Plains Pest Management

Integrated Pest Management Program

Hale, Swisher, and Floyd Counties

<u>2017 Annual Report</u>

Prepared by:

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Extension Agent-IPM

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2017 Plains Pest Management Newsletters available at: http://hale.agrilife.org/

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Plains Pest Management 2017 Advisory Committee

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

2017 Plains Pest Management Ag & Research IPM

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

Relevance

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

Response

The Plains Pest Management Association, made up of 21 participating grower members and steered by a chairing committee and the IPM agent, made informing the producers in Hale, Swisher, & Floyd Counties about the latest agriculture IPM principles, control methods and options a priority in 2017. During the year the activities included:

- Weekly field scouting for insect, weed, and disease problems of the 21 participating grower member's fields (6,588 acres of all crops) were conducted over the 2017 growing season. Information from this weekly field scouting was shared, interpreted, and IPM solution recommendations given to the participating growers via scouting report and direct interaction.

- Data generated from the field scouting, along with pertinent IPM research and successful recommendations were shared through the Plains Pest Management Newsletter weekly throughout the growing season and periodically during the offseason. (17 issues, 429 subscribers).

- Locally conducted 15 independent agriculture IPM related research trials and assisted with district IPM research trials with all resulting data rapidly disseminated through newsletters, blogs, radio programs, and direct interaction.

- Gave IPM presentations at 11 grower meetings, 3 professional and peer meetings, 2 producer turn-row meetings, 3 Progressive Grower Meetings, and a Field Scout School where IPM was a topic (61 CEUs offered total). Made 3 Pest Patrol Hotline submissions summing a current pest situation nearing problem status area wide and gave IPM recommendations.

- IPM and its implementation, current pest pressure, emerging pests, and control recommendations were major topics for all weekly Ag radio programs conducted. Weekly radio programs were conducted throughout the year on the 1090 AM High Plains Radio Network, Plainview, through August on Fox Talk 950's IPM report, Lubbock, and 7 six-minute educational spots on 900 All Ag All Day, Floydada.

Results

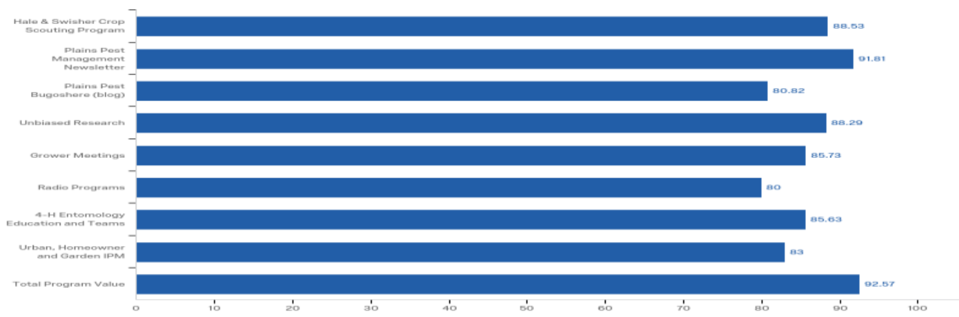
A retrospective post evaluation instrument was distributed to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) to interact with and respond to.

The survey responders were made up of: Ag Producers – **39.3% Independent Ag Crop Consultants –17.9%, Ag Industry –34.1%, Homeowners & Horticulturalists –0%, and Other –3.6%.**

Responders were also asked, “Has the Texas IPM program consultations, demonstrations, newsletters, meetings, radio programs, blogs, and other educational activities resulted in better IPM implementation and reduced pesticide use in your production operation, home, or business in recent years?”

- 100% of responders indicated yes.

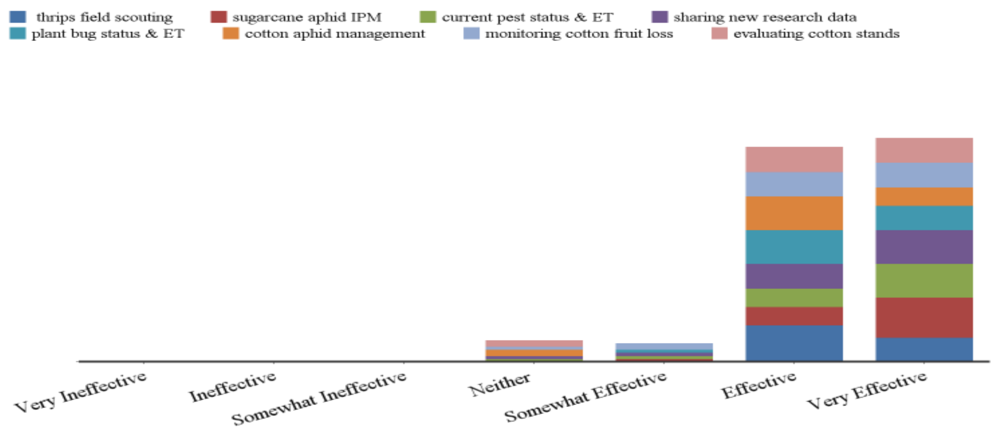
Responders were asked to assign a 0 to 100 value to each component of the Plains Pest Management Association's efforts and the information generated by those efforts, what would that value be?



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

- The average value response was $ 60.00 per crop acre.

Responders were also asked to rate how well for major each issue faced by the IPM Unit in 2017 was able to disseminate educational education to customers?



Summary

The IPM Program in Hale, Swisher, & Floyd Counties is proving to have real value and impact in the Hale, Swisher, & Floyd production agriculture economy. If the survey responder estimated **$60.00 per production acre estimate** of the value of the IPM Program is multiplied by **half of the irrigated cotton, corn, and sorghum production acres in Hale, Swisher, & Floyd Counties, a <u>$16,140,000.00 potential impact figure</u>** emerges. Even if this purposely conservative survey-based estimate proved to be high, the Plains Pest Management Association is still not only important to the production agriculture economy in the Hale, Swisher, & Floyd area, but is a significant part of that economy's maintenance and function.

2017 Cotton Insect Study and IPM Education In-Depth

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

Relevance

Agriculture is the foundation of the economies of Hale, Swisher, & Floyd Counties and cotton is one of the main commodities grown in this diverse production agriculture system. Over the past few growing seasons, weeds have understandably been the focus of cotton producer's control focus and there has been a shift away from cotton insect pest IPM and proven field scouting techniques. Traditional cotton pests such as Lygus, thrips, cotton aphids, and fleahoppers continue to quietly threaten the economics of cotton production in the area while bollworms have become a major issue to any region in the cotton belt where their population was significant. Meanwhile, new cotton pests, such as stink bugs and old-world bollworm could soon be encroaching into the area.

Response

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

- Conducted 5 independent and locally conducted IPM related cotton insect trial over 2016-2017 and shared results rapidly through newsletters, blogs, radio programs, grower meetings and direct interaction. Gave cotton pest or how to scout presentations at 8 grower or crop consultant meetings, 1 professional meeting, 2 turn-row meetings, and held 3 Progressive Grower Meetings where weed IPM was a topic (32 CEUs offered total).

- Weekly field scouting and crop consulting of the participating grower member's fields (6,359 acres of cotton) was conducted over the 2017 growing season. Information from this field scouting was shared, interpreted, and IPM solution recommendations given to the participating growers via scouting report and other direct interaction.

- Data generated from the field scouting, along with pertinent weed IPM research and successful recommendations were shared through the Plains Pest Management Newsletter weekly throughout the growing season and monthly during the offseason (17 issues, 429 subscribers).

- Cotton pest IPM, its evolving implementation, and pest status were topics for all weekly Ag radio programs. These weekly programs were conducted on the 1090 AM High Plains Radio Network, Plainview, weekly on Fox Talk 950's IPM report, Lubbock, until late August, and for 4 six-minute radio spots through 900 All Ag All Day, Floydada.

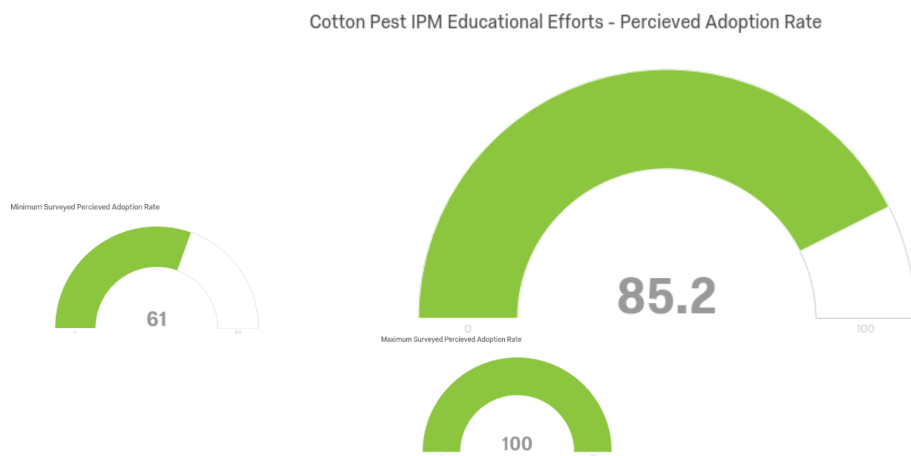
Results

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

The 2017 survey responders were made up of: **Ag Producers –39.3%, Independent Ag Crop Consultants –17.9%, Ag Industry –32.1%, Homeowners & Horticulturalists –0%, and Other –3.6%**.

The responders were asked to rate on a 0-100 scale their expected adoption rate of the Cotton Pest IPM suggested management recommendations from the IPM program in 2017?

- The mean expected adoption rate was 85.2%.



A retrospective survey was distributed at the Hale/Swisher Crops Conference on February 7, 2017 where cotton IPM presentations were made.

- Attendees to the conference indicated that 72% expected to see an economic return from their participation in the conference.

Responders to the online survey were also asked what the per acre value of the Hale, Swisher, & Floyd IPM Unit was to the area?

- The mean value indicated a $60.00 per acre value.

Field	Minimum	Maximum	Mean	Std Deviation	Variance
$ Value of the Plains Pest Management IPM Program	5.00	96.00	60.00	29.78	886.75

Summary

These results indicate a level of success in both increasing awareness of potential cotton IPM issues and a better understanding of implementation of practical IPM control measures by ag producers, ag industry, and independent crop consultants. If the survey **responder's 85.2% expected adoption rate** of the recommended cotton pest IPM management from 2017 is applied to the total acres of cotton grown in Hale, Swisher, & Floyd Counties, **then this plan has and will be influencing about 364,741.2 acres of cotton** in a positive way. With **72% of the attendees expecting an economic benefit** from attending just one of the programs focused on by the IPM Unit during 2017, and **a survey reported $60.00 per acre return** from this plan, the impacts of the 2017 Cotton Insect Study and IPM Education In-Depth plan were both large and economically beneficial to the region.

2017 General Horticulture, Homeowner, Gardening, & Youth IPM Education

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

Relevance

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

Response

The Plains Pest Management Association, made up of 21 participating grower members and steered by a chairing committee and the IPM agent, made informing the general populace of Hale, Swisher, & Floyd County about IPM principles and implementation into our daily pest control habits one of the IPM Program's focus in 2017. During the year activities included:

- Made 43 requested site visits to help solve direct customer IPM questions and fielded 91 direct customer IPM questions via phone, email, and office visits about invading honey bees, tree borers, garden pests, elm leaf beetles, lawn pests, bed bugs, and head lice.

- Gave 2 invited bed bug, mosquito presentations, IPM theory, and IPM Unit interpretations to local civic and church groups.

- Lead authored a needed revision of the Texas A&M AgriLife Extension numbered publication, Human Lice (ENTO-079) with Statewide educational impacts.
  Reed, B., Hurley, J. 2017. Human Lice. December 2017. 5 pp.

- IPM principles and its implementation for home, office, horticulture, agriculture, and gardening were common topics on 22 of the weekly Ag radio programs conducted on the HPRN, Plainview, and FoxTalk 950, Lubbock.

- Participation in the Hale County Ag Fair, delivering the entomology portion of the fair to 520 area Hale County 4th graders with presentation of "Entomology and You" with district entomologist Dr. Pat Porter.

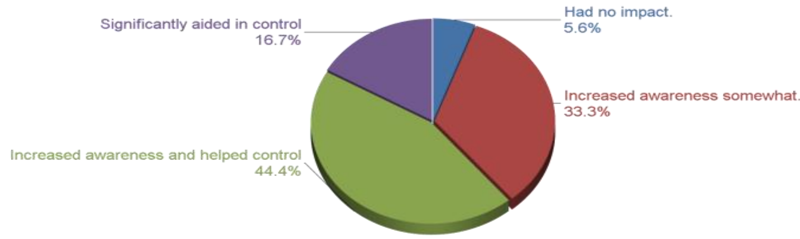
- Coaching of the Hale & Swisher 4-H Entomology ID Teams (3 teams, 10 youth) with both senior teams advancing to State Roundup, 1 youth placing at State, and intermediate team district champions.

Results

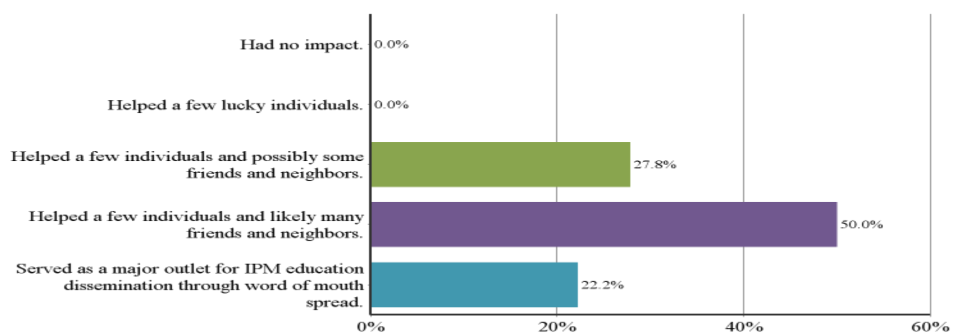
A retrospective post evaluation instrument was distributed to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) to interact with and respond to.

The 2017 survey responders were made up of: Ag Producers –39.3%, Independent Ag Crop Consultants –17.9%, Ag Industry –32.1%, Homeowners & Horticulturalists –0%, and Other –3.6%.

Responders were asked what kind of impact they felt the IPM Unit's educational efforts in IMM and bed bug IPM through radio, group, electronic, and print outlets had? **94.4% of the responders indicated that the efforts had some positive impacts of some level.**



Responders were then asked what kind of impact the IPM Unit had through requested site visits, customer interactions, and other direct service IPM questions from the public? **100% of the responders indicated that the efforts had positive impacts of some level.**



The survey responders were asked to place a perceived dollar value to each of the 43 IPM site visits made through 2017.

- The average value response was $ 82.64 per site visit with IPM solution recommendations.

Summary

The majority of responders to the retrospective post survey represented the various agricultural production sectors in Hale, Swisher, & Floyd Counties more than the general citizenry. The IPM Program’s efforts in horticulture, homeowner, and gardening IPM education received high marks from these sectors, attest to an impact for the successful IPM education on key issues in the area. The average of $82.62 in impact per IPM site visit indicates a direct $3,553.52 impact for these customers who sought IPM help from the Unit in 2017. The survey response of impact of these site visits indicates a possible 2 to 4-time multiplication of the impact through customer sharing of learned information. The economic impact of this plan for 2017 could then be as high as **$14,214.08 with additional human health and home pest control positive impacts** on a large scale for the region.

2017 Educational Activities

Farm Visits	2,473
Number of Newsletters Released	17
Newsletter Recipients	7,259
Direct Contacts	6,431
Radio Programs	66
Blog Releases	40
Ag Consultants, CEA, and Field Scouts Trained	199
Newspaper / Magazine / online Magazine articles written or interviewed for	41
Research Trials Initiated	16
Research Trials Supported	12
Presentations / Programs / Field Days Made for Adults	19
Presentations Made to Youth	21
Pest Patrol Hotline Alerts	3
Articles for other blogs	2
Educational Videos Released	9
Television Interviews	1

Activity Highlights

Plains Pest Management Scouting Program
(6,714.6 acres)
Applied Research Projects
Weekly Radio Programs
Swisher Fall Ag Conference
Hale & Swisher 4-H Youth Entomology Projects
Horticulture IPM Spot Checks
Hale County Youth Ag Fair
High Plains Association of Crop Consultants
CEU training
Texas Pest Management Association
Agent Trainings
FOCUS on South Plains Agriculture
Newspaper Press Releases
Invasive Pest Species Sampling

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

2017 at a Glance

The following is a brief overview of the 2017 growing season and pest populations in Hale, Swisher, & Floyd County agricultural crops. Copies of the Plains Pest Management Newsletters published in 2017 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 2017 on the High Plains were no exception. Spring growing conditions for wheat and summer crop fields were generally dry during this pre-plant period. This situation combined with low grain price market conditions forced much of the area's planted wheat to be utilized for cover, hay, or some other purpose other than grain. Greenbug, Russian wheat aphid, and other wheat diseases and pests were common in most fields but either did not reach threshold levels in many harvested for grain fields or fields were diverted for other uses leaving very few treatable wheat situations in 2017. Yields from fields harvested for grain were considered below average for the region.

A greatly depressed grain market but reasonable cotton price market in 2017 drove area producers to plant an inordinate amount of cotton compared to most seasons. Intended plantings of all other typical area crops such as corn, sorghum, or hay crop dropped significantly in favor of cotton. Newly available herbicide technologies in 2017 also provided a shift from more familiar cotton varieties for longer season lines containing the XtendFlex trait, and to a lesser extent, the Enlist trait for many cotton acres. Planting conditions through early and mid-May continued to decline to very poor with cold fronts holding soil temperatures well below acceptable cotton planting conditions, extended drought in some areas, and even wet conditions in others keeping planters from the field. It was late May before the bulk of the area's larger cotton acreage was planted with a substantial portion of cotton being planted 'late' well into June.

Widespread pockets of weather events containing high winds and hail caused the failure of 10-20% of the area's already largely late planted cotton. Still producers were reluctant to opt for the standard secondary replant crops of grain due to the depressed grain markets. A portion of reluctantly planted acres did go to late grain sorghum and late corn. Many of the failed acres continued to see cotton planted ever later with some cotton being replanted until well into late June and even early July. In a few cases acres were simply left fallow for the summer rather than face a late cotton crop or a low value grain crop.

Of the few early planted sorghum and corn acres, growing conditions through May and June were good with the cooler temperatures and weather having little negative and some positive impact on early season crop quality. Early season pests such as the whorl feeding fall armyworm, greenbug, or any early arriving sugarcane aphids were non-existent through mid-July.

Thrips pressure on the generally late cotton was very heavy from a Plainview line north and moderate from the same Plainview line south. The insecticidal seed treatments, utilized on the majority of cotton acres planted in the region, were very effective in limiting the delaying damage of this thrips population. Thrips populations continued to move into cotton as the insecticidal seed treatments began losing residual control somewhere about the 3rd or 4th true leaf stage. About 100% of the cotton acres north of Plainview required additional over the top insecticide treatments and about 75% of the cotton acres south of Plainview required additional thrips treatment. These treatments were very effective in controlling thrips, but applications were difficult as the newer herbicide technologies and labels often limited tank mix options and thrips treatments required an additional spray as they could not be mixed with early season herbicides to save applications.

Widespread drought conditions returned through July and early August. This allowed the late cotton to develop more rapidly and 'catch up' somewhat. The early planted corn and sorghum were under stress conditions at that time. This was particularly stressful for the corn during pollination while most sorghum was able to tolerate the stress better.

Mid-season cotton pests were relatively light with less than 5% of the area's cotton requiring treatment for fleahoppers or Lygus. Fall armyworms remained largely absent from the already stressed grain crops as did the spider mites in corn. High populations of mite specific predators aided greatly in mite suppression through the drought periods of 2017's mid-summer. The sugarcane aphid began arriving in late July and infested all sorghum type crops. The rate of sugarcane aphid population growth was slowed in 2017 compared to 2015 and 2016 with a better established beneficial population and fewer sorghum acres to infest. It would be mid to late-August before treatable levels of the aphid were area wide.

In early August localized areas began receiving some scattered rainfall that ultimately cumulated into area wide rain events by mid-August. Unfortunately, these rain events came again with cooler temperatures. For almost a two-week period, high temperature for each day failed to reach 80˚F or very much above. This weather period came as a welcome relief to the few grain crop acres in the area, and this short run of weather provided most early planted sorghum with enough moisture to develop to grain maturity before the sugarcane aphid reached economic levels. Several of these fields were harvested in late August and September without any economic pest issues including the sugarcane aphid. This represented one major researched and recommended IPM management decision achieved for some 2017 sorghum acres. The generally late cotton that had 'caught up' some in the heat of July quickly adapted for rapid vegetative growth in place of developing bolls in the extended period of cool and wet weather. Once the two-week weather cleared and heat unit accumulation returned closer to a 'normal' level, plant growth regulator treatments were widespread on most cotton fields in hopes of fields reaching absolute cut-out stage by the last effective bloom date of August 24th.

During mid-August flights of migrant bollworms began arriving in the area. This 2017 flight continued through the entire month of September and amounted to a very heavy population of a size and density the area has been accustomed to regularly for many years. This 2017 population was reminiscent of the 2016 flight, but without a notable volume of late corn acres, these moths only serious host plant option to lay eggs in was cotton and the scattering of late planted sorghum fields with the few early planted corn acres having developed past attractiveness to the worms. The resulting bollworm caterpillars reached economic levels in 80-95% of the area's non-Bt cotton and late planted sorghum. These migrant bollworms brought with them the control issues they had developed in the areas where they are an annual pest. Despite educational efforts, these control issues were unfamiliar or unbelievable to many area producers who could not make themselves spend the extra funds required to control modern bollworms at economic levels. As much as 40% of non-Bt cotton fields experiencing economic issues with the bollworms early in the moth flight were treated with cheaper pyrethroid insecticides that the worms were moderately resistant to resulting in control failures that required retreatment with proper but higher cost control measures. These retreated fields, with beneficial populations decimated, quickly developed cotton aphid issues that required additional insecticides to now control the aphid too. These bollworms also brought other resistant traits with them. As much as 22% of the areas Bt trait cotton required additional insecticide treatments to achieve bollworm control.

The few acres of the area's late planted sorghum had economic pest issues also but from multiple pests. Sorghum midge were an additional factor for any field blooming after a mid-August date and were combined with the bollworms/headworms during the bloom and early dough stages. Areawide, fields reached economic levels, although not all fields were treated for these two pests. Shortly following early dough, the beforementioned sugarcane aphid increased in population over several weeks, also reaching treatable levels for most area sorghum acres. Fields that reached economic levels for headworms and / or midge but utilized insecticides that were soft on beneficial populations were able to achieve control of the sugarcane aphid also. Where fields were treated with cheaper insecticides for headworms or midge that were harsh on beneficials, sugarcane aphid control became very difficult and multiple treatments were needed.

The last week of August through the first few weeks of September seen a return of cool, sub-80˚F temperatures and wet weather. These conditions brought an end to the sugarcane aphid threat to late planted sorghum but reinitiated the generally late cotton to vegetative growth. Only about 20% of the area's cotton had reach cut-out by the final average bloom date. The majority that had not continued to vegetativly grow, bloom, set new fruit, with retarded boll development well into October. As the last round of cool and wet conditions arrived and continued most early planted corn was nearing maturity and harvest. Damp conditions hampered corn harvest for several weeks while fields awaited warmer temperatures and sunshine.

The cumulative impact on the few early planted corn acres from drought during pollination followed by two extended periods of cool and wet conditions during grain development and dry-down caused an unprecedented and dangerous level of Fumonisin development in many of the grain fields. The drought conditions led to smaller ears and cob sizes, with limited kernel pollination, and a stressed situation. Once the cooler and wetter conditions arrived during grain development, cob sizes grew and exposed ears past shucks, kernels rapidly grew causing many to rupture for many reasons including silk scaring, ears remained erect longer, and damp conditions were allowed to settle in the base of the ears for extended periods, any available mycotoxins in the environment, namely fumonisin, thrived irrevocably damaging the grain. Most area fields, if found with these dangerous levels of fumonisin, experienced serious price penalties above the already greatly depressed grain markets.

Once the August/September wet and cool weather cleared, the area experienced an extended period of heat unit accumulation and good temperatures into November. This aided the generally late cotton crop in boll maturity but considering most fields had not yet reached absolute cut-out by the second week of September, there remained limited hope for solid lint yields and decent lint quality. The cumulative impacts of a late planting, use of longer season cotton varieties, and two extended periods of cloudy, wet, and cool weather on the areas cotton was profound. About 80% of fields experienced at least some low lint quality issues with over 50% experiencing serious quality discounts with only about 10-20% of the area's cotton being considered average or good quality lint. Yields were not terribly influenced, but there were many odd issues across the region where high yielding dryland fields out yielded nearby irrigated. This was largely due to the access of moisture and fertilizer in the irrigated being used on waisted vegetative growth but focused on boll development in the marginally cared for dryland.

Extreme drought conditions plagued the area once the last cool, and wet conditions cleared, with many locations in Hale, Swisher, & Floyd Counties going without any moisture from September through the remainder of 2017. Many fall planted wheat acres suffered through the end of 2017 with many stands failing or being grazed out and unable to regrow without moisture before 2018 began.

2017 Applied Research and Demonstration Projects

2017 Population Monitoring of Adult Bollworms in Hale, Swisher, & Floyd Counties

2017 USDA CAPS Invasive Moth Pest Species Trapping Survey

Practical Drone Use for Field Scouting in West Texas – 2017/ What Can a Commercial Drone Really Do?

Early vs. Late Planted Sorghum Study – 2017, A Three-Year Study on Pest Trends, and Economic Impact of Sorghum Planting Date on West Texas Grain Sorghum

2017 Experimental Sugarcane Aphid Product Efficacy Trial

Sivanto In-Furrow at Planting and Seed Treatment Efficacy for Season Long Sugarcane Aphid Control in West Texas Grain Sorghum 2017

Testing Chemigation Applications for Sugarcane Aphid Efficacy in West Texas Grain Sorghum 2017

Cotton Incorporated Seed Treatment Benefit, Thrips Efficacy, and Thrips Species Survey in Swisher County, 2017

2017 Pre-Emergence Residual Herbicide Efficacy in Cotton

2017 Floyd County Phytogen Cotton Variety Trail

2017 Swisher County Phytogen Cotton Variety Trail

Evaluation of Varying Rates of Onager for Banks Grass Mite Control in Corn – 2017

2017 Population Monitoring of Adult Bollworms in Hale, Swisher, & Floyd Counties

Texas A&M AgriLife Extension Service
Hale, Swisher, & Floyd Counties
Cooperators: Mike Goss, Shane Berry, Johnathan James
Blayne Reed EA-IPM Hale, Swisher, & Floyd and Dr. Charles Allen

Summary

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

The data generated from this effort indicated that the 2017 bollworm population in Hale and Swisher should be higher than 'average' for several population peak dates in August and early September while Floyd population was below 'average' but still following the same population peak trends. This concurred with what our scouting program and area crop consultants were finding via egg lay and young larva in our area crops fields soon afterwards, any cotton fields of which required treatment for economic populations of bollworms.

Objective

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

Materials and Methods

Standard wire-framed Lepidopteran cone traps and *Helicoverpa zea* specific pheromone lures were utilized in this effort. Traps were suspended upon rebar posts at a height of roughly 4 ½ feet to the top of the trap and at least 50 feet from any host plant to eliminate competition with the trap. Traps were checked, moths counted, recorded, and traps emptied weekly, and pheromone was changed bi-weekly.

Three trapping sites were utilized, one for each county served. The Swisher trap was in central Swisher along the Middle Tule Draw on the Mike Goss Farm (34 26 29.65N -101 44 27.33W) to capture overwintering moths and moths migrating from the east up the Caprock escarpment. The Hale trap was in southwestern Hale near Cotton Center on Shane Berry Farm (33 59 43.59N -101 58 31.39W) to capture overwintering moths and immigrant moths moving from the south. The Floyd trap was in southern Floyd along the Running Water Draw cut in the Caprock on Johnathon James Farm (33 52 40.74N -101 21 50.30W) to capture overwintering moths and those that would be utilizing the draw's cut through the Caprock escarpment as an easy access to the crops grown there. Traps were counted weekly and species-specific pheromone lures changed bi-weekly.

Figure 1. Floyd County Trap on August 14, 2017 with 25 moths caught.

Figure 2. Hale County Trap on August 14, 2017 with 410 moths captured.

Results and Discussion

Early season moth populations, which may be considered those emerging from overwintering locally, was very light. For the Hale and Swisher sites, moth trap catches increased through late July, August and continued well into September. Floyd followed a similar trend in population but remained very low by comparison. All populations uncharacteristically surged higher again in October. This late season surge in population has not been noted in any bollworm population monitoring before but was noted in other locations still collecting data in October in the United States in 2017. The significance of this late population is unknown but could be related to late season cool and wet conditions in September that moths simply sheltered from to return to activity once more suitable and warmer weather returned, at least locally.

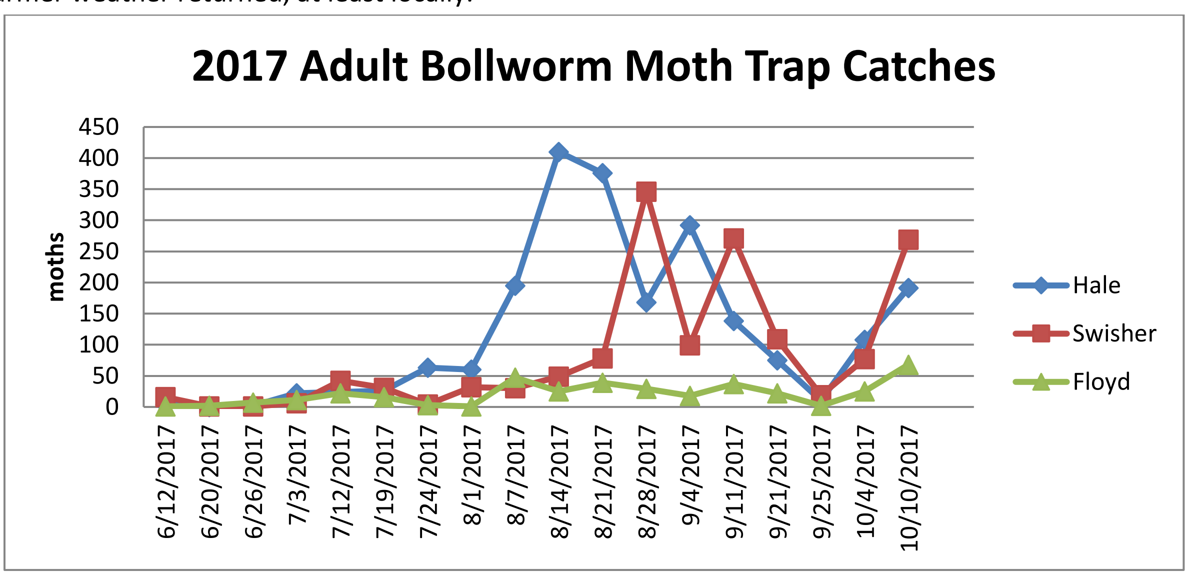


Figure 3. Bollworm moth populations for Hale, Swisher, and Floyd over the 2017 growing season.

Conclusions

While the populations in Hale and Swisher could be considered light to average from a historical perspective, the bollworm population was indeed higher than noted for the most recent 10-year averages. 2016 had similar population numbers but bollworm pressure remained uneconomic locally in that season due to a large amount of late planted corn, a more preferred pest host, to absorb the egg lay and resulting larval populations. In 2017, no such alternate sink-host was available, and the bollworm was a wide-spread and economic pest in area cotton with some Bt and most non-Bt fields requiring treatment.

Figure 4. Bollworm damaged cotton square in Swisher County 2017.

Acknowledgements

I would like to thank USDA/NIFA for salary funding of this and many other projects. I would like to extend thanks to Mike Goss, Shane Berry, and Johnathan James for cooperating with us to gather this data. I would also like to thank Dr. Ed Bynum and Dr. Pat Porter for sharing wisdom and thoughts. I would like to thank Dr. Charles Allen and the Texas A&M Department of Entomology for moth trapping supplies and the 2017 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Jim Graham, Denise Reed, Nik Clarkson, and Trey Buxton. Thank you all.

2017 USDA CAPS Invasive Moth Pest Species Trapping Survey

Texas A&M AgriLife Extension Service - Hale, Swisher, & Floyd Counties

Cooperators: Mike Goss, Craig Klepper, Wayne Johnson, Shane Berry, Texas A&M AgriLife Research-Halfway Station

Blayne Reed EA-IPM Hale, Swisher, & Floyd / Dr. Charles Allen Associate Department Head-Entomology / Xanthe A. Shirley Domestic Identifier (Entomologist) USDA APHIS PPQ

Summary

The Hale, Swisher, & Floyd Texas A&M AgriLife IPM Unit was proud to be one partner of many for this 2017 USDA moth trapping survey. This survey had five trapping locations over the three-county area and was but one piece of a larger State-wide survey within a National moth survey. *Helicoverpa armigera*, the dreaded old-world bollworm, was but one of five invasive moth pests trapped for. The other four were the pink bollworm, European corn borer, Egyptian cottonworm, and the American cutworm. Moth traps were set with two in Swisher County (Mike Goss Farm and Craig Klepper Farm), one in northwestern Floyd County (Wayne Johnson Farm), and two in Hale County (Halfway Research Farm and Shane Berry Farm). Trapping began on August 1st and continued weekly through September 21st, completely encompassing peak typical flight patterns for the area.

There were 427 potential invasive moths trapped on designed and species-specific pheromone lures total in 2017. All captured moths were first checked at the IPM Unit's laboratory in Plainview for preliminary identification. From Plainview there were 46 possible positive invasive moths forwarded to the Texas A&M AgriLife Extension Insect Identification Lab in College Station. Of the 46 potential invasive candidate moths, 0 were of the trapped for invasive moth pest species, including the main pest species of interest, *Helicoverpa armigera*.

Objective

Determine if any of five key Lepidopteran moth pest species are invading and establishing in the Hale, Swisher, & Floyd area as a portion of a larger State and national-wide moth trapping survey. The species of note included *Helicoverpa armigera*, the old-world bollworm, *Pectinophora gossypiella,* the pink bollworm, *Ostrinia nubilalis*, the European corn borer, *Spodoptera littoralis*, the Egyptian cottonworm, and *Spodoptera litura*, the American cutworm.

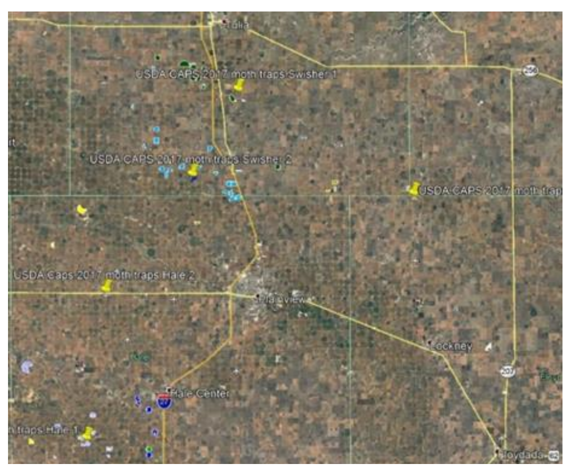


Figure 5. 2017 USDA Invasive Species Moth Trap Sites

Materials and Methods

The Hale, Swisher, & Floyd Texas A&M AgriLife IPM Unit was one partner of many for a 2017 USDA invasive moth species trapping survey. The species needing to be monitored for invasion included *Helicoverpa armigera*, the old-world bollworm, *Pectinophora gossypiella,* the pink bollworm, *Ostrinia* *nubilalis*, the European corn borer, *Spodoptera littoralis*, the Egyptian cottonworm, and *Spodoptera litura*, the American cutworm. All traps, lures, and funding were provided by USDA through the Texas A&M Department of Entomology. Coordination for all Texas trapping sights was conducted by Dr. Charles Allen, Associate Department Head – Entomology.

This survey had five trapping locations over the three-county area of Hale, Swisher, and Floyd and was but one piece of a larger State-wide survey within a National moth survey. Moth traps were set with two in Swisher County (Mike Goss Farm in central Swisher {34 26 29.65N -101 44 27.33W} and Craig Klepper Farm in Southwestern Swisher {34 19 57.84N -101 48 42.90W}), one in northwestern Floyd County (Wayne Johnson Farm {34 18 28.97N -101 28 08.90W}), and two in Hale County (Halfway Research Farm in western Hale {34 11 04.82N -101 56 44.39W}and Shane Berry Farm in southwestern Hale {33 59 43.59N -101 58 31.39W}). Trapping sites were intentionally chosen to encompass potential

Figure 6. All types of moth traps needed for the 2017 trapping survey. Each were species specific, as were the pheromone lures.

invasive pest moth preferred habitats and host preferences. Trapping began on August 1st and continued weekly through September 21st, completely encompassing peak typical flight patterns for the area. All traps and lures utilized were species specific per USDA CAPS 2017 protocol with one trap per species per location. All trapped moths were brought to the Hale, Swisher, & Floyd IPM Unit insect lab in Plainview for preliminary identification. Any potential invasive species candidate moths were forwarded to the Texas A&M AgriLife Extension insect ID lab under Xanthe A. Shirley for further or positive pest species identification.

Results and Discussion

There were 427 potential invasive moths trapped on designed pheromone lure traps total in 2017 by the Plains Pest Management effort. All captured moths were first checked at the IPM Unit's laboratory in Plainview for preliminary identification. From Plainview there were 46 possible positive invasive moths forwarded on to the Texas A&M AgriLife Extension Insect Identification Lab in College Station. Of the moths sent to College Station for identification through dissection or closer analysis 42 of the 46 potential moths were old-world bollworm candidates. Of the 42 old-world bollworm candidates, 0 were *Helicoverpa armigera*, and the remaining 4 moths were confirmed not to be of the targeted pest species.

For the remainder of the Texas and National moth trapping survey in 2017, no *Helicoverpa armigera* were found and no major advancement from known infested regions by other invasive moth species was found.

Figure 7. Helicoverpa zea, the "native" bollworm on a cotton boll.

Conclusions

There remains a strong need to remain vigilant in surveying for these potentially invasive moth pest species. This is especially true for *Helicoverpa armigera*, the old-world bollworm, with its tendency to develop resistance to control measures quickly and its wider host plant range. Detection of any of these pest species will be critical to quickly developing control measures and arming agricultural producers with IPM plans before these pests can economically impact production.

Acknowledgements

I would like to thank USDA/NIFA for salary funding of this and many other projects and for sponsorship of this effort. I would like to extend thanks to Mike Goss, Craig Klepper, Wayne Johnson, Texas A&M AgriLife Research, and Shane Berry for cooperating with us to complete this trial, and finally the 2017 Plains Pest Management Field Scouts and Lab Technicians for the operation, data collection, and labor associated with this trial: Jim Graham, Trey Buxton, Nik Clarkson, Jerik Reed, and Denise Reed.

Practical Drone Use for Field Scouting in West Texas – 2017/ What Can a Commercial Drone Really Do?

Texas A&M AgriLife Extension Service

Hale, Swisher, & Floyd Counties

Cooperators: Ronald Groves, Mike Goss, and Craig Klepper

Blayne Reed EA-IPM Hale, Swisher, & Floyd and Forrest Baldwin, President & Chief Pilot, AeroInfo

Summary

Forrest Baldwin, President & Chief Pilot, AeroInfo, 469-573-2376, approached the Plains Pest Management and the Hale, Swisher, Floyd IPM Unit about field testing AeroInfo's commercial drone-based imagery for use in West Texas row crop situations in early July 2017. Three opportunities were found to test AeroInfo's technology for some practical field applications. The three availing field opportunities were 1) Gathering and determining plant per acre stand counts in cotton following a damaging weather event and determining profitability of that surviving stand, 2) Assessing accidental herbicide damage to non-target cotton in both terms of area damaged and evaluating the remaining profitability of the surviving plants, and 3) Detecting economic banks grass mite populations within plots of an ongoing BGM efficacy trial in commercial field corn with known BGM populations. AeroInfo's drone and imagery platforms were considered to be roughly the latest and best commercially available by this team.

- At base settings, the most stable imaging platform that was economically practicable, with the best commercially feasible optics, and latest commercially available software could not detect cotton stands accurately. Additional imaging at 220 ft. and higher detailed settings proved better, but still were not adequate images and proved to be too draining on equipment and took too much time to be economical. This latter improvement from 220 ft. altitude and higher detailed settings gives hope for future development of the software and platform for this use.
- For assessing accidental herbicide damage the drone and resulting imagery proved very accurate in terms of where damage is and what percent of field is damaged but there are serious questions about available yield estimate accuracy.
- In terms of detecting economic levels of BGM, the drone and resulting images at highest detail settings failed to show any differences in Banks grass mite damage where differences were known to exist. There might never be a replacement for proven field scouting techniques with boots on the ground for pest pressure decisions.

Objective

Interest in precision imagery use and drones as the platform of choice is growing in the agriculture sector. With early technological implementation successes, drones show much potential for money saving abilities. The current level of these abilities and limitations of this quickly developing industry in production agriculture are not known well or understood by producers or industry. Rapid developments and horizon reaching challenges have burred what is currently feasible and what might become possible in the future. The purpose of this effort was to challenge and determine the current commercial capabilities and value to drone use and imaging technology in West Texas agricultural cropping systems in a way to best utilize the platform for maximum benefit.

Materials and Methods

Forrest Baldwin, President & Chief Pilot, AeroInfo, 469-573-2376, approached the Plains Pest Management and the Hale, Swisher, Floyd IPM Unit about field testing AeroInfo's commercial drone-based imagery for use in West Texas row crop situations in early July 2017. Three opportunities were found to test AeroInfo's technology for some practical field applications. The three availing field opportunities were 1) Gathering and determining plant per acre stand counts in cotton following a damaging weather event and determining profitability of that surviving stand, 2) Assessing accidental herbicide damage to non-target cotton in both terms of area damaged and evaluating the remaining profitability of the surviving plants, and 3) Detecting economic banks grass mite populations within plots of an ongoing BGM efficacy trial in commercial field corn with known BGM populations.

AeroInfo's drone and imagery platforms were considered to be roughly the latest and best commercially available platform, imagery, and analysis for practical field use by this team. The specifics of AeroInfo's drone equipment were:

- Flying Ag Professional quad copter drone
- 12-megapixel camera, with 94˚ field of view, on 3 axis gimbal
- Slantrange 2P sensor. Visual image and multi-spectral image in red, green, and red edge spectral range.

Figure 8. AeroInfo's quad drone programed and ready for liftoff.

The imagery analysis programs were also deemed by this team to be the best and most practical commercially available at the time. The systems utilized for analysis were:

- SlantRange for quick analysis
- Skymatics for more detailed and precise analysis

All fields or research trials contained in this effort were in the Plains Pest Management scouting program or under the Unit's management. Each field or trial was scouted at least weekly for insects, weeds, disease, irrigation, fertilizer, and PGR issues or needs. All field data scouted by the program were recorded utilizing Strider Protector© scouting program and software.

<u>Determining plant per acre stand counts following a damaging weather event</u>

An early July weather event southwest of Hale Center on a late planted cotton field belonging to Ronald Groves occurred. The field was at pinhead square stage at the time of crop injury. The pre-injury stand count was 40,833. Damage was sustained by high winds, blowing soil particles and light hail reduced the surviving plants per acre to a variable 27,375 average across the field, confirmed on 10 July by the Plains Pest Management scouting program. This average stand across the field varied from 21,000 in the Southwestern area of the pivot to 38,000 in Northeastern portion with most plants re-growing from alternate growing points and no surviving fruiting sites remaining.

The determination of the scouting program was to release the field for insurance due to the lateness of the damage. Had the damage occurred in early to mid-June, the PPM recommendation would have been to keep the field as viably economic with time to recover.

Figure 9. Forrest Baldwin programs the quad drone for its first flight on Ronald Groves' weather damaged cotton field with Ronald looking on.

Field was left until 21 July when AeroInfo was able to fly the field in an attempt to estimate surviving plants per acre. Standard drone flight settings for flight pattern, optics, and SlantRange analysis were used. The flight altitude utilized on the first image run was the standard 300 feet. A second flight of the field was made later in the day of 21 July where I higher detail flight setting, SlantRange analysis, optic recording settings, and an altitude of 220 feet were used.

Resulting imagery data was compared to the Strider scouting reports with precision data collection points and photographs of the actual site gathered by the Plains Pest Management scouting program.

Assessing accidental herbicide damage to non-target cotton

A cotton field belonging to Mike Goss in central Swisher County was utilized by the Plains Pest Management team for multiple research trials in 2017. These trials received an accidental overspray of Enlist in early July via faulty tank cleanout resulting in severe damage to all non-Enlist varieties across the field and in the various trial. The damage was consistent across the field, but not fully uniform across all plots.

Figure 10. Forrest Baldwin gives the quad drone a final check of GPS and battery settings before takeoff over Mike Goss' herbicide damaged pivot.

The Plains Pest Management scouting program had already determined that the no stand reduction had occurred but that the extent of the yield damage, if any, could not be known until harvest and that yields from damaged and undamaged areas would need to be kept separate and compared after harvest.

On 21 July AeroInfo flew the field on standard settings of flight pattern, optics, SlantRange analysis were used and flight altitude of 300 feet. AeroInfo returned to this field on 18 August and re-ran the flight pattern with standard settings again but added an additional analysis of Skymatics for a finer detail of analysis.

AeroInfo images for area damaged were compared to plot maps and SlantRange predicted yield reduction for both dates was compared to research trial plot yield results.

<u>Detecting economic banks grass mite populations on corn plots</u>

The Plains Pest Management team was conducting a seven treatment, small plot CRBD product efficacy trial with four replications for Banks grass mite in a larger production corn field southwest of Kress in Swisher County belonging to Craig Klepper. The plot size of the trial was 6-rows wide by 42-feet long with 5-foot alleys between replications. To prevent spray drift, only the middle 2 rows of each plot were counted. On 23 August, 21 DAT, damage ratings were given to all BGM plot's treated areas. Plot damage ratings ranged from 2 to 6 on a 0-10 mite damage rating scale with 3.5 being an economic level of mite damage that would require chemical treatment.

Figure 11. Forrest Baldwin prepares to guide the quad drone back in for landing following its flight run in case the flight path program fails in the last few feet.

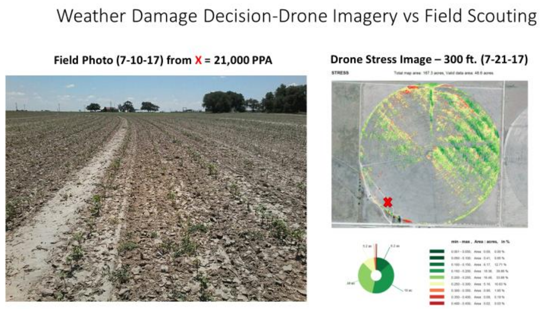
On 18 August, AeroInfo flew a very high detail flight setting, SlantRange analysis, optic recording settings, and an altitude of 150 feet to detect the various BGM damaged plots within the field.

SlantRange imagery was compared to research trial results and plot damage ratings for accuracy of economic BGM prediction.

Results and Discussion

<u>Determining plant per acre stand counts following a damaging weather event</u>

SlantRange developed imagery from the drone flight standard settings proved a wholly inaccurate measure of surviving plants per acre, regardless of image type. The drone failed to detect living plants for the majority of the field, while the traditional scouting techniques shown a variable population with an average of 27,375 PPA.



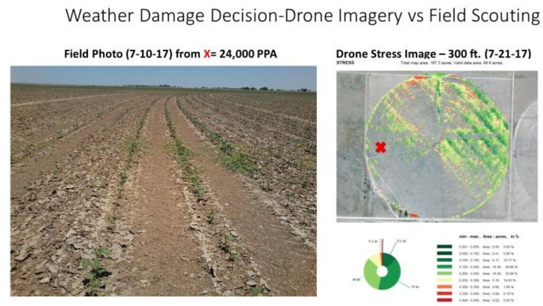
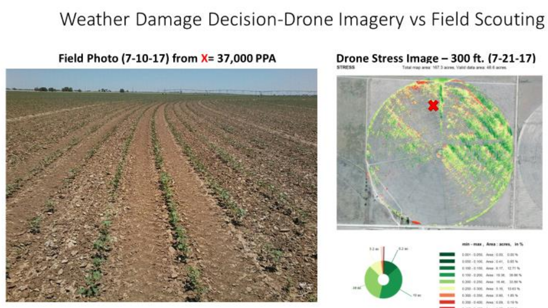


Figure 12. Field Scouting data set points and photographs (locations marked on image by red X on image) comparing plant stress image generated from the drone flight to determine plant per acre stand counts. Lack of color indicates that no plants were detected in that area by the drone.



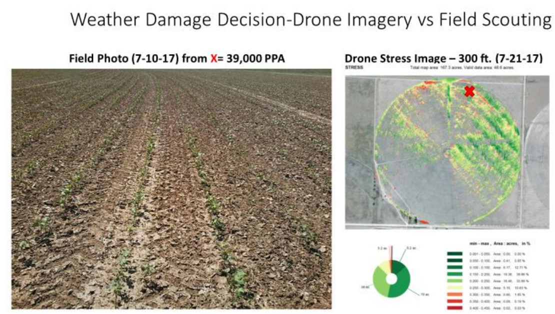


Figure 13. Field Scouting data set points and photographs (locations marked on image by red X on image) comparing plant stress image generated from the drone flight to determine plant per acre stand counts. Lack of color indicates that no plants were detected in that area by the drone.

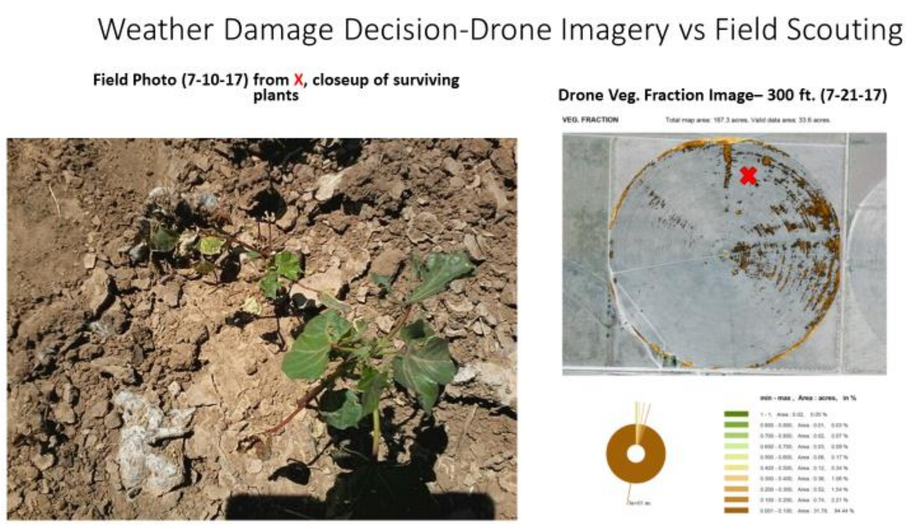


Figure 14. Field scouting generated closeup photograph of surviving seedlings (location marked on image by red X) comparing vegetative fraction image generated from the drone flight to determine plant per acre stand counts. Lack of color indicates that no plants were detected in in the area by the drone. Commercial imaging does not appear to be precise enough to detect plant matter this small yet.

When the precision settings for the imagery and drone flight were increased and flight altitude decreased, the resulting data proved better, but still were not adequate images and the effort proved to be too draining on equipment and took too much time to be economical for either party. The drone's batteries and backup batteries were fully drained before the data from the whole field could be collected.

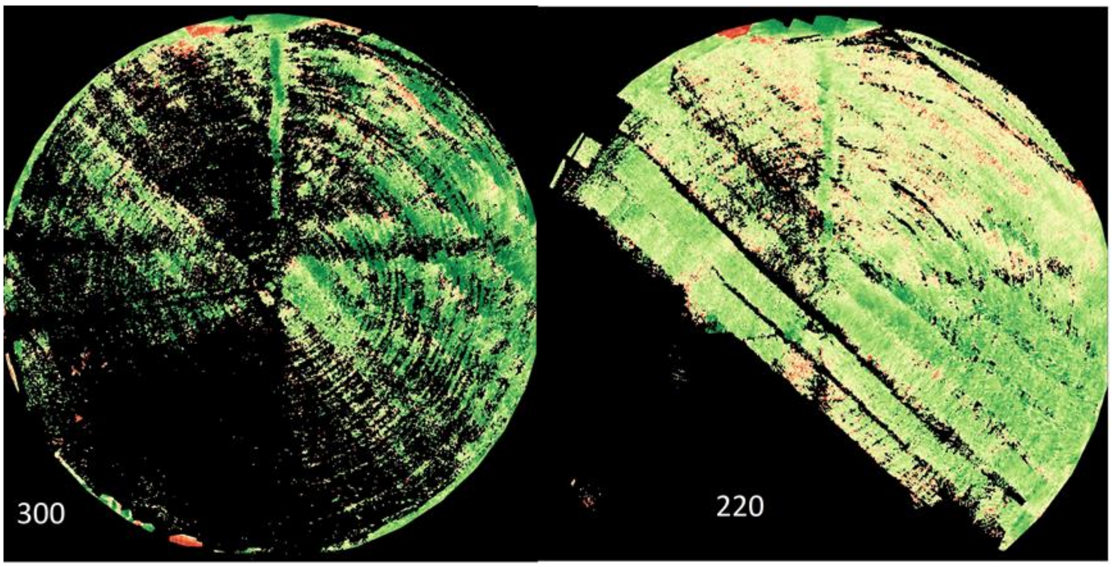


Figure 15. Generated images comparing the quality and detail of the standard 300-foot flight and the incomplete but higher detailed 220-foot flight. The improvement shows that this capability might be attainable by drone imagery in the near future.

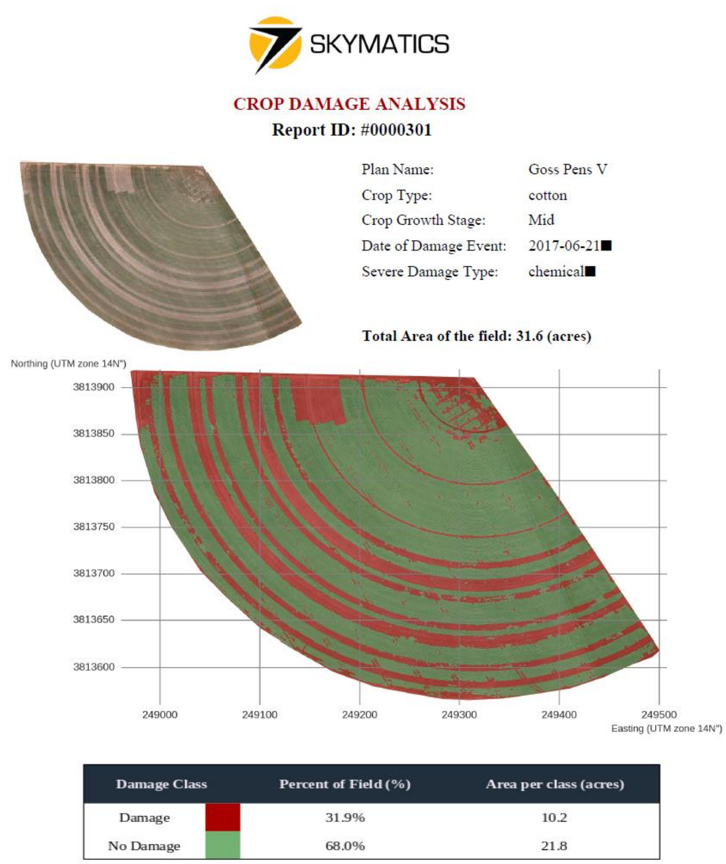
<u>Assessing accidental herbicide damage to non-target cotton</u>

SlantRange developed imagery from the drone flight standard settings for finding and estimating area damaged by the herbicide was excellent. All areas were well defined in the SlantRange images but the Skymatics took the level of precision ever higher an absolute measure of how much area was damaged.

Herbicide Damage Drone Imagery vs Field Scouting

Photo of field (7-21-17) **Drone Stress Image – 300 ft. (7-21-17)**

Figure 16. Photo of damaged field and generated stress image showing good precision detection of herbicide damaged areas.



Damage Class	Percent of Field (%)	Area per class (acres)
Damage	31.9%	10.2
No Damage	68.0%	21.8

Figure 17. Skymatic generated image showing remarkable precision in marking damaged area accurately.

Yield estimates by the PPM scouting program were not given at the time of damage due to the wildly variable and understudied impact of off target herbicides to susceptible cotton. The SlantRange analysis program did attempt to estimate yield for the various levels of damage for each respective area.

The SlantRange yield estimates for the 21 July date can be estimated manually with refractive measure calculations done on the image. These damage ratings for this date were 1.5 to 300 pounds lint per acre for the damaged areas and 300 to 900 pounds lint per acre for the undamaged areas.

The revisited SlantRange yield estimates generated from standard settings on 16 August were 450 to 1,200 pounds lint per acre for the damaged areas and 1,050 to 1,500 pounds lint per acre for the undamaged areas.

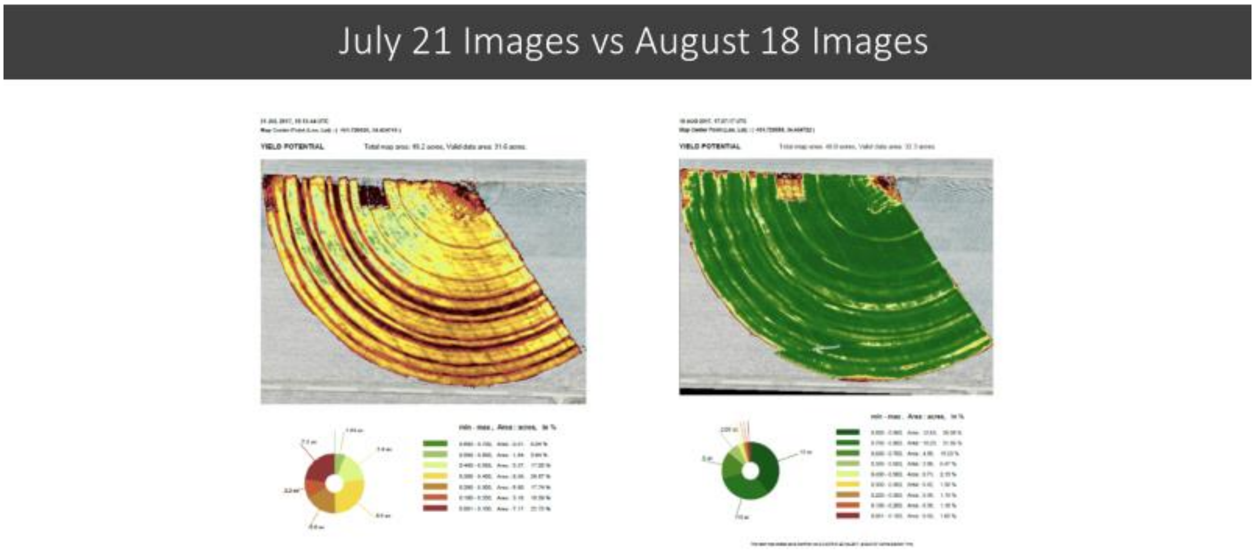


Figure 18. July 21 generated yield estimate image compared to August 18 generated yield estimate image. Neither proved wholly dependable for estimating the yield impact of the herbicide damage.

The actual yields harvested by the PPM team from the research trials were 76.6 to 165.8 pounds lint from the damaged areas and 885.67 to 1,153 pounds lint per acre in the undamaged plots.

Table 1. Image generated and calculated yield estimates compared to actual harvest yield.

	Damaged Area Average Range	Undamaged Area Average Range
July 21 SlantRange lint per acre yield estimate	1.5 – 300 lbs.	300 – 900 lbs.
August 18 SlantRange lint per acre yield estimate	450 – 1,200 lbs.	1,050 – 1,500 lbs.
Actual harvested lint per acre yield	76.6 – 165.8 lbs.	885.67 – 1,103.83 lbs.

Detecting economic banks grass mite populations on corn plots

SlantRange developed imagery from the drone flight set to a very high detail flight setting, SlantRange analysis, optic recording settings, and an altitude of 150 feet failed to show any differences in Banks grass mite damage within the various plots. The middle two rows of several plots were known to have economic BGM damage at varying levels and others were known to be below economic differences. The only detection visible to this team on any of the collected images are the 5-foot alleys between replications.

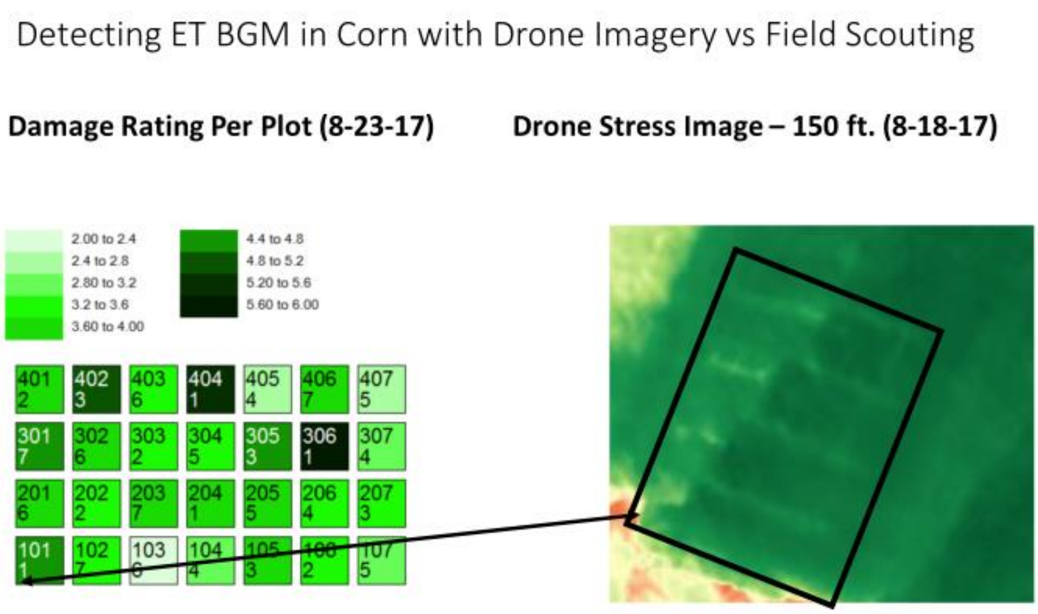


Figure 19. Research plot BGM damage ratings compared to drone generated enlarged plant stress image from high detail settings from altitude of 150 feet. The drone failed to find known BGM damage within the plots.

Conclusions

Commercially available drone and imagery's ability to determining plant per acre stand counts following a damaging weather event

Fail

- From 300 ft. the best, most stable imaging platform that was economically practicable, with the best commercially feasible optics, and latest commercially available software could not detect cotton stands accurately at base settings.
- Additional imaging at 220 ft. and higher detailed settings proved better, but still were not adequate images and proved to be too draining on equipment and took too much time to be economical for either party.

- This **latter improvement from 220 ft. altitude and higher detailed settings gives hope for future development of the software and platform for this use. We may be able to look to success soon.**

<u>Commercially available drone and imagery's ability to assess accidental herbicide damage to non-target cotton</u>

<u>Pass</u>

- **With Questions about yield estimate accuracy**. This issue exists for any and all hormone herbicide damage estimate methods and will require much research and testing before any yield loss prediction will be accurate.
- Very accurate in terms of **<u>where damage is</u>** and **<u>what percent of field</u>** is damaged.
- **<u>Best timing for drone use</u>**, for its many potential uses, should be **<u>during peak bloom or peak fruit set</u>** for most crops and not during early crop stages unless specific and well-established weed patches need to be mapped. This is the timing most of the yield, stress, and other imagery analysis algorithms are based upon thus far.

<u>Commercially available drone and imagery's ability to detect economic banks grass mite populations on corn plots</u>

<u>Fail</u>

We may be asking too much of the technology here

- **All Imagery must make use of reflectivity**
  - This typically comes from upper leaves and other visible portions of plants, **not pest damaged fruit or areas.**
- **Tiny insects do not reflect well**, unless in mass
- Most pests will be start low on the plant**, below the line of sight from any Image from above until far too late and well past ET**
  - This will typically be past any economic treatment timing with damage already done if not plants near death, when most images that have found pest issues have been taken thus far.
- **There might never be a replacement for proven field scouting techniques with boots on the ground for most pest pressure decisions**.

<u>Acknowledgements</u>

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 Ronald Groves, Mike Goss, and Craig Klepper for cooperating with us to gather this data from their fields. I would like to thank Forrest Baldwin of AeroInfo for offering and agreeing to capture this data. Thank you all.

Early vs. Late Planted Sorghum Study – 2017, A Three-Year Study on Pest Trends, and Economic Impact of Sorghum Planting Date on West Texas Grain Sorghum

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

Summary

For three years, various 48-row pivot spans at the Texas A&M AgriLife Experiment Station in Halfway, Texas was utilized for this large plot planting date comparison. Of the 48 rows utilized, 24 rows were used for each planting date. The early sorghum planting date targets were between 24 April and 5 May while the late planted targets were between 15 June and 10 July. This was achieved for all three seasons. All pest data was collected by the Plains Pest Management Scouting Program weekly with the highest recorded amount of each pest population per growing season being converted to a 0-10 scale for statistical analysis homogenization of data with a rating of 7 being ET for each pest. At the end of the 3-year trial period, all statistics were run in ARM using ANOVA as though the trial was a CRBD with 3 replications.

For all years of the trial and all pest species monitored, except spidermites, were higher in the late planted sorghum with the sugarcane aphid reaching ET all three seasons for the late planted plots and just once for the early planted plots. Sorghum midge and headworms reached ET levels just one out of three seasons for the late planted plots, but never for the early planted plots. While not a guarantee of avoiding sugarcane aphid or other pest issues and economic chemical treatment, these findings, for all seasons, indicate that **planting sorghum early should be the best IPM recommendation for economical sugarcane aphid management** and other pests **in West Texas grain sorghum**.

Objective

Interest in early or earlier planted secondary or rotational crop grain sorghum has increased locally over the past several growing seasons for multiple potential entomological and agronomic benefits that were not been fully verified. This three-season trial is intended to capture and quantify these potential pest management benefits with particular interest in sugarcane aphid IPM in West Texas grain sorghum.

Materials and Methods


Figure 20. Early and late planted plots at Halfway during SCA field scout training, 10, July 2016.

For three years, various 48-row pivot spans at the Texas A&M AgriLife Experiment Station in Halfway, Texas of the pie of the pivot designated for sorghum research was utilized for this large plot planting date comparison. Of the 48 rows utilized, 24 rows were used for each planting date. The early planting date targets were between 24 April and 5 May while the late planted targets were between 15 June and 10 July. The 2014 planting dates were 1 May and 16 June. The 2016 planting dates were 5 May and 6 July. The 2017 planting dates were 25 April and 19 June. The sorghum variety utilized in all plots in 2014 and 2016 was Pioneer 86G32 while the line used in 2017 was the sugarcane aphid resistant variety NK 7633. The targeted seed rate for both plots in all years was 32,000 seed per acre.

Irrigation timings could not be modified or adjusted for either planting date and for the purposes of this trial and were applied as deemed needed or able to irrigate by the Halfway farm manager Casey Hardin. However, it could be stated that in general terms irritation timings were better tailored for the late planted plots in all years as that planting timing more aligned with the remaining sorghum planted in that pivot pie section of the research farm. For all growing season of the trial, birds have played a significant role in consuming the early planted trial's yield potential, farther limiting the early planted plots yield potential. For these reasons, any yield component from this trial should not be compared as being fair with every agronomic management decision giving advantage given to the late planted plots. However, all plant stages were met by all plots for all seasons and adequate insect pest attractiveness equality was rated as better than adequate for the trial as a whole.


Figure 21. The 2016 plots highlighted as likely the best potential non-chemical IPM practice for managing SCA by Dr. Pat Porter and Blayne Reed at a Halfway Station field day.

Data collection for pest populations began in each plot shortly after germination and continued through until harvest. Data was collected by the Plains Pest Management Scouting Program weekly as separate fields with normal field scouting techniques for all pest populations from both plots. The maximum recorded pest populations for each pest recorded were adjusted to a standardized 0-10 scale with ET set at 7 for all pests after the growing season. For this trial, no pest control measures were ever implemented for the entirety of the trial, but only monitored for the pest's chosen behavior patterns to be recorded.

The pest species recorded included greenbug, yellow sugarcane aphid, spidermites, sorghum midge, headworms, and the sugarcane aphid. Only the 2014 season experienced notable greenbug population numbers and this pest species data were mixed with the yellow sugarcane aphid for simplicity. At the conclusion of the 3-year trial period, all statistics were run in ARM using ANOVA as though the trial was a CRBD with 3 replications.

Results and Discussion

For all years of the trial and all pest species monitored, except spidermites, were higher in the late planted sorghum. Spidermite populations were consistently higher in the early planted plots but never reached an economic level. The yellow sugarcane aphid/greenbug population never reach economic levels either but the late planted did come very close in 2017. The sorghum midge and headworm populations did become economic for the late planted plots only for the 2017 season and were significantly higher in all years. The sugarcane aphid population was consistently higher in the late planted plots reaching economic levels all three years of the trial while only reaching economic levels once in 2016 for the early planted plots.

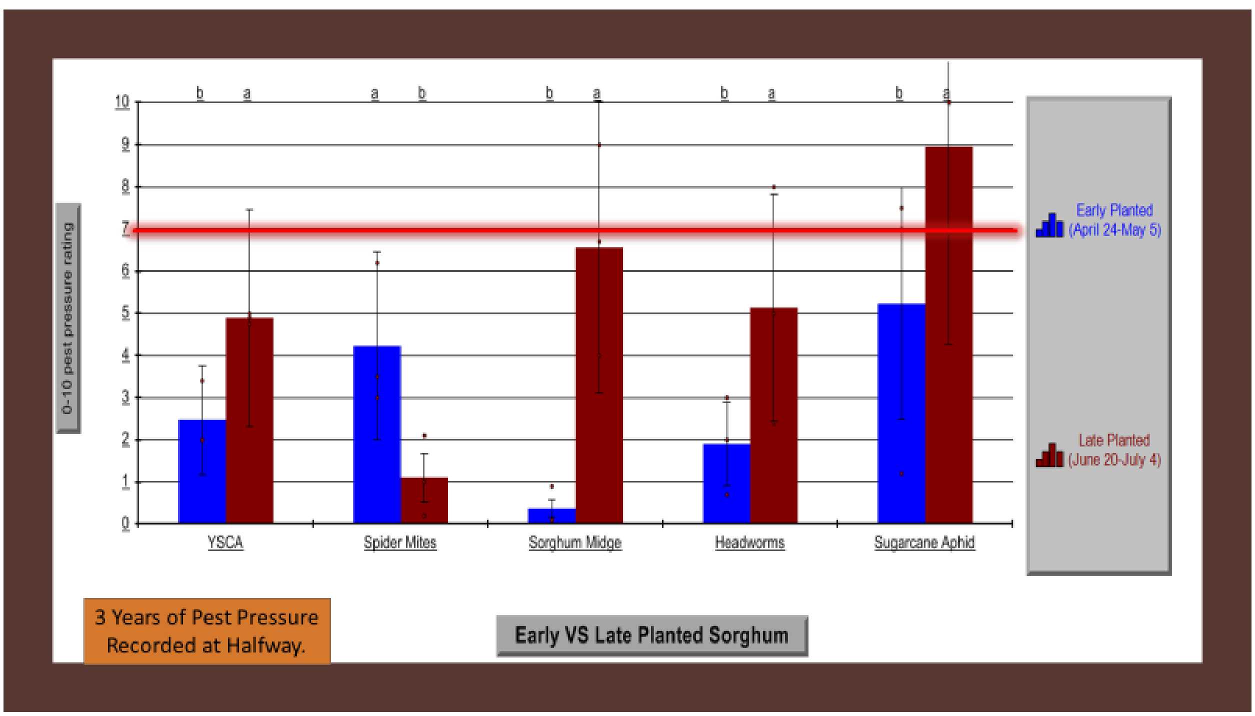


Figure 22. Peak pest population statistics for all three years of the trial set to the 0-10 rating scale with 7 being a standardized ET for each pest. Different letter headings are significantly different to at least the P<0.08 level.

The statistical probability lines for each pest also show a corresponding relationship for possible pest pressure as it relates to grain sorghum planting date. These probability lines indicate that if sorghum is planted late, there is an 8% chance of yellow sugarcane aphid reaching ET, 43% chance of sorghum midge reaching ET, and a 15% chance of headworms reaching ET all to a corresponding 0% chance of early planted sorghum reaching ET. For the sugarcane aphid, the late planted sorghum has an 89% chance of reaching ET while the early planted has a 20% chance of reaching ET.

Pest	Early Planted	Late Planted
Yellow sugarcane aphid / Greenbug	0%	8%
Spidermites	8%	0%
Sorghum midge	0%	**43%**
Headworms	0%	15%
Sugarcane aphid	20%	**89%**

Figure 23. Percent likelihood of an economic pest population occurring for each sorghum planting date by pest species, (P<0.08). Large differences in pest populations by planting dates highlighted in red.

Conclusions

This trial was not designed to be a sugarcane aphid trial. However, these findings, for all seasons, indicate that **planting sorghum early should be the best IPM recommendation for economical sugarcane aphid management in West Texas grain sorghum**. While not a guarantee of avoiding sugarcane aphid issues and economic chemical treatment, this is should be done in hopes to develop the sorghum crop past any developmental stage that sugarcane aphids can damage. All other pests, except for the spidermite, should also be easier to control due to the pest's population behavior patterns with an earlier sorghum planting date.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Casey Hardin for cooperating with us to complete this trial on their sorghum at the Halfway Station and the 2017 Plains Pest Management Field Scouts and lab technicians for the operation, data collection, and labor associated with this trial: Jim Graham, Nik Clarkson, Trey Buxton, Denise Reed, and Jerik Reed.

2017 Experimental Sugarcane Aphid Product Efficacy Trial

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

Summary

Seven sugarcane aphid treatments highlighting the experimental aphid product from BASF, now titled Sefina, were organized as: 1) UTC, 2) Sefina at 2.74 oz. /ac. plus Induce at 0.125% V/V, 3) Sefina at 5.48 oz./ac., 4) Sefina at 5.48 oz./ac. plus Agri-Dex at 1% V/V, 5) Sefina at 5.48 oz./ac. plus Induce at 0.125% V/V, 6) the commercial standard Sivanto at 7 oz./ac. plus Induce at 0.125% V/V, and 7) the commercial standard Transform at 1.5 oz./ac. with Induce at 0.125% V/V on a field of known sugarcane aphid susceptible KS 585 sorghum housed at the Halfway Research Farm in Hale County. Once sugarcane aphids reached ET naturally trial work began. Plots consisting of 6 rows wide by 44 feet long with only the middle 4 rows of each plot being treated to prevent spray drift were lain out with alleys cut for a 7 treatment CRBD with 4 replications. Pretreatment aphid counts, and treatments were made on August 16, 2017. Plots were then treated via CO2 backpack sprayer set at 16.8 GPA. Counts on 10 lower and 10 upper leaves per plot were made at 3, 7, 16, and 23 DAT and damage ratings taken at 23 DAT and the harvest date of October 20, 2017. Harvest was conducted on by hand harvesting 10 row feet from each plot, grain was threshed via trailer mounted Haldrup research grain thresher on site. Grain moisture and bushel weight measurements were collected on a Dickey-John Mini GAC Plus grain moisture analyzer. Grain samples were weighed in terms of grams per 10 row feet and converted to grain yield in pounds per acre.

By the 3 DAT count, all treatments except treatment 2 for lower leaves were significantly lower in all leaf counts compared to the UTC and by the 7 DAT counts all treatments outperformed the UTC. Significant differences between treatments also appeared at 3 DAT with the 6) Sivanto treatment separating from all others in total aphid numbers. This general trend continued until 23 DAT when the 7) Transform treatment increased to significantly higher than all other treatments, including the UTC. The 6) Sivanto was clearly superior to all other treatments with the 3), 4), and 5) treatments of Sefina proving very good to adequate control and the 7) Transform treatment originally providing good control but loosing residual control well before the trial period ended. These performance levels translated into the damage ratings and yields for the treatments directly with Sefina proving to be a valuable treatment option for sugarcane aphid control in grain sorghum.

Objective

Independently evaluate efficacy of experimental BASF insecticide compound, now titled Sefina and its unique mode of action on economic Texas High Plains sugarcane aphid populations on grain sorghum against two known industry standard control products for viability of novel mode of action control, rate efficacy impacts, and rate surfactants for impacts on Sefina's efficacy.

Materials and Methods

The seven treatments were organized into a completely randomized design small plot trial. The treatments were defined as: 1) UTC, 2) Sefina at 2.74 oz. ac. plus Induce at 0.125% V/V/, 3) Sefina at 5.48 oz./ac., 4) Sefina at 5.48 oz./ac. plus Agri-Dex at 1% V/V, 5) Sefina at 5.48 oz./ac. plus Induce at 0.125% V/V, 6) the commercial standard Sivanto at 7 oz./ac. plus Induce at 0.125% V/V, and 7) the commercial standard Transform at 1.5 oz./ac. with Induce at 0.125% V/V. Individual plot sizes were 4 rows wide by 44 feet long.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Untreated Check
2		BAS 44001I 2.74 FL OZ/A;Induce 0.125 % V/V
3		BAS 44001I 5.48 FL OZ/A
4		BAS 44001I 5.48 FL OZ/A;Agri-Dex 1 % V/V
5		BAS 44001I 5.48 FL OZ/A;Induce 0.125 % V/V
6		Sivanto 7 FL OZ/A;Induce 0.125 % V/V
7		Transform 1.5 OZ WT/A;Induce 0.125 % V/V

401 6	402 1	403 5	404 7	405 4	406 2	407 3
301 4	302 7	303 1	304 6	305 5	306 3	307 2
201 5	202 3	203 7	204 2	205 1	206 4	207 6
101 7	102 4	103 3	104 5	105 2	106 6	107 1

Figure 24. Trial product list and randomized plot plan.

The field utilized in the trial was located at the Halfway Research Farm in Hale County. The portion of the farm to this trial was planted with a known sugarcane aphid susceptible sorghum, KS 585, on 19 June. The field was monitored weekly by the Plains Pest Management scouting program. Once sugarcane aphids reached ET naturally trial work began on 16 August. Plots consisting of 6 rows wide, with the middle 4 rows treated, by 44 feet long were lain out with alleys cut for the 7 treatment CRBD with 4 replications.

Pretreatment aphid counts and treatments were made on the 16 August date. Plots were then treated via CO2 backpack sprayer set at 16.8 GPA. Counts on 10 lower and 10 upper leaves per plot were made at 3, 7, 16, and

Figure 25. The Plains Pest Management team making the applications to the trial.

23 DAT. Damage ratings taken at 23 DAT and the harvest date of 20 October. Harvest was conducted on by hand harvesting 10 row feet from each plot, grain was threshed via trailer mounted Haldrup research grain thresher on site. Grain moisture and bushel weight measurements were collected on a Dickey-john Mini GAC Plus grain moisture analyzer. Grain samples were weighed in terms of grams per 10 row feet and converted to grain yield in pounds per acre.

Results and Discussion

By the 3 DAT count, all treatments except treatment 2 for lower leaves were significantly lower in all leaf counts compared to the UTC. Significant differences between treatments also appeared at 3 DAT with the 6) Sivanto treatment separating from all others in total aphid numbers. At the 7 DAT counts, all treatments were superior to the UTC but statistically similar to each other. While the general trend of control compared to the UTC for all treatments continued through to the 23 DAT counts, several treatment differences in aphids per leaf were found at the 16 DAT count with the Sivanto treatment being superior to all other treatments and the Sefina high rate with Induce and Sefina high rate with Agri-Dex being superior to Sefina low rate with Induce, Transform, and UTC. At the 23 DAT count date, the Transform treatment increased to significantly higher than all other treatments, including the UTC.

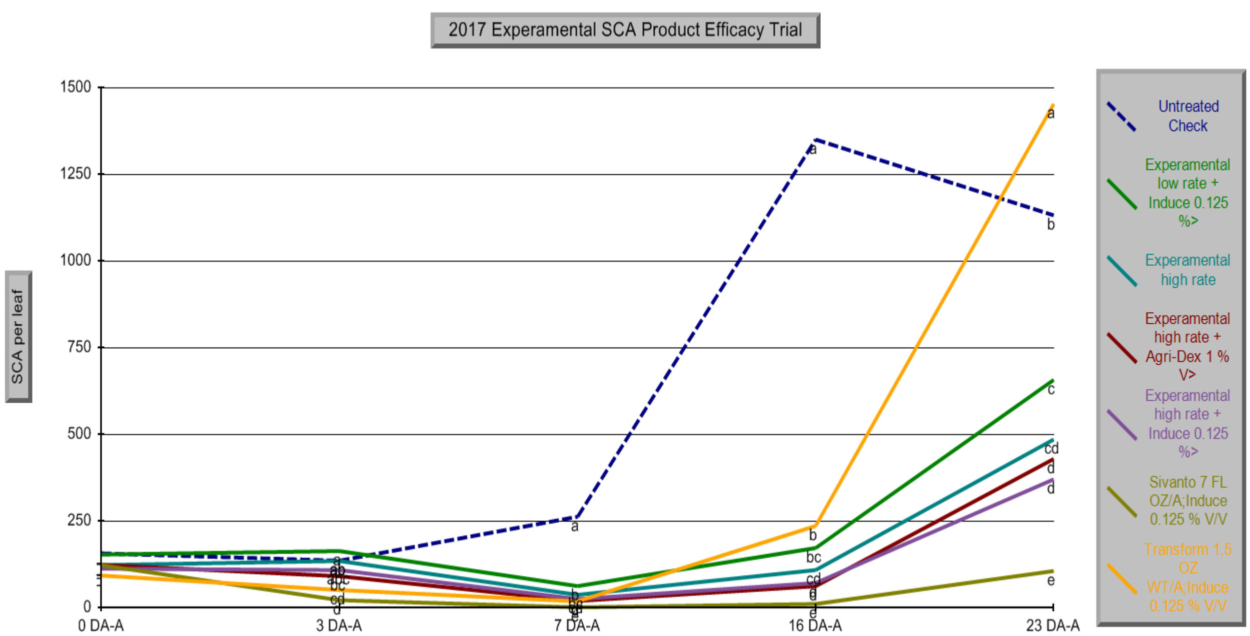


Figure 26. Total SCA per leaf by count date for the full trial period. Treatments showing differing letter assignments are at least P<0.05 significant.

In terms of damage ratings, all treatments shown less damage compared to the UTC for both rating dates with several treatments performing differently compared to each other at the differing dates. The Sivanto treatment clearly shown less damage than all other treatments per plot at the 23 DAT date while the Sefina high rate with Agri-Dex was superior to the UTC, Transform, Sefina low rate with Induce, and Sefina high rate alone. Sugarcane aphid damage continued to accumulate past the conclusion of the trial with all treatments incurring more damage by the 20 October harvest date. The Sivanto treatment continued to exhibit less damage but was statistically similar to the Sefina high rate with Induce, the Sefina high rate with Agri-Dex and the Sefina high rate alone. All Sefina treatments were statistically similar by the harvest rating date but remained lower than the Transform treatment.

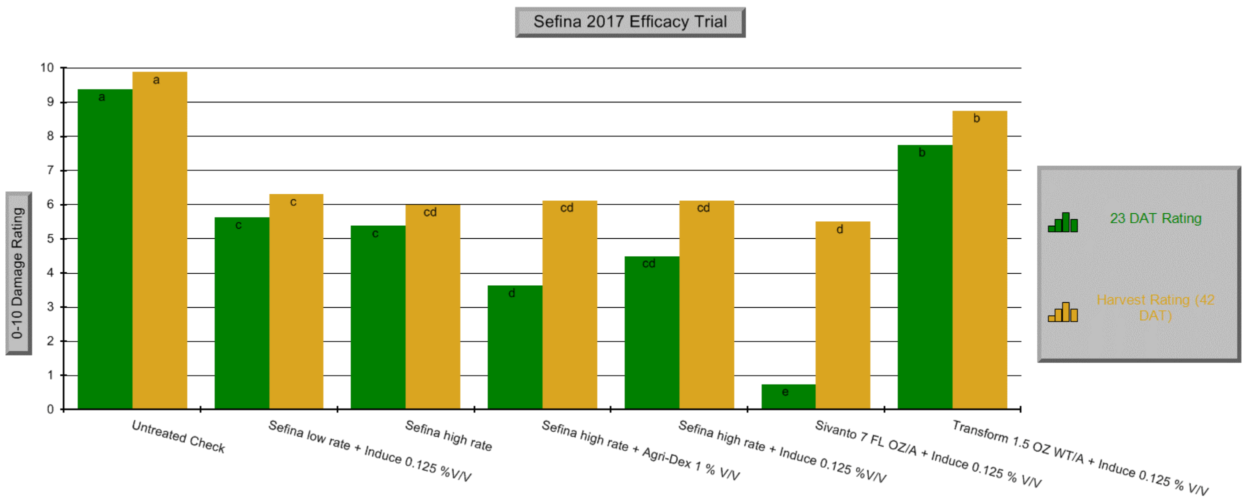


Figure 27. Damage ratings by treatment and date. Treatments showing differing letter assignments are at least P<0.05 significant.

Conclusions

All treatments, including all rates and adjuvant mixes with Sefina, proved to have acceptable efficacy on the sugarcane aphid in grain sorghum. A closer inspection of the data clearly shows Sivanto at 7 oz./ac. with Induce to be the superior and preferred treatment option for sugarcane aphids currently. The Transform treatment with Induce again provided good aphid knockdown but had limited residual to combat aphid re-infestation, a side affect of the plot design of 4 treated rows out of the actual 6 row plot size (2 untreated rows per plot) to prevent spray drift that allows a heavy source of re-infestation. If complete coverage of plants within a field can be achieved during treatment and all sources of re-infestation successfully treated, Transform remains a viable IPM tool for sugarcane aphid control in grain sorghum.

The Sefina treatments, with an understanding of their unique mode of action and biological nature, have proven to be a successful treatment option for sugarcane aphid control, regardless of adjuvant type, in grain sorghum. They will be a welcome addition to the sugarcane aphid in grain sorghum IPM toolbox once released in 2020. Treatment coverage for Sefina, while remaining critical, does not appear to be as critical as Transform but possibly more critical than with Sivanto. Because Sefina does not directly kill aphids, but rather interferes with their ability to feed, it is hypothesized that re-infesting aphids from the untreated rows were controlled through a longer residual, but damage to the plants and plots occurred and live aphids were counted before control was achieved. Fiving weight to this hypothesis is the lower amount of damage occurred between the 23 DAT damage rating and the harvest date damage rating when compared to the Sivanto treatment while the UTC and Transform treatments were already overwhelmed with aphids.

Figure 28. The Plains Pest Management team mixing and measuring the treatments for the trial.

When comparing the Sefina rates and adjuvant treatments there are subtlety significant and numerical differences between some of the treatments on some of the sample dates. The Sefina high rate treatments seem to edge the low rates and there are hints that utilizing some type of surfactant should aid in aphid knockdown and early-post treatment damage accumulation. The Sefina with Agri-Dex is statistically superior in damage rating at the 23 DAT date compared to the low rate and the Sefina high rate alone. However, much more product and adjuvant surfactant efficacy studies would be needed to prove or disprove this hypothesis.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Casey Hardin for cooperating with us to complete this trial on their sorghum at the Halfway Station, BASF for sponsoring this trial, the Haldrup Corporation for making a very good sorghum thresher, and the 2017 Plains Pest Management Field Scouts and lab technicians for the operation, data collection, and labor associated with this trial: Jim Graham, Nik Clarkson, Trey Buxton, Denise Reed, and Jerik Reed.

Sivanto In-Furrow at Planting and Seed Treatment Efficacy for Season Long Sugarcane Aphid Control in West Texas Grain Sorghum 2017

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

Summary

Before planting, 7 different treatments including an untreated check, Sivanto Prime applied in-furrow at planting at a rate of 4 oz. / ac., the insecticidal seed treatments included Poncho, Poncho + Fluoxastrobin, the experimental BYI02960, Poncho + BYI02960, and Cruiser were arranged into a CRBD with 4 replications. Plots were planted via plot planter capable of in-furrow applications at the Halfway Station with per leaf aphid counts starting once sugarcane aphids were found in field and continuing weekly until all treatments failed to provide control. An over the top application of Sivanto Prime was then applied to ensure completion of the trial. Aphid damage ratings were taken on the harvest date along with pounds per acre grain yields and other yield data information.

While the data on the Sivanto in-furrow looks superior to other treatments in this trial, in terms of aphids per leaf over long periods of time, it did not provide full-season sugarcane aphid control. This length of control was not only desired, it was required before this application method for aphid control would be recommended in West Texas grain sorghum production. Not only did this treatment not provide the hoped-for season long control of the aphid, it required what was essentially a second expensive sugarcane aphid treatment and its use risks development of resistance to Sivanto. The Poncho + BYI02960 seed treatment, in terms of aphid per leaf numbers at the 81 DAP date and in damage ratings and the performance of the BYI02960 seed treatment alone treatment in damage ratings offers hope from this experimental seed treatment and seed treatment mix might add a level of longevity to seed treatments purchased by producers in the future with additional study, refinement, and approval.

Objective

To evaluate the efficacy of a novel application method for Sivanto, applied in-furrow at sorghum planting, with potential for season long sugarcane aphid control and evaluate experimental and existing sorghum insecticide seed treatments for length of efficacy and crop injury potential in West Texas grain sorghum.

Materials and Methods

This company sponsored protocol consisted of 7 different treatments including an untreated check, Sivanto Prime applied in-furrow at planting at a rate of 4 oz. / ac., and 5 differing insecticidal seed treatments. The insecticidal seed treatments included Poncho, Poncho + Fluoxastrobin, the experimental BYI02960, Poncho + BYI02960, and Cruiser. All standard fungicide and safener seed treatments were included in all treatments.

The field containing the trial was located in a pivot irrigated field Halfway Experiment Station in Hale county. For the trial the known sugarcane aphid resistant sorghum variety DK 37-07 was used. On 19 June the plots were lain out in the Halfway field in a CRBD with 4 replications and planted utilizing a plot planter fitted with the ability to make in-furrow applications while planting in a standard 4-row plot pattern with plots being 35 feet long with 5-foot alleys.

Figure 29. A fairly typical producer planter capable of making in-furrow applications at planting.

On 28 June and 4 July all plots were rated for seedling vigor and crop damage from treatments. Starting on the 28 June date, the trial was monitored weekly by the Plains Pest Management scouting program for sugarcane aphid infestations. On 27 July, the 38 DAP date, sugarcane aphids were found in the trial area and weekly counts of sugarcane aphid per leaf numbers began and continued through to the 116 DAP date when no additional sugarcane aphids were found. Aphid per leaf counts were taken exclusively from the 1st and 4th rows of the trial with yield data coming from the 3rd or 4th rows while the whole plot was utilized for damage ratings. For the per leaf aphid counts, one lower (second green leaf above dead leaves) and one upper (second leaf below flag) were removed and counted on 10 randomly selected plants per plot on each count date.

Once residual control from the Sivanto in-furrow treatment waned and excessively high numbers of aphids on the UTC threatened to demolish all yield potential from those plots at the 88 DAP date, an over the top ground application of Sivanto Prime at 5 oz. / ac. with 1% COC was made to all plots and all treatments to ensure the completion of the trial to harvest on 90 DAP. This treatment was made via standard backpack CO2 research plot sprayer with boom attachment. Application ground speed was made at 3 mph, 16.8 GPA, and with a height of 5 feet, six-inches. At the 20 October harvest date sugarcane aphid damage ratings were taken. The damage rating scale utilized was the 0-10 sugarcane aphid damage rating scale developed by Reed, Bynum, and Porter for West Texas sorghum damage in 2015. Harvest was conducted on by hand harvesting 10 row feet from each plot, grain was threshed via trailer mounted Haldrup research grain thresher on site. Grain moisture and bushel weight measurements were collected on a Dickey-john Mini GAC Plus grain moisture analyzer. Grain samples were weighed in terms of grams per 10 row feet and converted to grain yield in pounds per acre.

Figure 30. The Plains Pest Management interns receiving training on tank mixes for larger applications.

During bloom and about the 69 DAP date, all plots reached economic levels for sorghum midge and headworms. An over the top application of Blackhawk was made a at moderate labeled to all treatments and plots and economic control of these pests was achieved and the trial continued without disruption.

Results and Discussion

No differences in plant per acre stand counts or crop injury from any treatment was noted on the early season check dates.

By the 45 DAP leaf count date, all treatments had significantly separated from the UTC but not each other. On the 51 DAP date the Sivanto in-furrow treatment was performing superior to all other treatments in terms of aphids per leaf while all the seed treatments remained similar to each other but still vastly outperforming the UTC. This trend in aphid numbers and significance continued for the duration of the trial until the over the top application of Sivanto was applied to all treatments on the 90 DAP date. However, by the 74 DAP date the standard seed treatments began losing economic control of the sugarcane aphid exceeding any action threshold level while the Sivanto in-furrow treatment held for longer. By the 81 DAP date, the Sivanto in-furrow treatment began to show breakdown also and acceded economic levels also but remained significantly superior to all other treatments while all seed treatments accept the Poncho + BYI02960 were no longer significantly superior to the UTC.

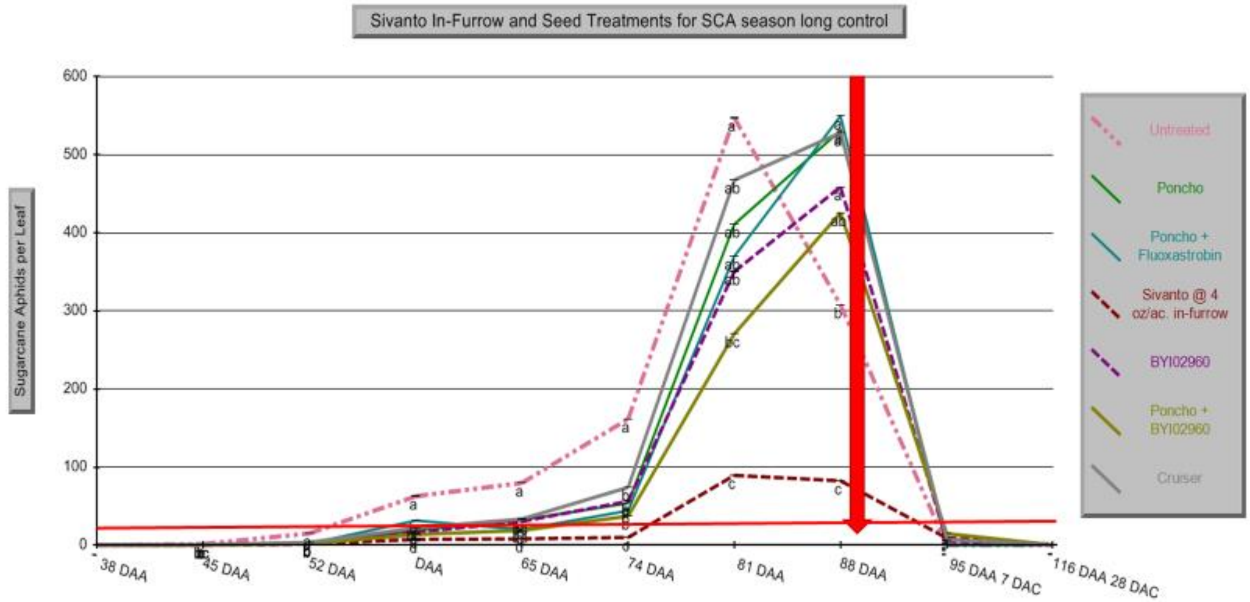


Figure 31. Per leaf aphid counts per treatment over the trial period with ET level shown and over the top application highlighted. Treatments displaying differing letters are at least significant to the P<0.05 level.

Cold temperatures seemed to prevent any additional large aphid population increases by the 88 DAP date while aphids began crashing on the heavily damaged UTC plots prompting the over the top aphid control treatment. Following the 90 DAP over the top treatment of Sivanto Prime, aphid numbers crashed for all treatments. The Sivanto in-furrow treatment held numerically more sugarcane aphids per leaf than all other treatments but no significance was found, and cooler weather and highly active beneficial populations fully collapsed the aphid population and the aphid counting portion of the trial concluded on the 116 DAP date.

Figure 4. View of the untreated check on the 90 DAP date.

Figure 5. View of the Sivanto in-furrow treatment on the 90 DAP date.

The harvest date damage ratings shown similar results to the aphid leaf count data. The Sivanto in-furrow treatment held significantly far less damage compared to all other treatments and all seed treatments were superior to the UTC. However, there were significant differences between the seed treatments in this category. The Poncho + BYI02960 treatment was significantly better than other seed treatments and the BYI02960 separated superior to the Poncho and Poncho + Fluoxastrobin treatment.

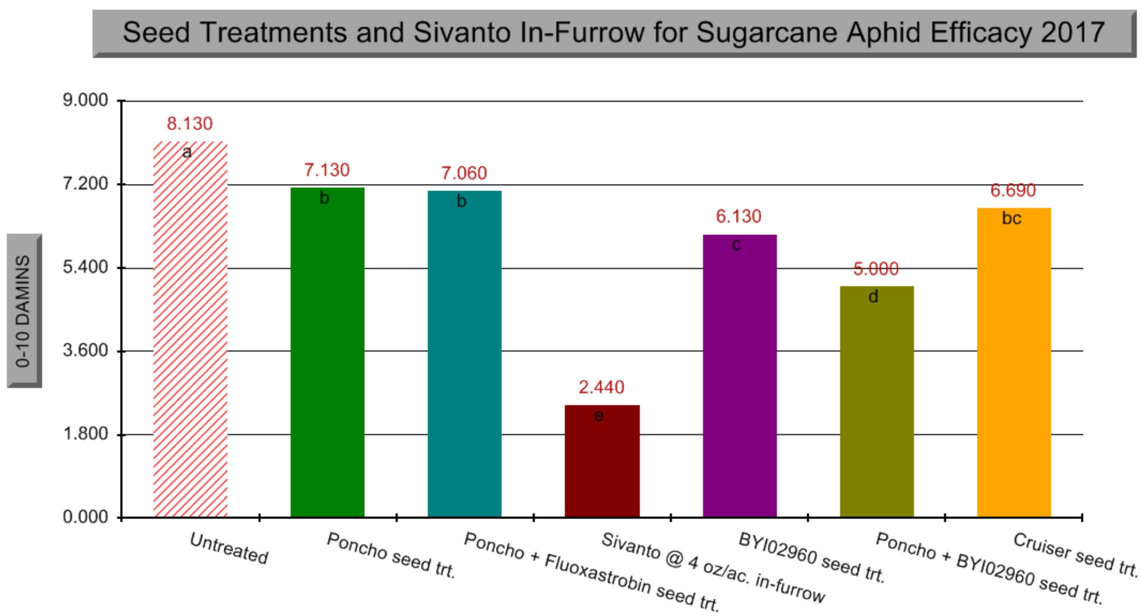


Figure 6. Aphid damage ratings on the harvest date by treatment. Treatments displaying different letters are significant to at least the P<0.05 level.

In terms of pounds grain yield per acre no treatment was significantly higher than any other. Numeric trends along these aphid number and damage rating lines were noted. No significant differences in percent grain moister or bushel weight were found.

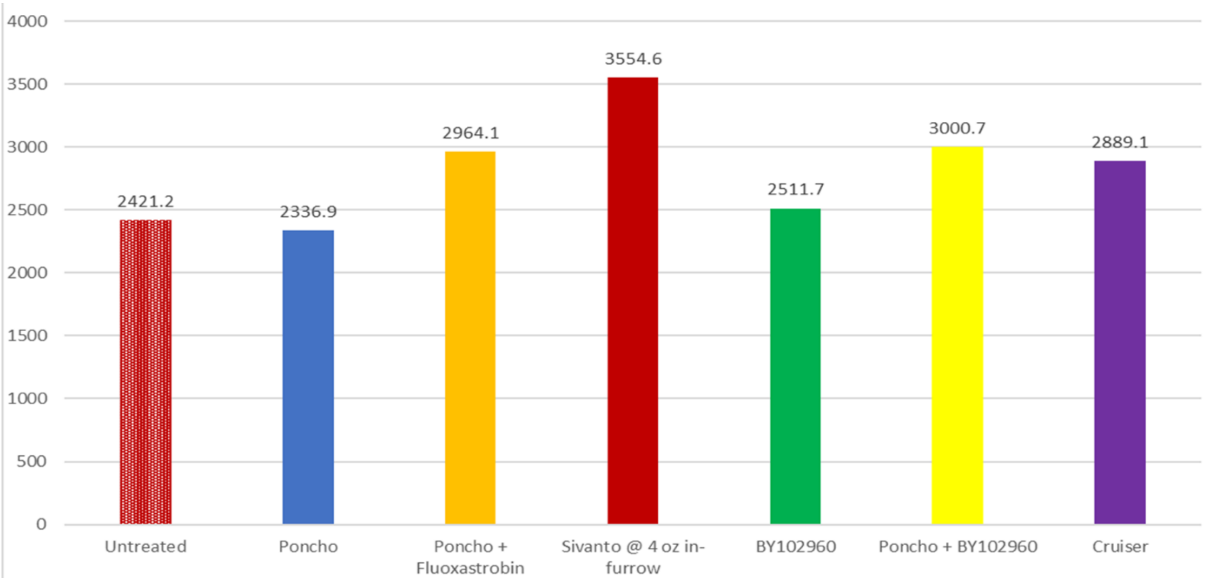


Figure 7. Yield data in terms of pounds grain per acre. No significant differences.

Conclusions

While the data on the Sivanto in-furrow looks superior to other treatments in this trial, it did not provide full-season sugarcane aphid control. This length of control was not only desired, it was required before this application method for aphid control would be recommended in West Texas grain sorghum production. Not only did this treatment not provide the hoped-for season long control of the aphid, it required what was essentially a second expensive sugarcane aphid treatment. In addition, the finding of numerically higher numbers of aphids in the Sivanto in-furrow plots post over the top treatment is very alarming. While not statistically significant, this finding could be the precursor to the use of this treatment developing resistance to Sivanto, a wholly unacceptable IPM development.

The seed treatments did provide a longer term of aphid control than was expected and there were treatments that slightly out performed others. The extended performance of the treatment Poncho + BYI02960 in aphid per leaf numbers and in damage ratings and the performance of BYI02960 alone treatment in damage ratings offers hope from this experimental mix might add a level of longevity to seed treatments purchased by producers in the future with additional study, refinement, and approval.

All treatments proved safe and a non-deterrent for sorghum establishment.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and

Agriculture. I would like to extend thanks to Casey Hardin for cooperating with us to complete this trial on their sorghum at the Halfway Station, Bayer Crop Science for sponsoring this trial, the Haldrup Corporation for making a very good sorghum thresher, and the 2017 Plains Pest Management Field Scouts and lab technicians for the operation, data collection, and labor associated with this trial: Jim Graham, Nik Clarkson, Trey Buxton, Denise Reed, and Jerik Reed.

Testing Chemigation Applications for Sugarcane Aphid Efficacy in West Texas Grain Sorghum 2017

Texas A&M AgriLife Extension Service Hale County

Halfway Experiment Station

Blayne Reed, EA-IPM Hale, Swisher, & Floyd, Dr. Ed Bynum, District 1 Entomologist, Dr. Pat Porter, District 2 Entomologist, Russ Perkins, Bayer Crop Science, Dr. Mike Lovelace, Dow

Summary

Six treatments consisting of an untreated check, Sivanto Prime at 5 oz. / ac. with 0.1% COC applied via chemigation, Sivanto Prime at 5 oz. / ac. with 1% COC applied via simulated air, Transform at 1.5 oz. / ac. with 0.1% COC applied via chemigation, Transform at 1.5 oz. / ac. with 1 % COC applied via ground, and Sefina at 5.48 oz. / ac. with 0.1% COC applied via chemigation were selected for this trial held at the Halfway Station in Hale County. The trial was organized as a CRBD with 4 replications. Chemigation treatments and air treatments were made via simulation while ground treatments were made with standard CO_2 research backpack sprayer. Per leaf aphid counts were made at 4, 10 and 17 DAT. Damage ratings were taken from all plots at 17 DAT and on the harvest date.

All chemigation treatments were vastly superior to any other respective treatment options in terms of aphids per leaf, 0-10 damage ratings, and yield. These results show that chemigation should be recommended and utilized where ever possible and labeled for sugarcane aphid control.

Objective

To determine, compare, and confirm the increased efficacy of Sivanto Prime and Transform in sugarcane aphid control in West Texas grain sorghum via chemigation contrasted against differing traditional application methods and an untreated check and to preliminarily determine if the experimental product Sefina can effectively be applied via chemigation.

Materials and Methods

Six treatments consisting of an untreated check, Sivanto Prime at 5 oz. / ac. with 0.1% COC applied via chemigation at 1868 GPA, Sivanto Prime at 5 oz. / ac. with 1% COC applied via simulated air at 2.9 GPA, Transform at 1.5 oz. / ac. with 0.1% COC applied via chemigation at 1868 GPA, Transform at 1.5 oz. / ac. with 1 % COC applied via ground at 16.8 GPA, and Sefina at 5.48 oz. / ac. with 0.1% COC applied via chemigation at 1868 GPA were selected for this trial.

The field containing the trial was located in a pivot irrigated field Halfway Experiment Station in Hale county. The field was planted with a known sugarcane aphid susceptible but agronomically preferred sorghum variety KS 585. Planting was made in a solid pattern on 40-inch rows on 19 June. On 27 July, sugarcane aphids were found in the trial field and alleys were cut and plots lain out on 28 July. The trial was organized as a CRBD with 4 replications. Plot size utilized were 10 rows wide by 50 feet long.

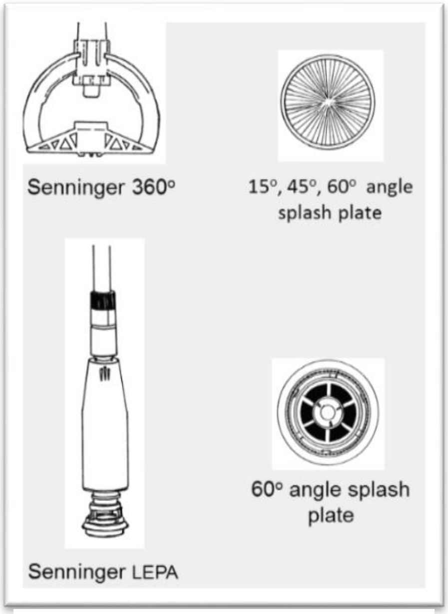


Figure 32. Chemigation plates utilized on simulator.

The equipment utilized for the chemigation treatments was a chemigation simulator designed for plot research. This simulator was made from a Ford 3910 turf tractor plumed with a nurse tank, treatment tank, and with extendable chemigation wing with drop hoses set to 8-inches above the soil surface. The simulator was calibrated for 1863 GPA. Chemigation plate information is available in Figure 2. Photo of simulator is available in Figure 3.

Figure 33. Photo of chemigation simulator.

Ground application treatment was made via standard backpack CO2 research plot sprayer with boom attachment. Application ground speed was made at 3 mph, 16.8 GPA, and with a height of 5 feet, six-inches. Air simulation was made via the same research sprayer, but with the sprayer set for 2.9 GPA, boom height of 20 feet, and a ground speed of 4.5 mph was utilized. Spray pattern markers indicated a very close resemblance to a poorly made air application with multiple obstacles.

Figure 4. Making a sugarcane aphid research treatment by ground with the research plot sprayer.

Figure 5. Calibrating the backpack research sprayer for simulating air treatments.

Figure 6. Extendable chemigation wing of simulator during application.

Of the 10 rows required for each plot, 2 rows, on the right-hand side of all plots, were designated for the chemigation simulator to traverse through. The next 6 rows were treated, which meet the width of the treatable area of the extendable chemigation boom of the simulator. The remaining two rows of each plot were left untreated to prevent treatment drift between plots. All plots had identical treated, drift and traversing areas with the ground and air simulation plots adjusted to match the chemigation plots. Due to plot treated area size, equipment needs, and other difficulties, treatments were mixed for each plot before application for all plots except the air simulated plots, which due to GPA needs, did not require multiple mixes.

Figure 7. The Plains Pest Management team mixing treatments for each plot in-field.

Pretreatment counts were made on 16 August, but due to weather, field conditions, and length of time required for simulated treatments, treatments were not made until 22 August. Attempts made prior to the 22 August date under adverse field conditions ruined the first replication of the trial and only the 2nd, 3rd, and 4th replications from the layout were utilized for the trial.

Of the 6 treated rows from each plot, only rows 2 and 3 were utilized for aphid counts while row 3 were used for harvest data and whole treated area was utilized for damage ratings. For per leaf aphid counts, one lower (second green leaf above dead leaves) and one upper (second leaf below flag) were removed and counted on 10 randomly selected plants per plot on each count date. Counts were made at 4, 10 and 17 DAT. Damage ratings were taken from all plots at 17 DAT and on the harvest date of 16 October which was 55 DAT. The damage rating scale utilized was the 0-10 sugarcane aphid damage rating scale developed by Reed, Bynum, and Porter for West Texas sorghum damage in 2015. Harvest was conducted on by hand harvesting 10 row feet from each plot, grain was threshed via trailer mounted Haldrup research grain thresher on site. Grain moisture and bushel weight measurements were collected on a Dickey-john Mini GAC Plus grain moisture analyzer. Grain samples were weighed in terms of grams per 10 row feet and converted to grain yield in pounds per acre.

Results and Discussion

By the 4 DAT count date, all chemigation treatments and the Transform by ground treatment had separated from the UTC and the Sivanto by air treatment. On that date, the Sivanto by air treatment shown a notable reduction in upper leaf aphid numbers but was not statistically significant from the UTC.

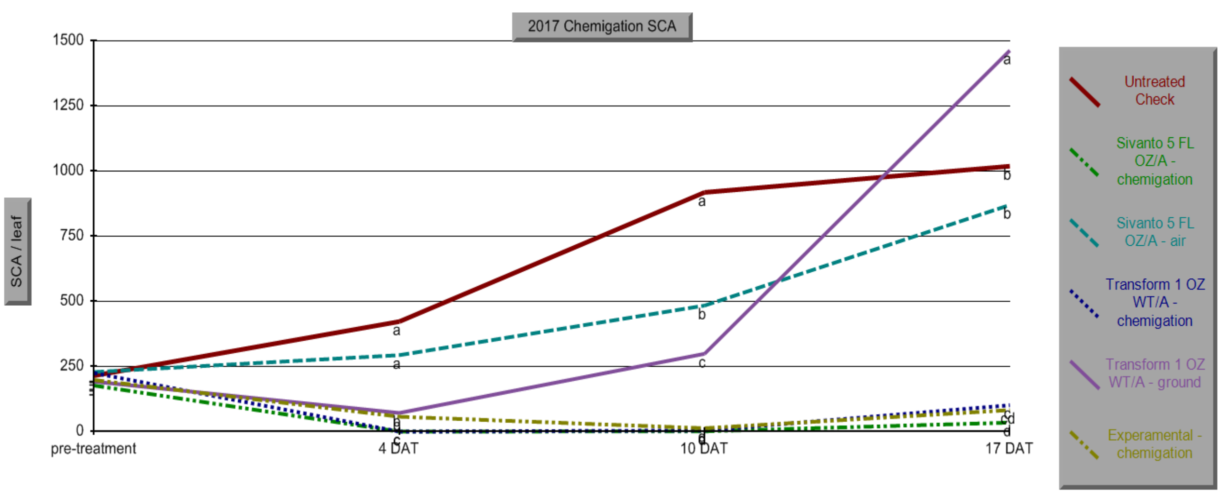


Figure 8. Sugarcane aphids per leaf for the duration of the trial. Treatments displaying different letters are significant to at least the P<0.05 level.

On the 10 DAT date, all chemigation treatments continued to provide outstanding control under very heavy sugarcane aphid pressure while the Transform by ground treatment began to lose control to from a re-infestation of aphids moving from the untreated areas of each plot but remained significantly superior to the UTC and Sivanto by air. The Sivanto by air treatment continued to slow aphid re-infestation on the successfully treated upper leaves from the lower leaves and the untreated areas of the plots but now at a significant level.

By the 17 DAT date, all chemigation treatments were maintaining outstanding aphid control with the Sivanto by chemigation treatment being numerically superior to all treatments and significantly superior to the Sefina treatment. The Transform by ground treatment lost control completely and actually exhibited higher aphid numbers than the UTC due to the UTC plots reaching near full desiccation from aphid damage and unable to support any more aphids. The Sivanto by air treatment continued to retard aphid development on successfully treated plant areas of the upper part of the plant but was beginning to slip in level of control being no longer significantly better than the UTC.

In terms of aphid damage rating, all chemigation treatments were superior to all other treatments. The Sivanto by chemigation treatment was also significantly better than the Transform by chemigation treatment at the 17 DAT date. By the at harvest rating date, all treatments continued to acquire more damage. However, all chemigation treatments were similar to each other with all these treatments remaining below the important late season 5 damage level retreatment threshold established for West Texas grain sorghum by Reed, Porter, and Bynum (2016). All other treatments would have required two aphid treatments in production field situations. For the 17 DAT date, Sivanto by air and Transform by ground were superior to the UTC but by the harvest date of these two non-chemigation treatments, only the Sivanto by air was significantly better than the UTC

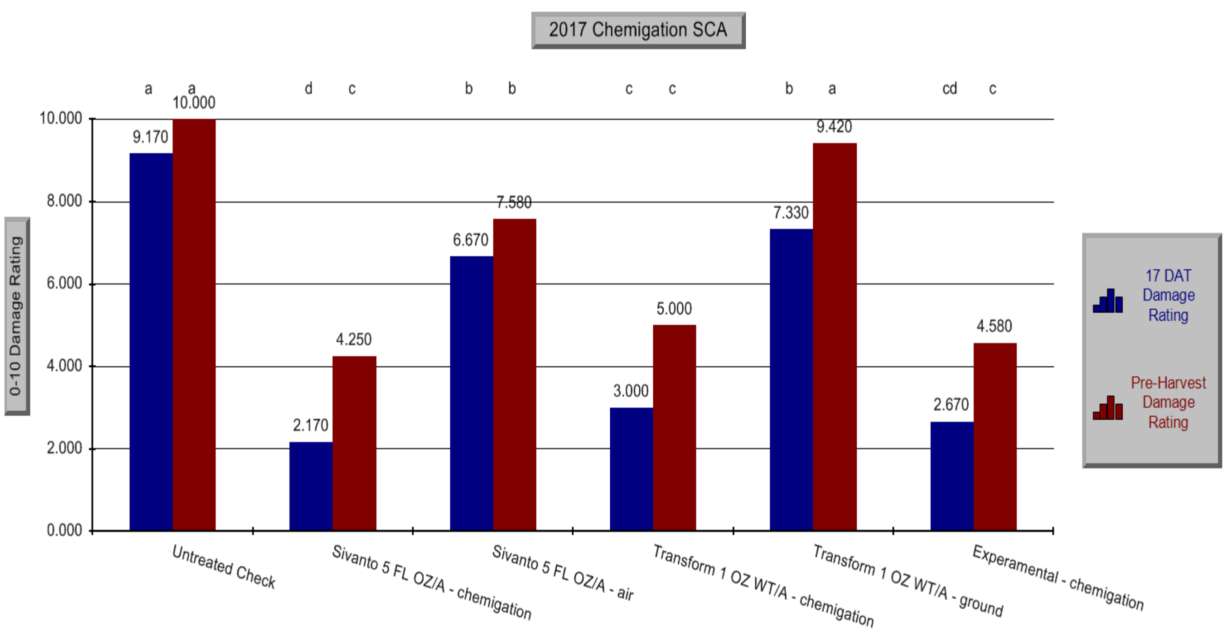


Figure 9. Sugarcane aphid 0-10 damage ratings by plot and by date. Treatments with different letter headings are significantly different to at least the P<0.05 level.

In terms of pounds grain yield per acre, all treatments followed a similar performance pattern with all chemigation treatments outperforming all others. Both the Sivanto by air and the Transform by ground outperformed the UTC in grain per acre with the Sivanto by air outperforming the Transform by ground. There were no significant differences in percent moisture or bushel weight.

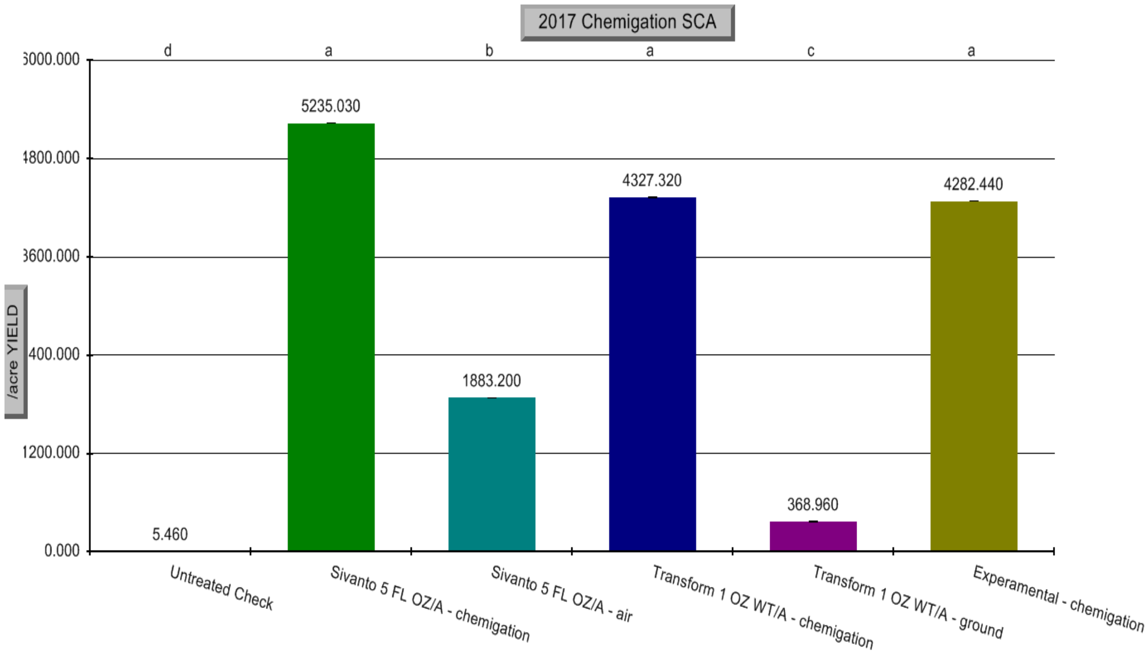


Figure 10. Yield by treatment in terms of pounds grain per acre. Treatments with different letter headings are significantly different to at least the P<0.05 level.

Conclusions

All chemigation treatments were superior to any other respective treatment option in all measured categories. This is likely primarily due to successful full product treatment coverage of the aphid infested target plants but there could be other unknown factors.

Currently, Sivanto is the only product labeled for chemigation for sugarcane aphid control in grain sorghum. Transform will be working forward to getting chemigation added to their eventual 24c label and Sefena will be considering adding chemigation before product release in 2020 with EPA approval pending for both products.

These results show that chemigation should be recommended and utilized where ever possible and labeled for sugarcane aphid control.

Acknowledgements
This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and

Agriculture. I would like to extend thanks to Casey Hardin for cooperating with us to complete this trial on their sorghum at the Halfway Station, Bayer Crop Science and Dow for sponsoring this trial, the Haldrup Corporation for making a very good sorghum thresher, and the 2017 Plains Pest Management Field Scouts and lab technicians for the operation, data collection, and labor associated with this trial: Jim Graham, Nik Clarkson, Trey Buxton, Denise Reed, and Jerik Reed.

Cotton Incorporated Seed Treatment Benefit, Thrips Efficacy, and Thrips Species Survey in Swisher County, 2017

Texas A&M AgriLife Extension Service Hale, Swisher, & Floyd County

Mike Goss Farms

Blayne Reed, EA-IPM Hale, Swisher, & Floyd and Dr. Suhas Vyavhare, District 2 Cotton Entomologist

Summary

Three cotton seed treatments were selected to participate in the trial including an untreated check, Goaucho and Cruiser were selected organized into a CRBD with 4 replications. The trial was planted in a commercial cotton field in south-central Swisher County with heavy thrips pressure expected. Thrips 0-5 damage ratings were taken at cotyledon, 2nd leaf stage, 4th leaf stage, and at pinhead square stage. At the cotyledon stage, 2nd leaf stage, and 4th leaf stage 10 randomly selected plants from the outside 2 rows of each plot were harvested and placed into labeled and individual plot mason jars containing 75% alcohol. These jars were transported to Dr. Suhas Vyavhare's lab at the Lubbock Center where any thrips captured in the jars would be filtered out of the solution, cleaned, counted, and species identified under microscope following the conclusion of the growing season. The thrips jar counts were utilized for number of thrips per plant differences by date between treatments and plots.

By the 2nd leaf stage collection date, both treatments were significantly much lower in thrips per leaf than the UTC and were significantly equal and both the Gaucho and Cruiser treatments were significantly better with less accumulated thrips damage at the pinhead square rating date compared to. Neither treatment separated from each other on these dates, indicating that both insecticidal seed treatments hold benefits for ag producers under heavy thrips pressure. The thrips identification yielded that in 2017 75% of the thrips present were onion thrips, a stark departure from the traditional western flower thrips domination.

Objective

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

Materials and Methods

Three cotton seed treatments were selected to participate in the trial including an untreated check (UTC). Two of the treatments are commercially available treatments that represent the two prominent and main active ingredients available for insecticidal cotton seed treatments. These were Gaucho at 0.375 mg./seed and Cruiser 600FS at 0.375 mg./seed. The treatments were organized into a CRBD with 4 replications.

A commercial cotton field in Swisher County belonging to Mike Goss Farms was selected to host the trial. This 2017 field had as a reliable source for migrating thrips to emerge from drying wheat to the West, North, and East. On 18 May the field was planted with Mr. Goss' field planter with boxes removed so that random plot placement of treatments could be made via hand dribbling of seed at a target rate of 1 seed per 3-inches. Plots were organized as 4-row by 40-feet long.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Untreated Check
2		Gaucho 0.375 mg AI/Seed
3		Cruiser 600FS 0.375 mg AI/Seed

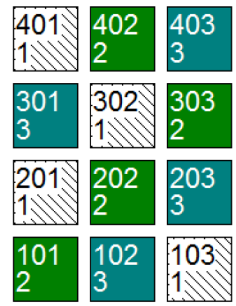


Figure 34. Treatments and plot map for the trial.

All protocol guidelines set forth by Cotton Incorporated were adhered to for the trial. These included using a 0-5 damage rating system was utilized to rate all plots for thrips damage at cotyledon stage, and at 2th true leaf stage, and at 4th true leaf stage. An additional rating was taken at the pinhead square stage to better quantify any delay on plant development caused by thrips damage. This concluded the thrips damage period of the trial. A percent open boll count was targeted for about a 20 October date and the middle two rows were to be harvested for yield comparisons. However, in mid-July the trial was accidentally over sprayed via unclean tank with inappropriate herbicides. The resulting damage was so severe that the potential to note any differences percent open boll or in yield in from seed treatments impact was lost.

Figure 35. The 0-5 thrips damage rating scale visualized with examples of damage at these levels.

On both rating dates, 10 randomly selected plants from the outside 2 rows of each plot were harvested and directly placed into labeled and individual plot mason jars containing 75% alcohol. This was made via scissors cutting the whole plant at the soil surface and placing the whole plant into the jar, capturing any thrips present on the plant at the time of collection. These jars were transported to Dr. Suhas Vyavhare's lab at the Lubbock Center where any thrips captured in the jars would be filtered out of the solution, cleaned, counted, and species identified under microscope following the conclusion of the growing season. The thrips jar counts were utilized for number of thrips per plant differences by date between treatments and plots.

Figure 36. The Plains Pest Management team, with help, hand planting the small plot trial on Mr. Goss' commercial field with his planter.

Results and Discussion

Thrips numbers per plant at the cotyledon stage were very high for all treatments indicating a very high level of thrips moving into the trial area from the drying wheat. At this count date, the Cruiser was significantly lower in thrips per plant than the Gaucho and the UTC, but all were well over any economic standard for thrips pressure. By the 2nd leaf stage collection date, both treatments were significantly much lower than the UTC and were significantly equal. However, both were around the established economic threshold for thrips on seedling cotton of 1 thrips per true leaf stage. By the 4th leaf stage, there were no significant differences between thrips but only the Cruiser treatment was below the thrips ET for that leaf stage. The overall drop in thrips pressure indicating that other, more suitable thrips hosts were becoming available, but the decline in level of control from both treatments indicated a loss of residual at the 4th leaf date.

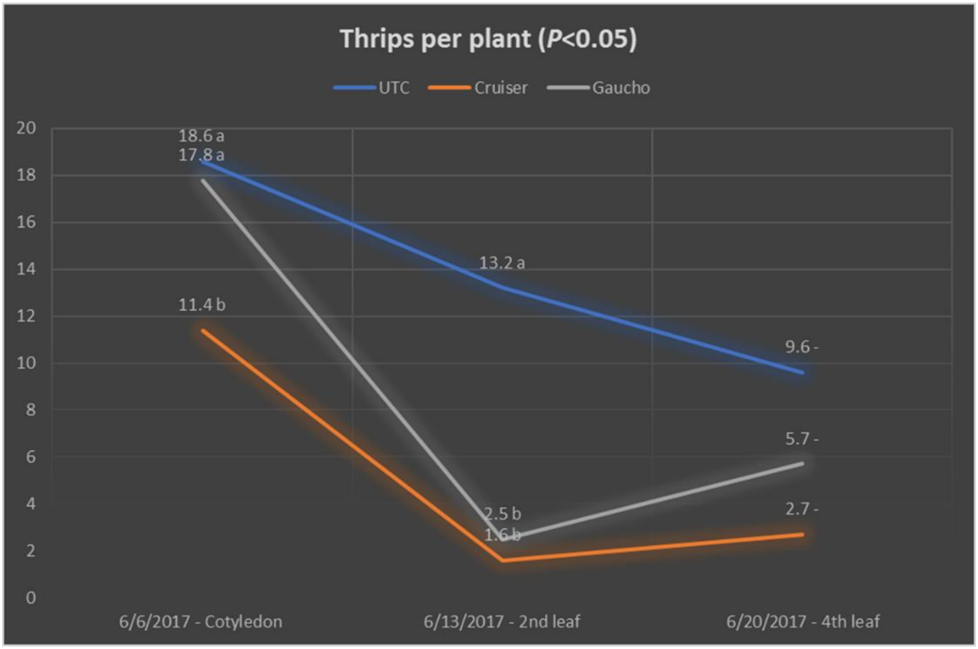


Figure 37. Thrips per plant by treatment and date. Treatments with a differing letter assignment are at least significant to the P<0.05 level.

Only the thrips accumulated damage rating for the pinhead square stage are shown here as this should represent end results of accumulated damage for the duration of the thrips susceptible period. Both the Gaucho and Cruiser treatments were significantly better with less accumulated damage compared to the UTC but did not separate from each other. The Cruiser treatment was numerically superior but no differences in treatments were found. All treatments were over the acceptable ET for early season thrips damage.

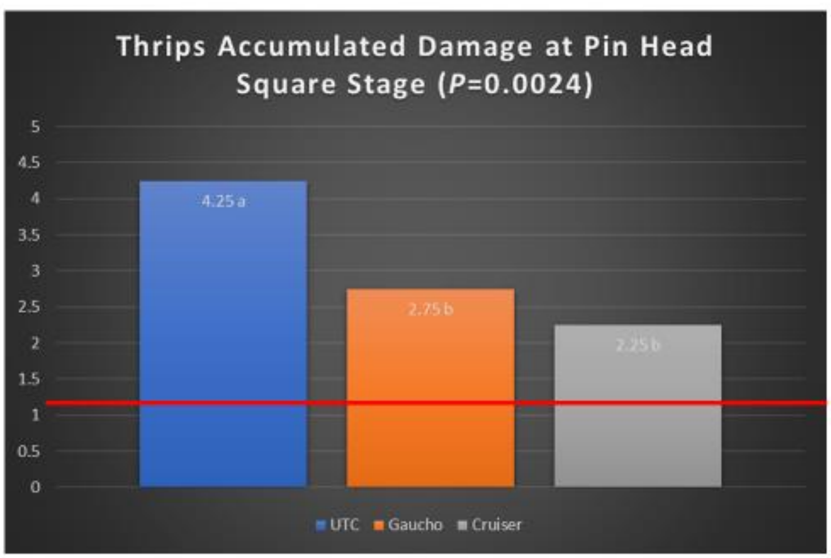


Figure 38. Accumulated thrips damage by the pinhead square stage on the 0-5 rating scale. Treatments with differing letter assignments are significantly different to at least the P<0.05 level.

The thrips population identification held surprising results. For all treatments, Onion Thrips made up around 75% of the thrips population. Meanwhile, western flower thrips only represented around 10% of the population. The remainder were made up of tobacco thrips and other lesser studied species.

Conclusions

Both the Gaucho and Cruiser treatments proved to be valuable where high thrips pressure situations are expected. Neither proved to be enough to hold thrips damage below an economic level and an additional over the top treatment would be required in a commercial field situation. However, without either of these treatments, an over the top application alone would not be sufficient unless thrips pressure lessened.

The population shift from the once predominant western flower thrips to onion was surprising and somewhat concerning. The tobacco, and to a lesser extent, the onion thrips are know to be resistant to several control measures including most insecticidal seed treatments and many over the top treatments in most other areas of the Cotton Belt in the United States. However, no sign of that resistance is found in this trial.

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 on his cotton, Cotton Incorporated for sponsoring this trial, Dr. Suhas Vyavhare, Adam Kesheimer, Dr. Katelyn Kesheimer, Dr. Pat Porter, Mike Goss Farms and the 2017 Plains Pest Management Field Scouts lab technicians for the operation, data collection, and labor associated with this trial: Jim Graham, Nik Clarkson, Trey Buxton, Denise Reed, and Jerik Reed.

<u>2017 Pre-Emergence Residual Herbicide Efficacy in Cotton</u>

Texas A&M AgriLife Extension Service
Swisher County
Cooperator: Jeremy Reed
Blayne Reed, EA-IPM Hale, Swisher, & Floyd

Summary

Seven residual cotton herbicide treatments, including one untreated check, were chosen for a trial to evaluate second residual mode-of-action weed efficacy in cotton. The "untreated check" consisted of the base treatment of pre-plant treatment alone while the remainder of the treatments represented the additional efficacy in germinating weed control each treatment provided above the UTC. The seven second residual herbicides were arranged into a CRBD small plot with the pre-plant treatment underneath all treatments. Plots were 4 rows wide on 40" rows and 38' long. The treatments list and plot map are found in Figure 1. All treatments were applied broadcast 2 days after planting on 24 May. Data collection from the trial began at 13 DAT and 27 DAT with plant per acre counts, herbicide damage ratings, and per plot weed counts. Due to drought conditions, data collection stopped until 51 DAT following rain events causing new weed activity in the plots. Percent weed control compared to the UTC were taken at 51, 62, 75, and 100 DAT to conclude the trial.

There were no significant differences in plant populations stand counts per acre, weed counts per plot, or herbicide damage ratings for the 13 or 27 DAT data collection dates. No new weeds emerged during the droughty conditions until after the rain events. At the 51 DAT date, all treatments separated in percent weed control compared to the UTC, but no residual herbicide separated statistically from any other. This general trend of 50% to 70% improvement over the UTC by the additional residual herbicide treatments continued to the 62 DAT and 75 DAT dates with several treatments joking for numerical superiority as more weed flushes continued. AT the 100 DAT date, all treatments had begun to fail in September.

The benefit of cotton producers in the region using any of these pre-emergence residual herbicide treatments in cotton as a second layer of control above pre-plant alone should improve weed control by 50% to 70% consistently.

Objective

To evaluate the efficacy of available pre-emergence cotton herbicides and their value to producers as a second residual mode of action under modern production practices and post glyphosate resistance discovery.

Materials and Methods

The south-western Swisher County cotton field chosen was a furrow irrigated, conventional till field treated pre-plant with a mix of Prowl H_2O at 1.5 pts./ac. and Treflan at 1.5 pts./ac. This base residual herbicide treatment was applied and incorporated by Jeremy Reed, the cooperator of the trial. Seven residual cotton herbicide treatments, including one untreated check, were chosen for a trial to evaluate second residual mode-of-action weed efficacy in cotton. The “untreated check” consisted of the base treatment of pre-plant treatment alone while the remainder of the treatments represented the additional efficacy in germinating weed control each treatment provided above the UTC. The seven second residual herbicides were arranged into a CRBD small plot with the pre-plant treatment underneath all treatments. Plots were 4 rows wide on 40” rows and 38’ long. The treatments list and plot map are found in Figure 1.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Untreated Check
2		Cotoran 4 3 PT/A;NIS 0.25 % V/V
3		Caparol FL 3 PT/A;NIS 0.25 % V/V
4		Direx 1.6 QT/A;NIS 0.25 % V/V
5		Dual Magnum 1.3 PT/A;NIS 0.25 % V/V
6		Warrent 1.9 QT/A;NIS 0.25 % V/V
7		Outlook 21 OZ/A;NIS 0.25 % V/V

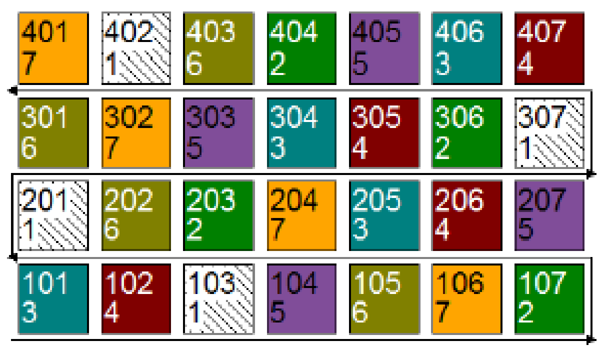


Figure 39. Treatment list and plot map for pre-emergence herbicide efficacy trail.

Treatments were applied two days post cotton planting by the cooperator on 24 May. All treatments were applied broadcast to all plots via backpack CO2 sprayer and handheld wand boom at 16.8 GPA and had NIS added at 0.25% V/V. No additional herbicides were applied to the trial area for the duration of the trial.

Data collection from the trial began on 6 June, 13 DAT, with plant per acre stand counts, per plot weed counts, and herbicide damage ratings on a 0-10 rating scale. This same data was collected again on 20 June, 27 DAT. Cotton stand establishment was minimally acceptable within all plots, but drought conditions existed throughout June and well into July and there was no new weed emergence until 44 DAT. Some existing weeds had escaped all the cooperators pre-plant tillage. All existing weeds were hoed and removed from all plots on the 27 DAT date ensuring any weed pressure within the plots would come from new weed flushes.

Following the rain events beginning at 44 DAT, trial area was finally accessible again at 51 DAT, the next data collection date. AT the 51 DAT date, percent weed control compared to the UTC plots and crop herbicide damage 0-10 ratings were taken. At 62 DAT, 75 DAT, and 100 DAT only percent weed control data was taken.

Results and Discussion

There were no significant differences in plant populations stand counts per acre, weed counts per plot, or herbicide damage ratings for the 13 or 27 DAT data collection dates. No new weeds emerged during the droughty conditions until after the 44 DAT rain events.

At the 51 DAT date, there were no significant differences in herbicide damage between treatments. The rain events starting at 44 DAT did cause new weed flushes in the plots and good data on residual herbicide efficacy could finally be found. All treatments separated in percent weed control compared to the UTC, but no residual herbicide separated statistically from any other. Numerically, Outlook at 21 oz./ac. performed best at 71% additional control over the base pre-plant alone (UTC) and Direx at 1.6 qt./ac. performed worst at 51% additional control over the base pre-plant alone (UTC).

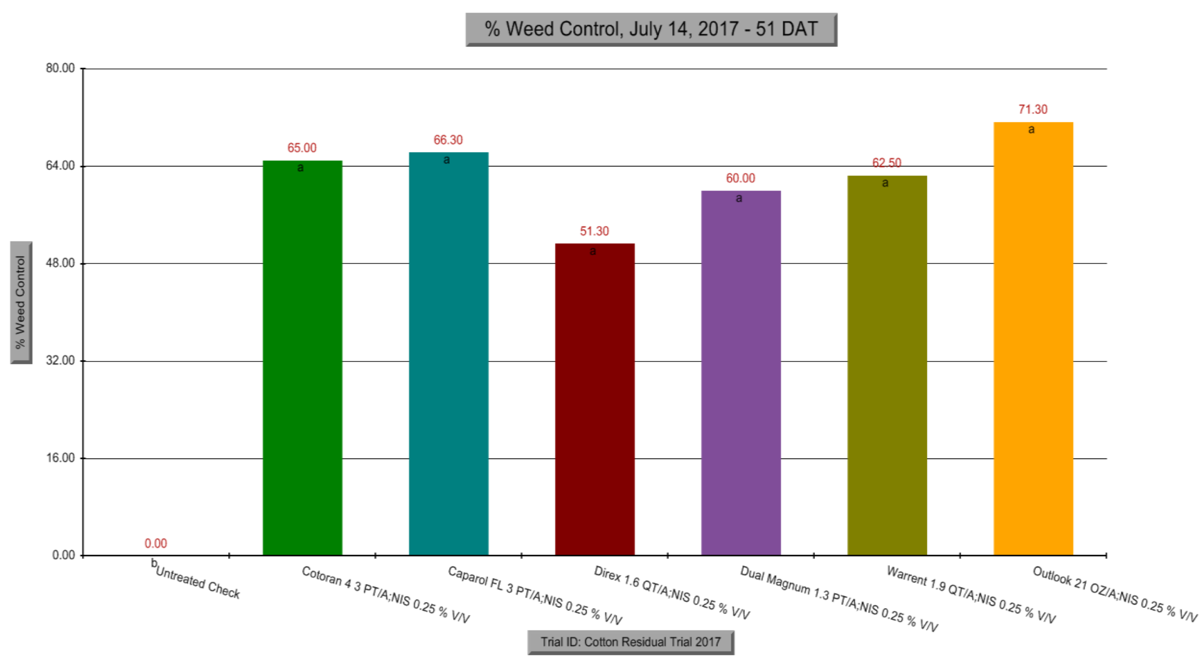


Figure 40. Percent weed control for each treatment at the 51 DAT date.

This general trend of 50% to 70% improvement over the UTC by the additional residual herbicide treatments continued to the 62 DAT and 75 DAT dates with several treatments joking for numerical superiority as more weed flushes continued. AT the 100 DAT date, all treatments had begun to fail as all treatments slipped greatly in terms of percent control down to 22.5% to 40% control compared to the UTC.

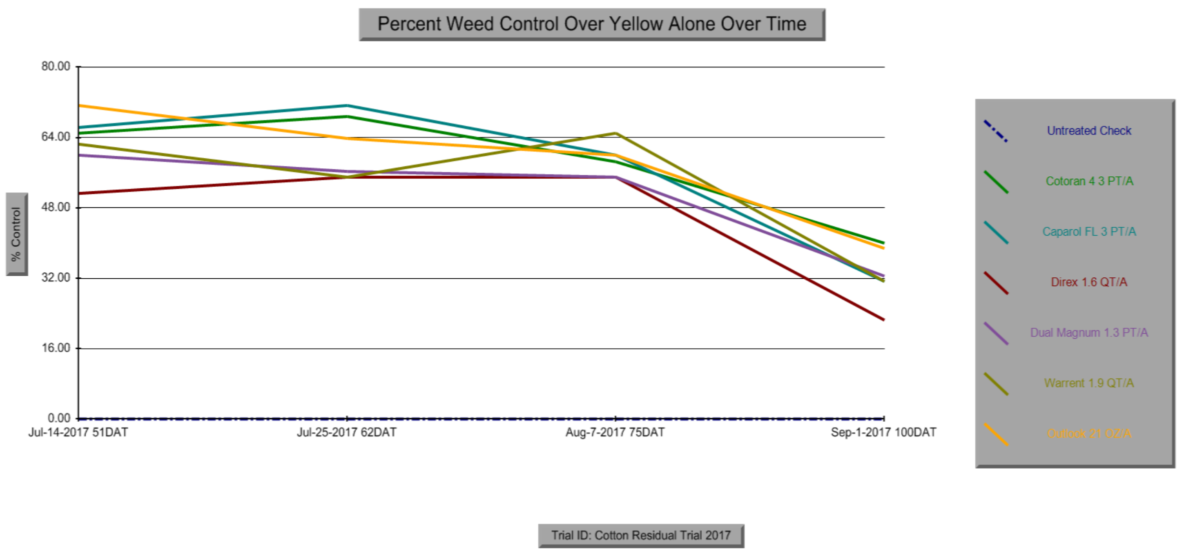


Figure 41. Percent weed control treatment over the UTC over the life of the trail.

Conclusions

The benefit of cotton producers in the region using any of these pre-emergence residual herbicide treatments in cotton as a second layer of control above pre-plant alone to prevent weeds from emerging has been quantified and fully justified. This level appears to be a consistent improvement in percent weeds controlled by a 50% to a 70% reduction regardless of herbicide of choice. Even as residual control begins to fail well into September, additional control remains above a single residual alone.

None of the treatments tested in this trial at maximum rates shown any significant level of crop damage at any stage.

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 Jeremy Reed for cooperating with us to complete this trial on his cotton, the Plains Pest Management Steering Committee for supporting this trial, and the 2017 Plains Pest Management Field Scouts lab technicians for the operation, data collection, and labor associated with this trial: Jim Graham, Nik Clarkson, Trey Buxton, Denise Reed, and Jerik Reed.

2017 Floyd County Phytogen Cotton Variety Trail

Texas A&M AgriLife Extension Service / Dow Crop Science

Floyd County

Cooperator: Johnathan James

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

Summary

Seven Phytogen Cotton varieties, PHY 243 WRF, PHY 333 WRF, PHY 300 W3FE, PHY 340 W3FE, PHY 450 W3FE, PHY 490 W3FE and one local industry commercial standard, FM 1830 GLT were planted on May 31, 2017 into a Floyd County drip irrigated production field in a large plot trial with 3 replications. Plots were 12-rows wide by ¼ mile and row width was 40-inches. Data on stand counts and vigor ratings were taken on 6 June and end of season agronomic data was collected on 13 October. Harvest occurred on 7 November via the producer's, self-modulating cotton stripper. Resulting bales were weighed on a mobile platform scales. Bale weights were recorded field-side during harvest and burr weight cotton yield per plot was captured. Grab samples were then taken by hand from the plot bales for fiber analysis.

There were no significant differences in plants per acre counts (*P*=0.1857) or seedling vigor ratings (*P*=0.0826) on the 6 June check date. For these values, FM 1830 GLT numerically had more emerging plants per acre and PHY 243 WRF had the best seedling vigor rating. On the 13 October collection date, there were significant differences in total plant height with PHY 234 WRF, PHY 300 W3FE, PHY 330 W3FE, and PHY 340 W3FE being shorter than PHY 333 WRF, PHY 450 W3FE, and PHY 490 W3FE (*P*=0.0137). In terms of 1st fruiting branch, PHY 300 W3FE and PHY 330 W3FE started fruiting sooner than PHY 243 WRF, FM 1830 GLT, PHY 450 W3FE, and PHY 490W3FE with other significant differences showing though the mid-range of this category (*P*=0.0044). In terms of total nodes or fruiting branches per plant PHY 300 W3FE and PHY 330 W3FE had fewer nodes per plant than all other varieties. In terms of uppermost harvestable boll, PHY 333 WRF, FM 1830 GLT, and PHY 450 W3FE had reproduction higher on the plants compared to PHY 300 W3FE with other mid-range significant differences (*P*=0.0116).

All lines were statistically similar in terms of lint yield per acre, the number one factor producers should consider for variety selection. This highlights the result that all lines tested are acceptable options for Floyd County and surrounding area cotton producers.

Objective

Determine the value of selected Phytogen Cotton Seed varieties in Floyd County compared to a competition standard variety through a large plot replicated trial.

Materials and Methods

Seven Phytogen Cotton varieties, PHY 243 WRF, PHY 333 WRF, PHY 300 W3FE, PHY 340 W3FE, PHY 450 W3FE, PHY 490 W3FE and one local industry commercial standard, FM 1830 GLT were planted on May 31, 2017 into a Floyd County drip irrigated production field in a large plot trial with 3 replications. A 12-row vacuum planter was utilized to plant all plots on 16 May 2017 on a 40-inch row spacing. Plots were 12-rows wide by ¼ mile. Data on stand counts and vigor ratings were taken on 6 June and end of season agronomic data was collected on 13 October. 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 the 6 June date. The agronomic data collected on 13 October were collected with 5 randomly selected plants per plot and measured for plant height, 1st fruiting branch, total fruiting branches, uppermost harvestable boll, and uppermost open boll.

Harvest occurred on 7 November via the producer's, Johnathan James, self-modulating cotton stripper. Resulting bales were weighed on a mobile platform scales belonging to Texas A&M AgriLife Research. Bale weights were recorded field-side during harvest and burr weight cotton yield per plot was captured. Grab samples were then taken by hand from the plot bales for fiber analysis. Grab samples were then transferred to Dow for sample ginning and fiber analysis. Once percent lint turnout was captured, lint yield per plot and other harvest data was recorded for all plots and treatments. All results, both agronomic, yield, and fiber, were statistically compared utilizing ANOVA and LSD = 0.05.

Figure 42. Photos from the 2017 Floyd Phytogen Variety Trial showing machine harvest and mobile platform scales in use.

Results and Discussion

There were no significant differences in plants per acre counts (*P*=0.1857) or seedling vigor ratings (*P*=0.0826) on the 6 June check date. For these values, FM 1830 GLT numerically had more emerging plants per acre and PHY 243 WRF had the best seedling vigor rating.

On the 13 October collection date, there were significant differences in total plant height with PHY 234 WRF, PHY 300 W3FE, PHY 330 W3FE, and PHY 340 W3FE being shorter than PHY 333 WRF, PHY 450 W3FE, and PHY 490 W3FE (*P*=0.0137). In terms of 1st fruiting branch, PHY 300 W3FE and PHY 330 W3FE started fruiting sooner than PHY 243 WRF, FM 1830 GLT, PHY 450 W3FE, and PHY 490W3FE with other significant differences showing though the mid-range of this category (*P*=0.0044). In terms of total nodes or fruiting branches per plant PHY 300 W3FE and PHY 330 W3FE had fewer nodes per plant than all other varieties. In terms of uppermost harvestable boll, PHY 333 WRF, FM 1830 GLT, and PHY 450 W3FE had reproduction higher on the plants compared to PHY 300 W3FE with other mid-range significant differences (*P*=0.0116). No other in-season agronomic factors were found.

In terms of burr weight (P=0.6009) or lint yield (*P*=0.3407) there were no significant differences in the varieties with FM 1830 GLT holding numeric edges in both categories. In percent lint turnout FM 1830 GLT was significantly better than all other lines except PHY 330 W3FE with other mid-range significant differences. All agronomic and yield data can be viewed in Table 1.

Table 2. Trial agronomic and yield data. Values with differing letter assignments are significant to at least the P=0.05 level. See column Prob(F) for specific significance.

Texas A&M AgriLife Extension

2017 Floyd County Phytogen Variety Trial

Trial ID: 2017 Floyd County Phytogen V
Protocol ID: Floyd-Phytogen 2017
Crop: Other
Project ID:

Location: Jonathan James
Investigator: Blayne Reed
Study Director: Dr. Ken Lege
Sponsor Contact:

Trial Year: 2017

					1	2	3	4	5	6	7	8	9	10
Crop Code					GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI
Description					Plants per acre	seedling vigor	plant ht.	1st fruiting b>	total nodes	highest harves>	highest open b>	burr weight	% lint trunout	lint yield per>
Part Rated					PLAEME	PLAEME	PLAEME	PLAEME	PLAEME	PLAEME	PLAEME	SEECOT		
Rating Date					Jun-6-2017	Jun-6-2017	Oct-13-2017	Oct-13-2017	Oct-13-2017	Oct-13-2017	Oct-13-2017	Nov-7-2017	Nov-7-2017	Nov-7-2017
Rating Data Type					CROPST	VIGOR	HEIGHT	FLOSTA	COPLPA	FRUSET	FRUSET	YIELD	CONFIB	YIELD
Rating Unit					/acre	1-5	IN	POSNUM	POSNUM	POSNUM	POSNUM	lb/plot	%	lb/ac
ARM Action Codes									AL					
Entry No.	Entry Name	Seeding Rate	Rate Unit	Appl Code	1	2	3	4	5	6	7	8	9	10
1	PHY 243 WRF	48000	seeds/a	A	36800.0 -	1.333 -	25.28 b	7.8 a	21.3 a	16.4 -	13.3 bcd	7703.3 -	32.03 c	1252.17 -
2	PHY 333 WRF	48000	seeds/a	A	34533.3 -	2.083 -	28.72 a	6.8 bcd	20.9 a	16.6 -	15.1 a	7340.0 -	33.50 bc	1230.95 -
3	PHY 300 W3FE	48000	seeds/a	A	35333.3 -	2.000 -	24.11 b	6.1 d	18.6 b	14.1 -	12.9 d	7416.7 -	33.63 bc	1261.53 -
4	PHY 330 W3FE	48000	seeds/a	A	36400.0 -	1.917 -	24.56 b	6.6 cd	18.5 b	14.8 -	13.3 bcd	7236.7 -	34.60 ab	1267.07 -
5	PHY 340 W3FE	48000	seeds/a	A	36400.0 -	1.667 -	24.17 b	7.2 abc	20.2 a	14.3 -	13.3 bcd	7346.7 -	33.63 bc	1250.47 -
6	PHY 450 W3FE	48000	seeds/a	A	32800.0 -	2.000 -	28.83 a	7.8 a	21.2 a	16.4 -	14.2 abc	7020.0 -	33.37 bc	1189.33 -
7	PHY 490 W3FE	48000	seeds/a	A	37000.0 -	1.750 -	29.06 a	7.6 ab	21.2 a	15.9 -	13.1 cd	7796.7 -	32.67 c	1290.17 -
8	FM 1830 GLT	48000	seeds/a	A	37533.3 -	1.500 -	26.78 ab	7.8 a	21.1 a	17.2 -	14.4 ab	7883.3 -	36.17 a	1441.23 -
LSD P=.05					3609.61	0.5287	3.330	0.86	1.51 - 1.60	2.22	1.16	1019.32	1.816	201.777
Standard Deviation					2061.21	0.3019	1.902	0.49	0.02t	1.26	0.66	577.87	1.037	114.390
CV					5.75	16.95	7.19	6.81	1.39t	8.05	4.83	7.74	3.08	8.99
Grand Mean					35850.00	1.7813	26.438	7.19	1.33t	15.72	13.72	7467.92	33.700	1272.865
Levene's F					0.261	0.543	0.339	0.172	0.425	0.177	1.116	0.72	0.36	1.047
Levene's Prob(F)					0.961	0.79	0.924	0.987	0.872	0.987	0.40	0.658	0.912	0.441
Friedman's X2					10.083	11.583	14.944	13.333	15.417	10.222	12.056	8.556	12.333	8.778
P(Friedman's X2)					0.184	0.115	0.037	0.064	0.031	0.176	0.099	0.286	0.09	0.269
Skewness					-0.3879	0.4643	0.3761	-0.4771	-0.361	-0.1926	0.1394	0.6155	0.0045	-0.3505
Kurtosis					-0.6955	-0.5649	-0.2176	-0.7512	-0.6897	-1.176	-0.6259	0.9173	-0.2181	0.4334
Replicate F					1.982	2.143	3.338	0.251	0.262	0.177	2.038	0.761	5.845	1.181
Replicate Prob(F)					0.1746	0.1542	0.0652	0.7817	0.7734	0.8400	0.1672	0.4871	0.0143	0.3379
Treatment F					1.711	2.347	3.956	5.190	5.037	2.527	4.127	0.801	4.342	1.260
Treatment Prob(F)					0.1857	0.0826	0.0137	0.0044	0.0050	0.0663	0.0116	0.6009	0.0094	0.3407

There were also significant differences in percent seed turnout with PHY 243 WRF producing significantly more than all lines except PHY 450 W3FE (*P*=0.0006) with additional mid-range significant differences. In fiber quality, there were significant differences in mic, fiber length, uniformity, strength, elongation, Rd, color grade (chart), but not leaf grade. Fiber differences can be viewed in table 2.

Table 3. Seed yield and fiber quality data from trial. Values assigned different letters are significant to at least the P=0.05 level. See specific column Prob(F) for specific significance.

Texas A&M AgriLife Extension

2017 Floyd County Phytogen Variety Trial

Trial ID: 2017 Floyd County Phytogen V
Protocol ID: Floyd-Phytogen 2017
Crop: Other
Project ID:

Location: Jonathan James
Investigator: Blayne Reed
Study Director: Dr. Ken Lege
Sponsor Contact:

Trial Year: 2017

Crop Code	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI	GOSHI
Description										
Part Rated										
Rating Date	Nov-7-2017	Nov-7-2017	Dec-14-2017	Dec-14-2017	Dec-14-2017	Dec-14-2017	Dec-14-2017	Dec-14-2017	Dec-14-2017	Dec-14-2017
Rating Data Type	LINPER	WEIGHT	CONFIB	CONFIB	PERCEN	CONFIB	CONFIB	CONFIB	CONFIB	CONFIB
Rating Unit	%	lb/ac	1-6	IN	%ABS					1-7
ARM Action Codes		AL								
Entry No. Entry Name / Seeding Rate Rate Unit / Appl Code	11	12	13	14	15	16	17	18	19	20
1 PHY 243 WRF 48000 seeds/a A	45.30 a	1754.76 -	3.10 c	1.180 ab	81.13 d	29.53 bc	9.93 b	77.20 abc	7.57 d	4.0 -
2 PHY 333 WRF 48000 seeds/a A	41.17 cde	1512.85 -	3.63 ab	1.153 bc	83.07 a	30.27 b	9.30 bc	74.53 d	8.70 a	3.7 -
3 PHY 300 W3FE 48000 seeds/a A	41.03 de	1538.60 -	3.97 a	1.120 c	81.83 cd	28.77 c	9.50 bc	75.03 cd	8.57 ab	3.7 -
4 PHY 330 W3FE 48000 seeds/a A	40.63 e	1486.89 -	3.77 ab	1.137 c	81.87 cd	29.30 bc	9.33 bc	75.70 bcd	8.27 abc	3.3 -
5 PHY 340 W3FE 48000 seeds/a A	40.80 e	1515.61 -	3.90 a	1.137 c	82.07 bcd	28.93 c	9.43 bc	76.43 a-d	8.30 abc	3.7 -
6 PHY 450 W3FE 48000 seeds/a A	44.20 ab	1566.52 -	3.87 a	1.130 c	83.43 a	32.13 a	10.90 a	75.27 cd	8.63 a	3.3 -
7 PHY 490 W3FE 48000 seeds/a A	42.93 bc	1691.36 -	3.90 a	1.147 bc	82.53 abc	31.47 a	11.37 a	77.87 ab	8.00 bcd	3.3 -
8 FM 1830 GLT 48000 seeds/a A	42.73 bcd	1703.27 -	3.47 bc	1.220 a	83.00 ab	31.43 a	8.90 c	78.53 a	7.73 cd	3.7 -
LSD P=.05	1.893	229.419 - 234.556	0.376	0.0401	0.997	1.138	0.945	2.447	0.594	1.56
Standard Deviation	1.081	0.035t	0.215	0.0229	0.570	0.650	0.540	1.397	0.339	0.89
CV	2.55	1.1t	5.8	1.99	0.69	2.15	5.49	1.83	4.13	24.83
Grand Mean	42.350	3.203t	3.700	1.1529	82.367	30.229	9.833	76.321	8.221	3.58
Levene's F	0.733	0.63	0.096	1.188	0.317	0.327	0.392	0.194	1.48	0.352
Levene's Prob(F)	0.648	0.724	0.998	0.363	0.935	0.931	0.894	0.982	0.243	0.917
Friedman's X2	17.889	11.444	12.722	16.222	17.889	17.778	16.639	15.667	15.611	0.917
P(Friedman's X2)	0.012	0.12	0.079	0.023	0.012	0.013	0.02	0.028	0.029	0.996
Skewness	0.2455	0.8941	-0.0918	1.6785*	-0.4642	0.0994	0.5513	-0.4984	-0.7194	-0.3022
Kurtosis	-0.3785	1.0405	-0.8586	3.1879*	-0.0599	-0.966	-0.0056	-0.1832	-0.6066	-0.0146
Replicate F	0.097	0.665	24.577	0.484	0.626	6.686	0.465	6.757	1.306	1.000
Replicate Prob(F)	0.9079	0.5310	0.0001	0.6265	0.5492	0.0092	0.6374	0.0088	0.3020	0.3927
Treatment F	7.734	1.866	5.595	6.042	5.553	11.942	7.619	3.165	4.622	0.211
Treatment Prob(F)	0.0006	0.1573	0.0031	0.0022	0.0032	0.0001	0.0007	0.0316	0.0072	0.9772

Conclusions

All lines were statistically similar in terms of lint yield per acre, the number one factor producers should consider for variety selection. This highlights the result that all lines tested are acceptable options for Floyd County and surrounding area cotton producers.

Other significant differences of note were found between the cotton varieties tested that should be of note for area producers. 2017 was a notably tough year for developing fiber quality. The significant differences found in Table 2, columns 13-20 should be of special note for these important fiber factors.

Many significant differences were found in the fiber qualities, yet no one variety seemed to be a consistently better performer unless weight is given to one factor over the others.

Other factors of agronomic traits might also help producers select varieties from this trial. Significant factors of note could be the plant height with shorter lines indicating ease of in-season management and 1st fruiting branch as an indication of earliness. These factors are found in Table 1 columns 3 and 4. Percent lint turnout, Table 1, column 9, should also be a solid guiding factor.

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 Johnathon James for cooperating with us to complete this trial on his cotton, Dow for sponsoring and partnership of this trial, the 2017 Plains Pest Management Field Scouts and lab technicians for the operation, data collection, and labor associated with this trial: Jim Graham, Nik Clarkson, Trey Buxton, and Denise Reed.

<u>2017 Swisher County Phytogen Cotton Variety Trail</u>

Texas A&M AgriLife Extension Service / Dow Crop Science

Swisher County

Cooperator: Mike Goss

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

<u>Summary</u>

Seven Phytogen Cotton varieties, PHY 243 WRF, PHY 333 WRF, PHY 300 W3FE, PHY 340 W3FE, PHY 450 W3FE, PHY 490 W3FE and one local industry commercial standard, FM 1911 GLT were planted in a central Swisher County irrigated production field in a large plot trial with 3 replications. Data on stand counts and vigor ratings were taken on 13 June and end of season agronomic data was collected on 1 November. The trial received an accidental overspray of Enlist in early July via faulty tank cleanout resulting in severe damage to the non-Enlist varieties. As a result, much of the data collected after the July overspray incident reflects this damage. Some of the damaged plots were so heavily damaged, that agronomic data could not be gathered from them. Harvest occurred on 14 December with per plot burr weights recorded field-side during harvest. Grab samples were then taken by hand from the weight buggy after weights were recorded. All results, both agronomic, yield, and fiber, were statistically compared utilizing ANOVA and LSD = 0.05.

The only truly reliable information that can be gathered from this accidentally herbicide over sprayed trial is the early season data, in which the lines FM 1911 GLT, PHY 330 W3FE, PHY 300 W3FE, and PHY 243 WRF performed very well in seedling vigor. In terms of lint yield under these conditions, the lines PHY 330 W3FE and PHY 340 W3FE performed admirably.

<u>Objective</u>

Determine the value of selected Phytogen Cotton Seed varieties in Swisher County compared to a competition standard variety through a large plot replicated trial.

Materials and Methods

Seven Phytogen Cotton varieties, PHY 243 WRF, PHY 333 WRF, PHY 300 W3FE, PHY 340 W3FE, PHY 450 W3FE, PHY 490 W3FE and one local industry commercial standard, FM 1911 GLT were planted on May 18, 2017 into the outer four towers of 1/3 of a 120-acre pivot in central Swisher County irrigated production field in a large plot trial with 3 replications. An 8-row vacuum planter was utilized to plant all plots on 18 May 2017 on a 30-inch row spacing. Plots were 8-rows wide and around the outer 4 towers of a 1/3 pie of a 120-acre pivot. Data on stand counts and vigor ratings were taken on 13 June and end of season agronomic data was collected on 1 November. Five randomly selected 1/1000-acre areas per plot was 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 the 13 June date.

Figure 43. November 1 photo from one of the herbicide damaged plots. This damage influenced the balance of the trial from July forward.

The trial received an accidental overspray of Enlist in early July via faulty tank cleanout resulting in severe damage to the non-Enlist varieties. As a result, much of the data collected after the July overspray incident reflects this damage. Some of the damaged plots were so heavily damaged, that agronomic data could not be gathered from them. With these issues already known, compiled with other complicating factors including weather, the trial was somewhat neglected in timing of other needed management including PGR applications for remainder of the trial period seriously harming the results of the trial. The agronomic data collected on 1 November were collected with 5 randomly selected plants per plot and measured for plant height, 1st fruiting branch, total fruiting branches, uppermost harvestable boll, and uppermost open boll on all plots where this data could be taken from.

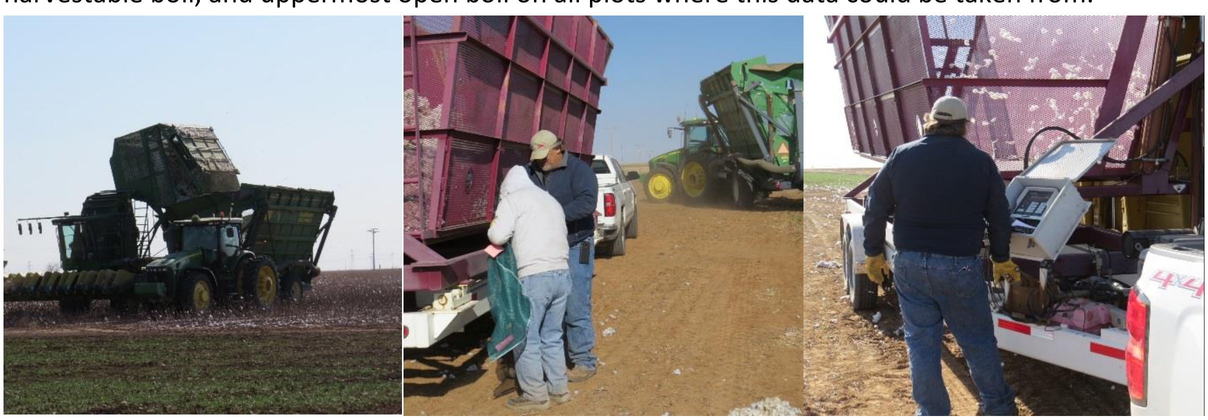


Figure 44. Harvest and data collection field-side on the 13 December date.

Harvest occurred on 14 December via the producer's, Mike Goss, 8-row cotton stripper. Burr cotton was weighed with a mobile boll buggy scale belonging to Texas A&M AgriLife Research. Per plot burr weights were recorded field-side during harvest. Grab samples were then taken by hand from the weight buggy after weights were recorded. Grab samples were then transferred to Dow for sample ginning and fiber analysis. Once percent lint turnout was captured, lint yield per plot and other harvest data was recorded for all plots and treatments. All results, both agronomic, yield, and fiber, were statistically compared utilizing ANOVA and LSD = 0.05.

Results and Discussion

For the early season seedling agronomic data, there were no significant differences in plant per acre establishment but there were differences in seedling vigor rating (*P*=0.0066). FM 1911 GLT, PHY 330 W3FE, and PHY 300 W3FE were more aggressive as seedlings compared to PHY 333WRF, PHY 490 W3FE, and PHY 450 W3FE with additional mid-range differences.

Table 4. Early season data, late season agronomic data, plus burr wt., and % lint turnout. Varieties with different letter assignments are significantly different to at least the P<0.05 level. For specific column statistics see Prob(F).

Texas A&M AgriLife Extension

2017 Swisher County Phytogen Variety Trial

Trial ID: 2017 Swisher County Phytogen   Location: Mike Goss - Pens   Trial Year: 2017
Protocol ID: Swisher-Phytogen 2017   Investigator: Blayne Reed
Crop: Other   Study Director: Dr. Ken Lege
Project ID: Sponsor Contact:

Crop Name			American uplan>	American uplan>	American uplan>	American uplan>	American uplan>	American uplan>	American uplan>	American uplan>	American uplan>
Description			Plants / acre	seedling vigor	plant ht.	1st fruiting b>	total nodes	node top boll	uppermost crac>	burr wt./ac	% lint turnout
Rating Date			Jun-13-2017	Jun-13-2017	Nov-1-2017	Nov-1-2017	Nov-1-2017	Nov-1-2017	Nov-1-2017	Dec-14-2017	Jan-19-2018
Rating Data Type			CROPST	VIGOR	HEIGHT	FLOSTA	COPLPA	FRUSET	FRUSET	WEIFRE	PERCEN
Rating Unit			/acre	1-5	IN	POSNUM	POSNUM	POSNUM	POSNUM	lb/ac	%
ARM Action Codes					ET8						
Entry No.	Entry Name	Appl Code	1	2	3	4	5	6	7	8	9
1	PHY 243 WRF	A	42466.7 -	2.000 bcd	36.83 -	6.0 b	20.7 -	15.0 -	14.0 -	856.97 e	17.90 cd
2	PHY 333 WRF	A	41533.3 -	2.583 a						622.30 e	21.23 bc
3	PHY 300 W3FE	A	45733.3 -	2.000 bcd	38.50 -	6.9 b	20.1 -	14.6 -	10.8 -	3664.10 bc	25.07 ab
4	PHY 330 W3FE	A	44333.3 -	1.917 cd	39.06 -	6.8 b	21.0 -	15.8 -	11.3 -	4296.13 a	25.73 a
5	PHY 340 W3FE	A	42000.0 -	2.000 bcd	37.28 -	6.7 b	20.8 -	15.0 -	12.4 -	4098.03 ab	26.90 a
6	PHY 450 W3FE	A	43066.7 -	2.250 abc	39.00 -	9.3 a	21.4 -	16.0 -	12.1 -	3548.97 c	24.93 ab
7	PHY 490 W3FE	A	44733.3 -	2.333 ab	42.06 -	9.1 a	22.4 -	17.0 -	9.6 -	3094.07 d	25.07 ab
8	FM 1911 GLT	A	41333.3 -	1.667 d						495.73 e	15.33 d
LSD P=.05			3896.11	0.3954	5.618	1.27	1.49	2.09	3.48	437.389	4.357
Standard Deviation			2224.81	0.2258	2.984	0.67	0.79	1.11	1.85	249.763	2.488
CV			5.16	10.78	7.69	9.01	3.76	7.12	15.8	9.66	10.93
Grand Mean			43150.00	2.0938	38.787	7.46	21.07	15.56	11.71	2584.538	22.771
Levene's F			0.639	0.56	0.50	0.471	0.16	0.423	0.355	0.453	1.059
Levene's Prob(F)			0.718	0.778	0.737	0.757	0.954	0.789	0.835	0.854	0.431
Friedman's X2			9.528	13.389	8.571	13.19	8.762	8.905	7.952	20.333	17.583
P(Friedman's X2)			0.217	0.063	0.127	0.022	0.119	0.113	0.159	0.005	0.014
Skewness			0.4125	0.6411	-0.6495	0.7471	0.2486	-0.2662	-0.115	-0.4277	-1.0779*
Kurtosis			-0.7027	0.0136	2.033	-0.7366	-0.6207	-0.8994	-1.0108	-1.6724	-0.4966
Replicate F			0.583	1.993	0.253	0.423	0.305	0.589	0.841	1.624	3.889
Replicate Prob(F)			0.5713	0.1732	0.7825	0.6688	0.7456	0.5774	0.4661	0.2322	0.0454
Treatment F			1.584	4.723	1.144	12.988	3.058	1.932	2.014	128.976	8.479
Treatment Prob(F)			0.2196	0.0066	0.4111	0.0011	0.0777	0.1944	0.1808	0.0001	0.0004

For the1 November end of season agronomic check date, there were few significant differences between varieties. The only significant differences were in 1st fruiting branch with PHY 300 W3FE, PHY 330 W3FE, PHY 340 W3FE, and PHY 243 WRF fruiting earlier than PHY 450 W3FE and PHY 490 W3FE. The non-Enlist lines were so deformed from herbicide damage, few were viable enough for the plant measurements. Of these three lines only PHY 243 WRF had recovered enough to take accurate data. Having this damage and unmeasurable traits go into the data as missing undoubtedly skewed results and made significance hard to find.

There were several yield and fiber quality data differences in held in the trial. However, with the known herbicide damage factor and partial abandonment of the trial both skewing and influencing results, only the lint yield will be discussed here. The remainder of the data can be found in Table 2.

Table 5. Percent seed turnout, pounds seed per acre, lint yield and fiber data. Varieties with different letter assignments are significantly different to at least the P<0.05 level. For specific column statistics see Prob(F).

Texas A&M AgriLife Extension

2017 Swisher County Phytogen Variety Trial

Trial ID: 2017 Swisher County Phytogen — Location: Mike Goss - Pens — Trial Year: 2017
Protocol ID: Swisher-Phytogen 2017 — Investigator: Blayne Reed
Crop: Other — Study Director: Dr. Ken Lege
Project ID: — Sponsor Contact:

Crop Name	American uplan>	American uplan>	American uplan>	American uplan>	American uplan>	American uplan>	American uplan>	American uplan>	American uplan>
Description	% seed turnout	seed per ac.	lint yield per>	mic	fiber length	uniformity	strength	Elongation	Color (+b&CGRD)
Rating Date	Jan-19-2018	Jan-19-2018	Jan-19-2018	Feb-5-2018	Feb-5-2018	Feb-5-2018	Feb-5-2018	Feb-5-2018	Feb-5-2018
Rating Data Type	PERCEN	WEIFRE	YIELD	CONFIB	CONFIB	CONFIB	STRENG	ELONG	CONFIB
Rating Unit	%	lb/ac	lb/ac	1-4	IN	%	PSI	0-20	%
ARM Action Codes									
Entry No. / Entry Name / Appl Code	10	11	12	13	14	15	16	17	18
1 PHY 243 WRF A	26.63 bc	242.33 e	165.80 d	2.40 c	1.050 d	80.60 -	27.30 b	8.60 c	70.00 -
2 PHY 333 WRF A	32.63 b	219.07 e	144.17 d	2.30 c	1.080 c	79.60 -	27.55 b	9.10 bc	72.00 -
3 PHY 300 W3FE A	43.30 a	1584.73 bc	919.40 b	2.53 bc	1.080 c	79.00 -	27.43 b	9.63 ab	72.50 -
4 PHY 330 W3FE A	41.07 a	1761.53 a	1103.83 a	2.77 ab	1.117 ab	81.43 -	30.27 a	9.03 bc	72.83 -
5 PHY 340 W3FE A	41.73 a	1708.63 ab	1100.53 a	2.93 a	1.097 bc	80.30 -	28.73 ab	9.17 bc	73.17 -
6 PHY 450 W3FE A	42.97 a	1524.30 c	885.67 b	2.53 bc	1.083 c	79.47 -	28.13 b	10.00 a	71.17 -
7 PHY 490 W3FE A	43.10 a	1334.00 d	774.13 c	2.37 c	1.127 a	79.73 -	28.83 ab	9.83 ab	70.67 -
8 FM 1911 GLT A	22.97 c	112.93 e	76.40 d						
LSD P=.05	6.301	165.888	101.388	0.282	0.0240	2.100	1.625	0.811	4.533
Standard Deviation	3.598	94.728	57.896	0.153	0.0130	1.137	0.880	0.439	2.454
CV	9.78	8.93	8.96	5.99	1.19	1.42	3.11	4.7	3.42
Grand Mean	36.800	1060.942	646.242	2.548	1.0905	80.019	28.321	9.338	71.762
Levene's F	1.397	0.716	0.613	0.455	0.82	0.732	0.543	0.882	0.053
Levene's Prob(F)	0.273	0.66	0.738	0.802	0.56	0.615	0.74	0.524	0.998
Friedman's X2	18.306	20.444	19.889	14.107	14.714	10.714	11.821	13.964	6.321
P(Friedman's X2)	0.011	0.005	0.006	0.028	0.023	0.098	0.066	0.03	0.388
Skewness	-1.0168*	-0.4829	-0.3894	0.3158	-0.2766	0.238	1.0614	0.4743	-0.2771
Kurtosis	-0.6731	-1.729	-1.6395	0.6548	-1.0227	-0.3335	1.1152	-0.5623	-1.1228
Replicate F	1.487	2.631	6.508	3.089	2.236	0.939	2.244	1.381	0.204
Replicate Prob(F)	0.2597	0.1071	0.0100	0.0952	0.1628	0.4263	0.1619	0.2998	0.8195
Treatment F	15.709	179.175	175.381	6.723	11.717	1.554	4.315	3.877	0.696
Treatment Prob(F)	0.0001	0.0001	0.0001	0.0061	0.0008	0.2648	0.0251	0.0342	0.6604

In terms of lint yield, the lines PHY 330 W3FE and PHY 340 W3FE were significantly higher compared to all other lines. The lines PHY 243 WRF, PHY 333 WRF, and FM 1911 GLT only yielded between 76.4 and 165.8 lint pounds per acre due to the herbicide damage and should be dropped from scrutinization here. The lines PHY 300 W3FE, PHY 450 W3FE, and PHY 490 W3FE were underperformers in this irrigated trial where management was critical but missing.

Conclusions

The only truly reliable information that can be gathered from this accidentally herbicide over sprayed trial is the early season data, in which the lines FM 1911 GLT, PHY 330 W3FE, PHY 300 W3FE, and PHY 243 WRF performed very well in seedling vigor. In terms of lint yield under these conditions, the lines PHY 330 W3FE and PHY 340 W3FE performed admirably.

Acknowledgements

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Evaluation of Varying Rates of Onager for Banks Grass Mite Control in Corn – 2017

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Summary

Three rates of Onager, 12, 16, and 24 oz. / ac., one treatment of an experimental compound., a mixed treatment of Onager at 12 oz. / ac. with the experimental compound, one competitive standard treatment of Oberon at 6 oz. / ac., plus an untreated check were tested in a small plot completely randomized block design efficacy trail for Banks grass mites in a commercial corn field in Swisher County with mites flared to an economically damaging level in the trial area. Data on mites per leaf were recorded pre-treatment and at 8, 15, and 21 DAT with a mite damage rating taken at 21 DAT. All data were compared using ANOVA and LSD.

There were no significant differences between treatments in pre-treatment or by 8 DAT despite numeric trends following treatments. By the 15 DAT count, all treatments had significantly fewer mites per leaf compared to the UTC, except for the experimental compound, which is not designed to have any mite activity. By the 21 DAT date, all treatments, including the experimental, had significantly fewer mites than the UTC, but no treatment was superior to any other. For the 21 DAT damage rating, all treatments except the experimental compound were significantly better than the UTC but the Onager at 12 oz. / ac. mixed with the experimental compound was superior to the Oberon treatment. There should be no proven benefit to increasing rates of Onager to increase field mite control, and the experimental compound does not interfere with Onager's efficacy.

Objective

To answer concerns over Onager' continued efficacy on BGM at normal use rates in the region by evaluating Onager at normal, high, and over labelled use rates compared to a competitive standard treatment. Any additional benefit to efficacy in West Texas Banks Grass Mite populations by higher use rates would trigger a change in treatment recommendations across the region in corn. A second objective was to evaluate an experimental compound not targeted for mite control for any activity or hinderance to Onager's efficacy in a future tank mix for labeling requirements and future uses.

Figure 45. Typical 0-leaf BGM colony on the day of treatment

Materials and Methods

Three rates of Onager, 12, 16, and 24 oz. / ac., one treatment of an experimental compound., a mixed treatment of Onager at 12 oz. / ac. with the experimental compound, one competitive standard treatment of Oberon at 6 oz. / ac., plus an untreated check were tested in a small plot completely randomized block design efficacy trail for Banks grass mites in a commercial corn field in Swisher County. Mite populations were 'flared' with a treatment of Warrior at 2.9 oz. / ac. to lower predator levels and ensure an economically damaging level of mites in the trial area. The flaring treatment was applied 19 July. Pre-treatment counts and trial treatments were made 2 August. All treatments were made via CO2 backpack sprayer with corn boom attachment

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Untreated check
2		Onager 12 OZ/A;COC 0.5 % V/V
3		GWN-10598 5 OZ/A;COC 0.5 % V/V
4		Onager 12 OZ/A;GWN-10598 5 OZ/A;COC 0.5 % V/V
5		Onager 16 OZ/A;COC 0.5 % V/V
6		Onager 24 OZ/A;COC 0.5 % V/V
7		Oberon 2 SC 6 FL OZ/A;COC 0.5 % V/V

401 2	402 3	403 6	404 1	405 4	406 7	407 5
301 7	302 6	303 2	304 5	305 3	306 1	307 4
201 6	202 2	203 7	204 1	205 5	206 4	207 3
101 1	102 7	103 6	104 4	105 3	106 2	107 5

Table 6. Treatment list and plot map of trial.

Data on mites per leaf were recorded pre-treatment and at 8, 15, and 21 DAT with a mite damage rating taken at 21 DAT. Five randomly selected ear leaves were harvested from each plot on count dates and taken to the Plains Pest Management Insect Lab in Plainview were mites per leaf were counted under magnification. All data were recorded in ARM and following trial completion compared using ANOVA and LSD.

Results and Discussion

Mite populations proved to be significantly uniform in pretreatment counts. By the 8 DAT count date there were still no significant differences between treatments despite a noticeable numeric trend showing fewer mites for all treatments compared to the untreated check. By the 15 DAT count, all treatments had significantly fewer mites per leaf compared to the UTC, except for the experimental compound, which is not designed to have any mite activity. The experimental compound was still statistically similar to all treatments except the mixed treatment.

By the 21 DAT date, all treatments, including the experimental, had significantly fewer mites than the UTC, but no treatment was superior to any other. Mite populations had begun crashing naturally with beneficial pressure by the 21 DAT date.

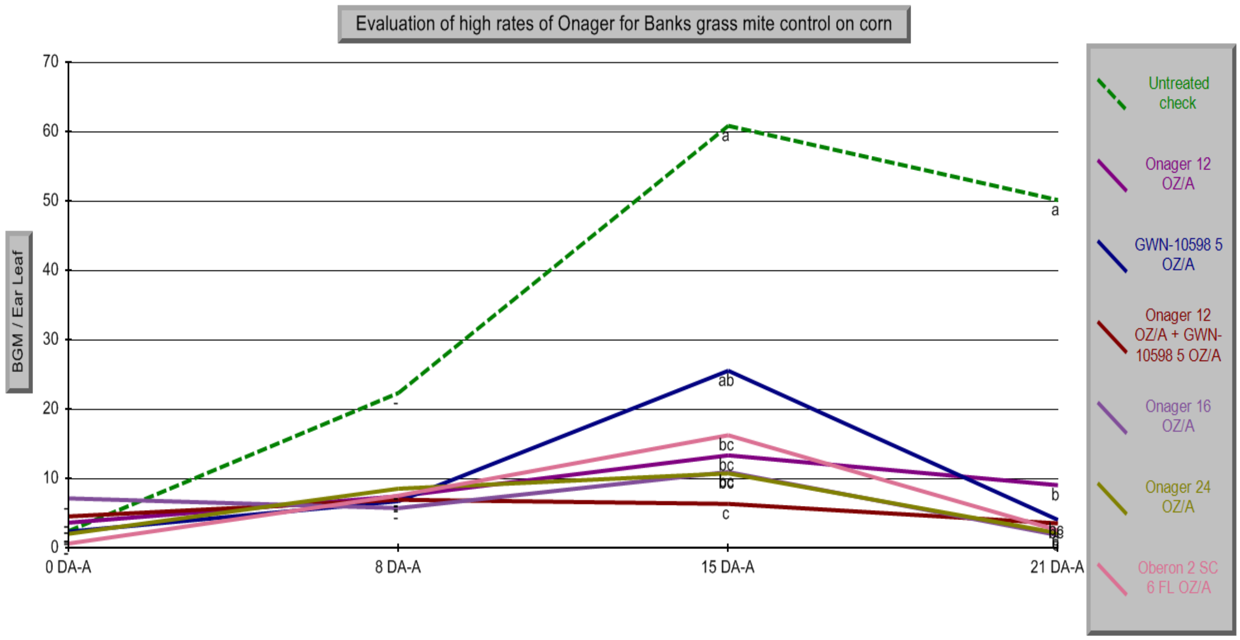

Figure 46. BGM populations for the length of the trial. Lines showing differing letters for corresponding dates were significantly different at least to the P=0.05 level.

The 21 DAT damage ratings shown significant trends following the amount of BGM pressure. All treatments, except the experimental compound alone, were significantly better than the UTC but the Onager at 12 oz. / ac. mixed with the experimental compound was superior to the Oberon treatment.

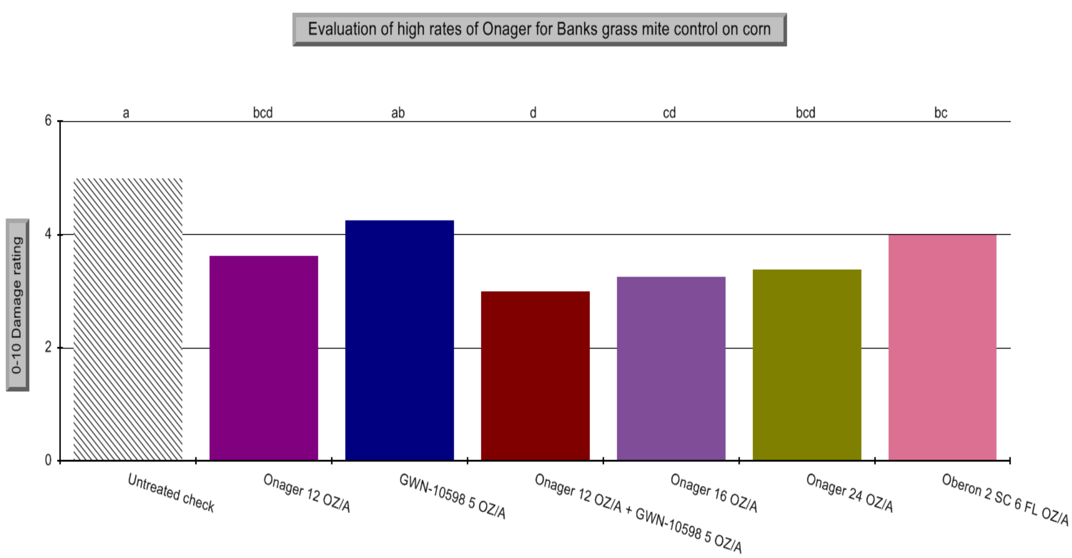

Figure 47. 21 DAT Damage ratings by treatment. Treatments with differing letters were significantly different to at least the P=0.05 level.

Conclusions

The existing concern for entomologists, producers, and company representative that higher rates of Onager might be needed in West Texas BGM control in corn look to be unfounded in this region at this time. There should be no proven benefit to increasing rates of Onager to increase field mite control. The addition of the experimental compound to an application of Onager for BGM control does not appear interfere with Onager's efficacy.

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