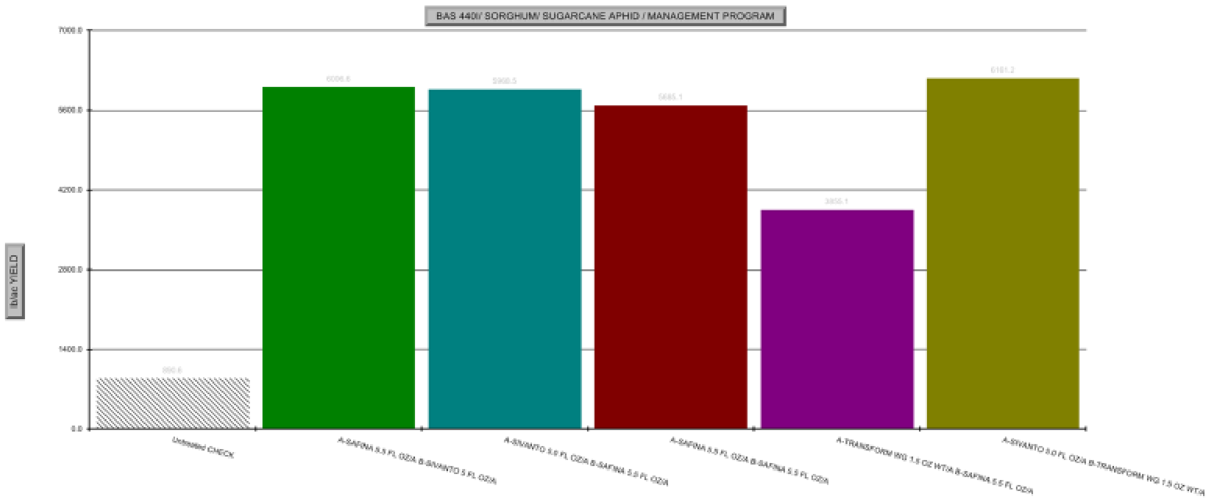


Figure 5. Harvest yield data in terms of pounds grain per acre. Significant differences of at least *P*<0.05 in treatments by date are denoted by differing lettering accompanying treatment.

Conclusions

Safina, as the experamental product of question, proved to be adequate as a first and/or second treatment option in sugarcane aphid control in West Texas grain sorghum. There were no product interactions, product hinderance, phytotoxicity, or lessening of control offered with Safina in any paired treatment combination. It should be considered safe to label and utilize as a stand-alone product or as a viable option if a second for sugarcane aphid treatment becomes economically necessary.

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 Jacob Reed for sponsoring and partnership of this trial, the 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, Jerik Reed, and Christina Safford. Thank you all.

Testing Transform Application Methods for Improved Sugarcane Aphid Efficacy in West Texas Grain Sorghum 2018

Texas A&M AgriLife Extension Service Hale County

Halfway Experiment Station

Blayne Reed, EA-IPM Hale, Swisher, & Floyd, Dr. Pat Porter, District 2 Entomologist, Dr. Mike Lovelace, Corteva

Summary

Four treatments consisting of an untreated check and three treatments of Transform applied via differing application methods including chemigation, ground, and simulated air were selected for this trial held at the Halfway Station in Hale County. The rate of Transform used was 1.5 oz/acre for the chemigation and ground treatments and a 2X above labeled rate of 3 oz/acre would be used for the simulated air application. All Transform treatments included 1% COC V/V. The trial was organized as a CRBD with 4 replications. Chemigation applications were made via chemigation simulated set for 1832 GPA LEPA chemigation settings. Ground applications were made with standard CO2 research backpack sprayer at 16.8 GPA and a walking groundspeed of 2.5 MPH with the boom height of 5 ft. Air treatments were made with the same CO2 backpack sprayer set at 2.5 GPA, a walking groundspeed of 4.5 MPH, and a boom height of 20 ft. Per leaf aphid counts were made on 10 upper and 10 lower leaves per plot pretreatment and at 3, 8, 14, and 21 DAT. Damage ratings were taken from all plots at 21 DAT. All plots had 10 row feet selected randomly and hand harvested. Grain was threshed via trailer mounted Haldrup research grain thresher on site and grain data was converted to pounds grain per acre. Grain moisture and bushel weight measurements were collected on a Dickey-john Mini GAC Plus grain moisture analyzer. All aphid leaf data, damage ratings and harvest data were analyzed utilizing ARM ANOVA at a P=0.05 level.

All treatments outperformed the UTC, but the chemigation application treatment also outperformed the other application methods. This application method not only outperformed ground application, but the 2X labeled rate of Transform applied via simulated air application.

Objective

To confirm the increased efficacy of Transform in sugarcane aphid control in West Texas grain sorghum when applied via chemigation compared to other traditional application methods and an untreated check. Resulting data will also be utilized determining viability in National product labeling of the Transform by the EPA.

Materials and Methods

Four treatments consisting of an untreated check and three treatments of Transform applied via differing methods including chemigation, ground, and simulated air were selected for this trial held at the Halfway Station in Hale County. The rate of Transform used was 1.5 oz/acre for the chemigation and ground treatments and an above labeled rate of 3 oz/acre would be used for the simulated air application. All Transform treatments included 1% COC V/V. The trial was organized as a CRBD with 4 replications.

The field containing the trial was located in a pivot irrigated field Halfway Experiment Station in Hale county. The field was planted with a known sugarcane aphid susceptible but agronomically preferred sorghum variety KS 585. Planting was made in a solid pattern on 40-inch rows on 5 June. On 31 July, sugarcane aphids were found in the trial field and alleys were cut and plots lain out on. The trial was organized as a CRBD with 4 replications.

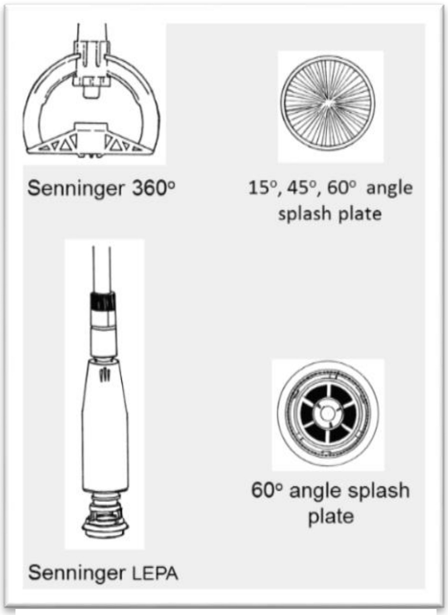


Figure 1. Chemigation plates utilized on simulator.


Figure 24. Photo of chemigation simulator.


Figure 3. Making a sugarcane aphid research treatment by ground with the research plot sprayer.

The equipment utilized for the chemigation treatments was a chemigation simulator designed for plot research. This simulator was made from a Ford 3910 turf tractor plumed with a nurse tank, treatment tank, and with extendable chemigation wing with drop hoses set to 8-inches above the soil surface. The simulator was calibrated for 1863 GPA. Chemigation plate information is available in Figure 1. Photo of simulator is available in Figure 3.

Ground application treatment was made via standard backpack CO2 research plot sprayer with boom attachment. Application ground speed was made at 3 mph, 16.8 GPA, and with a height of 5 feet. Air simulation was made via the same research sprayer, but with the sprayer set for 2.5 GPA, boom height of 20 feet, and a ground speed of 4.5 mph was utilized. Spray pattern markers indicated a very close resemblance to a poorly made air application with multiple obstacles.

Plots were 10-40-inch rows wide by 52 feet in length. Of the 10 rows required for each plot, 2 rows, on the right-hand side of all plots, were designated for the chemigation simulator to traverse through and 2 rows were utilized as buffer between plots to prevent drift. These 2 extra rows also provide a source for re-infestation of the treated plot area placing increased pest pressure on the treatment's residual potential. The next 6 rows were treated, which meet the width of the treatable area of the extendable chemigation boom of the simulator. The remaining two rows of each plot were left untreated to

Figure 4. Calibrating the backpack research sprayer for simulating air treatments.

Figure 5. Extendable chemigation wing of simulator during an application.

prevent treatment drift between plots. All plots had identical treated, drift and traversing areas with the ground and air simulation plots adjusted to match the chemigation plots. Due to plot treated area size, equipment needs, and other difficulties, treatments were mixed for each plot before application for all plots except the air simulated plots, which due to GPA needs, did not require multiple mixes.

On 31 July an economic population of sugarcane aphids were found in the trial area. Pretreatment counts were made on 4 August and treatments were applied on 6 August. Of the 6 treated rows from each plot, only rows 2 and 3 were utilized for aphid counts while row 3 were used for harvest data and whole treated area was utilized for damage ratings. For per leaf aphid counts, one lower (second green leaf above dead leaves) and one upper (second leaf below flag) were removed and counted on 10 randomly selected plants per plot on each count date. Counts were made at 3, 9, 14, and 21 DAT.

Damage ratings were taken from all plots at 21 DAT. The damage rating scale utilized was the 0-10 sugarcane aphid damage rating scale developed by Reed, Bynum, and Porter for West Texas sorghum damage in 2015. Harvest was conducted on 29 October by hand harvesting 10 row feet randomly selected from each plot. Grain was 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.

Results and Discussion

All treatments differentiated from the UTC by the 3 DAT date but the ground and chemigation application treatments separated from the simulated air treatment also. By the 8 DAT count date, all application treatments were similar to each other but the UTC continued to increase to very heavy infestation levels. ON the 14 DAT date, the UTC plants could no longer support high populations of aphids and control began to slip in all application treatments with the chemigation treatment outperforming the ground application but remained statistically similar to the 2X rate air simulated treatment despite a large numeric superiority. By the 21 DAT date, all populations of aphids were crashing with the chemigation treatment and 2X rate air simulated treatment leading in control despite being equal in aphid numbers to the UTC which were represented almost exclusively by desiccated plants incapable of supporting any aphids.

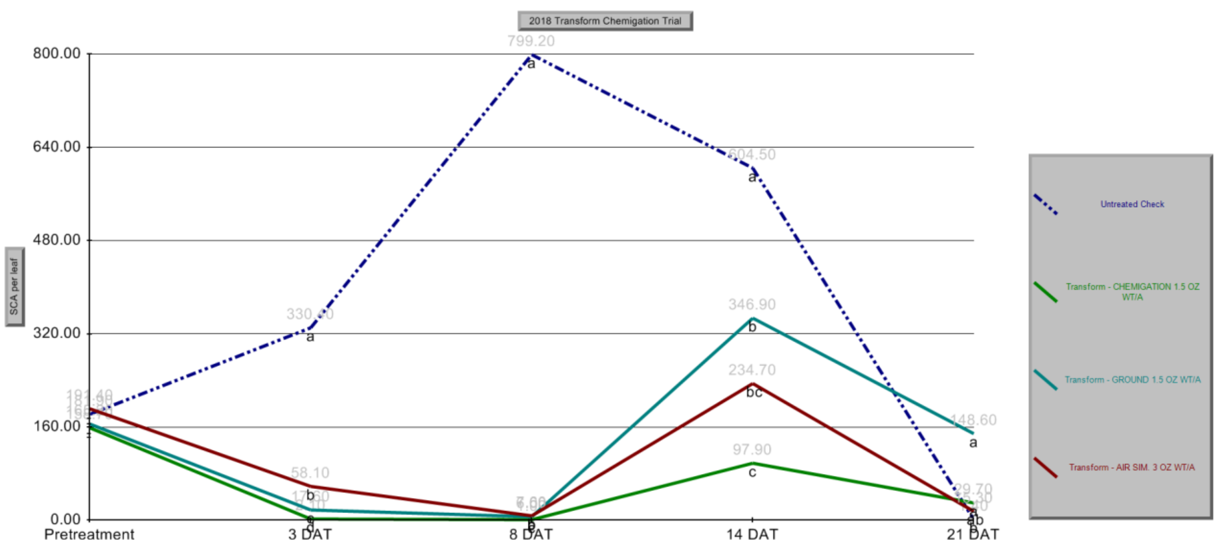


Figure 6. Total sugarcane aphid per leaf numbers by treatment by count date. Treatments with differing letter associations are at least significant to the 0.05 level.

The 0-10 sugarcane aphid damage ratings taken at 21 DAT show superior all-around performance for the chemigation treatment compared to either alternate application method or the UTC. All treatments outperformed the UTC, which were nearly all desiccated plants incapable of supporting aphids or quality grain production.

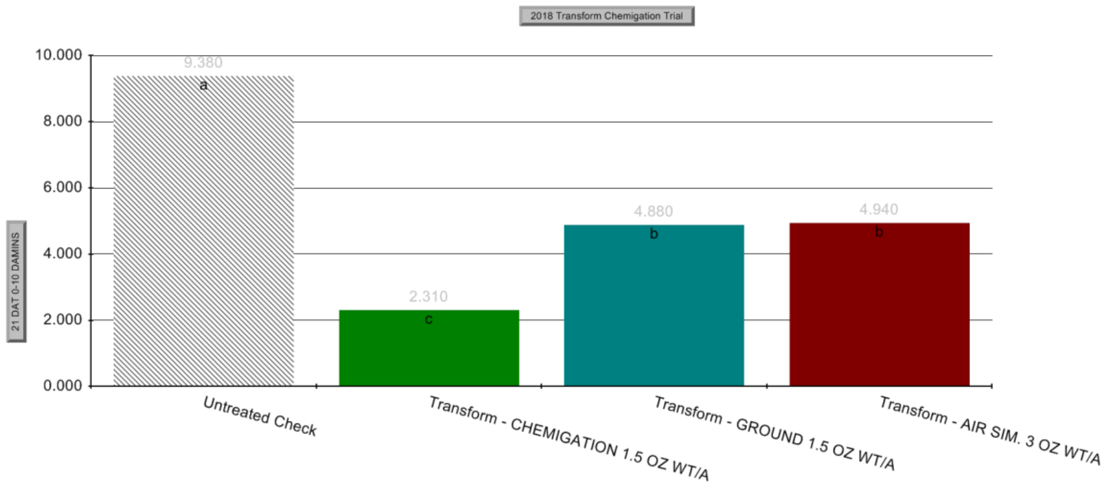


Figure 7. Sugarcane aphid damage ratings from the 21 DAT check date. Treatments with differing letter associations are at least significant to the 0.05 level.

Yield results in terms of pounds grain per acre showed similar results with the chemigation application method vastly outperforming other application methods which also vastly outperformed the UTC. There were no significant differences in bushel weight or percent grain moisture.

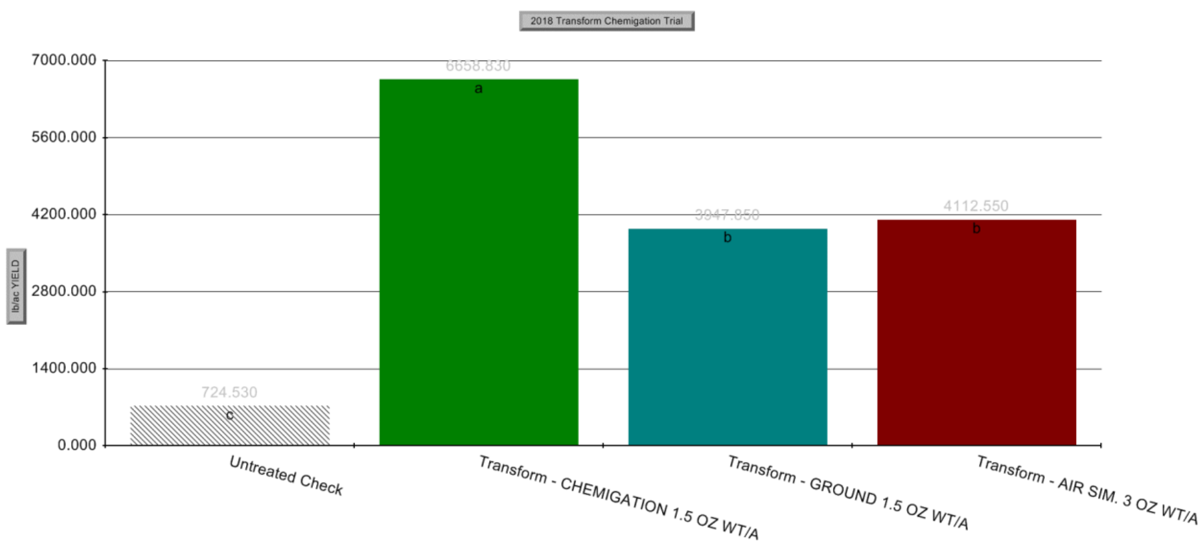


Figure 8. Harvest data in terms of pounds grain per acre. Treatments with differing letter associations are at least significant to the 0.05 level.

Conclusions

It is recommended by the results of this trial, and others preceding it, that Transform should and needs to have chemigation as an approved and labeled application method for controlling the sugarcane aphid in all types of sorghum in West Texas. Once labeled, sorghum producers should utilize this form of aphid control wherever and whenever possible once aphids reach an economic level. This application method not only outperformed ground application, but the 2X labeled rate of Transform applied via simulated air application.

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 Jacob Reed for sponsoring and partnership of this trial, the 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, Jerik Reed, and Christina Safford. Thank you all.

Sorghum Seed Treatment Efficacy and Sugarcane Aphid Control in West Texas Grain Sorghum 2018

Texas A&M AgriLife Extension Service Hale County
Halfway Experiment Station
Blayne Reed, EA-IPM Hale, Swisher, & Floyd and Russ Perkins, Bayer Crop Science

Summary

Six commercial sorghum insecticidal seed treatments were chosen to for the trial, an untreated check, Poncho, Poncho + Fluoxistrobin, Poncho/Votivo, Cruiser, and Poncho/Votivo TWO.O. On 5 June plots for a 4 replication CRBD were lain out and all plots were planted via plot planter with 4 rows per plot and roughly 130 seed per seed packet planted in 38 feet long plots (4 seed packets per plot). At 13 DAP stand establishment counts were made by counting number seedlings emerged per each plot row, with four counts per plot. Counts were made again at 20 DAP and a 1-6 vigor rating was given to each plot based upon emergence vigor and/or vigor determent from the insecticidal seed treatment. Weekly aphid counts began at 44 DAP and continued at 51, 58, 65, and 72 DAP when the all plots of the trial were over sprayed for aphid control utilizing Sivanto at 7 oz/ac. At the 72 DAP date, an aphid percent damage rating was given to each plot. On 15 November, 10 randomly selected 10 row feet per plot were hand harvested. Grain was then threshed via trailer mounted Haldrup research grain thresher on site. All aphid leaf data, damage ratings and harvest data were analyzed utilizing ARM ANOVA at a *P*=0.05 level.

By the 20 DAP date, all insecticidal seed treatments were statistically identical ranging between 117 and 120 plants per 38 row feet and were all superior to the UTC with only 102 surviving plants per 38 row feet. Differences in plant stands by the treatments compared to the UTC were likely due to wireworm control factors alone. By the 51 DAP date, all treatments were superior in terms of aphid control compared to the UTC, a trend that continued through the 72 DAP date when all treatments remained superior to the UTC but were all also over the local ET. No significant differences in yield were found in the trial despite accumulated damage shown at the 72 DAP ratings likely due to the thoroughness of control from the OVT Sivanto treatment on that date. These results ultimately indicate that any of the tested insecticidal seed treatments should offer roughly 60 days of economic aphid protection post planting.

Objective

To evaluate experimental and existing sorghum insecticide seed treatments for length of efficacy, potential crop injury potential, and economic benefit in sugarcane aphid control in commercial West Texas grain sorghum.

Materials and Methods

Six commercial sorghum insecticidal seed treatments were chosen to for the trial held at the Halfway Experiment Station in Hale County. The treatments included identical fungicidal and herbicide safening seed treatments with the only varying factor being the insecticide added to the seed treatments. The insecticides utilized included an untreated check, Poncho, Poncho + Fluoxistrobin, Poncho/Votivo, Cruiser, and Poncho/Votivo TWO.O. The variety utilized for the trial was Dekalb 37, with known sugarcane aphid resistance. On 5 June plots for a 4 replication CRBD were lain out and all plots were planted via plot planter with 4 rows per plot and roughly 130 seed per seed packet planted in 38 feet long plots (4 seed packets per plot). The field utilized for the trial was under LEPA pivot irrigation simulating a commercial environment. Stand establishment required less than 2 weeks and by 13 DAP stand establishment counts were made by counting number seedlings emerged per each plot row, with four counts per plot. Counts were made again at 20 DAP and a 1-6 vigor rating was given to each plot based upon emergence vigor and/or vigor determent from the insecticidal seed treatment.

Trial Map Treatment Description

Trt	Code	Description
1	REF	check
2		Poncho
3		Poncho + Fluoxistrobin
4		Poncho/Votivo
5		Cruiser
6		Poncho/Votivo + TWO.O

401 6	402 2	403 5	404 3	405 4	406 1
301 2	302 6	303 3	304 1	305 5	306 4
201 3	202 5	203 6	204 2	205 4	206 1
101 1	102 2	103 3	104 4	105 5	106 6

Figure 1. Plot map and insecticidal seed treatment list.

Regular weekly field scouting began by the Plains Pest Management Scouting Program at 7 DAP and continued through harvest. All typical and best agronomic, herbicide, and pest management practices were managed in the field by the Halfway Experiment Station Farm Manager and the Plains Pest Management Scouting Recommendations, except the sugarcane aphid management, which would be monitored and managed for the trial.

Figure 2. Planting the trial with a plot planter.

Figure 3. Making the over-the-top economic Sivanto application at 72 DAP.

At 38 DAP a naturally occurring sugarcane aphid population was found in field and weekly aphid counts began at 44 DAP and continued until all treatments were over the High Plains Sugarcane Aphid Economic Threshold for 2 weeks when the all plots of the trial were over sprayed for aphid control utilizing Sivanto at 7 oz/ac. This Sivanto treatment occurred at 72 DAP following final aphid counts with actual count dates occurring on 44, 51, 58, 65, and 72 DAP. Aphid counts were made by randomly selecting 10 plants per plot and counting the lowest green leaf to represent a low leaf and the second leaf below the flag leaf to represent an upper leaf. At the 72 DAP date, an aphid percent damage rating was given to each plot. On 15 November, 10 randomly selected 10 row feet per plot were hand harvested. Grain was then 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 aphid leaf data, damage ratings and harvest data were analyzed utilizing ARM ANOVA at a P=0.05 level.

Results and Discussion

Stand counts in terms of plants per 38 row feet were significantly different between treatments and the UTC at the 13 DAP date. The Poncho + Fluoxistrobin treatment had more plants per 38 row feet than the UTC and all other treatments accept Poncho/Votivo. By the 20 DAP date, all insecticidal seed treatments were statistically identical ranging between 117 and 120 plants per 38 row feet and were all superior to the UTC with only 102 surviving plants per 38 row feet.

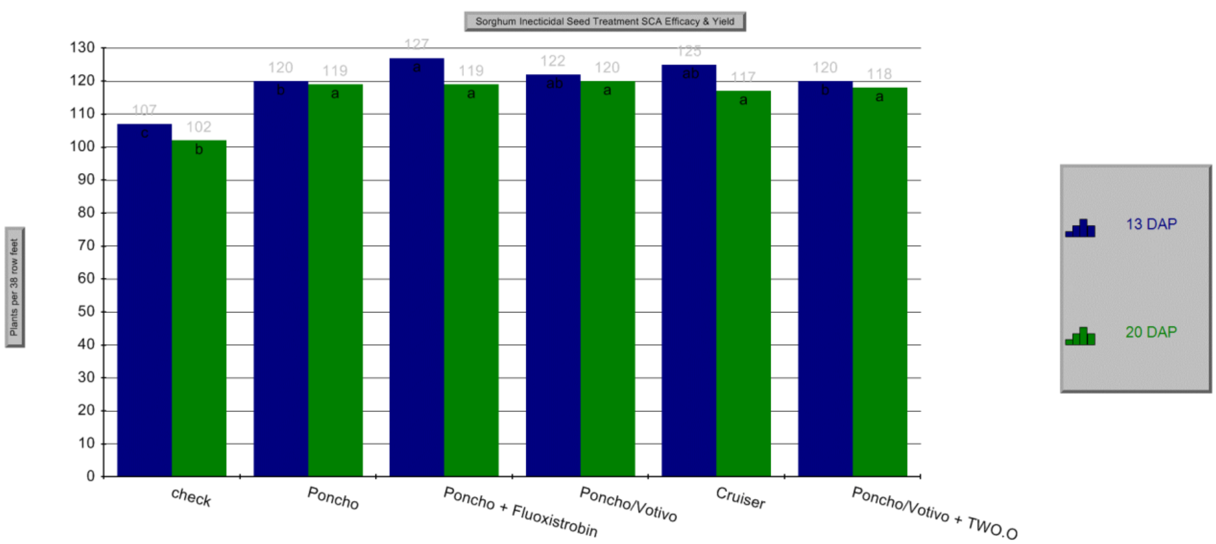


Figure 4. Sorghum Seedlings per 38 row feet by treatment at 13 DAP and 20 DAP.

No significant differences were noted in seedling vigor between treatments despite a numeric superiority for the Poncho/Votivo treatment.

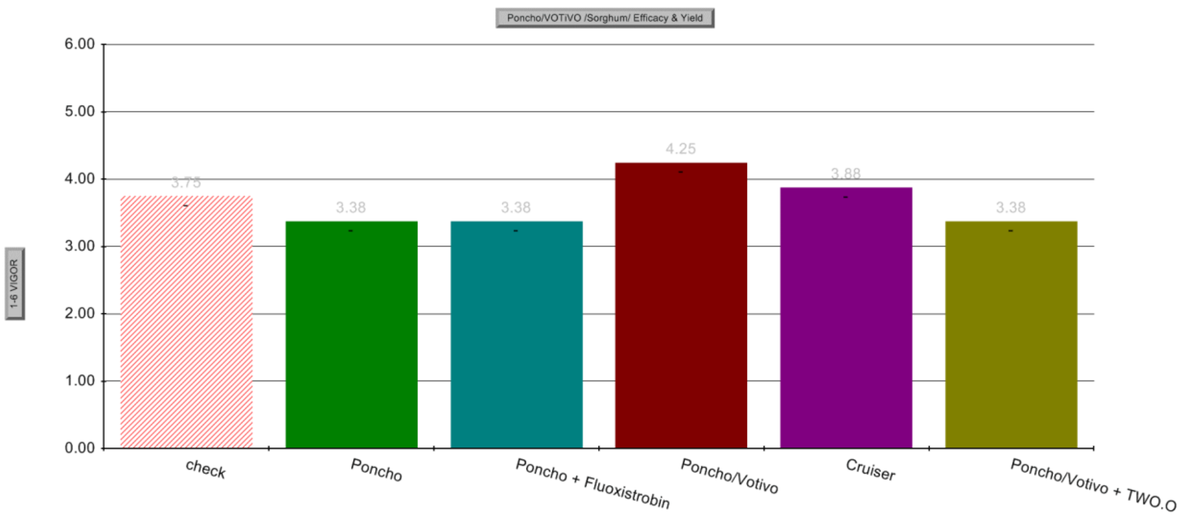


Figure 5. 1-6 Seedling vigor ratings at 20 DAP by treatment.

At the 44 DAP first aphid per leaf count date, numbers were very light as aphid colonies began establishing in field. By the 51 DAP date, all treatments were superior in terms of aphid control compared to the UTC with the UTC still not having reached an economic level. At the 58 DAP date, the UTC had reached an economic level while all treatments were similar to each other in aphid per leaf numbers and were still below economic levels. By the 65 DAP date, all treatments remained similar and mostly superior to the UTC, but all plots were well above an economic level. The upward trend of all treatments continued through the 72 DAP date with most treatments still outperforming the UTC, but at this time all treatments had been under economic pressure for at least two weeks and an OVT Sivanto treatment was needed to preserve any economic differences incurred during the aphid infestation period in the treatments through to yield.

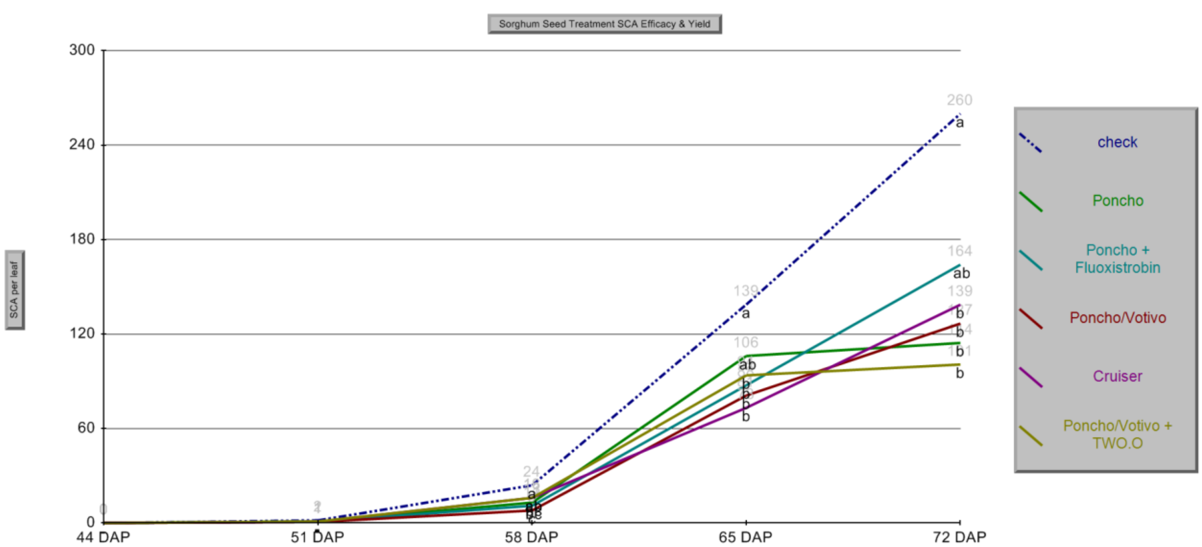


Figure 6. Sugarcane aphids per leaf over time by treatment.

At the 72 DAP date, a 0-100 damage rating scale was utilized before the plots were over sprayed with the Sivanto treatment. All treatments outperformed the UTC, but similar to each other.

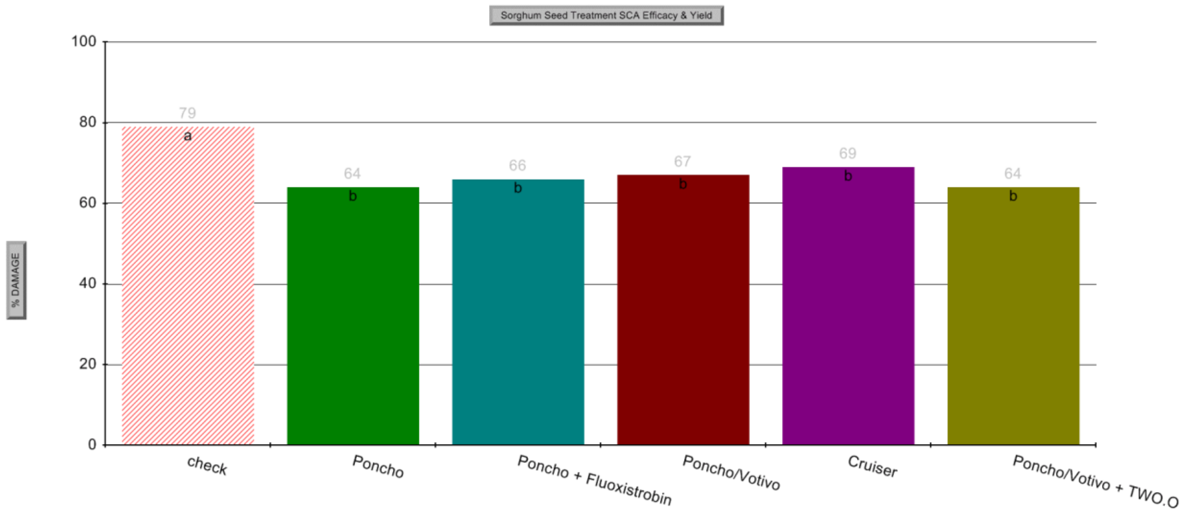


Figure 7. Percent sugarcane aphid damage at the 72 DAP date by treatment.

There were no differences in grain yield per acre between any treatments despite the all treatments being superior to the UTC in aphid per leaf numbers and aphid damage incurred prior to the OVT Sivanto treatment.

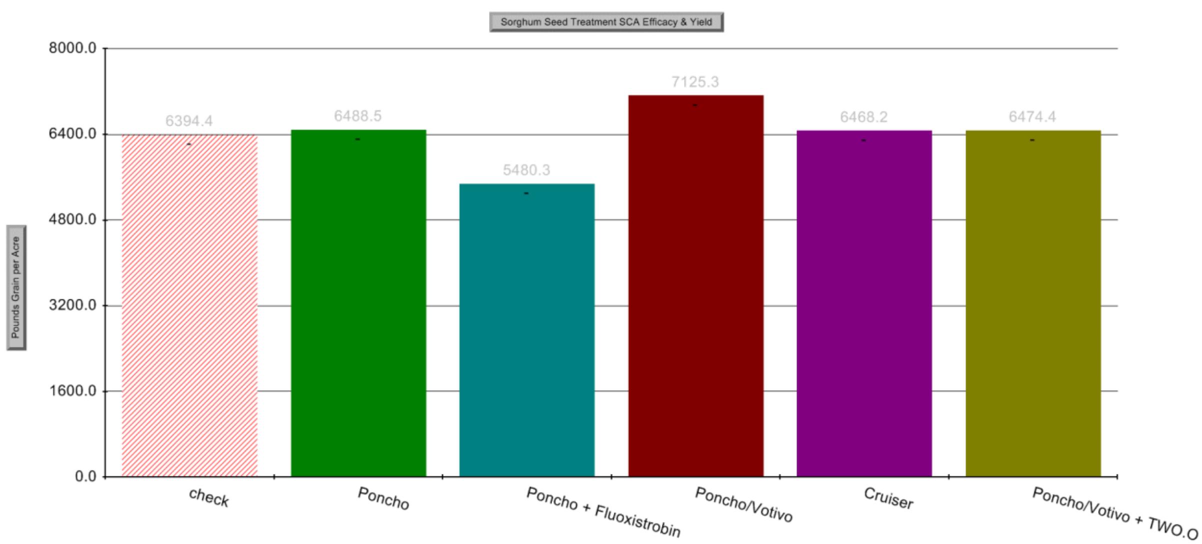


Figure 8. Grain yield in terms of pounds per acre by treatment.

Conclusions

The expressed differences in final plant stands at the 13 and 20 DAP dates between the insecticidal seed treatments and the check were likely due to wireworm control factors and should not be considered as an improvement in performance in agronomic vigor as highlighted by the similarities in the treatment's vigor ratings as seedlings. The added stand establishment qualities of the treatments in terms of wireworm control should be noted but if the likely wireworm factor could be removed it must be noted there are no establishment drags due to any insecticidal seed treatment effects.

It should be noted that sugarcane aphids did not arrive to pressure the field until 38 DAT and could not be counted until 44 DAP. Then aphids did not reach economic levels in the check until the 58 DAP date. At that point, all insecticidal seed treatments offered equal control to each other while offering superior SCA control over the check. After that date and despite being superior to the check, all treatments reached economic levels by the 65 DAP date. It should be fair to estimate that if the aphid had arrived and established earlier all insecticidal seed treatments offered roughly a 60 DAP length of protection.

Differences in damage ratings at the 72 DAP were from a 7-day period additional that the check plots were exposed to economic levels of aphids. These differences were not enough to cause significant yield differences. Had the aphid arrived and established earlier, that damage period would have likely been longer, offering increased economic benefit. The results show that a thorough and timely OVT treatment to economic aphids should be utilized once seed treatment efficacy ends. These results also ultimately indicate that any of the tested insecticidal seed treatments should offer roughly 60 days of economic aphid protection post planting.

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, Bayer Crop Science and Russ Perkins for sponsoring and partnership of this trial, the 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, Jerik Reed, and Christina Safford. Thank you all.

2018 Hale County Phytogen Limited Irrigation Cotton Behind Cotton Variety Trail

Texas A&M AgriLife Extension Service / Dow Crop Science

Hale County

Texas A&M AgriLife Research Farm-Halfway, Texas

Blayne Reed, EA-IPM Hale, Swisher, & Floyd and Dr. Ken Lege, PhytoGen Seed

Summary

Eight Phytogen Cotton varieties, PHY 250 W3FE, PHY 300 W3FE, PHY 320 W3FE, PHY 340 W3FE, PHY 350 W3FE, PHY 480 W3FE, PHY 490 W3FE, and the experimental PHY 2A31 W3FE were planted on May 14, 2018 in a large plot trial with 3 replications in a section of a pivot irrigated field at the Halfway Experiment Station with limited irrigation capabilities. The section of the pivot chosen was in its third season of continuous cotton production. Plots were 4-rows wide with a row width of 40-inches and a variable plot length. Data on stand counts and vigor ratings were taken on 30 May and end of season agronomic data was collected on 27 September. Harvest occurred on 2 November via the Halfway Experiment Station's harvest equipment, weight trailer, and module builder. Burr weights for each plot were recorded and grab samples from each plot were taken. Samples were subsequently ginned by Phytogen via company sample gin and all percent turnout, lint data, and fiber quality measurements were recorded.

There were no significant differences in plants per acre counts (*P*=0.4239) or seedling vigor ratings (*P*=0.1629) on the 30 May check date despite numerically different values. On the 27 September agronomic data collection date, there were significant differences in total plant height with PHY 490 W3FE being the tallest variety and the new experimental PHY 2A31 W3FE being the shortest with several differences among the varieties (*P*=0.0101). In terms of 1st fruiting branch, total plant nodes, node above cracked boll there were not significant differences (*P*=0.0750, *P*=0.1230, *P*=0.2268). In terms of node of the uppermost cracked boll the experimental variety PHY 2A31 W3FE had the highest cracked boll while PHY 300 W3FE had the lowest highest cracked boll with several other significant differences in the varieties (*P*=0.0132).

All lines were statistically similar in terms of lint yield per acre, the number one factor producers should consider for variety selection. The numeric differences in yield between these varieties, in this situation, and at this location only ranged between PHY 320 W3FE at 1,133 lint pounds per acre and PHY 480 W3FE at 1,040 lint pounds per acre. The lines PHY 250 W3FE, PHY 300 W3FE, PHY 350 W3FE, PHY 2A31 W3FE, and PHY 340 W3FE had significantly better turnout values (*P*=0.0419). The lines PHY 2A31 W3FE and PHY 350 W3FE had significantly higher micronaire values (*P*=0.0024) while the lines PHY 250 W3FE and PHY 350 W3FE had longer fiber lengths (*P*=0.0038). The lines PHY 250 W3FE, PHY 300 W3FE, PHY 320 W3FE, PHY 350 W3FE, and PHY 2A31 W3FE had significantly better loan value (*P*=0.0002). With all factors considered and calculated, the variety PHY 250 W3FE expressed the greatest numeric dollar value per acre at $616 per acre and PHY 480 W3FE had the least value at $503 per acre, but none of these final dollar values were significant (*P*=0.2209).

Objective

Determine the value of selected Phytogen Cotton Seed varieties in Hale County in a non-rotation, limited irrigation situation.

Materials and Methods

Eight Phytogen Cotton varieties, PHY 250 W3FE, PHY 300 W3FE, PHY 320 W3FE, PHY 340 W3FE, PHY 350 W3FE, PHY 480 W3FE, PHY 490 W3FE, and the experimental PHY 2A31 W3FE were planted on May 14, 2018 in a large plot trial with 3 replications in a section of a pivot irrigated field at the Halfway Experiment Station with limited irrigation capabilities. The section of the pivot chosen was in its third season of continuous cotton production. Plots were 4-rows wide with a row width of 40-inches and a variable plot length.

All agronomic production and harvest inputs were made by the staff of the Halfway Experiment Station under the direction of Farm Manager Casey Hardin. About 8-acre inches of irrigation water was applied between pre-irrigation and absolute cut-out via LEPA irrigation with an additional 4.2 in-season acre inches of rainfall fell during the same growing period. An additional 4.9-acre inches of rainfall fell on the trial during the first open boll stage and harvest causing substantial harvest aid issues and adding little to yield potential.

On 30 May, data on early season agronomic values and ratings were taken. Five randomly selected 1/1000-acre areas per plot were counted for stand count values and averaged together for a representative stand count value while whole plots were rated on a 1-5 seedling vigor rating scale.

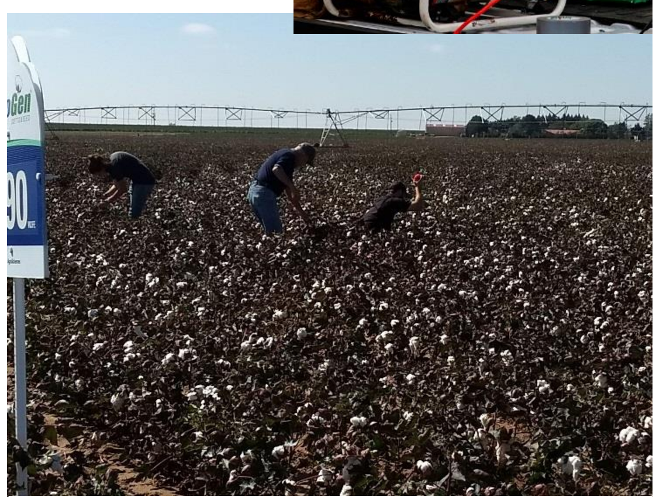


Figure 25. Photos from the 2018 Hale County Phytogen Variety Trial showing the PPM Field Scouts and Lab Techs managing plot seed and equipment and gathering agronomic data.

On the 27 September date late season agronomic data were collected with 5 randomly selected plants per plot measured for plant height, 1st fruiting branch, total number of fruiting branches, node of the uppermost harvestable boll, and uppermost open boll.

Harvest occurred on 2 November via the Halfway Experiment Station's harvest equipment, experimental cotton weight trailer, and module builder. Burr weights for each plot were recorded and grab samples from each plot were taken following burr weight recording. Samples were subsequently transferred to Phytogen personnel and ginned via company sample gin. All percent turnout, lint data, and fiber quality measurements were taken and recorded in house and shared back with the primary researchers. All results, both agronomic, yield, and fiber, were statistically compared utilizing ANOVA and LSD = 0.05.

Results and Discussion

There were no significant differences in plants per acre counts (*P*=0.4239) or seedling vigor ratings (*P*=0.1629) on the 30 May check date despite numerically different values. The numeric differences in seedling vigor ratings indicate that the line PHY 320 W3FE got off to the best start while PHY 480 W3FE was the slowest.

On the 27 September agronomic data collection date, there were significant differences in total plant height with PHY 490 W3FE being the tallest variety and the new experimental PHY 2A31 W3FE being the shortest with several differences among the varieties (*P*=0.0101). In terms of 1st fruiting branch, total plant nodes, node above cracked boll there were not significant differences (*P*=0.0750, *P*=0.1230, *P*=0.2268). In terms of node of the uppermost cracked boll the experimental variety PHY 2A31 W3FE had the highest cracked boll while PHY 300 W3FE had the lowest highest cracked boll with several other significant differences in the varieties (*P*=0.0132).

All lines were statistically similar in terms of lint yield per acre. The numeric differences in yield between these varieties, in this situation, and at this location only ranged between PHY 320 W3FE at 1,133 lint pounds per acre and PHY 480 W3FE at 1,040 lint pounds per acre. All other lines fell in between these two lint yield values (*P*=0.7821).

The lines PHY 250 W3FE, PHY 300 W3FE, PHY 350 W3FE, PHY 2A31 W3FE, and PHY 340 W3FE had significantly better percent lint turnout values compared to the remaining lines (*P*=0.0419).

The lines PHY 2A31 W3FE and PHY 350 W3FE had significantly higher micronaire values (*P*=0.0024) while the lines PHY 250 W3FE and PHY 350 W3FE had longer fiber lengths (*P*=0.0038) compared to the other cotton varieties.

The lines PHY 250 W3FE, PHY 300 W3FE, PHY 320 W3FE, PHY 350 W3FE, and PHY 2A31 W3FE had significantly better loan value (*P*=0.0002) aiding in the dollar value per acre.

With all factors considered and calculated, the variety PHY 250 W3FE expressed the greatest numeric dollar value per acre at $616 per acre and PHY 480 W3FE had the least value at $503 per acre, but none of these values was significant (*P*=0.2209).

PhytoGen COTTONSEED — *W3FE Innovation Trial*

Enlist Cotton — Texas A&M AgriLife Extension

Grower Cooperator:	Blayne Reed, TAMU	Planting Date:	5/14/2018
PhytoGen CDS:	Ken Legé, Ph.D.	Seed Treatments:	TRiO
Location:	Halfway, TX	Moist. @ planting:	Good
Replicates:	3	Soil Temp @ planting:	
Plot Size:	4 rows x various lengths	Seed/Acre:	
Row Spacing:	40"	GPS Lat:	34.183893
Beds:	Yes	GPS Long:	-101.945999
Previous crop(s):	Cotton	Elevation:	3519
Soil type:	Pullman clay loam	Harvest Date:	11/2/2018
Irrigation:	LEPA		

Variety	Lint Yield (lbs/A	Turnout (%)	Micronaire	Length (in)	Strength (g/tex)	Uniformity (%)	Loan Value ($/lb)	Lint Value ($/A)
PHY 250 W3FE	1130	35.4	3.60	**1.17**	**33.2**	83.2	0.5447	**616**
PHY 300 W3FE	1124	35.3	3.66	1.13	31.1	83.2	0.5418	609
PHY 320 W3FE	**1133**	34.3	3.67	1.13	31.6	84.0	0.5348	605
PHY 490 W3FE	1125	34.2	3.57	1.15	32.8	84.0	0.5370	605
PHY 350 W3FE	1091	35.4	3.90	1.16	32.2	83.8	0.5453	595
PX2A31W3FE	1060	**35.8**	**3.94**	1.15	33.1	**84.5**	**0.5463**	579
PHY 340 W3FE	1054	35.5	3.55	1.13	31.7	83.4	0.5338	563
PHY 480 W3FE	1040	34.1	3.00	1.15	31.4	83.9	0.4868	506
Mean	*1095*	*35.0*	*3.61*	*1.15*	*32.1*	*83.7*	*0.5338*	*585*
LSD	*ns*	*0.7*	*0.22*	*0.01*	*ns*	*ns*	*0.0115*	*ns*
R-square	*0.23*	*0.61*	*0.75*	*0.73*	*0.59*	*0.50*	*0.83*	*0.45*
CV (%)	*8.2*	*1.9*	*5.7*	*1.0*	*2.8*	*0.8*	*2.0*	*8.5*
Prob>F, variety	*0.7821*	*0.0419*	*0.0024*	*0.0038*	*0.0748*	*0.2792*	*0.0002*	*0.2209*

Loan values according to 2018 CCC loan schedule, assuming base color (41) and leaf (4) grades

Variety	Node of 1st Fruiting Branch	Final Plant Height *(in)*	Final Total Nodes	Nodes Above Cracked Boll	Plant Population *(#/A)*	Vigor Rating *(1=excellent; 5=very poor)*
PHY 250 W3FE	8.2	20.7	17.8	1.3	50867	2.5
PHY 300 W3FE	6.7	22.4	16.1	2.3	46400	2.3
PHY 320 W3FE	7.6	21.8	17.1	1.7	50933	1.9
PHY 490 W3FE	7.6	**24.1**	17.6	**0.9**	**49267**	2.4
PHY 350 W3FE	6.8	22.1	16.9	2.0	49467	2.2
PX2A31W3FE	8.0	20.1	**18.4**	1.3	48533	2.4
PHY 340 W3FE	**6.6**	23.8	16.7	1.3	45800	**3.4**
PHY 480 W3FE	8.0	22.6	18.1	**0.9**	48667	2.5
Mean	*7.4*	*22.2*	*17.3*		*48742*	*2.5*
LSD	*ns*	*2.0*	*ns*		*ns*	*ns*
CV (%)	*10.0*	*5.2*	*5.5*		*6.37*	*22.7*
Prob>F, variety	*0.0750*	*0.0101*	*0.1230*		*0.4239*	*0.1629*

Values in bold are highest within each column; values in green-shaded cells are not significantly different from the highest value

Table 3. Trial agronomic and yield data. Values highlighted are significant to at least the P=0.05 level. See column Prob(F) for specific significance level.

Conclusions

All lines were statistically similar in terms of lint yield per acre, the number one factor producers should consider for variety selection. All these lines, given the agronomic environment they were tested under, show to offer acceptable yield potential. The superior performance of some of the lines in loan value as well as some of the turnout and lint quality data, should be of interest in producer's decisions on these lines and if they are appropriate for their respective cotton farming operations.

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, Corteva for sponsoring and partnership of this trial, the 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, Jerik Reed, and Christina Safford. Thank you all.

2018 Swisher County Phytogen Cotton Variety Trail

Texas A&M AgriLife Extension Service / Dow Crop Science
Hale, Swisher, & Floyd County
Cooperator: Mike Goss
Blayne Reed, EA-IPM Hale, Swisher, & Floyd and Dr. Ken Lege, PhytoGen Seed

Summary

Eight Phytogen Cotton varieties, PHY 250 W3FE, PHY 300 W3FE, PHY 320 W3FE, PHY 340 W3FE, PHY 350 W3FE, PHY 480 W3FE, PHY 490 W3FE, and the experimental PHY 2A31 W3FE were planted on 21 May 2018 in a large plot trial with 3 replications in a portion of a new drip irrigated field near Tulia, Texas belonging to Mike Goss with heavier irrigation potential. The trial was planted into heavy wheat stubble strictly obeying a wheat, layout, cotton no-till rotation. Plots were 8-rows wide with a row width of 30-inches and a plot length of ¼ mile. Data on stand counts and vigor ratings were taken on 5 June and end of season agronomic data was collected on 2 October. Harvest occurred on 20 November via Mike Goss' harvest equipment, Texas A&M AgriLife weight trailer, and module builder. Burr weights for each plot were recorded and grab samples from each plot were taken. Samples were subsequently ginned by Phytogen via company sample gin and all percent turnout, lint data, and fiber quality measurements were recorded.

There were no significant differences in seedling stand (P=0.4422) for the early 5 June agronomic check date, but there were several differences in seedling vigor (P=0.0013) with the line PHY 480 W3FE, PHY 250 W3FE, and PHY 2A31 W3FE emerging with the better performances. On the 2 October late agronomic check date, there were differences in plant height (P=0.0001), fist fruiting branch (P=0.0256), total nodes (P=0.0276), and uppermost cracked boll node (P=0.0133) with the lines PHY 2A31 W3FE and PHY 250 W3FE being among the most determinate and shortest statured lines, PHY 300 W3FE and PHY 350 W3FE being among the earliest fruit setting, PHY 490 W3FE having the most nodes, and PHY 2A31 W3FE, PHY 250 W3FE, and PHY 300 W3FE being the most harvest aid ready and mature.

Significant differences were found in lint yield between varieties (P=0.0073) once percent turnout was calculated from the grab samples with the lines PHY 340 W3FE and PHY 300 W3FE performing best with 1,894 and 1,872 lint pounds per acre respectively with the line PHY 320 W3FE only producing 1,729 lint pounds per acre. Several differences were noted in fiber quality measurements resulting in the lines PHY 350 W3FE, PHY 2A31 W3FE, and PHY 250 W3FE having better loan values than the other lines (P=0.0046). There were no significant differences between the lines in terms of lint value per acre (P=0.1598) but with all factors calculated the line PHY 300 W3FE numerically lead the trial with a $998 per acre value.

Objective

Determine the value of selected Phytogen Cotton Seed varieties in Swisher County in a no-till full rotation with focused irrigation ability.

Materials and Methods

Eight Phytogen Cotton varieties, PHY 250 W3FE, PHY 300 W3FE, PHY 320 W3FE, PHY 340 W3FE, PHY 350 W3FE, PHY 480 W3FE, PHY 490 W3FE, and the experimental PHY 2A31 W3FE were planted on 21 May 2018 in a large plot trial with 3 replications in a portion of a new drip irrigated field near Tulia, Texas belonging to Mike Goss with heavier irrigation potential.

All agronomic production and harvest inputs were made by Mike Goss with input considerations and recommendations made by the Plains Pest Management Scouting Program. The field planted into was heavy with wheat stubble following a wheat, layout, cotton no-till rotation. Plots were 8-rows wide with a row width of 30-inches and a plot length of ¼ mile.

Data on stand counts and vigor ratings were taken on 5 June and end of season agronomic data was collected on 2 October. Harvest occurred on 20 November via Mike Goss' harvest equipment, Texas A&M AgriLife weight trailer, and module builder. Burr weights for each plot were recorded and grab samples from each plot were taken. Samples were subsequently ginned by Phytogen via company sample gin and all percent turnout, lint data, and fiber quality measurements were recorded.

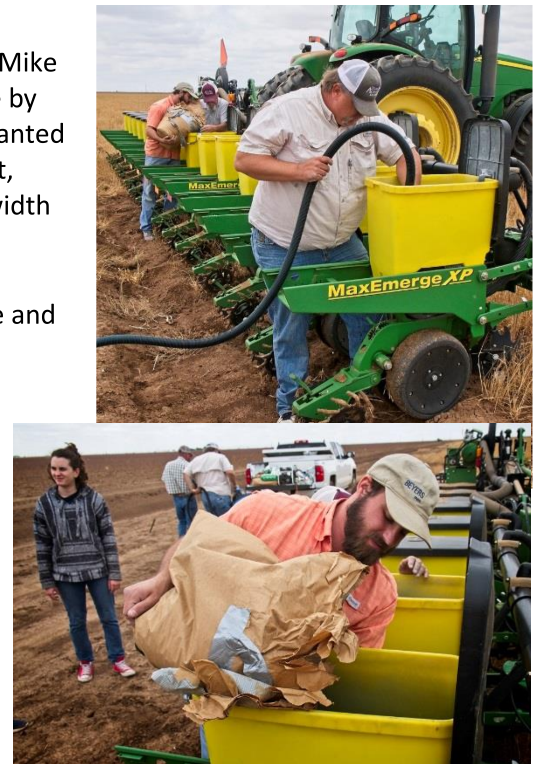


Table 1. The 2018 PPM crew and Mike Goss working to plant the replicated trial in May 2018 with the correct seeds in the correct, randomized plots.

Results and Discussion

There were no significant differences in lint value per acre (P=0.1598) with the lines PHY 300 W3FE and PHY 340 W3FE leading the varieties with values of $998 and $995 per acre with the line PHY 320 W3FE offering the least with $922 per acre. There were significant differences in all other measured factors except plant population.

Significant differences were found in lint yield between varieties (P=0.0073) once percent turnout was calculated from the grab samples with the lines PHY 340 W3FE and PHY 300 W3FE performing best with 1,894 and 1,872 lint pounds per acre respectively with the line PHY 320 W3FE only producing 1,729 lint pounds per acre. Several differences were noted in fiber quality measurements resulting in the lines PHY 350 W3FE, PHY 2A31 W3FE, and PHY 250 W3FE having better loan values than the other lines (P=0.0046).

The lines PHY 300 W3FE, PHY 340 W3FE, and PHY 350 W3FE all expressed first fruiting node placement before node 7 while PHY 2A31 W3FE and PHY 250 W3FE proved to be the shorter, more determinant varieties in the trial. The lines PHY 490 W3FE and PHY 480 W3FE expressed the most total nodes with more than 18 with the lines PHY 480 W3FE, PHY 250 W3FE, and PHY 2A31 W3FE expressed the best seedling vigor ratings.

PhytoGen COTTONSEED **W3FE Innovation Trial**

Enlist Cotton

TEXAS A&M AGRILIFE EXTENSION

Grower Cooperator:	Mike Goss	Planting Date:	5/21/2018
Trial Cooperator:	Blayne Reed, TAMU	Seed Treatments:	TRiO
PhytoGen CDS:	Ken Legé, Ph.D.	Moist. @ planting:	Good
Location:	Tulia, TX	Soil Temp @ planting:	Warm
Replicates:	3	Seed/Acre:	
Plot Size:	8 rows x 1900'	GPS Lat:	34.477571
Row Spacing:	30"	GPS Long:	-101.793646
Beds:	No	Elevation:	3521
Previous crop(s):	Cotton	Harvest Date:	11/20/2018
Soil type:	Pullman clay loam		
Irrigation:	Drip		

Sorted by Lint Value

Variety	Lint Yield (lbs/A	Turnout (%)	Micronaire	Length (in)	Strength (g/tex)	Uniformity (%)	Color Grade	Leaf Grade	Loan Value ($/lb)	Lint Value ($/A)
PHY 300 W3FE	1872	36.1	4.15	1.11	30.0	82.8	31, 41, 41	4.3	0.5328	998
PHY 340 W3FE	1894	36.2	4.15	1.11	29.8	82.6	41, 41, 41	4.3	0.5250	995
PHY 350 W3FE	1787	35.9	4.18	1.14	29.4	82.9	31, 31, 41	3.0	0.5552	992
PHY 490 W3FE	1805	35.5	4.36	1.14	30.7	83.5	31, 41, 41	4.0	0.5445	983
PX2A31W3FE	1737	35.4	4.06	1.15	30.8	83.3	31, 31, 41	3.3	0.5573	968
PHY 250 W3FE	1744	35.4	3.89	1.15	31.6	82.3	31, 41, 41	3.0	0.5538	966
PHY 480 W3FE	1758	34.9	3.72	1.12	28.6	83.5	31, 31, 31	4.3	0.5393	948
PHY 320 W3FE	1729	34.2	3.85	1.11	30.1	82.5	31, 41, 41	4.3	0.5330	922
Mean	*1791*	*35.5*	*4.05*	*1.13*	*30.1*	*82.9*		*3.8*	*0.5426*	*972*
LSD	*89*	*0.8*	*0.19*	*0.03*	*1.2*	*0.8*		*1.0*	*0.0099*	*ns*
CV (%)	*2.8*	*1.3*	*2.7*	*1.3*	*2.3*	*0.6*		*14.4*	*1.7*	*3.5*
Prob>F, variety	*0.0073*	*0.0017*	*0.0001*	*0.0098*	*0.0044*	*0.0327*		*0.0167*	*0.0046*	*0.1598*

Variety	Node of 1st Fruiting Branch	Final Plant Height *(in)*	Final Total Nodes	Nodes Above Cracked Boll	Plant Population *(#/A)*	Vigor Rating *(1=excellent; 5=very poor)*
PHY 340 W3FE	6.8	32.6	17.3	0.9	47800	2.1
PHY 300 W3FE	6.6	30.5	17.2	1.4	46000	2.3
PHY 490 W3FE	7.8	31.7	18.7	2.9	46267	1.8
PHY 350 W3FE	6.7	30.6	16.3	1.1	51200	1.9
PHY 480 W3FE	7.8	28.2	18.6	2.7	46533	1.4
PHY 250 W3FE	7.7	26.2	17.7	0.8	50200	1.6
PX2A31W3FE	8.3	24.2	17.4	0.7	48667	1.6
PHY 320 W3FE	7.2	29.9	17.2	1.0	50467	1.8
Mean	*7.4*	*29.2*	*17.6*		*48392*	*1.8*
LSD	*1.1*	*1.8*	*1.3*		*ns*	*0.3*
CV (%)	*8.2*	*3.4*	*4.1*		*7.2*	*11.0*
Prob>F, variety	*0.0256*	*0.0001*	*0.0276*		*0.4422*	*0.0013*

Values in bold are best within each column; values in green-shaded cells are not significantly different from the best value

Conclusions

With no significant differences in dollar value per acre found between varieties, and all variety per acre values being so high, all tested varieties could be considered as a good fit for a no-till, higher yield potential situation in Swisher County.

Most other measured fiber and yield factors did show significant differences, including yield, which did not always relate directly to value per acre with some factors increasing bottom line value to match the highest yielding lines. These differences should be considered when choosing a variety best suited for any production situation. Which of these differences are of prominent importance will likely vary depending upon expected field situation. Loan value of fiber qualities might be considered more important than pure yield potential, especially if this value translates into improved per acre value. In other situations, seedling vigor or earliness might be of primary import, particularly for late planting situations.

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 and his working crew for cooperating with us to complete this trial, Corteva for sponsoring and partnership of this trial, the 2018 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Nik Clarkson, Nicole Kiem, Denise Reed, Jerik Reed, and Christina Safford. Thank you all.