Plains Pest Management

Integrated Pest Management Program

Hale and Swisher County

<u>2021 Annual Report</u>

Prepared by:

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Extension Agent-IPM

TEXAS IPM

Partners with Nature

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2020 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 2020 Plains Pest Management Program:

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Lauryn Carrol	Plains Pest Management, Intern
Jerik Reed	Plains Pest Management, Intern
Denise Reed	Plains Pest Management, Lab Assistant
Patricia Phillips	Plains Pest Management, Secretary

Plains Pest Management 2021 Advisory Committee

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

2021 Plains Pest Management Ag & Research IPM

Blayne Reed, Extension Agent – IPM, Hale and Swisher Counties

Relevance

Production agriculture is the foundation of the economies of Hale and Swisher 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 producers about the latest IPM principles and help implement sound IPM control strategies into producer's operations in Hale and Swisher Counties.

Response

The Plains Pest Management Association, made up of 16 participating grower members and steered by a chairing committee and the IPM agent, made informing the producers in Hale and Swisher Counties about the latest agriculture IPM principles, control methods and options a priority in 2020. During the year the activities included:

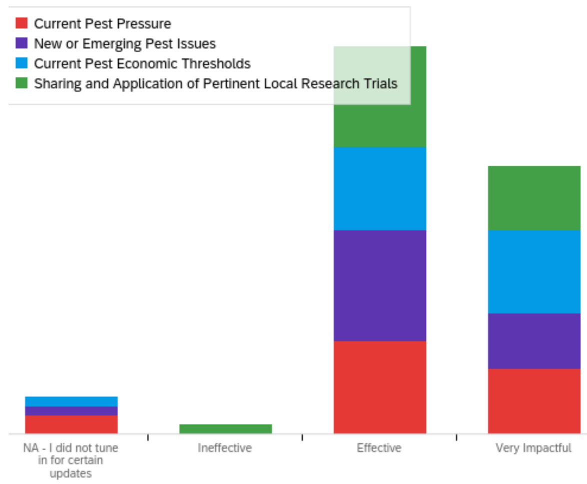
- Weekly field scouting for insect, weed, and disease problems of the 16 participating grower member's fields (6,796.49 acres of all crops) were conducted over the 2021 growing season. Information from this weekly field scouting was shared, interpreted, and IPM solution recommendations given to the participating growers via scouting reports and direct interactions.
- Data generated from the field scouting, along with pertinent IPM research and successful recommendations were shared through the Plains Pest Management Newsletter weekly throughout the growing season and periodically during the offseason (16 issues, 436 weekly subscriber recipients) and though the weekly High Plains IPM 'Radio' Podcast (28 podcasts) with All Ag, All Day rebroadcast.
- Locally conducted 10 independent agriculture IPM related research trials and assisted with district and State IPM research trials with all resulting data rapidly disseminated through newsletters, podcast, blogs, radio programs, and direct interactions.
- Gave IPM presentations(in person and remote) at 7 grower meetings, 3 professional and peer meetings, 2 producer turn-row meetings, and a Field Scout School where IPM was a topic (44 CEUs offered total). Made 2 Pest Patrol Hotline submissions summing a current pest situation nearing problem status area wide and gave IPM recommendations.

Results

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

The 2021 Plains Pest Management online survey responders were made up of: **Ag Producers – 31.58%, Independent Ag Crop Consultants –21.05%, Ag Industry –26.32%, Ag Retail – 5.26%, Landlord, Homeowners, Gardeners & Horticulturalists – 5.26%.**

Respondents to the PPM Survey were asked how helpful the Plains Pest Management IPM program was during the 2021 growing season in improving your awareness of the growing season's issues.



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 and Swisher Counties, what would it be? Responders were also asked to respond with how many acres their work in agriculture represent?

The average value response was $51.85 per crop acre and represented 251,415 acres of all major crops grown in the area (large outlier responses in responder acre representation with values of more than 50,000 acres from the ag industry sector were removed from the total acres represented in the survey).

Responders to the High Plains 'Radio' Podcast result survey were asked what value per acre the podcast had this year.

The average value response was $43.42 per respondent crop acre.

Summary

The IPM Program in Hale and Swisher Counties is proving to have real value and impact in the Hale and Swisher production agriculture economy. If the survey responder estimated **$51.85 per production acre estimate** of the value of the IPM Program is multiplied by just **the survey responders represented production acres, a $13,035,867.75 potential IPM Program impact figure** emerges. Even if this conservative survey-based estimate proved to be high, the Plains Pest Management is still not only important to the production agriculture economy in the Hale and Swisher area but is a significant part of that economy's maintenance and function. The addition of new podcast and remote educational efforts are also quickly showing returns and educational value results.

2021 General Horticulture, Homeowner, Gardening, & Youth IPM Education

Blayne Reed, Extension Agent – IPM, Hale & Swisher County

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 forty plus year history of proven environmentally sound and effective approaches to pest management by utilizing a combination of established principles and evolving specific control practices to maintain pest control. The Plains Pest Management IPM Program is an educational program that strives to educate the producers and citizens of Hale and Swisher Counties about the IPM principles and the latest IPM control methods to help implement IPM into our daily pest control strategies.

Response

The Plains Pest Management Association, made up of 16 participating grower members and steered by a chairing committee and the IPM Agent, made informing the general populace of Hale and Swisher Counties about IPM principles and implementation into our daily pest control habits one of the IPM Program's focus in 2020. The year's activities included:

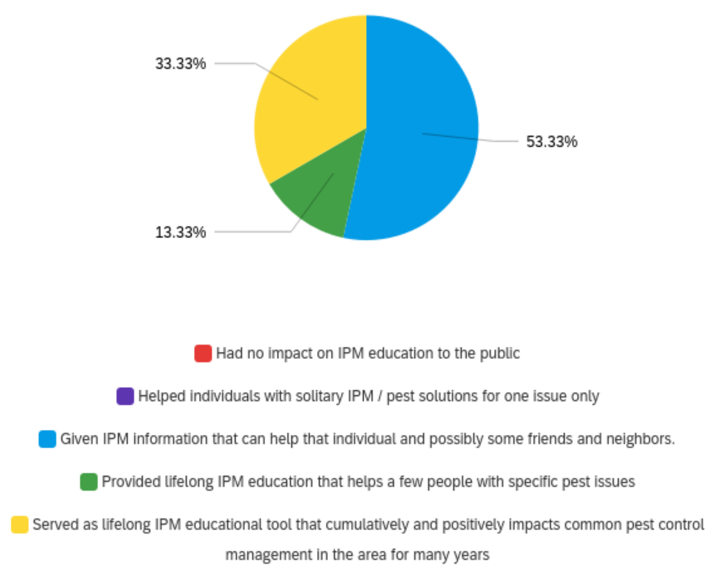
- Direct non-ag customer interactions through site visits (36 with 84 contacts), insect ID (18), phone calls / emails (21), and civic group presentations (2) that involved IPM Education and solution recommendations.
- Written newspaper articles and interviews (2), dedicated radio topics (2), and blogs and other specially dedicated social media posts (18),
- Participation in Texas A&M Entomology Departmental Insect Factsheets development for online insect identification and education (4 insect factsheets written).
- Youth efforts involving coaching of the Hale & Swisher 4-H Entomology ID Teams (2 teams, 6 youth) with all contests, Texas 4-H Insect Photography State Contest Superintendent (41 contestants), and participation in Hale County Ag Fair for all 4th graders in Hale presentation (432 students).

2021 Sr. Hale County Entomology ID Team (2nd Place State)

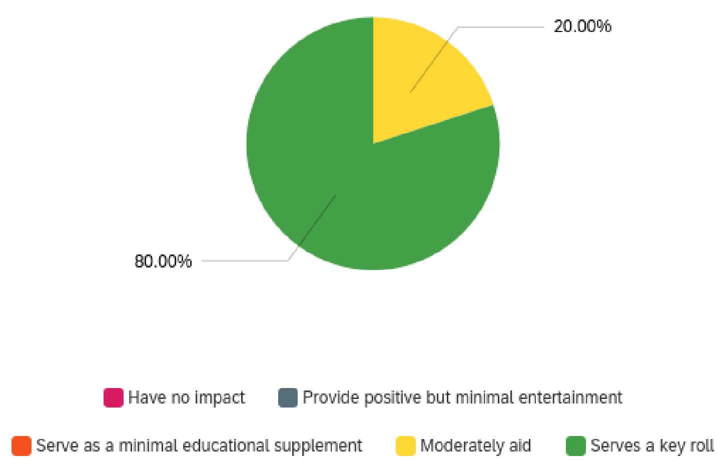
Results

A retrospective post evaluation instrument was distributed online to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) and other social media outlets.

The 2021 Plains Pest Management online survey responders were made up of: **Ag Producers – 31.58%, Independent Ag Crop Consultants –21.05%, Ag Industry –26.32%, Ag Retail – 5.26%, Landlord, Homeowners, Gardeners & Horticulturalists – 5.26%.**



The survey responders were also asked what role the program's efforts in youth IPM education were having in developing the area youth into tomorrow's leaders, scientists, agriculturalists, and professionals:



Summary

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

2021 In-Depth Managing Crops and Pests with Diminishing Resources

Blayne Reed, Extension Agent – IPM, Hale & Swisher County

Relevance

Production agriculture is the foundation of the economies of Hale and Swisher Counties, and irrigation has been a key component to that economy. Irrigation research and improved infrastructure have led to great advancements in improving irrigation water use efficiency and conservation on the Texas High Plains (THP) over the past 50 years. While these improvements extended the useful life of the Ogallala Aquifer for agricultural use into the 21st Century, there is no longer sufficient irrigation capacity to continue current levels or amounts of irrigation across much of the THP. The Plains Pest Management IPM Program is an educational program that strives to educate producers about the latest agricultural IPM principles and help implement sound IPM control strategies into producer's operations in Hale and Swisher Counties.

Response

The Plains Pest Management Association, made up of 16 participating grower members and steered by a chairing committee and the IPM agent, made informing the producers in Hale and Swisher Counties about the latest sustainable conservation production practices and evolving principles a priority in 2021. During the year the activities included:

- Weekly field scouting for insect, weed, irrigation scheduling, and disease problems of the 16 participating grower member's fields (6,796.49 acres) were conducted over the 2021 growing season. The information generated, with special emphasis on crop water management and other conservation practices, from this weekly field scouting was shared, interpreted, and solution recommendations given to the participating growers via scouting reports and direct interactions.

- Data generated from the field scouting, along with pertinent research and successful recommendations were shared through the Plains Pest Management Newsletter weekly throughout the growing season and periodically during the offseason (16 issues, subscribers) and though the weekly High Plains IPM 'Radio' Podcast (28 podcasts) with All Ag, All Day rebroadcast.

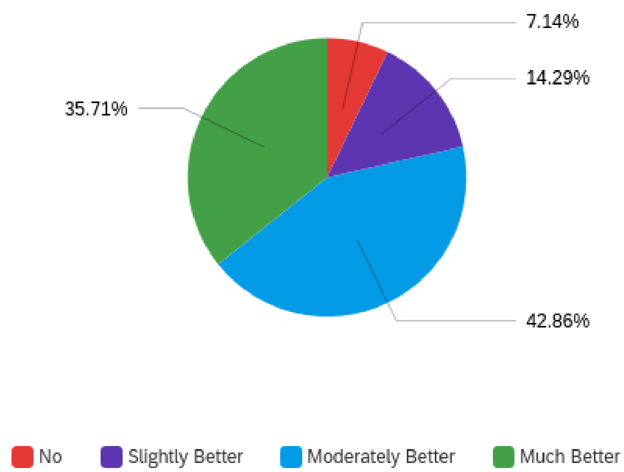
- Active sought grants and funding to conduct sustainable water conservation methods for the THP with applicable research partners. Increased emphasis on advancing crop water conservation practices addressed at all grower meetings, field days, podcasts, newsletters, and interviews with active participation in water conservation summits.

Results

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

The 2020 Plains Pest Management online survey responders were made up of: **Ag Producers – 31.58%, Independent Ag Crop Consultants –21.05%, Ag Industry –26.32%, Ag Retail – 5.26%, Landlord, Homeowners, Gardeners & Horticulturalists – 5.26%.**

The 2021 PPM survey responders were asked if they felt the educational efforts in crop management with diminishing resources do you feel you will be better prepared to meet your future challenges?



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 and Swisher Counties, what would it be?

<u>The average value response was $51.85 per crop acre.</u>

Summary

The IPM Program in Hale and Swisher Counties is proving to have real value and impact in the Hale and Swisher production agriculture economy. A solid **92.86%** of the PPM survey responders indicated that they would be at better prepared at some level for future diminishing water resource issues due to these educational efforts. With 2022 grant and other funding approved, additional education, demonstration, and hypothesis testing efforts to better aid producers with managing THP crops with diminishing water resources sustainably will be revisited and expanded.

2021 Ag Advocacy for Hale & Swisher IPM

Blayne Reed, Extension Agent – IPM, Hale and Swisher Counties

Relevance

Agriculture is the foundation of the economies of Hale and Swisher Counties. The vast majority of the United States population are at least two generations removed from production agriculture. Many, even those in the Hale and Swisher region, do not understand the importance or inner workings of agriculture, IPM, and how it impacts their daily lives. This Science of Agriculture (Ag Literacy/Awareness) program targets adults and youth not involved in production agriculture in Hale and Swisher County and offers ambassadorial education, insights, and potential educational projects they can become involved with.

Response

The Plains Pest Management Association, made up of 16 participating grower members and steered by a chairing committee and the IPM Agent, made advocating sustainable production agriculture to non-agricultural customers of the Hale & Swisher IPM Unit and IPM education a priority during 2021.

- Participation in Hale County Ag Fair for all 4th graders in Hale with educational presentation (432 students). Presentations to non-ag youth groups (2 with 48 contacts)
- Direct non-ag customer face to face interactions were opportunistic in nature with ag advocacy interactions recorded (72 contacts)
- Written newspaper articles and interviews published in non-ag outlets (2 articles) discussing ag and IPM issues.
- Participation in 2021 Ogallala Summit as breakout session host representing ag sector in multiple breakout discussion sessions about water conservation for a balanced representation of water use stakeholders in the six-State region (210 contacts).
- 2 non-ag radio programs in non-ag markets targeting discussions about sustainable agriculture and IPM in 2021.
- County Commissioner's Court interpretations (2 with 17 contacts)

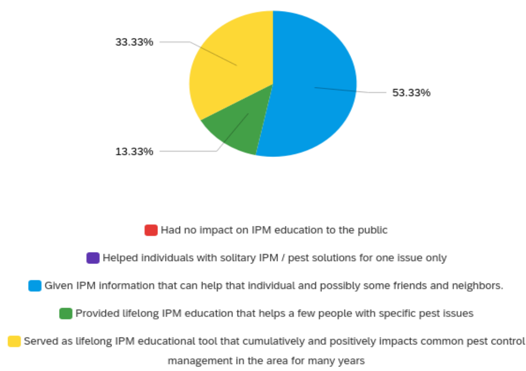
Discussions about agriculture and advocacy were common in 2021.

Results

A retrospective post evaluation instrument was distributed online to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) and other social media outlets. An interactive survey of the participants in the 2021 Ogallala Summit and personal reactions were recorded from face-to-face interactions.

The 2021 Plains Pest Management online survey responders were made up of: **Ag Producers – 31.58%, Independent Ag Crop Consultants –21.05%, Ag Industry –26.32%, Ag Retail – 5.26%, Landlord, Homeowners, Gardeners & Horticulturalists – 5.26%.**

One of the questions from the 2021 online survey dealt with impacts from the program's educational efforts in the non-agriculture sector. Responders were asked how much impact these educational efforts made:



An artist attending the 2021 Ogallala Summit recorded the impact and mindset of the balanced representation of the summit following its conclusion. There were no calls for the legal restriction of water use from agriculture for protected use by the high population centers from the attendees, as there had been early in the discussions by several stake holding parties. A better understanding of mutual support from all stakeholders was achieved through the advocacy of agriculture at the summit.

100% of face-to-face interactions resulted in positive responses with curious questions and attentive attitudes.

Summary

Impact from a year of agricultural advocacy is difficult to result-quantify from a mostly remote setting as 2021 presented. All available responses to the advocacy efforts were positive with informative interactions, particularly from the Ogallala Summit where non-agricultural stakeholders shared thoughts and challenges over conserving the limited resource . Continued advocacy efforts remain a desperate necessity for the agricultural industry for the safeguarding of the Nation's food supply and sustainability of production.

2021 Educational Activities

Farm and Site Visits	1,714
Number of Newsletters Released	16
Newsletter Recipients	26,066
Direct Contacts	5,014
Radio Programs	30
Blog Releases	86
Ag Consultants, CEA, and Field Scouts Trained	89
Newspaper / Magazine / online Magazine articles (written or interviewed)	16
Research Trials Initiated	14
Research Trials Supported	14
Professional Presentations	8
Presentations / Programs / Field Days Made for Adults	19
Presentations Made to Youth	7
Pest Patrol Hotline Alerts	3
High Plains IPM 'Radio' Podcasts	28

Activity Highlights

Plains Pest Management Scouting Program (6,796.49 acres)
Applied Research Projects
All Ag, All Day Radio Programs
Hale & Swisher 4-H Youth Entomology Projects
Horticulture IPM Spot Checks
Hale County Youth Ag Fair
High Plains Association of Crop Consultants
CEU training & County Meeting Support
Texas Pest Management Association
Agent Trainings
FOCUS on South Plains Agriculture
Newspaper Press Releases
Early Professional Hands-On Field Scout Training

Plains Pest Management Newsletter
Plains Pest Management Bugoshere (blog)
Hale & Swisher Ag Day
Hale County BLT Program Support
Progressive Growers Breakfasts
Entomological Society of America
Field Scout Schools
Ogallala Water Conference
Pest Patrol Hotline
4-H Entomology ID Teams
Corteva Innovations
High Plains IPM 'Radio" Podcast
Hale, Swisher, & Floyd Cotton Field Day
Halfway Research Field Day

2021 at a Glance

The following is a brief overview of the 2021 growing season and pest populations in Hale & Swisher County agricultural crops. Copies of the Plains Pest Management Newsletters published in 2021 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 2021 on the High Plains were no exception.

The 2021 season started in extreme drought conditions with wheat established well but faring poorly as the spring progressed. This led to many wheat fields having been made use for alternative resources such as cover for summer crops or graze out. Alfalfa weevil populations moved into area fields for the second year in a row causing economic damage and triggering control treatments through March and April, some fields requiring multiple treatments. This larval damage combined with drought conditions made early cutting of alfalfa to be of poor quality.

As May began, very little relief from the drought situation had come with only very light and scattered showers falling that offered very little usable moisture. Even pasture situations became dire, and cattle sell off from the area began. With irrigation systems and Ogallala resources having already been stressed too far in recent years, most summer crop planting intentions were put on hold until relief did come for both dryland and irrigated acres. A drastic change in weather patters soon followed with multiple widespread and heavy rain events across the region. New problem arose as wet weather continued through the month and into June. Soil temperatures plummeted despite the calendar date and fields quickly became quagmires. Producers were now had very few days available to conduct field work and plant. In the few days acceptable for field work between rain events, producers covered a remarkable amount of acres with planting, fertilizer, and herbicide applications with most fields planting dates occurring on or near the insurance cut-off plant date for cotton. Still many fields missed this insurance last planting date for cotton or were planted later to alternate grain crops such as late corn, sorghum, or hay crops.

As field crop planting was hurriedly underway, area pastures quickly recovered with the multiple rains. The area cattle sell-off was curbed and a quick buy back began with summer grass grazing suddenly available to cow-calf producers. An unusually high pasture weed problem soon ensued for the balance of the summer. The few wheat fields that were left for grain were in early grain fill stage once the rainfall events began. This did aid yields some in grain fill but also caused harvest issues in terms of maturity (overly drought stressed areas or pockets of most fields often had not exerted heads, barely still transpiring and developed well behind the balance of the field). Wheat grain yields were rarely above 25 bushels for irrigated wheat and 10 for dryland.

Most summer crops were slow starting due to cool soil temperatures, increased seedling disease, and increased weather damage. This combined with the generally late planting date caused the 2021 crop to be considered late for the majority of the summer. Rain events continued with some regularity through the whole of June and most of July. Weed populations flushed with each rain event continuing to put pressure on hastily incorporated residual herbicides and producers trying to make timely applications for optimal control.

During this early summer timeframe, an rarely seen population of fleahoppers began plaguing squaring cotton. It is very likely that the flush of rain inspired and weeds, in all fields, field margins, and pastures alike availed an unusually high amount of host plant feeding sites for the fleahoppers. Once these weeds were controlled over the early summer, these primary host plants became unavailable to a now massive fleahopper population. The now late cotton crop remained susceptible to the fleahopper much longer in the calendar year than usual as first bloom dates were generally delayed until late July. Typically, fleahoppers do not damage cotton once flowering and boll set has begun. These factors resulted in about 85% of area cotton fields requiring treatment for economic populations of fleahoppers. The extended pressure from fleahopeprs moving into cotton and the lateness of the crop caused the need for multiple treatments in many fields, something almost unheard of on the Texas High Plains for fleahopper control.

Corn and sorghum weathered June and July better but were still considered late due to planting date. Very few pests of note were issues for the grain crops early in their development, which proceeded well. This included the presence of fungal diseases despite humid and rainy conditions during the vegetative stages.

Rainfall events generally stopped in late July or early August for most fields. Between the start of rainfall events in May until the last notable even, most fields had almost received their annual average rainfall. Cotton fields were a bit growthy despite PGR applications and fruit load could be considered light as cotton fields moved into bloom stages. Lygus and bollworm pressure was almost nonexistent with few fields holding notable populations and it was believed that fields could makeup fruit load late in the year if heat units continued.

Despite annual rainfall amounts having almost been reached in just a few months, soil moisture profiles remained fairly low for all crops. Before the rains began, deep soil moisture was severely lacking. Early season crops either tended to use the moisture available to develop to this point in the season or fields experienced a high amount of runoff. In both cases, soil moisture was lacking just as all summer crops came into peak water use and reproductive stages. All crops had to rely upon limited irrigation capacities for grain fill and boll set. With intense heat and stress, the Banks grass mite reached economic levels in roughly 25% of area corn. In sorghum, the sugarcane aphid population seemed to arrive in most fields just about bloom stage and increase rapidly, reaching ET in about 80% of area grain, seed, and hay sorghums. Frequent irrigations and early morning dews, following such a wet early summer, led to quite a bit of late corn reaching economic levels for southern rust with about 30% being treated.

As crops moved into the fall, plenty of developmental time and heat awaited. The annual killing freeze actually arrived in mid-November, about two weeks late. Harvest aid treatments for cotton did start later than an average year, but volume of acres treated and ready had caught up by the freeze date. With a few high-capacity systems, the limited irrigation capacities could not keep up with crop needs and yields suffered without any rainfall support. Dryland cotton raced into early cut-out, sometimes mere weeks following first bloom. Most irrigated cotton followed suit with mostly average cut-out dates despite late and slow starts to the year. The few higher capacity irrigation systems in the area did have cotton fields very late, attracting the few area Lygus in the area to threaten the already rank fields with yield losses. A few Lygus treatments were justified as late as the first week of September in the ranker fields. These later fields became a concern for late season maturity management and some managed maturity applications were made, but all fields were feasibly ready for the freeze date when it arrived.

Following the early season rains and a quick change in producer crop expectations, hopes were high for good yields combined with rising commodity prices. Indeed, failure to plant issues would have been widespread if not for the release of rainfall in May. Rains that continued though July gave hopes of solid yields with producers feeling that deep moisture would be available. The deep moisture was either utilized by the crops hand to mouth or was never really available. The dry situations during peak water use stages in most crops without sufficient moisture did have a negative impact on yields. Most cotton and corn were considered to make 20% or more off producer expected yields. This dropped average dryland cotton yields to 100-200 pounds lint per acre and irrigated to 800-1,000 pounds lint per acre. Corn dropped to an average of 6,000 to 7,000 pounds also. Sorghum did not seem to dip quite as much but yields were still below expectations at 4,000 to 6,000 pounds irrigated and only 1,000 pounds dryland.

The drought conditions continue throughout the fall and winter months. The severely moisture depleted soils could not support wheat establishment. As a result, very few irrigated wheat acres were planted and almost no dryland wheat was planted in the area. It is estimated that there could be as much as 70% fewer wheat pasture calves out for grazing compared to average. As producers look forward to the 2022 season, the drought situation seems eerily similar to 2021 with the addition of likely product availability issues. If the rainfall situations do not change, planting intentions for all summer crops could mirror the wheat.

2021 Applied Research and Demonstration Projects

2021 Population Monitoring of Adult Bollworms in Hale & Swisher County

2021 Bollworm, *Helicoverpa zea*, - Pyrethroid Resistance Survey in Hale & Swisher

Sentinel Plot Monitoring of Bollworm, *Helicoverpa zea*, Resistance to Bt Technologies in Cotton 2021

Auxin Spray Tip Impact on Early Season Thrips Control in West Texas Cotton 2020 and 2021

2021 Hale County Phytogen Cotton Variety Trial

2021 Swisher County Phytogen Late Planted, Dryland Cotton Variety Trail

2021 Mite Product Efficacy Trial in West Texas Corn

2021 Halfway Grain Sorghum Variety Trial and New Sorghum Technology Evaluation

2021 Population Monitoring of Adult Bollworms in Hale & Swisher County

Texas A&M AgriLife Extension Service
Hale & Swisher County
Cooperators: Mike Goss, Shane Berry
Blayne Reed EA-IPM Hale & Swisher and Dr. David Kerns

Summary

The data generated from this effort indicated that the 2021 bollworm population in both counties was far below what average season's pressure, much like the 2019 and 2020 seasons were. This marks three consecutive seasons of light bollworm pressure. It was suspected that a lack of migratory worms to the region was due to weather patterns and possibly better management of the bollworms by producers in other crops and possibly other regions. Our field data generated by the Plains Pest Management scouting program confirmed this light population for 2019, 2020, and 2021 with a nearly complete lack of economic problems caused by the bollworm during the growing season.

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

Objective

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

Materials and Methods

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

Figure 1. Standard moth trap used in monitoring.

Two 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. Traps were counted weekly and species-specific pheromone lures changed bi-weekly. All traps were set during the first week of June centering on 3 June and concluded the first week of October centering on 7 October.

Results and Discussion

The population for all two counties started lighter than an average year and remained low for the third consecutive year. Hale County did experience a few peaks while Swisher only followed Hale with an early peak but then remained low throughout the season. All peaks remained well below the economic concern for bollworms in West Texas with one peak well after any local crops would have been threatened.

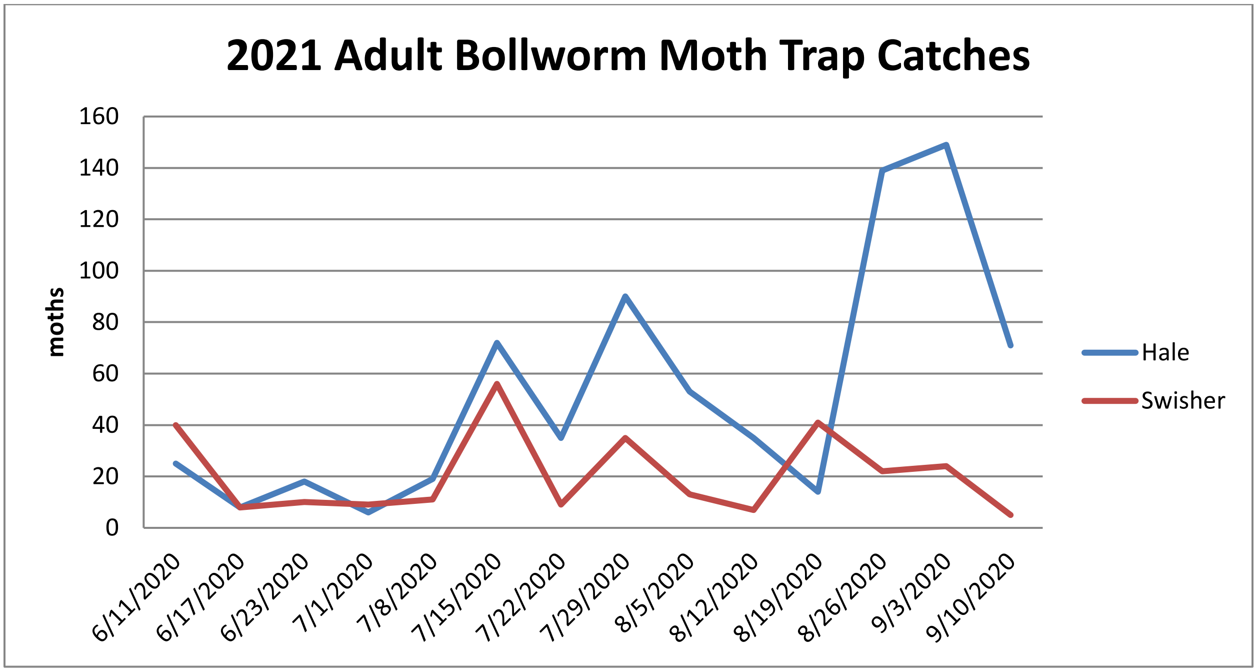


Figure 2. Bollworm moth catches by county per week over time.

The Hale trap peaked last and highest with 149 moths the week of 3 September. Swisher's highest date occurred on the week of 15 July with only 56 moths.

Conclusions

For the third straight season, the bollworm population was well below an average or economic concern for the region. An average bollworm population for the Texas High Plains should yield about 450 moths per week during July and August. This historically includes healthy migratory populations of bollworms moving into the area from other crop producing areas to the south and east. The 2021 peak moth capture was only 149 for one week with only one major populations found in any adjoining week. This lower population trend likely represents the 'native' or successfully overwintered population of bollworms from the previous season only with very few traditionally present migratory bollworm populations moving into the region.

The majority of the Cotton Belt over the past few seasons have dealt with economic populations of Bt and Pyrethroid resistant bollworms very effectively, likely limiting the number of bollworms migrating to the Texas High Plains. For the 2021 growing season, bollworm populations remained light in these traditionally higher bollworm populations were greatly reduced also. It is not known if this trend of light populations will continue for the region or the Cotton Belt. If bollworms return to the High Plains in at least average numbers or higher, it is very likely they will be very hard to control through locally preferred means.

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 our cooperating producers Mike Goss and Shane Berry for working with us to gather this data. I would like to thank the 2020 Plains Pest Management Interns for data collection and labor associated with this work: Shawn Feagley and Jerik Reed. Thank you all.

2021 Bollworm, *Helicoverpa zea*, - Pyrethroid Resistance Survey in Hale & Swisher County

Texas A&M AgriLife Extension Service / Cotton Incorporated

Hale & Swisher County

Cooperators: Mike Goss and Shane Berry

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

Summary

This study is one location of several *Helicoverpa zea* pyrethroid resistance study sites across Texas sponsored by Cotton Incorporated. Traps from the 2021 Hale & Swisher bollworm adult population study were utilized in catching live male moths for this study. Two trapping sites were utilized, one for each county served. Moth exposure vials utilized were 20 mL Scintillation Vials for the product exposure or moth survival test. All moth testing vials were prepared by Dr. David Kern's lab in College Station in groups of 99. All test vials were pre-treated with one of three treatment levels, an untreated check, 5 ug cypermethrin, or 10 ug cypermethrin. All vials were color coded according to treatment levels for ease of trial procedural routine. Due to a light bollworm population during the 2021 growing season, only one check date yielded any moths for an evaluation.

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

These results indicate that we should only expect at best about **75.0% control from any pyrethroid** application to this population of bollworms on the Texas High Plains. They also show that 12.5% of the bollworm population present in 2021 will pass dominant resistance genetic traits on to the

next generation of bollworms. This is a considerable drop from the previous year indicating a possible dip in resistance trait dominance being passed to the next generation but is far too high to offer hope for a return to susceptibility. 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 2021 or the near future.

Objective

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

Materials and Methods

This study is one location of several *Helicoverpa zea* pyrethroid resistance study sites across Texas sponsored by Cotton Incorporated. Traps from the 2021 Hale & Swisher 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, traps emptied weekly, and pheromone was changed bi-weekly.

Figure 3. Example of adult bollworm moth trap used.

Two 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. Traps were counted weekly and species-specific pheromone lures changed bi-weekly. No kill strips were used to maintain optimum moth health.

Due to a light bollworm population during the 2021 growing season, only 1 date yielded enough moths to test. On September, only moths were collected from the Hale County site in the 24-hour period and 8 from the Swisher County Site. Both sites were combined for an overall area assessment, but data was analyzed separately for site specific data.

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 specialists including this site. This location received 2 groups of treated vials for the completion of this survey, but only 28 vials were used. All test vials were pre-treated with one of three levels of cypermethrin, an untreated check, 5 ug cypermethrin, or 10 ug cypermethrin. All vials were color coded according to treatment levels for ease of trial procedural routine. Untreated vials remained clear, 5 ug vials were tainted white across the bottom of the vial and 10 ug vials were tainted red across the bottom. Untreated vials were used to test the overall health of the moth population while the 5 ug rate represented a maximum field rate of cypermethrin and survivors would represent a resistant population that would survive a labeled field treatment. The 10 ug rate would represent a 2X rate of cypermethrin and survivors should represent a dominant resistant trait within the moth population. All vials following moth transfer were left slightly loose to ensure air transfer for the moths.

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

Results and Discussion

The survivorship for both counties were very similar in every aspect in 2021. The overall health of the tested bollworm population was moderate to poor with an average UTC survivorship of 89.7% moths surviving 24-hours in untreated vials. The percentage of bollworms surviving the 5-µg treatment, with the Abbott's Adjustment for population health, for both counties becomes 25%. The number of bollworms surviving the 10 µg and thus likely to pass the resistant trait to the next generation becomes 12.5% for both counties.

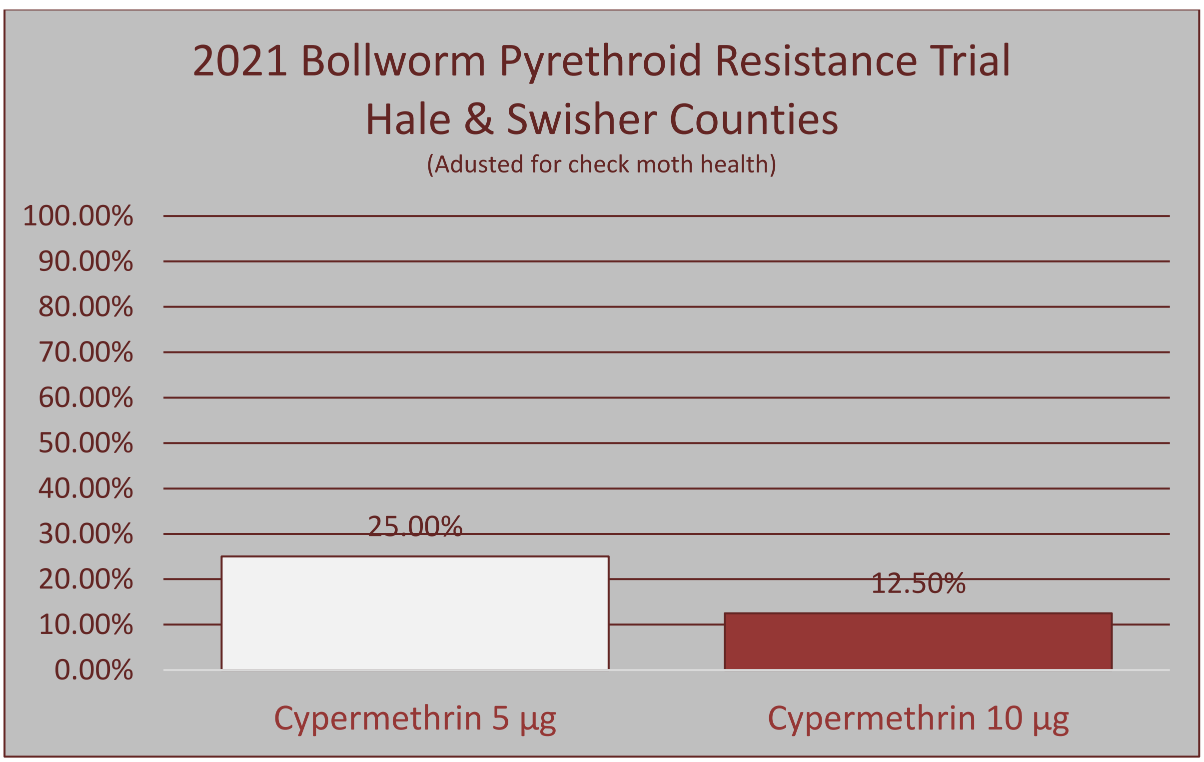


Figure 4. Adult bollworm survivorship by treatment following Abbot's Adjustment calculations.

The 2021 percent bollworm moth 5 µg survivorship data shows a decrease in resistance from 2020 (42.13%), which had reduced from 2019 (50%) while the 10 µg increased from 2020 (7.68%) but remains much lower than the 2019 (40%) level.

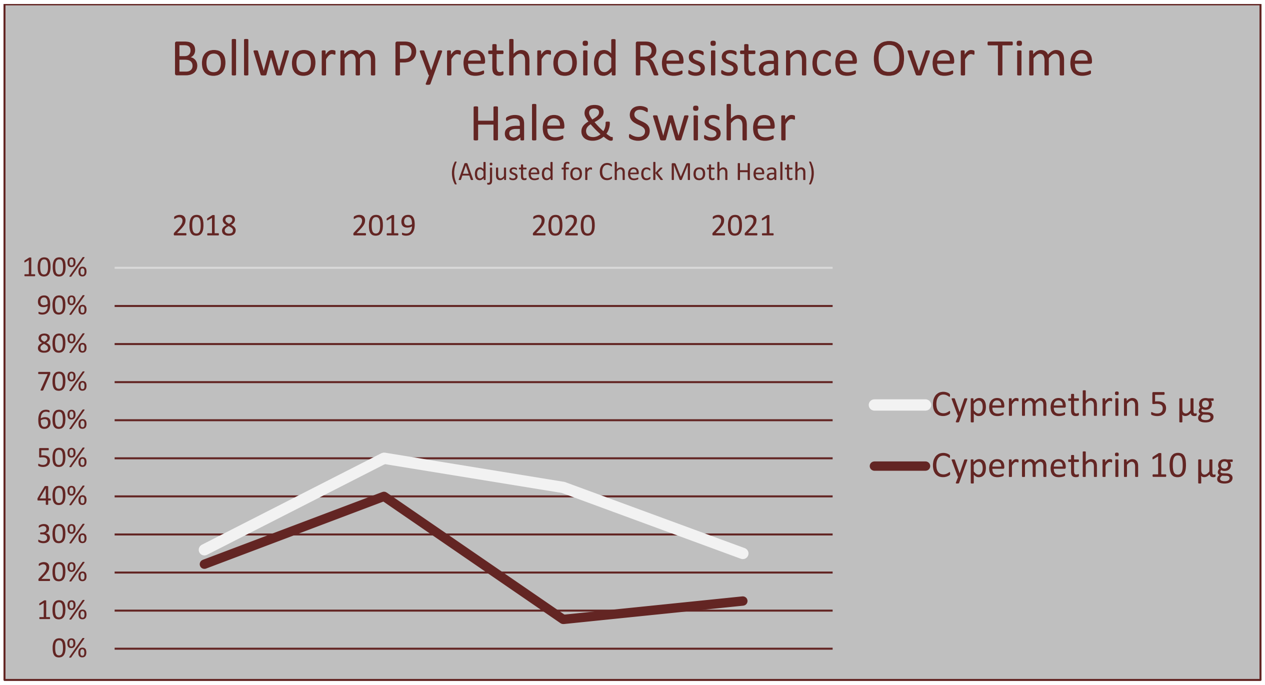


Figure 5. Percent moth survivorship over the past three years by treatment.

Conclusions

While the population available for testing in 2021 was light, and the results show a reduction in resistance of the population tested, they remain startling. The moderate health of the population indicates that these moths likely migrated a great distance, experienced hardships and limited food along the way, were exhausted upon arrival, and had little food available this late in the growing season. The results indicate that during the 2021 growing season, only **75% control should be expected from any pyrethroid application to this population of bollworms**. They also show that increasing the rate of pyrethroid treatment would increase control, but not result in true control levels. These results fall within the norm of other areas of the State tested. The survivorship of the 5 µg typically ranges between 10% and 60%. The best optimistic point comes from the continued drop in the 10 µg survivorship numbers this year for Hale & Swisher County. This could indicate that a return to susceptibility might be possible in future years if selection for pyrethroid resistance can be avoided across the Cotton Belt. However, only three years of data, trends of this sort are hard to determine and more study is needed.

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 2021 or the near future for all crops. It also indicates that pyrethroids should not be removed as a control option permanently. If large scale use across the Cotton Belt can be avoided, likely for several more growing seasons, the economic use pyrethroids could return through the lessening selection pressure on the pyrethroid resistance factors. This might be of paramount importance with fewer and fewer insecticides being labeled.

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: Jerik Reed and Shawn Feagley. Thank you all.

2021 Sentinel Plot Monitoring of Bollworm, Helicoverpa zea, Resistance to Bt Technologies in Cotton on the Texas High Plains

Texas A&M AgriLife Extension Service
Floyd, Crosby, Hale & Swisher County
Cooperator: Clay Golden
Blayne Reed, EA-IPM Hale & Swisher, John Thobe, EA-IPM Parmer, Bailey, and Castro, and Tim Culpepper, BASF

Summary

With confirmed Bt technology resistance confirmed, each year the need for monitoring resistance in Bt cotton at the local level increases. A Fibermax large plot cotton variety trial near Aiken, Texas, in northwestern Floyd was utilized for Sentinel Purposes. A non-Bt line, FM 2202 GL, a TwinLink (Cry1AB+Cry2Ae) line, FM 1830 GLT, and a TwinLink Plus (Cry1AB+Cry2Ae+Vip3A) line, FM 1730 GLTP were chosen for resistance screening. Data collection began with weekly counts of 50 whole plant inspections, 100 boll inspections, 100 square inspections, and 50 white flower inspections per technology beginning at first bloom and continuing weekly until absolute cut-out stage of 3.5 NAWF.

These results show that some level of field control is exhibited by all Bt traits but not at absolute levels that would prevent economic damage under higher pressure situations. The 2 trait technology offered a 54% reduction in bollworms per acre compaired to the non-Bt line while the addition of the Vip3A trait offered a 70% reduction. These proportions are very similar to bollworm resitance studies across the Cotton Belt. While a benefit in reducing worms and damage, nether technology remains strong enough to prevent economic populations from forming in the Texas High Plains and should be scouted accordingly.

Objective

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

Materials and Methods

A Fibermax large plot cotton variety trial near Aiken, Texas, in a northwestern Floyd drip irrigated field was utilized for these Sentinel Plot Trial Purposes in 2021. All planting, agronomic and IPM inputs were managed by the cooperating producer and Clay Golden Consulting. A non-Bt line, FM 2202 GL, a TwinLink (Cry1AB+Cry2Ae) line, FM 1830 GLT, and a TwinLink Plus (Cry1AB+Cry2Ae+Vip3A) line, FM 1730 GLTP were chosen for this bollworm resistance monitoring effort.

Data collection began with weekly counts of 50 whole plant inspections, 100 boll inspections, 100 square inspections, and 50 white flower inspections per technology beginning at first bloom and continuing weekly until absolute cut-out stage of less than 3.5 NAWF for a total of seven weeks of data collection. The first count date occurred on 26 July and the last on 7 September.

Figure 6. Field data collection for the 2021 monitoring efforts.

Field stand counts in terms of plants per acre were taken from 1/1000th of an acre from all lines utilized were taken on the first check date which resulted in 36,500 PPA. For commonality with local bollworm ET standards and in sharing resulting data with producers regionally, all resulting bollworm whole plant inspection data was converted calculated with the plants per acre data and converted into bollworms per acre. All resulting damaged fruit data was also converted into percent damaged fruit for commonality with the new Cotton Beltwide ET of 6% harvestable fruit damage. Foliar feeding larva species such as cabbage loopers, beet armyworms, true armyworms and others were also recorded in terms of larva per acre.

Results and Discussion

All bollworm populations were light again for the 2021 evaluation with no Bt technology reaching economic threshold levels by any metric.

In terms of bollworm larva per acre, no larva were were found in any technology for the first two check weeks. On the third check week, 10 August, a very small number of worms were found in all technologies at very low levels, 730 per acre. In the non-Bt trait this increased to 2,190 small worms per acre on 18 August and 3,650 on 24 August before dropping down to 2,920 small worms per acre on 31 August.

In the TwinLink technology, the small bollworms per acre remained 67% less than the non-Bt with only 730 worms before on the 18 August date. The TwinLink technology then increased to 2,920 on the 24 August but remained 20% less than the non-Bt trait on the same date.

For the TwinLink Plus line, no worms were found on the 18 August date. By the 24 August date 1,460 small worms per acre were found which was 51% less than the TwinLink line and 60% less than the non-Bt line. For the 31 August date, the TwinLink Plus line had 730 worms per acre when the TwinLink line had none but was 75% less than the non-Bt line. No bollworms were found on the 7 September date in any line. In terms of total number of bollworms per acre for the season, the non-Bt line had 9,490 worms, the TwinLink line had 4380 (54% reduction from non-Bt), and the TwinLink Plus line had 2,920 worms per acre (33% reduction from TwinLink, 70% reduction from non-Bt).

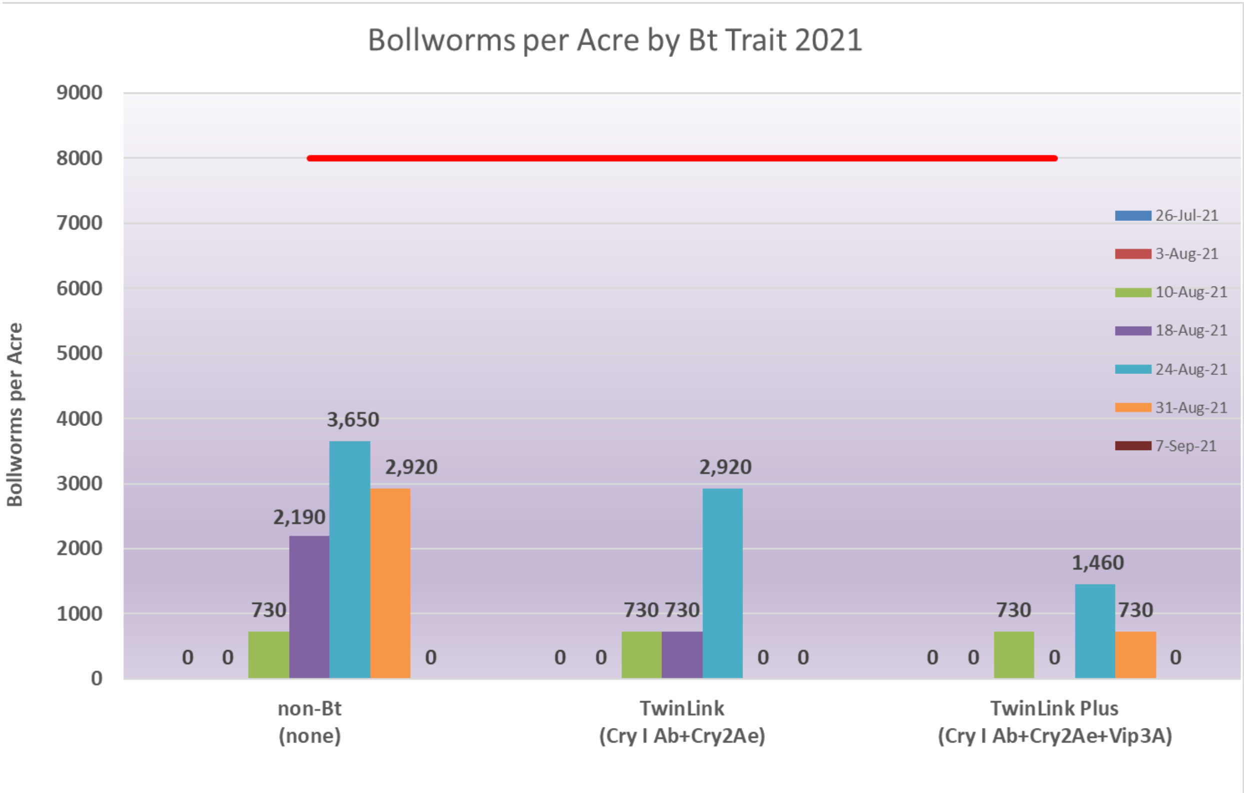


Figure 7. Bollworms per acre by date.

In terms of percent fruit damage, some damage was recorded on all check dates, but no technology reached economic levels. The non-Bt line peaked for damage on the 18 August date at 4.8% while the TwinLink line peaked on the 10 August date at 2% and the TwinLink Plus line peaked at the 18 August date at 1.2%. For the non-Bt line, only the first check date of 26 July had damage of less than 1% while the TwinLink line only had damage over 1% during the peak dates of 10 and 18 August and the TwinLink Plus only had damage over 1% at the 18 August date.

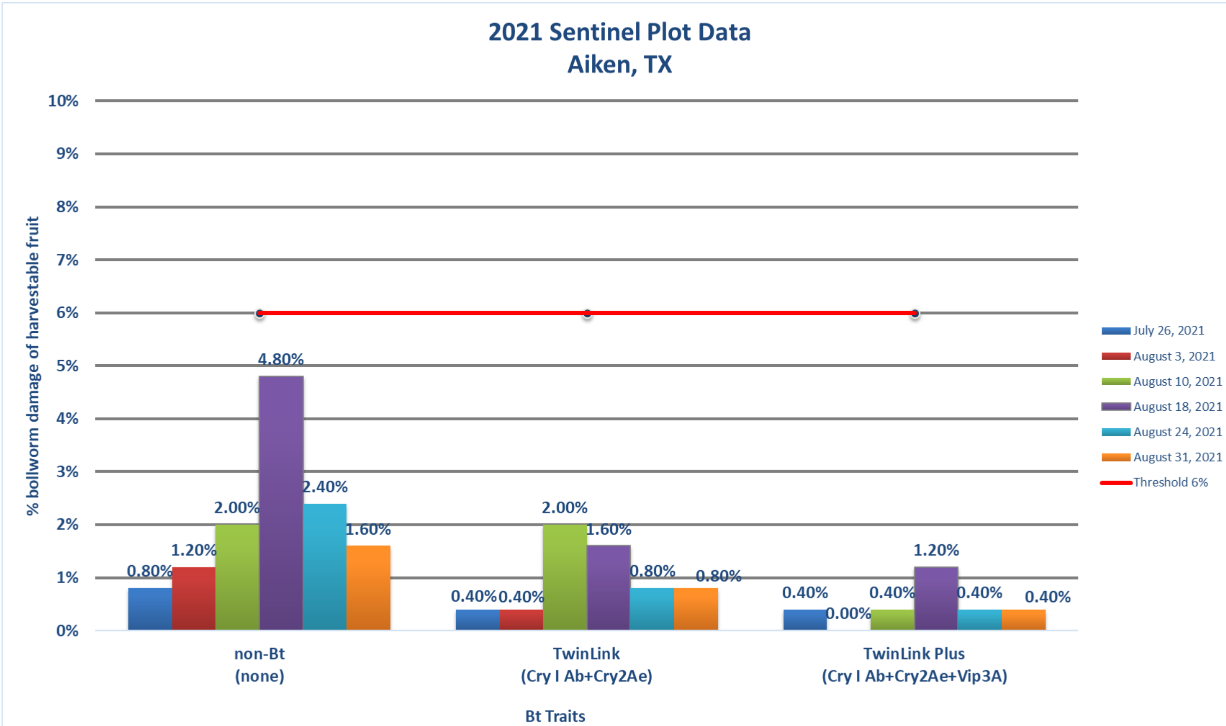


Figure 8. Bollworm damage to harvestable fruit by date.

Very few foliar caterpiller larva were found during the trial. On the 26 July and 3 August check dates 730 worms per acre were found in the non-Bt line. No other worms were found in the non-Bt until the 7 September date when 365 larva were found. No foliar feeding caterpillar larva were found in either the TwinLink or TwinLink Plus lines for the duration fo the evaluation.

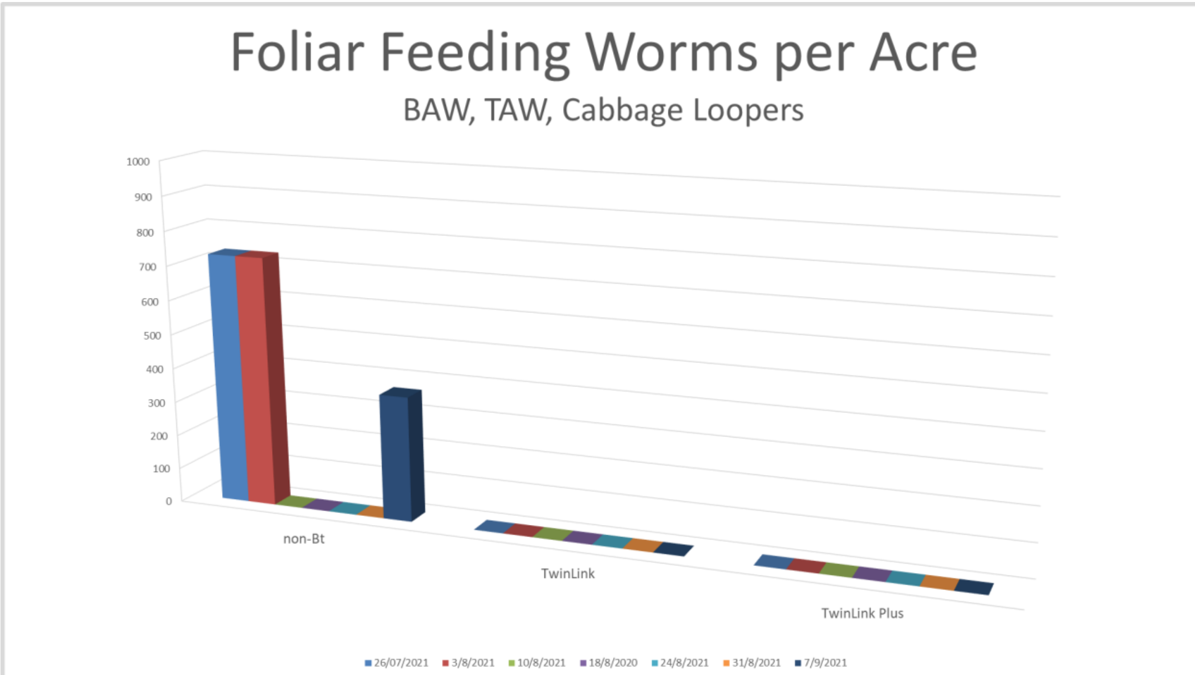


Figure 4. Foliar feeding pests by trait and date.

Conclusions

Despite a light bollworm pressure population for this evaluation there was enough pressure to capture meaningful trait performance data representative of bollworm control in the region.

These results show that some level of field control is exhibited by all Bt traits but not at absolute levels that would prevent economic damage under higher pressure situations. These results also indicate an increase in bollworm control when the Vip3A trait is added to the Cry1Ab and the C ry2Ae traits. These results agree with lab and field bollworm resistance studies from across the cotton belt. Even the proportion of control offered by the varied traits over the non-Bt trait remains similar if not identical regarless of location. Is common that under heavier pressure, the 2 trait technology can ond often does reach economic levels in cotton exhibiting fewer worms and damage than the non-Bt. The increasing of bollworm control from the Vip3A trait over the 2 trait technology is well documented and not new for the 2021 season. The finding of some level of damage and surviving worms in the Vip3A trait is new, indicating and agreeing with lab and other field studies that the resistance level to the

Vip3A trait is increasing but is not at a failure level yet. While we still should expect a higher level of control from Vip3A over the 2 trait technology, these results indicate that even the Vip3A trait could reach economic levels with enough bollworm pressure. All available Bt traits, while still offering reductions and benefits in bollworm control in cotton, should all be scouted for economic bollworm populations equally.

The foliar pest data indicates that the TwinLink and TwinLink Plus traits both still offer outstanding and likely complete control of these pest species.

We can also infer from these results that bollworms will not be an annual economic cotton pest on the Texas High Plains. Most areas of the cotton belt have adopted new economic thresholds for bollworms in response to Bt resistance, which include chemical preventative treatments triggered by egg lay for all Bt lines. These results show that the High Plains does not consistently have enough bollworm pressure to adopt these extreme measures of prophylactic chemical treatments. Instead, the High Plains likely should extend the existing economic threshold of 8,000 small bollworms, 4,000 medium or larger bollworms per acre or the 6% harvestable fruit damage to all Bt lines due to the likelihood of some level of resistance.

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 Wayne Johnson for cooperating with us to complete this trial, Corteva for sponsoring and partnership of this trial, the 2021 Plains Pest Management Interns and Lab Technicians for data collection and labor: Shawn Feagley, Brandy Reed, and Jerik Reed, and John Thobe of the High Plains IPM Team for additional assistance and data collection associated with this trial. Thank you all.

Auxin Spray Tip Impact on Early Season Thrips Control in West Texas Cotton 2020 and 2021

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

Summary

Five treatments involving the auxin herbicide Enlist, the insecticide Orthene, and the insecticide Bidrin were organized into a small plot completely randomized block design (CRBD) with four replications. These treatments were grouped into an application A and application B. Application A consisted of all treatments made with auxin approved spray tips. Application B consisted of a second treatment with medium flat fan spray tips. Treatment 1 was made with application A and Enlist alone. Treatment 2 and 4 were made of application A with a mixed treatment of Enlist and a select insecticide for thrips control. Treatment 3 and treatment 5 were made with application A with Enlist alone, followed by treatment B with select insecticides alone. Orthene was utilized in treatment 2 and 3 while Bidrin was utilized in treatment 4 and 5. 0-5 thrips damage ratings were taken preharvest, 3 DAT, 7 DAT, and 10 DAT.

In 2020 treatment 2 and 4 separated from the UTC at the 7 and 10 DAT in terms of damage reduction while treatment 3 separated from all other treatments on the 7 DAT date. Treatment 4 and 5 never spirited from each other. In 2021, all treatments were superior to the UTC while treatment 3 separated from treatment 2 at the 3, and 10 DAT date and treatment 5 only separated from treatment 4 at the 10 DAT date. These results hint that thrips control might be improved by changing to spray tips for a second targeted thrips treatment that offers better coverage, but the practice of mixing insecticide with the auxin application with the approved tips remains viable form of control.

Objective

Evaluate the impact, if any, of the use of auxin herbicide recommended large droplet spray nozzle tips on thrips efficacy from joint broadcast herbicide with insecticide early season treatments in West Texas Cotton. This will determine if auxin herbicide and thrips insecticide treatments need to be made in one mixed treatment or will two separate treatments with two differing and specialized spray tips are needed.

Materials and Methods

Commercial cotton field intended to be planted in Enlist cotton in central Swisher County belonging to Mike Goss Farms was selected to house this trial for both years. The fields selected for this trial had a reliable source for migrating thrips to emerge from drying wheat to the cotton on several sides. In 2020 the field was planted on 6 May and in 2021 on 21 May with Mr. Goss' field planter with the Enlist variety PHY 490 W3FE without any insecticidal seed treatments at 52,000 seeds per acre. On 2 June and 8 June respectively the plots were lain out and alleys cut into Mike Goss' established field. All plots were 4 30-inch rows wide and 36 feet long in both years.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Auxin A;Roundup Power Max 32 FL OZ/A A;residual A
2		Auxin A;Roundup Power Max 32 FL OZ/A A;Residual A;Orthene 2.5 OZ WT/A A
3		Auxin A;Roundup Power Max 32 FL OZ/A A;Residual A;Orthene 2.5 OZ WT/A B
4		Auxin A;Roundup Power Max 32 FL OZ/A A;Residual A;Bidrin 1.6 FL OZ/A A
5		Auxin A;Roundup Power Max 32 FL OZ/A A;Residual A;Bidrin 1.6 FL OZ/A B

Figure 9. Plot map and treatment list for the 2020 trial.

Five treatments involving the auxin herbicide Enlist, the insecticide Orthene, and the insecticide Bidrin were organized into a small plot CRBD with four replications. These treatments were grouped into an application A and application B. Application A consisted of all treatments made with auxin approved spray tips. Application B consisted of a second treatment with medium flat fan spray tips. Application A was applied to all plots (1-5) with treatment 1, 3, and 5 being made with Enlist alone. Application A for treatment 2 and 4 was a mix of Enlist and a selected insecticide for weed and thrips control. Application B was made with medium flat fan nozzles and represented a second application of insecticide alone following application A and was applied to treatment 3 and 5. Orthene at 2.5 oz./ac. was mixed with Enlist for treatment 2 and in treatment 3 was applied alone in application B. Bidrin at 1.6 oz./ac. was mixed with Enlist for treatment 4 and in treatment 5 was applied alone in application B.

All sprays were made with a CO2 backpack sprayer at 16.2 GPA with a walking groundspeed of 2.5 MPH. All application A treatments were made with Enlist at 32 oz./ac. with the Enlist label approved TeeJet TTI, 02, H spray tips. All application B treatments were made with TeeJet 8002V (medium flat fan) spray tips. NIS at 1% V/V was added as a surfactant to all A and B applications. Treatments were made on 8 June in 2020 and 9 June in 2021. Between all treatments, the backpack spray system was cleansed and made ready for the next application regime. Sprays began with application A for treatments 1, 3, and 5 (Enlist alone). Application A for treatments 2 and 4 (Enlist mixed with insecticides) began shortly following shortly after. Following the conclusion of all application A treatments, the spray system was cleansed, and spray tips were changed for application B. Once complete application B for treatment 3 was made (Orthene alone) and application B was made for treatment 5 (Bidrin alone) following another system cleansing.

Figure 10. CO2 backpack sprayer with auxin labeled tips making an application in cotton.

Thrips numbers were collected on these dates by harvesting 10 randomly selected plants from the middle 2 rows of each plot, by cutting them at the soil level, and directly placing them into labeled and individual plot mason jars containing 75% alcohol. These jars were transported to Dr. Megah Parjulee's Cotton Insect Lab at the Texas A&M AgriLife Center in Lubbock where any thrips captured in the jars would be filtered out of the solution, cleaned, counted, and species identified under microscope at leisure. Issues at the Insect Lab existed in 2020 in filter screen size utilized for separating the thrips from the solution and the numbers of thrips from each plot were not valid or usable for this trial. Due to heavy rain events the population of thrips in 2021 was greatly reduced and damage ratings proved sufficient for the trial.

Thrips damage ratings were taken from the plots pretreatment the date of treatment, and at the 3, 7, and 10 DAT dates. This approved damage rating system utilizes a 0-5 numeric assignment of increasing damage given each plot by the on-site researcher who can make use of visual thrips damage differences down to a 0.5 increment level.

Figure 11. The 0-5 thrips damage rating scale visualized with examples of damage at these levels.

Notes were taken on weed control differences within the plots on a percent control basis for all check dates.

<u>Results and Discussion</u>

2020

All plots rated a 3 damage level on the 0-5 damage rating system pretreatment on 8 June when the plant stages were just above the 1^{st} true leaf stage. By the 3 DAT date, there still were no significant differences between treatments (*P*=0.5539). All treatments had dropped in damage rating, but all treatments including an insecticide were dropping numerically faster than the treatment with Enlist alone. In addition, the treatments made via application B (second treatment with insecticide alone) were numercally lower than those of application A that included an insecticide with Enlist.

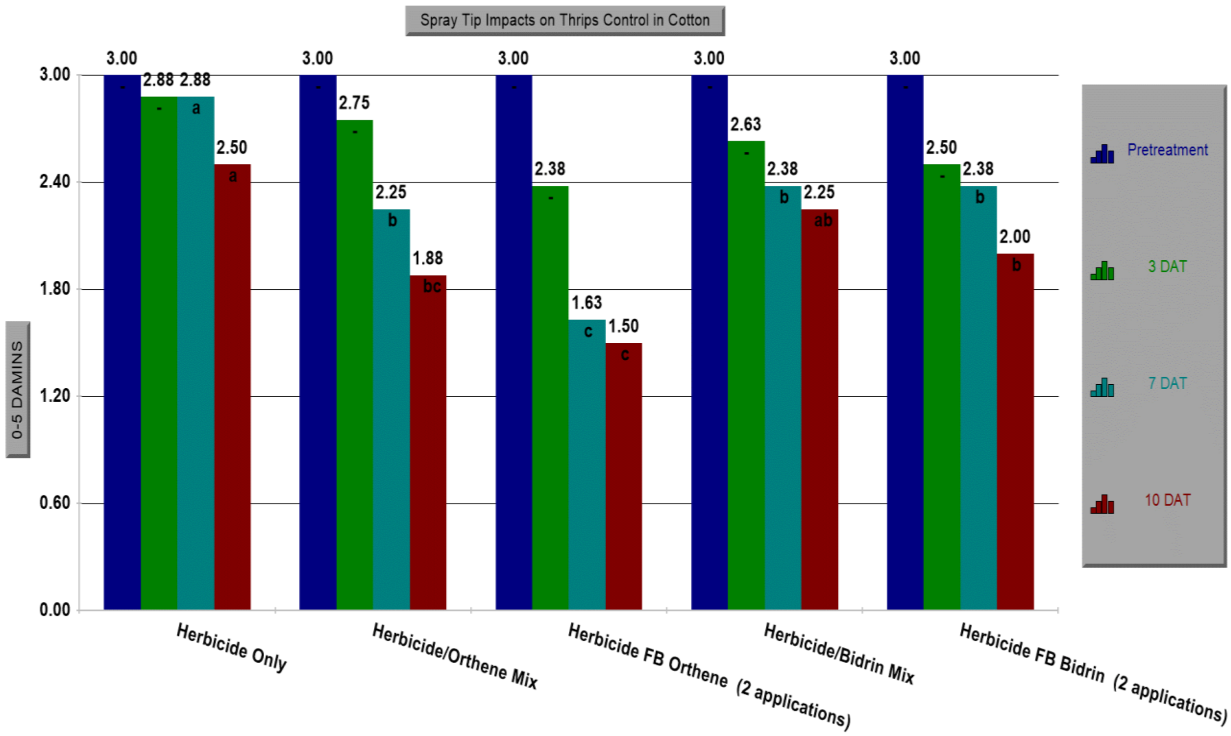


Figure 12. Damage ratings by treatment over time.

By the 7 DAT date, all treatments that included an insecticide treatment were performing better than the auxin alone or UTC treatment. In addition, treatment 3, with Orthene made as application B alone, was significantly superior to all other treatments (*P*=0.0006). By the 10 DAT date, treatment 4, the treatment that included a mix of Enlist and Bidrin mixed for application A, was no longer significantly different from treatment 1, Enlist alone. Treatment 3, Orthene alone as a second application B, was still numerically lower than all other treatments and was significantly lower in damage rating to all treatments except treatment 2, which mixed Orthene with Enlist for application A. Meanwhile, Treatment 5, Bidrin alone in application B, was numerically superior to treatment 4, Enlist and Bidrin mixed in application A.

2021

All treatments were superior to the UTC in terms of reduction in thrips damage at the 3 and 10 DAT dates. Treatment 3, the Orthene via application B, improved over treatment 2, the Orthene mixed with Auxin via application A, at the 3 and 10 DAT date. Treatment 5, the Bidrin via application B, separated from treatment 4, the Bidrin mixed with Auxin via application A, at the 10 DAT date only. Both of the application B treatments (3 and 5) were numerically superior to the applications with the Auxin spray tips for all check dates, but only significantly different for the check dates listed.

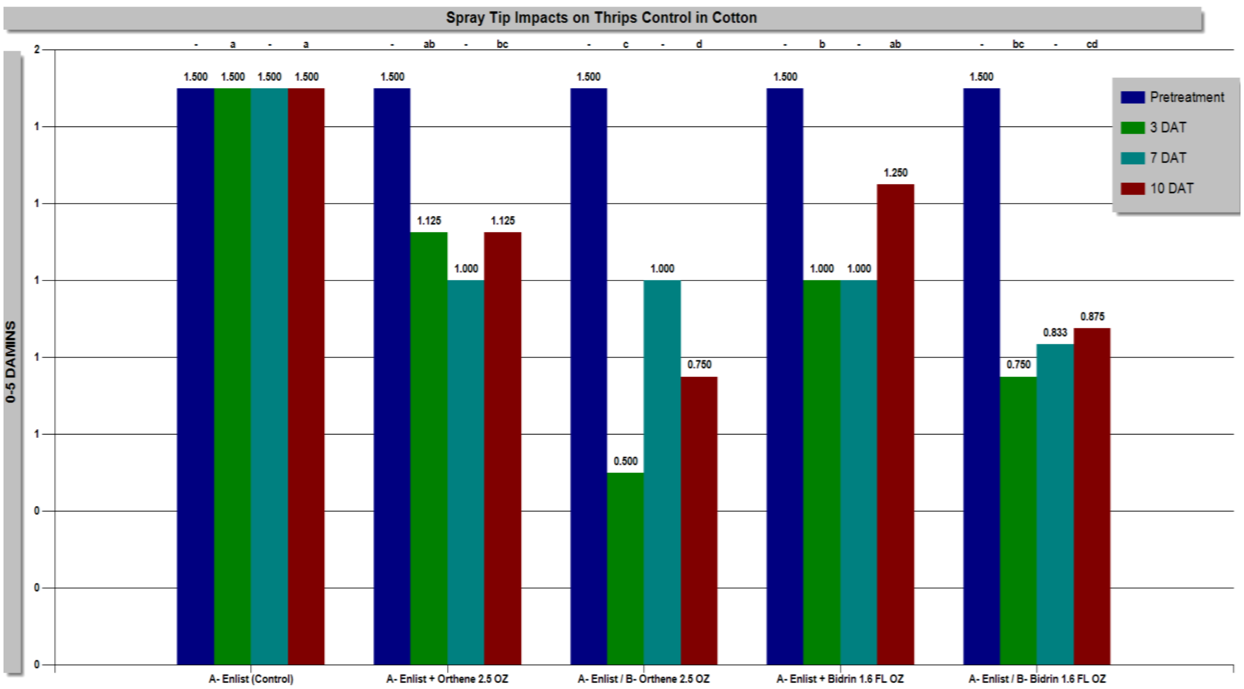


Figure 13. Thrips damage ratings from the 2021 trial.

In terms of weed control, there were no differences between treatments for either year with all plots being rated at 100% control.

Conclusions

These results are not conclusive and additional research, complete with thrips numbers by treatment over time, is needed. It has shown that the practice of mixing insecticides with Auxin herbicides while utilizing large droplet producing auxin approved spray tips is useful in terms of thrips control. These results also hint that thrips control might be improved by utilizing a spray tip with better coverage. The mandatory use of auxin spray tips if thrips control is needed while herbicide applications are being made. Therefore, if additional thrips control is needed, a second application utilizing spray tips with better coverage might be needed.

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 Cotton Insect Lab for thrips counting and species analysis, the 2020 and 2021 Plains Pest Management Interns and Lab Technicians for data collection and labor associated with this trial: Jerik Reed, Shawn Feagley, and Lauryn Carrol. Thank you all.

2021 Hale County Phytogen Cotton Variety Trial

Texas A&M AgriLife Extension Service / Corteva Agriscience

Hale County

Cooperator: Wayne Johnson

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

Summary

Eight Phytogen Cotton varieties, PHY 205 W3FE, PHY 210 W3FE, PHY 250 W3FE, PHY 332 W3FE, PHY 350 W3FE, PHY 394 W3FE, PHY 443 W3FE, and the experimental line PX3E33 W3FE were planted on 22 May 2021 in a large plot trial with 3 replications in a section of a pivot irrigated field at Wayne Johnson's NE Hale Farm. Plots were 8-rows wide with a row width of 40-inches and a variable plot length. Data on stand counts and vigor ratings were taken on 8 June and end of season agronomic data was collected on 5 October. Harvest occurred on 12 November via Wayne Johnson's self-modulating harvest equipment with onboard weight scales used to collect burr weights. Grab samples from each plot were taken from the resulting round bales. Samples were subsequently ginned at the Texas Tech University Fiber & Biopolymer Research Institute in Lubbock with all percent lint turnout and fiber quality measurements recorded.

There were no significant differences in lint yield per acre or lint value per acre but large numeric differences in loan value determined the order of performance in this trial with PHY 210 W3FE being the best performer and PHY 394 W3FE being the lowest. Significant differences in established plants per acre and seedling vigor indicated that some poor seed quality was used to represent some of the lines. If these differences are annual, they might represent some lines to be avoided.

Objective

Determine the value of selected Phytogen Cotton Seed varieties in Hale County in an area typical agronomic situation.

Materials and Methods

Eight Phytogen Cotton varieties, PHY 205 W3FE, PHY 210 W3FE, PHY 250 W3FE, PHY 332 W3FE, PHY 350 W3FE, PHY 394 W3FE, PHY 443 W3FE, and the experimental line PX3E33 W3FE) were planted on 22 May 2020 in a large plot trial with 3 randomized replications in a section of a pivot irrigated field in Northwestern Hale County belonging to Wayne Johnson. Plots were 8-rows wide with a row width of 40-inches and a variable plot length around the pivot arch. Seed for all plots were planted at 52,000 seed per acre.

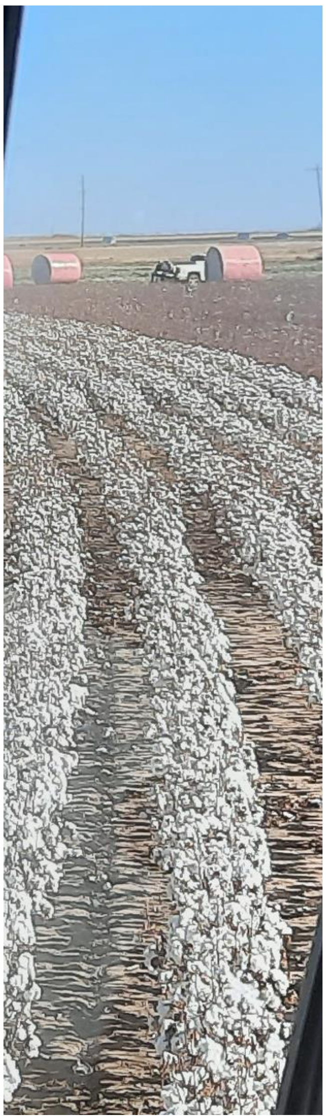


Figure 14. Harvest from Wayne Johnson's equipment with the PPM crew taking grab samples from the resulting modules.

All agronomic production and harvest inputs were made by Wayne Johnson with entomological and agronomic scouting and solution recommendations from the Plains Pest Management field scouting program.

On 8 June, 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. On 5 October all late season agronomic data were collected. 5 randomly selected plants per plot were 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 12 November via Wayne Johnson’s self-modulating harvest equipment. Burr weights for each plot were recorded onboard the self-modulating stripper and grab samples from each plot were taken following from the resulting bales.   Samples were subsequently ginned at the Texas Tech University Fiber & Biopolymer Research Institute in Lubbock with all percent lint turnout and fiber quality measurements recorded.

All results, both agronomic, yield, and fiber, were statistically compared utilizing ANOVA and LSD = 0.05.

Results and Discussion

All resulting trial data is listed in table 1.

PhytoGen COTTONSEED ***W3FE Innovation Trial***

TEXAS A&M AGRILIFE EXTENSION

Grower Cooperator:	Wayne Johnson	Planting Date:	5/28/2021
Trial Cooperator:	Blayne Reed, Texas AgriLife Ext.	Seed Treatments:	TRiO*
PhytoGen CDS:	Ken Legé, Ph.D.	Moist. @ planting:	Very good
Location:	Claytonville, TX (Hale Co)	Soil Temp @ planting:	
Replicates:	3	Seed/Acre:	52,000
Plot Size:	8 rows x half circle	GPS Lat:	34.25431
Row Spacing:	40"	GPS Long:	-101.579760
Beds:	No	Elevation:	3338
Previous crop(s):	Wheat cover	Harvest Date:	11/12/2021
Soil type:	Pullman clay loam	*PHY250W3FE was base fungicide only	
Irrigation:	LEPA	Harvest Equipt: JD CS690	Seasonal DD60s: 2233

Sorted by Lint Value

Variety	Lint Yield (lbs/A)	Turnout (%)	Mic	Length (in)	Staple (1/32 in)	Strength (g/tex)	Uniformity (%)	Color Grades	Leaf Grade	Loan Value ($/lb)	Lint Value ($/A)
PHY210W3FE	1140	33.3	3.65	1.12	35.9	31.1	81.5	21, 11, 11	2.3	0.5698	650
PHY350W3FE	1146	32.6	3.71	1.11	35.4	28.8	80.8	21, 11, 21	2.3	0.5622	644
PHY443W3FE	1149	34.6	3.99	1.08	34.7	29.6	81.1	11, 11, 11	1.3	0.5498	632
PHY205W3FE	1158	32.4	3.72	1.06	33.8	30.1	80.9	21, 11, 21	3.0	0.5278	611
PHY332W3FE	1044	30.5	3.58	1.13	36.3	29.9	81.1	11, 11, 11	2.0	0.5697	595
PX3E33W3FE	1057	33.8	3.88	1.09	34.8	28.6	80.0	11, 11, 11	1.0	0.5508	582
PHY250W3FE	1101	34.1	3.37	1.09	34.9	28.3	79.7	21, 11, 21	2.0	0.5113	563
PHY394W3FE	992	31.7	3.42	1.11	35.4	27.9	79.1	21, 21, 21	3.7	0.5070	503
Mean	*1098*	*32.9*	*3.66*	*1.10*	*35.1*	*29.3*	*80.5*		*2.2*	*0.5436*	*597*

Variety	Node of 1st Fruiting Branch	Final Plant Height (in)	Final Total Nodes	Nodes Above Cracked Boll	Seasonal Vigor** (in/internode)	Seedling Vigor Rating (1=excellent; 5=very poor)	Plant Population (#/A)	% Square Drop, 07/21/21	Fleahopper Population, 7/21/21 (#)	Seed/lb	Warm Germ (%)	Cool Germ (%)
PHY210W3FE	7.8	28.2	20.1	2.6	1.40	2.5	41000	4.7	1.3	4433	90	68
PHY350W3FE	7.7	33.4	19.7	3.8	1.69	1.8	43200	9.2	0.7	4399	94	91
PHY443W3FE	8.5	31.1	19.0	4.6	1.64	1.5	42600	10.1	1.0	4369	96	91
PHY205W3FE	7.9	26.4	20.1	3.1	1.31	1.8	44600	10.8	1.3	4494	95	88
PHY332W3FE	7.9	31.6	19.8	4.3	1.60	2.0	41133	12.3	0.3	4380	94	92
PX3E33W3FE	8.5	30.2	19.6	4.0	1.54	1.8	41400	6.9	2.0	4675	96	89
PHY250W3FE	8.1	27.1	19.8	3.6	1.37	2.2	38000	7.6	2.0	4539	92	68
PHY394W3FE	9.1	28.5	21.4	4.7	1.33	1.7	43533	6.4	1.0	4198	96	92
Mean	*8.2*	*29.6*	*19.9*	*3.9*	*1.43*	*1.9*	*41933*	*8.5*	*1.2*			
LSD	*ns*	*2.8*	*1.3*			*0.5*	*3186*	*4.9*	*ns*			
CV (%)	*6.9*	*5.4*	*3.7*			*15.2*	*4.3*	*32.7*	*66.7*			
Prob>F, variety	*0.0893*	*0.0013*	*0.0482*			*0.0253*	*0.0169*	*0.0715*	*0.2134*			

Table 1. Trial data with significance by category.

There were no statistically significant differences between any cotton varieties in terms of lint yield, percent turnout, mic, length, staple, strength, uniformity, color grades, leaf grade, loan value, lint value, 1st fruiting branch node, NACB, or seedling vigor rating. Numerically, the line PHY 210 W3FE was the top overall performer with a return for lint per acre of $650 while PHY 394 W3FE was the worst performer with $503 return for lint per acre. Lint yield per acre ranged from PHY 350 W3FE with 1,146 pounds per acre and PHY 394 W3FE only producing 992 pounds lint per acre.

There were significant and impactful differences in terms of established plants per acre, seeding vigor ratings, total number of final nodes, and final plant height. The line PHY 250 W3FE only established with 38,000 plants per acre while the lines PHY 350 W3FE, PHY 205 W3FE, and PHY 393 W3FE all placed themselves in the upper group with better established plant stands (P=0.0169). The lines PHY 210 W3FE and PHY 250 W3FE were outperformed in terms of seedling vigor following establishment. The lines PHY 210 W3FE, PHY 205 W3FE, and PHY 393 W3FE all had more final total nodes than the other lines while PHY 350 W3FE, PHY 443 W3FE, and PHY 332 W3FE all proved to be among the tallest of the varieties.

Conclusions

The tightness in the results of the most value impactful results, such as lint value and lint yield, indicate that many of these lines are all just about as well suited to the area as each other. While not significant, the differences in loan value between the lines should be taken into account when evaluating this trial. The trials top overall performer PHY 210 W3FE had a value of 0.5698 per pound lint. This stands in stark contrast to the trial's bottom performer, PHY 394 W3FE with a value of only 0.5070 per pound lint. In fact, the numeric performance of all lines are stacked in order of loan value per pound of lint and not along the narrow yield per acre numbers.

Other important factors that were significant should also impact a fair evaluation of this trial. The poor performance of PHY 250 W3FE in terms of plant population and seedling vigor could very well indicate a poor seed quality batch or a varietal trait. If this line performs similarly over multiple years, it could prove to be a factor of varietal trait and something that might need to be avoided. Factors such as significant differences in a high 1st fruiting node, excess plant height, and failure to produce enough final nodes to support harvestable fruit can be traits worth avoiding in the tough High Plains area with a limited summer growing season.

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 Wayne Johnson for cooperating with us to complete this trial, Corteva for sponsoring and partnership of this trial, the 2021 Plains Pest Management Interns and Lab Technicians for data collection and labor: Denise Reed, Shawn Feagley, Brandy Reed, and Jerik Reed, and John Thobe of the High Plains IPM Team for additional assistance and data collection associated with this trial. Thank you all.

2021 Swisher County Phytogen Late Planted, Dryland Cotton Variety Trail

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

Summary

Eight Phytogen Cotton varieties, PHY 205 W3FE, PHY 210 W3FE, PHY 250 W3FE, PHY 300 W3FE, PHY 332 W3FE, PHY 350 W3FE, PHY 443 W3FE, and the experimental line PX3E33 W3FE were planted on 5 June 2020 in a replant situation, large plot trial with 3 replications in a section of a no-till dryland field at Mike Goss central Swisher Farm. Both the unique weather pattern in 2021 and replant situation were viewed as opportunities to better evaluate these varieties in harsh situations. Plots were 8-rows wide with a row width of 30-inches. Data on stand counts and vigor ratings were taken on 16 June and end of season agronomic data was collected on 27 September. Harvest occurred on 15 November via Mike Goss' harvest self-modulating equipment with varietal burr weight data captured by the harvest equipment. Grab samples from each variety were taken. Samples were subsequently ginned at the Texas A&M Cotton Research sample gin in Lubbock and all percent turnout and lint yield data were taken.

No significant yield differences were found. The numeric results here indicate that the more determinate lines were able to take advantage of the available early season moisture of 2021 and mature harvestable fruit better with PHY 205 W3FE being the top performer and PHY 443 W3FE being the bottom performer. The outstanding early season vigor of PHY 332 W3FE in all early season agronomic measurements and the poor performance of PHY 210 W3FE in those same factors should not be overlooked.

Objective

Determine the value of selected Phytogen Cotton Seed varieties in Swisher County in an area challenging but typical dryland agronomic situation for the High Plains.

Materials and Methods

Eight Phytogen Cotton varieties, PHY 205 W3FE, PHY 210 W3FE, PHY 250 W3FE, PHY 300 W3FE, PHY 332 W3FE, PHY 350 W3FE, PHY 443 W3FE, and the experimental line PX3E33 W3FE were late planted following adequate rainfall on 5 June 2021 in a no-till, wheat, layout, cotton rotation replant situation large plot trial with 3 randomized replications in a section of a dryland field in Central Swisher County belonging to Mike Goss. Plots were 8-rows wide with a row width of 30-inches. Seed for all plots were planted at 27,000 seed per acre.

All agronomic production and harvest inputs were made by Mike Goss with IPM and agronomic scouting and solution recommendations from the Plains Pest Management field scouting program.

Figure 15. Mike Goss, trial cooperator, operating harvest equipment.

On 16 June, 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. During late July and early August, just as the field was coming into bloom stages, the field experienced severe drought conditions offering insight into real-world, worst-case scenarios that can add value to the evaluation of this trial. On 27 September all late season agronomic data were collected. 5 randomly selected plants per plot were 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 15 November via Mike Goss' self-modulating harvest equipment. Resulting yields were not high enough to produce a module per plot, so all like varietal plots were combined for harvest. Burr weights for each variety were recorded onboard the self-modulating stripper and grab samples from each variety were taken following from the resulting bales. Samples were subsequently ginned at the Texas Tech University Fiber & Biopolymer Research Institute in Lubbock with all percent lint turnout and fiber quality measurements recorded.

Figure 16. Vacuuming seed from seed boxes for replicated variety trial.

All results, both agronomic and yield, were statistically compared utilizing ANOVA and LSD = 0.05.

Results and Discussion

All resulting trial data is listed in table 1.

Table 2. All trial data from the 2021 dryland trial.

W3FE Innovation Trial

Grower Cooperator:	Mike Goss	Planting Date:		6/5/2021
Trial Cooperator:	Blayne Reed, Texas AgriLife Ext.	Seed Treatments:	TRiO*	
PhytoGen CDS:	Ken Legé, Ph.D.	Moist. @ planting:	Good	
Location:	Kress, TX (Swisher Co.)	Soil Temp @ planting:		
Replicates:	Planted 3 reps; combined reps @ harvest	Seed/Acre:		
Plot Size:	8 rows x ~2028'	GPS Lat:		34.457002
Row Spacing:	30"	GPS Long:		-101.802333
Beds:	No	Elevation:		3532
Previous crop(s):	Wheat fallow	Harvest Date:		11/15/2021
Soil type:	Pullman clay loam	**PHY250W3FE was base fungicide only*		
Irrigation:	Dryland	Harvest Equipt: JD CS690		

Variety	Lint Yield (lbs/A)	Turnout (%)	Seedling Vigor Rating (1=excellent; 5=very poor)	Plant Population (#/A)	Final Plant Height (in)	Final Total Nodes	Node of 1st Fruiting Branch	Nodes Above Cracked Boll	Seasonal Vigor** (in/internode)
PHY205W3FE	293	34.3	1.7	23400	18.8	14.5	8.0	0.2	1.30
PHY300W3FE	285	36.5	2.0	22800	18.7	13.1	6.2	0.2	1.43
PHY210W3FE	268	**37.0**	2.6	21600	19.4	14.7	7.1	0.4	1.32
PHY250W3FE	267	36.1	1.7	19800	17.4	14.3	7.5	0.9	1.22
PHY350W3FE	266	36.1	1.7	24933	20.5	13.5	7.0	0.6	1.52
PHY332W3FE	258	35.8	**1.0**	**24533**	19.9	13.9	7.4	0.6	1.43
PX3E33W3FE	242	35.8	1.7	23867	18.7	15.3	8.7	1.7	1.22
PHY443W3FE	227	36.2	1.5	23800	19.0	14.1	8.5	0.6	1.35
Mean	*263*	*36.0*	*1.7*	*23092*	*19.0*	*14.2*	*7.6*	*0.7*	*1.35*

There were no statistically significant differences in any yield data due to the light yield/replication issues of the trial. PHY 205 W3FE was the top lint yield per acre performer with 293 pounds per acre while PHY 443 W3FE was the lightest performer with 227 pounds lint. PHY 210 W3FE had a percent lint turnout of 37.0% while PHY 205 W3FE only exhibited a closer to normal 34.3%.

There were also no significant differences in terms of plant height, plants per acre final stand counts, and uppermost cracked boll location. PHY 332 W3FE alone separated from all other lines by outperforming in seedling vigor while PHY 210 W3FE was outperformed by all other lines (*P*=0.0013). In terms of 1st fruiting branch, PHY 350 W3FE and PHY 210 W3FE set fruit earlier than many other lines (*P*=0.0001). The experimental line PX3E33 W3FE placed more fruiting nodes per plant and had a higher average top fruiting site compared to most other lines (*P*=0.0118, *P*=0.0014)

Conclusions

When reviewing these results, it is important to note the planting date, wet early crop conditions, and extreme drought situation at key boll developmental stages and the impacts upon this trial. The trial was late planted following failed cotton and sufficient rainfall. During June and July, rainfall was adequate, but no rain fell after 27 July, just as the trial plants were in the first full week of bloom. Extreme drought conditions ensued and heavily impacted the trial and yield results.

The results here indicate that the more determinate lines were able to take advantage of the available moisture and mature harvestable fruit better with PHY 205 W3FE being the top performer and PHY 443 W3FE being the bottom performer. This is contrary to many dryland situations with the longer developing lines being less drought sensitive. However, the late planting date, followed by the shorter season lines performance do hint that even for dryland, late planted cotton might still be better served under some circumstances if more determinate lines are selected.

Other data on seedling vigor and final plant per acre stands will always be useful information in West Texas. The outstanding vigor of PHY 332 W3FE in all early season agronomic measurements and the poor performance of PHY 210 W3FE in those same factors should not be overlooked.

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, Corteva for sponsoring and partnership of this trial, the 2021 Plains Pest Management Interns and Lab Technicians for data collection and labor: Denise Reed, Shawn Feagley, Brandy Reed, and Jerik Reed, and John Thobe of the High Plains IPM Team for additional assistance and data collection associated with this trial. Thank you all.

2021 Mite Product Efficacy Trial in West Texas Corn

Texas A&M AgriLife Extension Service / Gowan / Bayer Crop Science
Cooperator: Jimmy Sageser
Blayne Reed, EA-IPM Hale & Swisher, John Thobe, EA-IPM Parmer, Bailey, Castro
Dr. Craig Sandoski, Gowan, Russ Perkins, Bayer

Summary

Seven labeled miticide treatments and an untreated check was organized for this trial. Three rates of Onager (10, 12, and 14 oz./ac.) Oberon (8 oz./ac.), Zeal 3 oz. wt. / ac.), Portal XLO (32 oz./ac.), and Comite (36 oz./ac.) were selected for the trial. All treatments were organized into a small plot CRBD with four replications in a commercial corn field in Northwestern Hale County. Plots were lain out on 30 July in one of the stronger pockets of BGM available in the field. The treated rows of each plot were then flared with a treatment of Karate at 2.4 oz. / acre via CO2 backpack sprayer with overhead boom attachment at 16.2 GPA. All treatments were applied on 7 August with the CO2 backpack sprayer with the overhead boom attachment. Data on mites per zero leaf were recorded pre-treatment, 3, 10, and 17 DAT with a mite damage rating taken at 17 DAT with the 0-10 Texas A&M AgriLife Mite Damage Rating Scale. All data was then analyzed via ARM utilizing ANOVA and LSD of *P*=0.05 or less as a significance level.

There were no responses in control to the rate increases of Onager with all rates giving good control for the full 17 DAT date. Onager, Oberon, and Zeal all provided superior control for the duration of the trial compared to the UTC with Portal XLO and Comite II not significantly performing any better than the UTC in terms of mites per leaf or in the 0-10 17 DAT damage ratings (*P=0.233)*.

Objective

Obtain a current evaluation all long time, labeled and recommended miticides for Banks Grass Mite efficacy in West Texas Field Corn under field conditions while evaluating for a rate response to the most common local miticide.

Materials and Methods

Plots for an 8-treatment trial were lain out on 29 and 30 July in one of the stronger population pockets of BGM available in a production pivot irrigated corn field of Jimmy Sageser in northwestern Hale County. The pocket of BGM were detected by the Plains Pest Management Field Scouting Program amongst a generally non-economic BGM field though weekly scouting duties. The use of a pocket of mites within a generally non-economic field helps prevent control over-sprays that could demolish trial results. All treatments were organized into a small plot CRBD with four replications. Plots were 6 rows wide and 43 feet long with the middle 2 rows of each plot being the actual treatment area. Rows between the treated areas acted as a buffer to prevent spray drift between treatments while also offering a source for mite reinfestation. This source for mite reinfestation is intended to allow for an ultimate test of product viability and efficacy. A flaring treatment of Karate at 2.4 oz. / acre via CO2 backpack sprayer with overhead boom attachment at 16.2 GPA was made on the 30 July date to ensure an economic population within all plots were present at trial initiation by reducing beneficial populations. On 5 August, the treated areas of all plots reached threshold levels for BGM.

Image 17. Between treatment applications in August.

On 7 August the pretreatment counts were made and treatments made with the CO2 backpack sprayer with the overhead boom attachment at 16.2 GPA. Data on mites per leaf were recorded pre-treatment, 3, 10, and 17 DAT with a mite damage rating taken at 24 DAT with the 0-10 Texas A&M AgriLife Mite Damage Rating Scale. There were seven labeled miticide treatments and an untreated check was organized for this trial. Three rates of Onager (10, 12, and 14

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

oz./ac.) and the max labeled rates of Oberon (8 oz./ac.), Zeal 3 oz. wt. / ac.), Portal XLO (32 oz./ac.), and Comite (36 oz./ac.) were all utilized. Corp Oil Concentrate at 1% V/V were used as surfactant for all treatments.

Image 18. Typical ear leaf for BGM per leaf counting at the PPM lab.

For the mite per leaf counts, five randomly selected ear leaves were harvested from each plot on count dates and taken to the Plains Pest Management Insect Lab in Plainview where 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.

<u>Results and Discussion</u>

All pretreatment counts shown a fairly well distributed BGM population with no significant differences between plots or treatments. By the 3 DAT counts, no significant differences were found yet. At the 11 DAT date a solid grouping of treatments were proving to be significantly different from the UTC. All Onager treatments, the Zeal treatment, the Oberon treatment, and the Comite II treatment were among this superior group with the Portal XLO not significantly separating from the UTC but still similar to the Comite II and Oberon treatments. By the 17 DAT date all Onager treatments and the Zeal treatment remained the only treatments significantly different from the UTC. The low rate for Onager was also statistically similar to the Oberon, Portal XLO and Comite II treatments.

Trt No.	Treatment Name	Rate	Rate Unit	1 d&AL	2	3 d&AL	4 d&AL
1	Untreated Check			46.9 -	125.8 -	470.4 a	671.6 a
2	Onager COC	10 1	oz/a % v/v	56.8 -	116.5 -	119.6 c	248.6 bc
3	Onager COC	12 1	oz/a % v/v	69.2 -	101.0 -	129.7 c	160.9 c
4	Onager COC	14 1	oz/a % v/v	80.5 -	38.0 -	120.7 c	186.5 c
5	Oberon COC	8 1	fl oz/a % v/v	57.8 -	66.0 -	182.4 bc	266.2 abc
6	Zeal COC	3 1	oz wt/a % v/v	47.1 -	58.8 -	98.9 c	133.9 c
7	Portal XLO COC	32 1	fl oz/a % v/v	79.9 -	97.0 -	294.4 ab	527.0 ab
8	Comite II COC	36 1	fl oz/a % v/v	36.6 -	79.1 -	145.2 bc	347.1 abc
LSD P=.05 (% mean diff)				62.80 - 126.28 (37%)	70.98 (83%)	125.72 - 262.65 (16%)	224.46 - 420.09 (18%)
Standard Deviation				0.43t	48.27	0.24t	0.29t
CV				24.62t	56.62	10.78t	11.85t
Grand Mean				1.77t	85.25	2.23t	2.44t
Levene's F^				0.474	1.407	1.463	1.077
Levene's Prob(F)				0.844	0.248	0.227	0.408
Rank X2				.	.	.	.
P(Rank X2)				.	.	.	.
Skewness^				-0.2096	-0.1577	-0.0599	0.344
Kurtosis^				-0.2514	-0.6371	-0.8856	1.298
Minimum Replicates (power = 80)				27	6	3	4
Largest Mean Difference (% mean diff)				0.34t (19%)	87.85 (103%)	0.67t (30%)	0.70t (28%)
Replicate F				2.266	3.856	3.277	2.399
Replicate Prob(F)				0.1105	0.0242	0.0412	0.0966
Treatment F				0.297	1.558	3.639	2.865
Treatment Prob(F)				0.9472	0.2026	0.0100	0.0290

Table 1. ARM ANOVA results showing BGM / leaf by treatment with LSD and P values shown.

On the 17 DAT damage ratings, all of the Onager treatments, the Oberon treatment and the Zeal treatment shown significantly less BGM damage than the UTC and the Portal XLO treatment. The Portal XLO was similar to the UTC and the Comite II treatment did not differentiate from any treatment of the UTC.

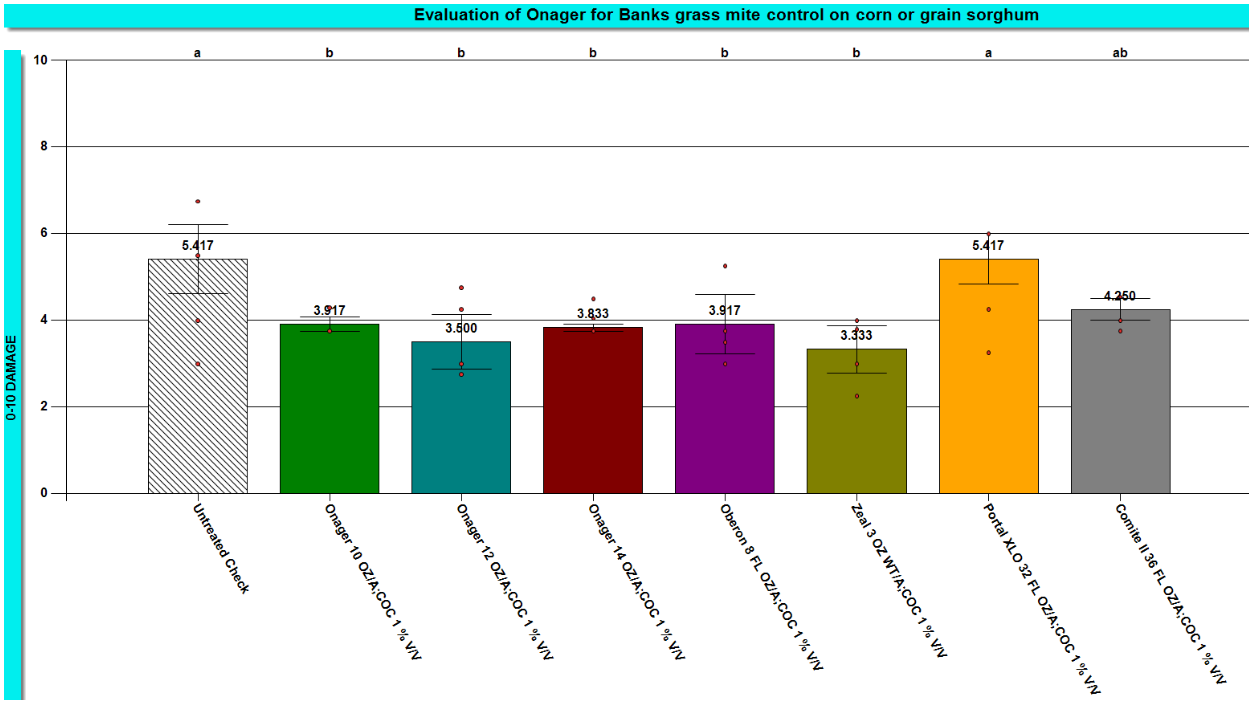


Table 2. 0-10 BGM damage ratings by treatment at 17 DAT (P=0.0233, LSD @ .05 = 1.31)

Conclusions

We did not see a large rate response in the level of control or damage prevented from an increase in rate among the Onager treatments, although a numeric slippage in mites per leaf for the light rate hinted that under longer pest pressure, this rate might slip in control. In this trial, this numeric slip did not result in significant mite population differences and did not show an increase in BGM damage. To date, even the light rate of Onager should provide 17 DAT control of BGM in the Hale and Swisher County area.

Despite the length of time that Onager, Oberon, and Zeal being on the market with heavy selection pressure placed upon them for BGM resistance are still proving to be valuable treatment options for BGM control in the Texas High Plains area. This is especially surprising for Oberon, as it existed as the lone effective BGM product in corn for many years before its competitors were released. It is hypothesized that there has been a conscious effort by area entomologist and area corn producers to avoid Oberon, easing the selection pressure for this product that has resulting in the renewal of the products efficacy locally. The questionable performance of Portal XLO is likely due to a formulation issue that resulted in this product being a better fit for higher value crops in other areas under pressure from other mite species Thus Portal XLO should not be considered a prime choice for BGM in Texas High Plains Corn. The poor performance of Comite II likely resulted due to the preventative nature of the product being overutilized utilized frequently in both prophylactic treatments and economic treatments due to a lower price. These results indicate that Comite II could benefit from an easing of use as an economic treatment consideration locally.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Gowan's Craig Sandoski, Bayer's Russ Perkins for sponsoring and partnership of this trial, Jimmy Sageser for Cooperating and hosting this trial, and the 2021 Plains Pest Management Interns and lab techs for data collection and labor associated with this trial: Jerik Reed, Shawn Feagley, Denise Reed, and Brandy Reed. Thank you all.

2021 Halfway Grain Sorghum Variety Trial and New Sorghum Technology Evaluation

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

Summary

Six select sorghum varieties, 85P75, 86P20, SP 68M57, SP SC344, ADV G1120IG, ADV G1153 were chosen for their various SCA tolerance or herbicide trait representations and arranged into a large plot CRBD with 3 replications and placed at the Halfway Experiment Station. All Texas High Plains Sugarcane Aphid Management recommendations were followed through the season which included early planting, use of insecticidal seed treatments (provided via the companies), weekly scouting, beneficial conservation, treatment at the High Plains SCA ET, and follow up weekly scouting. Early season agronomic qualities were quantified at 35 DAP, weekly SCA counts and 83 DAP, and harvest at 152 DAP.

The lines ADV G1120IG and ADV G1153 performed very poorly in early season agronomic traits such as final PPA stands and vigor ratings with the other lines outperforming them both early and in resulting yield. The aphids reached ET for all lines regardless of SCA tolerance ratings by 111 DAP and all lines required treatment. There were highly significant differences in the number of SCA at the 111 DAP date with the tolerant lines performing much better than the lines without any SCA tolerant trait resulting in better yields for all SCA tolerant lines compared to lines without the trait.

Objective

Evaluate likely popular new sorghum varieties with emerging or improved sugarcane aphid tolerance and herbicide technologies for local agronomic fit and aphid control value.

Materials and Methods

Three sorghum seed companies, Pioneer Seed, Sorghum Partners, and Alta Seeds, all with new or relevant early-mid sorghum varieties containing sugarcane aphid resistant traits or new sorghum herbicide resistance traits and were expected to have serious planting interest on the Texas High Plains for the 2021 season and beyond, were approached about having varieties included in this trial. Pioneer offered the early-mid 85P75 (company rated 7/9 SCA tolerance) and the early 86P20 (company rated 6/9 SCA tolerance). Sorghum Partners offered SP 68M57 (moderate rated SCA tolerance) and SP SC344, and early-mid experimental (high rated SCA tolerance). Alta Seed offered ADV G1120IG a medium-early with the new igrowth herbicide technology and ADV G1153 a medium-early with the aphix SCA tolerance trait.

These six sorghum varieties were arranged into a large plot CRBD with 3 replications and placed at the Halfway Experiment Station. All Texas High Plains Sugarcane Aphid Management recommendations were followed through the season which included early planting, use of insecticidal seed treatments (provided via the companies), weekly scouting, beneficial conservation, treatment at the High Plains SCA ET, and fallow up weekly scouting. Planting occurred on 30 April with the Halfway Station field planter at 27,000 seed per acre on the inside 2 pivot spans of section C. Plots were 4 rows wide and varied in length and thus plot size varied due to pivot pie curve. Establishment irrigation of 1.5-inches was applied 3 May. Over the month of May, heavy rainstorms and weather events occurred in the trial area of the field. Over 5-inches of rain fell, and 3 separate severe hail events damaged all lines equally in trial. The igrowth herbicide trait was not treated with herbicide for performance and all lines were agronomically managed identically by Casey Hardin, Halfway Station

Figure 19. Vacuuming a planter and changing seed for a variety trail.

Manager with inputs and additional advisory and weed hoeing inputs by the Plains Pest Management Team.

On 4 June (35 DAP) all early season agronomic data was taken and weekly scouting by the Plains Pest Management field scouting program began. Five plant per acre stand counts were taken in each plot by measuring 1/1000th of an acre, counting emerged plants within, and multiplying by 1000, and taking the average per plot and resulting average per variety. Seedling V-Stage or average vegetative growth stage for each plot and variety were recorded and Standard 1-5 Seedling vigor ratings for each plot were taken on the same date. All agronomic and insect scouting data was recorded via Syngenta's Crop Protector field scouting system. On 22 July (83 DAP) additional stage agronomic data was recorded noting maturity differences in each variety during early bloom stages.

Figure 20. A typical scene of counting SCA per leaf.

On the 22 July date, sugarcane aphids were found in the trial area and weekly per leaf aphid counts began. Five randomly plants per plot with both an upper (1-2 leaf below flag) and lower leaf (1-2 leaf above desiccation) were counted per plant for a total of 10 leaves. All aphid per leaf counts were entered in ARM and ANOVA was run for LSD differences in aphids per upper leaf, aphids per lower leaf, and total aphids per leaf ($P<0.05$). Weekly aphid per leaf counts continued until all lines reached the High Plains sugarcane aphid economic threshold by 26 August. An over-the-top application of Sivanto at 5 oz./ac. with 1% COC was applied via Halfway Station's ground rig at 111 DAP. Control was outstanding and no other sorghum pest reached ET in the trial.

Figure 21. Harvest of the 2021 trial plots at Halfway.

Harvest occurred on 29 September with the Halfway Station combine harvest equipment. Total grain plot weight yields were captured via scaled grain cart and adjusted to a per acre standard to adjust for actual plot size.

Results and Discussion

The 35 DAP plant per acre final stand counts held significant differences with most of the sorghum lines breed, tested, and selected on the High Plains performing much better through the torrent of weather events during the month of May. The lines SP SC344 (24,800 PPA), 85P75 (24,133 PPA) and 86P20 (24,933 PPA) were superior to all other lines while SP 688M57 (21,200 PPA) remained superior to G1120IG (14,400 PPA) and G1153 (17,067 PPA) with G1153 performing better than G1120IG (*P*=0.0001).

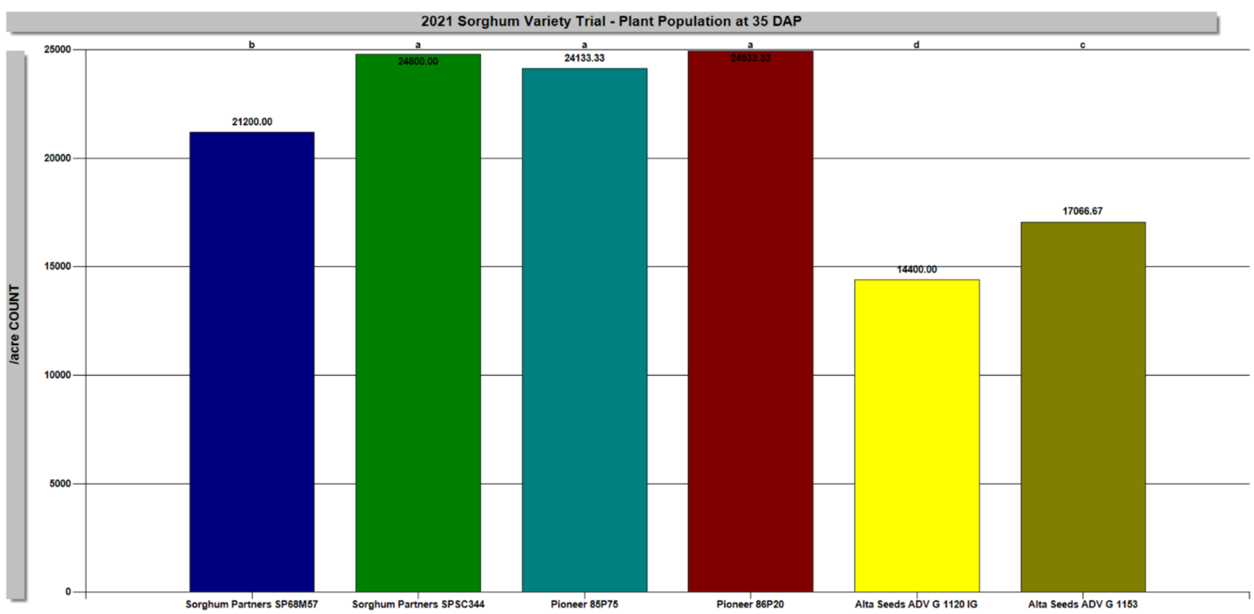


Figure 22. Final PPA stands by variety at 35 DAP (P=0.0001).

In terms of vegetative growth stage, there were no significant differences in lines with SP 68M57 coming in the oldest at V3.6 and G1120IG coming in youngest at V2.7 (*P*=0.0536). The High Plains breed, tested, and selected lines all significantly outperformed the Alta lines in terms of seedling vigor ratings.

SP 68M57 (rating of 3), SP SC344 (rating of 2.83), 85P75 (rating of 3.5), and 86P20 (rating of 3.5) were all almost statistically identical in vigor following the May weather events with moderate ratings. The Alta lines G1120IG (rating of 4.5) and G1153 (rating of 4.33) both performed very poorly with short vigor through the tough High Plains environment (*P*=0.0101).

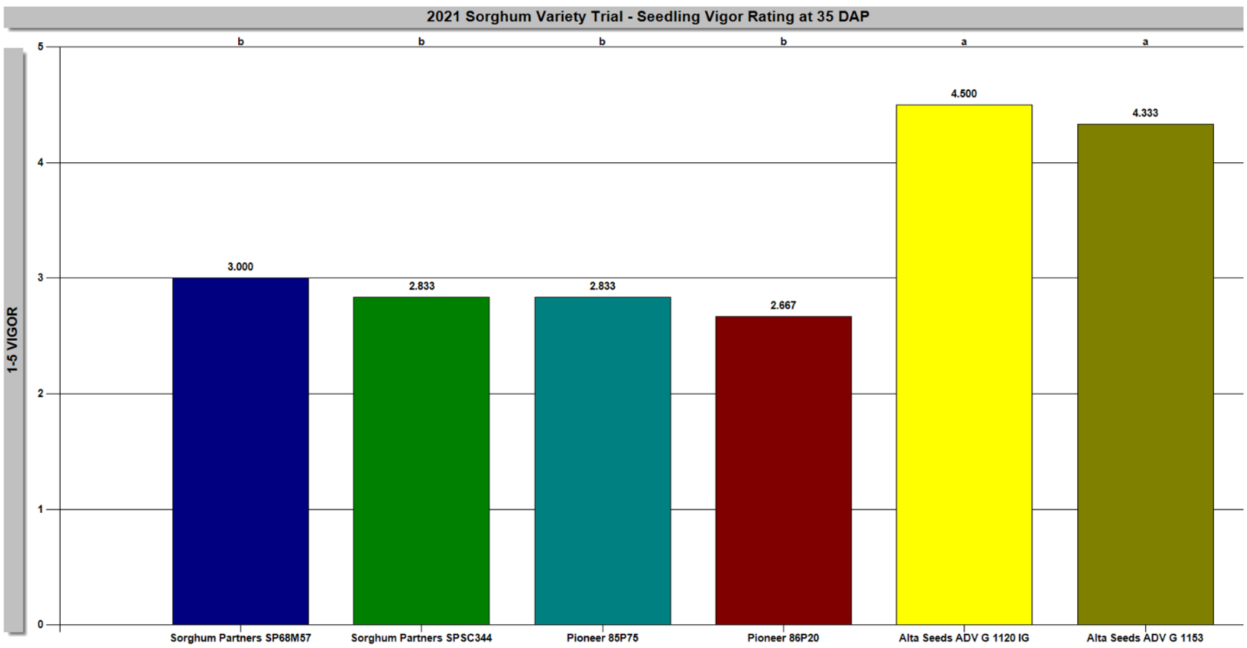


Figure 23. Seedling vigor rating by variety at 35 DAP (P=0.0101).

The 83 DAP plant stage also had significant differences in plant stage along variety lines. These differences related strongly to the company advertised maturities of the lines with 86P20 coming in earliest at 66.7% bloom stage and G1153 the latest at 4% bloom stage (*P*=0.011).

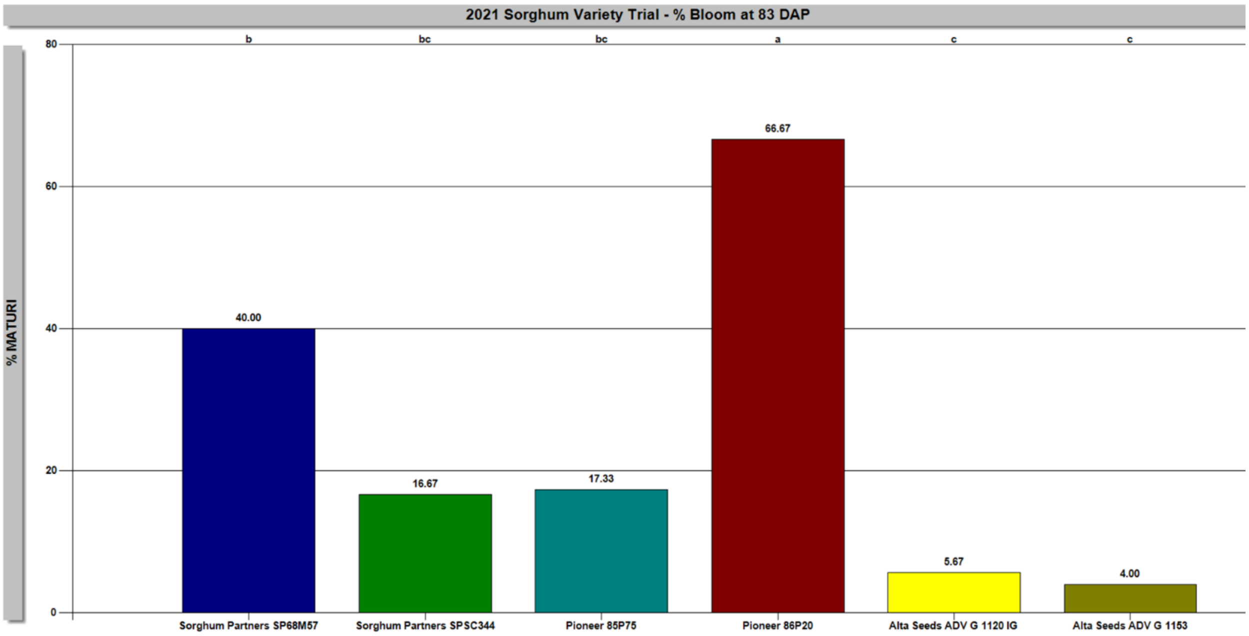


Figure 24. Percent bloom stage by variety at 83DAP (P=0.0011)

No significant differences between lines were found in sugarcane aphid per leaf data between the 83 DAP date and the 97 DAP date. The sugarcane aphid population gradually built, regardless of resistance/tolerance rating until the 104 DAP date when differences began to show. By the 104DAP date, no line had yet reached the High Plains ET level. At that date strong differences at the lower leaf level were found arrayed by the strength of the aphid resistance / tolerance ratings. The line 1120IG, with no SCA tolerance, was outperformed by all lines in number of aphids per leaf with 99.9. The line SC344, with a strong company aphid resistance rating, outperformed 68M57, a moderate company resistance rating, 85P75, a 7/9 company tolerance rating, and 86P20, and with a 6/9 company tolerance rating. The line G1153, with the aphix SCA tolerance trait performed statistically the same as SC344, 68M57, 85P75, and 86P20 but was superior to G1120IG.

Regardless of SCA tolerance ratings, all varieties and plots reached the High Plains SCA threshold at about the same time and by the 111 DAP date. However, there were large differences in the SCA population arrayed again along the lines of company SCA ratings. The line G1120IG, without any SCA tolerance, exhibited over 1,129 aphids per leaf, quickly becoming overcome with aphids and was outperformed by any SCA tolerant trait. The heavily resistant rated line SC344 (63 aphids per leaf) vastly outperformed G1120IG but also outperformed the moderately tolerant line SPM57 (241 aphids per leaf). Statistically, the remaining four lines, 68M57, 85P75, 86P20 and G1153 performed similarly with each other with a range of aphids per leaf starting at 128 and moving up to 241 aphids per leaf(*P*=0.445).

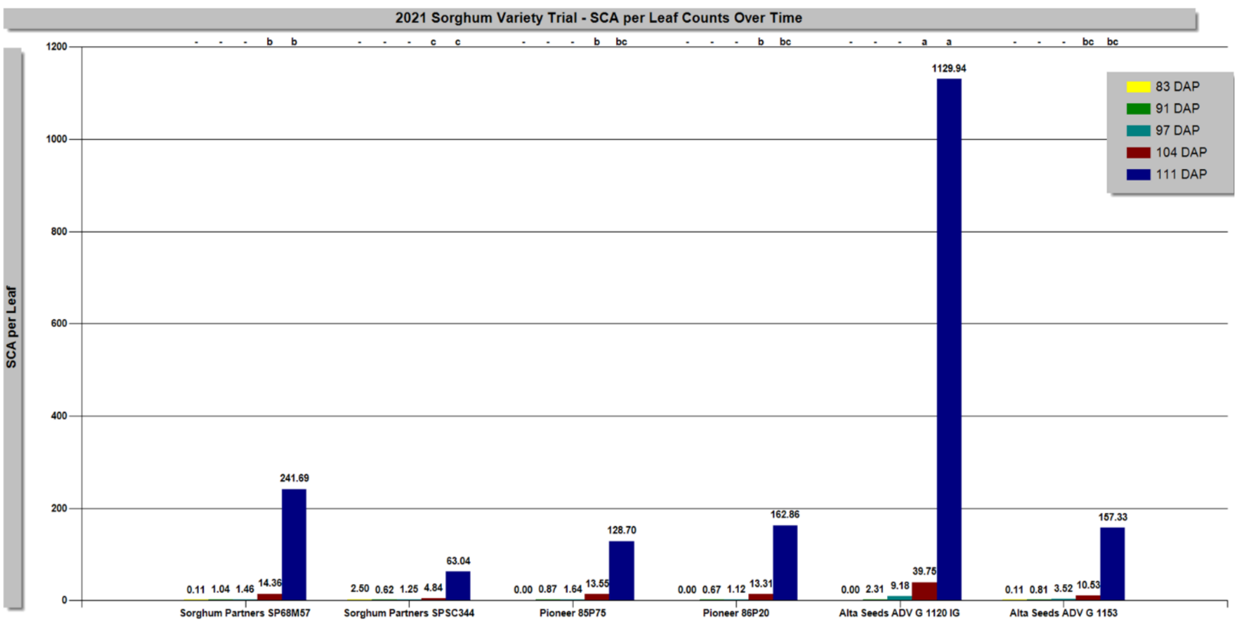


Figure 25. SCA per leaf by variety over time (P=0.039/P=0.0445).

As the trial progressed into grain stages, the line 86P20 remained much earlier maturing than all the other lines, reaching maturity much faster. As a result, this line was forced to wait on the other varieties for harvest once blackline stage had been reached. This exposed the line to very selective bird feeding that caused significant damage as the only line available for the wild birds to feed upon. This very likely significantly lowered this line's final yield.

Yields per acre in terms of pounds grain aligned along both the early agronomic fit parameters and the SCA tolerance traits. The line SC344 (5,255 pounds grain per acre) was the top numeric performer. The lines 85P75 (5,121 pounds grain per acre) and 68M57 (4,664 pounds grain per acre) were statistically similar to SC344. The line 86P20 (4304 pounds grain per acre) remained similar to 68M57 but was likely unfairly impacted by the bird damage and the wait for harvest lowering its normal value below the top 2 performers in this trial. The line G1153 (3,808 pounds grain per acre) was outperformed by the upper 4 performers of the trial but did outperform the trial's low performer G1120IG (2,687 pounds grain per acre) (*P*=0.0002).

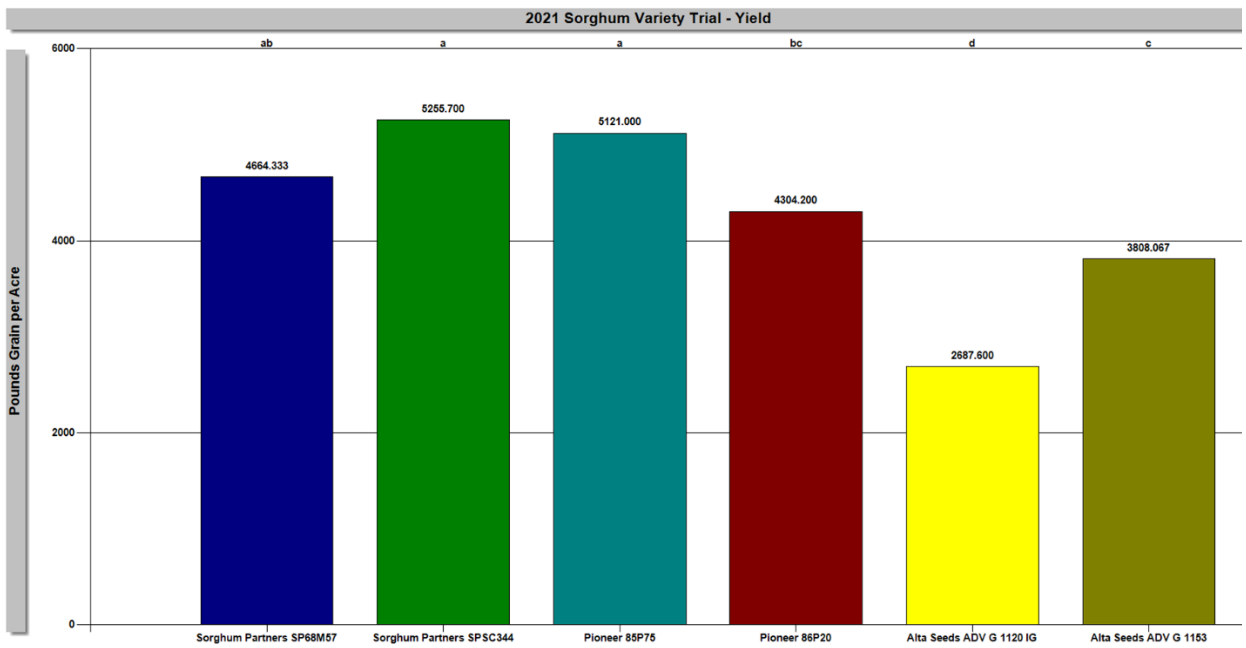


Figure 26. Pounds grain yield per acre by variety (P=0.0002).

Conclusions

The scope of this trial is likely to narrow to fully research an ideal sorghum variety for the Hale and Swisher area from the vast pool of sorghum varieties to choose from. It is also too broad in technology evaluations to fully review all the impacts of each new sorghum technology by the multitude of sorghum lines available. It is a solid snapshot of both.

The drastic early season shortcomings of both Alta seed lines in PPA establishment and seedling vigor speaks volumes toward the need for unbiased, local agronomic testing to ensure varietal fit, no matter how impressive or useful a new technology could be. Conversely, the relative decent performance of the Pioneer and Sorghum Partner lines, all developed on the High Plains, underscores the same issue. Perhaps without such a violent High Plains May with weather events stressing these Alta lines, they might have performed better but it must also be considered that the Pioneer and Sorghum Partner lines performed locally despite the weather issues. In this case, this trial and the early season environmental stress proved these 2 Alta lines were not a good fit on the High Plains under these circumstances while the Pioneer and Sorghum Partner lines would be.

The company sugarcane aphid tolerance/resistance ratings have proven here to be truthful in their approximation and value. A strong note needs to be made that even the strongest aphid rating did not prevent the aphids from reaching economic levels. In fact, it did not even allow for an extended period of time before reaching the ET. These traits will not hold the aphid in check alone but do appear to remain valuable. For whatever reason, lines with these traits did blunt the rapid expansion of the aphid and its assorted damage as the aphid population went into a rapid expansion. The result and value of these traits is apparent somewhat statistically and definitely numerically visible in the grain yields represented here. All lines with a moderate or good SCA tolerance rating proved valuable by having fewer aphids and damage as the aphids reached ET resulting in those yield differences.

Acknowledgements

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