Integrated Pest Management

Bailey-Parmer
IPM Program
2013

Northwest Plains

Integrated Pest Management Program
Bailey and Parmer Counties

2013 Annual Report

Prepared by

Monti Vandiver
Extension Agent-IPM

Texas IPM

Partners With Nature

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ACKNOWLEDGMENTS

The success and achievements of any Extension program depend on the support and participation provided by area producers, agribusinessmen and others.

Appreciation is extended to the following producers for their cooperation, support and participation in the 2013 Northwest Plains Integrated Pest Management Program:

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Calvin Trostle	Extension Agronomist, Lubbock
Jason Woodward	Extension Plant Pathologist, Lubbock
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Charles Allen	Associate Department Head and IPM Coordinator, San Angelo
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Ray White	IPM Intern, Bailey-Parmer Counties
Hayden Hadley	Demonstration Technician, Bailey-Parmer Counties
Austin Mason	Demonstration Technician, Bailey-Parmer Counties
Linda Luera	Office Manager, Bailey County

Bailey-Parmer Integrated Pest Management Committee

Cody Copland	Mark Logan	Keith Burch	Jordan Pool
Chris Bass	Kelly Kettner	Ryan Willians	

2013 Northwest Plains IPM Program Summary

Monti Vandiver, Extension Agent - IPM, Bailey & Parmer Counties

Relevance

Agriculture is the foundation of the economy in Bailey and Parmer Counties. 569,700 acres of cropland are intensively managed for maximum production and profitability. The Northwest Plains Integrated Pest Management Program is an educational program designed to promote a pest management strategy that will meet an individual's production goals in the most economically and environmentally sound manner possible. Integrated Pest Management (IPM) is a systematic, information-intensive approach which depends on an understanding of the entire production system. It strives to use several complimentary tactics or control methods to manage pests, which makes the system more stable and subject to fewer production risks.

Response

The Northwest Plains Integrated Pest Management Program is directed by a program area committee consisting of 7 individuals including agriculture producers, consultants, and agriculture businessmen. The committee actively participates in the identification of the targeted audience, planning, and implementation of the program. Sixteen Bailey and Parmer County producers actively participated in the scouting and applied research components and many more participated in other program mechanisms. Educational activities included:

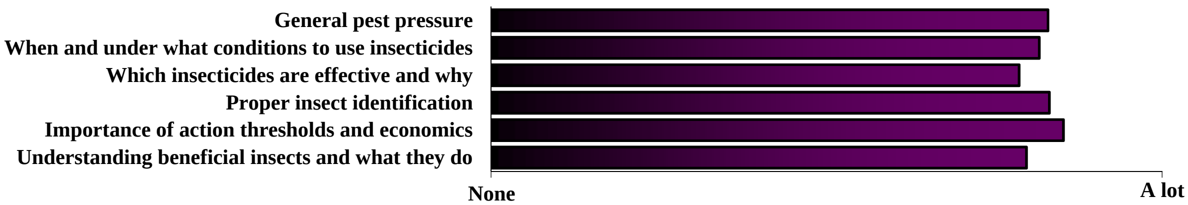
- Field visits (402), information gathered on these visits were delivered and interpreted to the individual producers electronically or regular mail and in person, at site, or by phone;
- Pest management plans were developed and implemented based on these consultations;
- Diagnostic laboratory testing for plant disease;
- 25 local and area wide applied research and result demonstration projects initiated;
- Northwest Plains Pest Management News (15 issues, 496 individuals/issue, 3 websites);
- Weekly radio show on Fox Talk 950, Lubbock;
- Pest Patrol hotline, verbal pest updates recorded and delivered electronically to subscribers;
- Social media updates – Twitter, Blogger and Google+ (105 posts)
- Android app created to calculate dynamic economic thresholds based on producer input for sorghum headworm;
- Group meetings, 22 presentations at producer and professional meetings;
- Print media 13 articles in newspaper and trade journals published to distribute educational information area wide;
- 33 CEUs offered;
- 8 published abstracts, Extension publications, posters, fact sheets, and journal articles.

Results

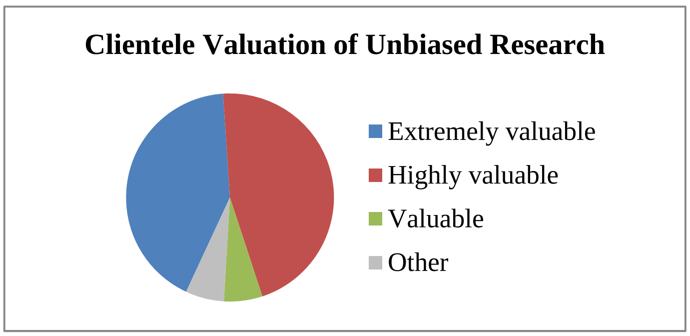
A retrospective post evaluation instrument was administered to clientele to determine the relevance and value of the Northwest Plains Integrated Pest Management Program. Seventy six clientele responded to the evaluation survey (completed by 52) who were either directly or indirectly involved in the Northwest Plains IPM Program; 34 producers, 5 consultants, 16 ag retailers, 19 ag industry representatives, and 2 individuals whose affiliation was not disclosed. Those producers and consultants (38) which answered acreage questions farm, manage, or consult **92,655** acres.

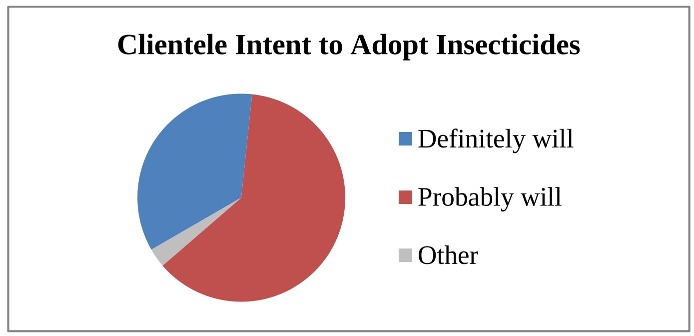
- **100%** (52 of 52) of respondents state that IPM reduces risks associated with crop production.
- **100%** (52 of 52) of respondents state that IPM maintains or increases yields while reducing input costs resulting in increased net profits.
- **67%** (35) of respondents strongly agree the Northwest Plains Integrated Pest Management Program improves their awareness of emerging pest management issues and potential solutions (33% (17) agree).
- **95%** (35) of respondents assigned a letter grade of "A" in their assessment of the total NWP IPM Program value and effectiveness (68% A+).

- The following graphic describes the level that best reflects how much the NWP IPM Program improves clientele knowledge of the following key insect pest management issues (31 respondents).

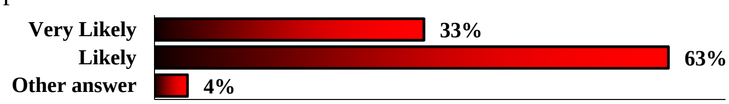


- Agriculture is rapidly changing. Unbiased research is a way to evaluate new technologies, production practices, and pest management tactics without undue risk. This research provides producers information to help them evaluate crop management options under local growing conditions.
    - Survey respondents consider AgriLife unbiased research to be **highly to extremely valuable**
    - Clientele will adopt new and/or continue use of standard insecticides based on AgriLife research



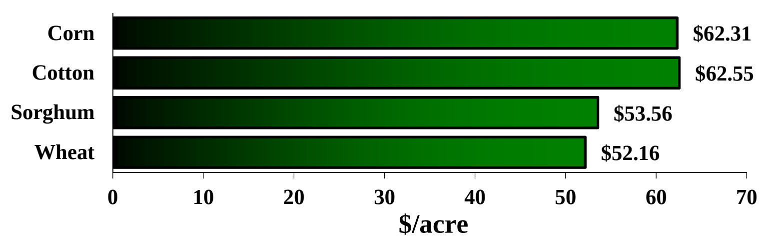


- Treatment thresholds are key to an economically and environmentally sound IPM program, the following graph illustrates clientele intent to adopt/utilize Extension economic thresholds?



- Natural enemies (beneficials) are the cornerstone to a sound IPM program, the following graph illustrates clientele intent to adopt Extension pest management suggestions which conserve beneficials?

- In an attempt to valuate the Total IPM Program across various crops, producers were asked to estimate the value/acre the IPM Program has had on their operation.



Summary

It is apparent that the Northwest Plains IPM Program is valuable program to Northwest Plains agriculture. Clientele not only gain knowledge they actually utilize it in their operation illustrated by high adoption rates of Extension pest management recommendations. The IPM value per acre assigned by producers and consultants and their reported acreage can be used to quantify the potential economic value of Northwest Plains Integrated Pest Management Program; calculated in this way, the economic value of the program exceeds **$5.3 million**. For any production system to be sustainable, it must be profitable, and it is clear that the Northwest Plains IPM Program enhances sustainable agriculture in the Northwest Plains of Texas.

2013 Educational Activities

Clientele reached: Data derived from the end of year summary of the Extension monthly reporting system.

Farm Visits	749
Newsletter Issues Prepared	18
Newsletters distributed	8,643
Direct Ag Contacts	33,065
Other Direct Contacts	1,397
News Releases	10
Radio/Television Interviews	34
Result Demonstrations Established	25
Presentations Made	26
Social Media Posts	105
Continuing Education Units (CEU) Offered	33

Activity Highlights

Applied Research Projects
Northwest Plains Scouting Program (2,100 ac)
Llano Estacado Cotton Conference
Field visits/scouting
Weekly Radio Program
Sorghum Field Day
NM Ag Expo
Producer meetings
Social media
Android sorghum headworm threshold calculator

Northwest Plains Pest Management Newsletter
Private Applicator Training and Testing
Beltwide Cotton Conference Posters
Lawn and Garden News
Newspaper interviews/releases
Guest Speaking Opportunities
Ag in the Classroom
Roosevelt County, NM CEU Meeting
Pest Patrol Hotline
Agriculture Business, Marketing and Risk Management Programming

2013 at a Glance

The following is a brief overview of the 2013 production season. Copies of the Northwest Plains Pest Management News published in 2013 have been included in the appendix of this report to further document environmental conditions, crop conditions, and pest pressure.

Environmental data from the National Oceanic and Atmospheric Administration (NOAA) weather stations located in the Northwest Plains of Texas indicate very eratic and cold temperatures March-early May followed by normal to slightly above normal temperature through October. (Figure 1). Area last and first frost dates were May 4 and October 11 compared to the 30 year average (1981-2010) of April 18 and Oct 21 respectively. Accumulated heat units (DD60s) from May 1 through October 22 were 110% of the area long term average (Figure 2). Rainfall ranged from approximately 11.7 to 15.8 inches versus the long term average of 18.9 inches (Figure 3). Snowfall ranged from 13.1-18 inches compared to the long term average of 8.8. inches.

Corn

The Northwest Plains corn crop was considered good overall and highly dependent on irrigation capacity. Corn silage yields were reported from 15 to 30+ tons per acre. The average corn yield according to the National Agricultural Statistics Service (NASS) averaged slightly over 180 bu/acre for the NWP area. Northwest Plains (NWP, Bailey and Parmer Counties) corn producers planted over 80,000 acres of corn in 2013.

2013 Pest Pressure:

Overall	moderate to heavy
Southwestern Corn Borer	moderate
Spider Mites	heavy to extreme
Fall armyworm	light to heavy

Cotton

Planting conditions were very cold in early May reaching 21 degrees F May 4 at the Muleshoe weather station. Warm temperatures allowed good cotton development into the fall but an early freeze Oct 11 halted development which significantly impacted micronare on immature bolls. Irrigated yields were good overall and the dryland crop was very short. Only 39,180 acres of cotton were harvested in the NWP due to extreme environmental conditions including early drought conditions and a large amount of hail, especially in Parmer county, during the growing season.

2013 Pest Pressure:

Overall	light
Thrips	moderate
Cotton Fleahopper	very light
Lygus	very light
Aphids	light
Bollworms	light

Grain Sorghum

The average estimated sorghum yield (grain) according to NASS was 82 bu/acre irrigated and 20bu/acre dryland in the Northwest Plains. Producers planted 124,700 acres of sorghum in 2013 up slightly from 103,223 planted in 2012. An early freeze Oct 11 halted development which impacted yield and test weight on later maturing fields.

2013 Pest Pressure

Overall	moderate
Greenbugs	light
Yellow sugarcane aphid	very light
Spider mites	light-moderate
Headworms	moderate-heavy
Fall armyworm	moderate

Wheat

Less than 50,000 acres of wheat were harvested in 2013 and yields were very low; near 20 bu/ac. Significant acreage was intended for forage and grazing purposes and extreme freezing conditions in March, April, and May severely damaged much of the area crop. Clorpyrophos resistant greenbugs were confirmed in a few isolated spots where control problems were observed via a method developed by Ed Bynum (E. D. Bynum, JR. and T. L. Archer, 2000. Identifying Insecticide-Resistant Greenbugs (Homoptera: Aphididae) with Diagnostic Assay Tests, J. Econ. Entomol. 93(4):1286Ð1292 (2000)).

2013 Pest Pressure

Overall	light to moderate
Greanbugs	moderate-heavy
Russian wheat aphid	light to moderate
Disease	light to moderate

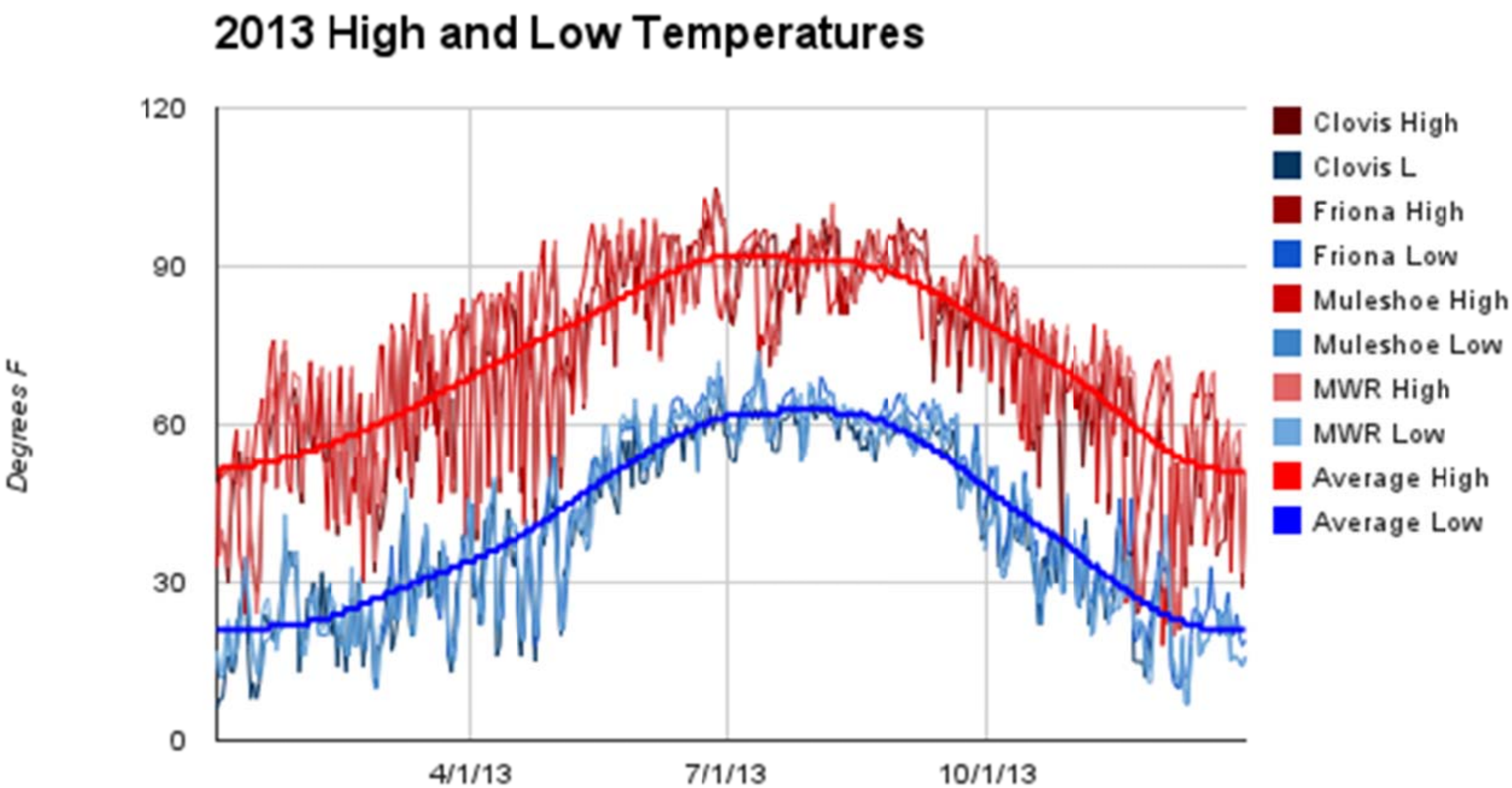


Figure 1. Daily high and low temperatures from 4 weather stations versus the 30 year long term average (1981-2010) in the Northwest Plains of Texas.

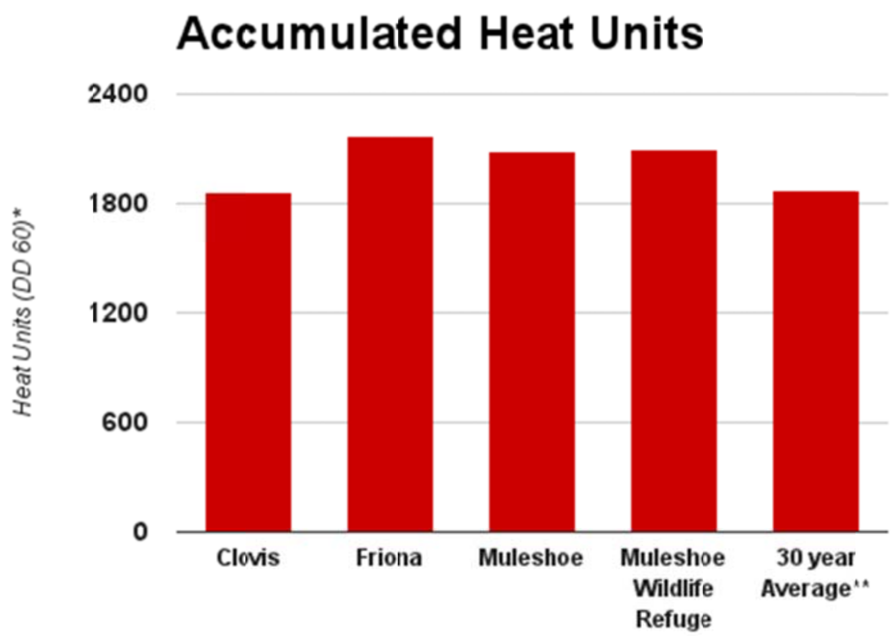


Figure 2. Accumulated heat unit data (DD60 May 1 – Oct 22, 2013) from 4 weather stations in the Northwest Plains versus the 30 year long term average (1981-2010).

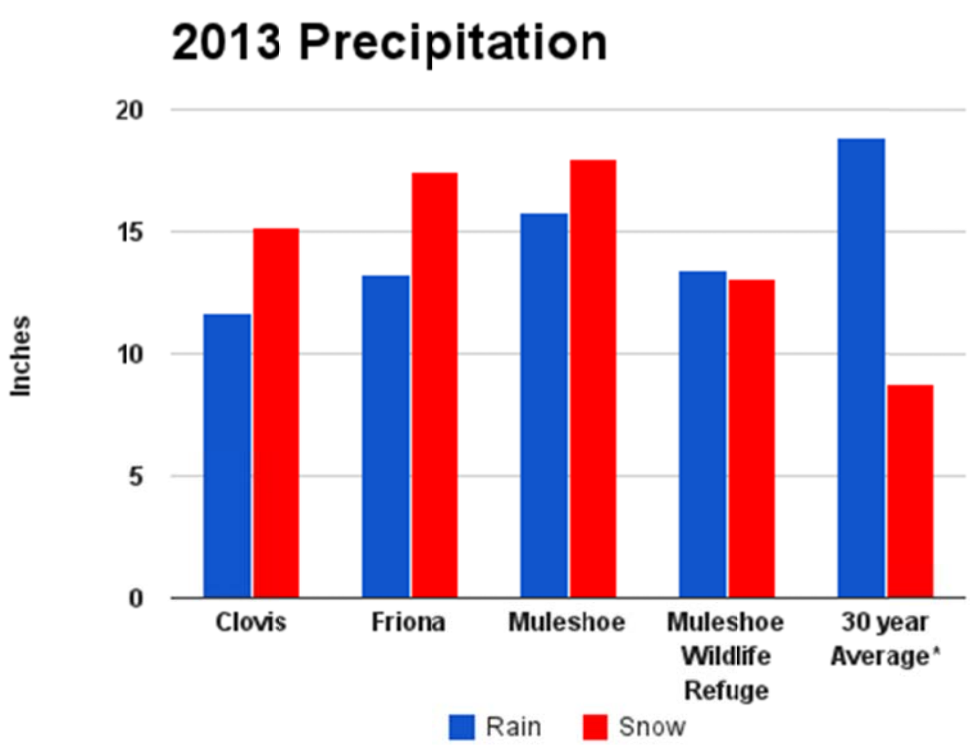


Figure 3. Precipitation data from 4 weather stations in the Northwest Plains (2013) versus the 30 year long term average (1981-2010).

TEXAS A&M AGRILIFE EXTENSION

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2013 Applied Research and Demonstration Projects

Unbiased applied research which evaluates new technologies and pest management options is an integral part of Texas AgriLife Extension programming; the following projects were initiated in 2013. Environmental conditions damaged and/or destroyed an unusually high number of trials in 2013 limiting available data.

- Evaluation of Preventive Insecticides for Control of Western Flower Thrips in Irrigated Cotton in the Northwest Plains of Texas, Chris Bass Farm
- Evaluation of Several Curative Spider Mite Management Options in Corn, Kelly Kettner Farm
- Evaluation of the SmartStax Transgenic Corn System for Fall Armyworm Suppression in Corn, Tim Black Farm
- Evaluation of Insecticide Oversprays for Control of Bollworms in Transgenic Bt Cotton, Jordan Pool Farm
- Evaluation of three cotton bollworm management options in cotton, Steve Bell Farm
- Evaluation of Potential Nematode Management Options in Corn, Tim Black Farm
- Evaluation of Adjuvants in Combination With Onager for Managing Spider Mites in Corn, Kelly Kettner Farm
- Evaluation of Remedial Spider Mite Management Options in Corn, Chris Bass Farm
- Replicated Cotton Variety Trial Comparing New GT and GL Varieties to a Producer Standard, Pool Farm
- Evaluation of Huskie herbicide efficacy in grain sorghum, Shane Mason Farm
- Evaluation of an experimental cotton bollworm management compound in cotton, Steve Bell Farm
- Managing Thrips Using Host Plant Resistance and Organically Approved insecticides in Cotton, Jimmy Wedel Farm
- Monitoring Corn Earworm / Cotton Bollworm for Resistance Development to Transginc (Bt) plants
- Evaluation of Several conventional and novel seed treatments in cotton, Kelly Kettner Farms
- Evaluation of Commercial Spider Mite Management Options in Corn, Kelly Kettner Farm
- Evaluating Ear Protection Afforded in Strip Refuges from Pollen Flow from Nearby Bt Corn, Daniel Schacher Farm
- Evaluation of Corn for yield loss associated with foliage feeding fall armyworm, Tim Black Farm
- Evaluation of potential crop injury after a Huskie herbicide application in grain sorghum, Shannon Weaver Farm

- Replicated Cotton Variety Trial in an Irrigated Production System, Pool Farms
- Systems Agronomic and Economic Evaluation of Cotton Varieties, Mark Williams Farm
- Evaluation of in furrow applications of fertilizer and inoculants in green beans, Pool Farms
- Replicated Grain Sorghum Hybrid Trial in an Irrigated Production System, Chris Bass Farm
- Evaluation of different seeding rates in cotton, Pool Farms
- Replicated Experimental Cotton Variety Trial, Mitchell Wiseman Farms
- Replicated Forage Sorghum Hybrid Trial in an Irrigated Production System, Matt Beckerink Farm

Texas A&M AgriLife Extension

Evaluation of Commercial Miticides When Applied At Economic Threshold In Corn

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Ludwig, Perkins, Sandoski

Discipline: I insecticide
Trial Status: F one-year/final   **Trial Reliability:** HIGH
Initiation Date: Jul-25-2013

Trial Location

City: Muleshoe
State/Prov.: Texas

Investigator: Monti Vandiver   **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C   **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas   **Mobile No.:** 575-799-1040
Postal Code: 79347   **E-mail:** mrvandiver@ag.tamu.edu

Sponsor: Craig Sandoski
Organization: Gowan

Cooperator/Landowner

Cooperator: Chris Bass   **Role:** FALDOW
City: Muleshoe
State/Prov: Texas

Crop Description

Crop 1: ZEAMX   Zea mays   Corn
Row Spacing, Unit: 30   IN
Soil Moisture: NORMAL normal, adequate

Pest Description

Pest 1 Type: I   **Code:** OLIGPR Oligonychus pratensis
Common Name: Banks grass mite

Site and Design

Treated Plot Width: 10 FT   **Site Type:** FIELD   field
Treated Plot Length: 30 FT
Treated Plot Area: 300 FT2   **Treatments:** 12   **Tillage Type:** CONTIL   conventional-till
Replications: 4   **Study Design:** RACOBL Randomized Complete Block (RCB)

Application Description

	A
Application Date:	Jul-25-2013
Appl. Start Time:	1
Appl. Stop Time:	3:00 AM
Application Method:	SPRAY
Application Timing:	THRESH
Application Placement:	FOLIAR
Applied By:	Monti
Air Temperature, Unit:	80 F
% Relative Humidity:	60
Wind Velocity, Unit:	3 MPH
Wind Direction:	SE
Dew Presence (Y/N):	N no
% Cloud Cover:	50
Next Moisture Occurred On:	Jul-27-2013
Time to Next Moisture, Unit:	2 DAY

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	ZEAMX BCOR
Stage Scale Used:	DESC
Stage Majority, Percent:	Silk 100
Crop coverage (%):	100

Texas A&M AgriLife Extension

Evaluation of Comercial Miticides When Applied At Economic Threshold In Corn

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Ludwig, Perkins, Sandoski

Pest Stage At Each Application

	A
Pest 1 Code, Type, Scale:	OLIGPR I

Application Equipment

	A
Appl. Equipment:	BOH
Equipment Type:	BACCAI
Operation Pressure, Unit:	55 PSI
Nozzle Type:	TwinJet
Nozzle Size:	11002
Nozzle Spacing, Unit:	30 IN
Nozzles/Row:	1
% Coverage:	100
Boom Length, Unit:	60 IN
Boom Height, Unit:	9 FT
Ground Speed, Unit:	3 MPH
Carrier:	WATER
Spray Volume, Unit:	15 gal/ac
Mix Size, Unit:	2.5 liters
Propellant:	COMCO2

Texas A&M AgriLife Extension

Evaluation of Comercial Miticides When Applied At Economic Threshold In Corn

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Ludwig, Perkins, Sandoski

Description										
Part Rated				Mites/leaf	Mites/leaf	Mites/leaf	Leaf Damage	Mites/leaf	Leaf Damage	Plant Damage R>
Part Rated				MOTILE P	MOTILE P	MOTILE P	LEBLE1 C	MOTILE P	LEAEAR C	PLANT C
Rating Date				Jul-25-2013	Aug-1-2013	Aug-8-2013	Aug-8-2013	Aug-16-2013	Aug-16-2013	Aug-22-2013
Rating Type				COUNT	COUNT	COUNT	DAMAGE	COUNT	DAMAGE	DAMAGE
Rating Unit				NUMBER	NUMBER	NUMBER	%AREA	NUMBER	%AREA	1-10
Trt-Eval Interval				0 DA-A	0 DA-A	7 DA-A	7 DA-A	14 DA-A	14 DA-A	22 DA-A
Footnote Number										1
Treatment Name	Rate	Rate Unit	Appl Code							
Untreated				16 a	65 ab	81 a	24 a	52 a	36 a	7.0 a
Oberon	4	oz/a	A	21 a	34 d	13 b	7 b	11 bc	11 b	5.2 c
COC	1	qt/a	A							
Oberon	6	oz/a	A	12 a	36 cd	16 b	6 b	9 bc	6 b	5.0 c
COC	1	qt/a	A							
Oberon	8	oz/a	A	14 a	44 bcd	30 b	10 b	8 bc	6 b	5.0 c
COC	1	qt/a	A							
Onager	10	oz/a	A	11 a	67 a	18 b	10 b	10 bc	11 b	5.5 bc
COC	1	qt/a	A							
Portal	32	oz/a	A	12 a	58 abc	24 b	11 ab	16 b	11 b	6.0 b
NIS	0.25	% v/v	A							
Zeal	2	oz/a	A	10 a	51 a-d	23 b	10 b	7 c	8 b	5.0 c
NIS	0.25	% v/v	A							
LSD (P=.05)				0.2t	21.7	3.1t	0.3t	0.3t	0.3t	0.04t
CV				13.98	28.83	40.23	21.0	19.03	18.47	3.24
Grand Mean				1.16t	50.77	5.19t	1.04t	1.13t	1.07t	0.81t
Replicate F				0.795	9.314	0.261	0.136	1.834	1.062	0.623
Replicate Prob(F)				0.5123	0.0006	0.8523	0.9371	0.1771	0.3899	0.6090
Treatment F				1.532	3.255	2.983	2.664	6.933	5.860	12.289
Treatment Prob(F)				0.2241	0.0240	0.0334	0.0498	0.0006	0.0016	0.0001

<u>Part Rated</u>
MOTILE = motile
LEBLE1 = first leaf below ear
LEAEAR = leaf - ear
PLANT = plant
P = Pest is Part Rated
C = Crop is Part Rated
<u>Rating Type</u>
COUNT = count
DAMAGE = damage
<u>Rating Unit</u>
NUMBER = number
%AREA = percent of area
1-10 = 1-10 index/scale

Footnote 1: 1. A few small mite colonies and associated damage (chlorotic spots) along the midrib of the lowest leaves
2. Mite Colonies and damage spread along the midribs on the lowest leaves on the plant.
3. Mite colonies and damage spreading out from the midrib on the lowest leaves and small colonied may occure on leaves up to the ear.
4. Mites and damge cover most of the leaf area on the 1-2 lowest leaves and mite coloonies and damage extend along the midrib to the ear leaf.
5. Mites have killed one leaf, bottom 2-3 green leaves heavily infested and damged, and mite colonies on 1-2 leaves above the ear.
6. Mites have killed or nearly killed the bottom two leaves and colonies and damage extend beyond the midribs on two leaves above the ear.
7. Mites have killed or nearly killed the bottom three leaves, all leaves up to the ear significately damaged, and mite colonies and damge found on most to all leaves on the plant.
8. Mites have killed or nearly killed all leaves up to the ear and mites and damage occur most to all leaves on the plant.
9. Most leaves on the plant killed my mite feeding and only on leaves in upper third of plant alive.
10. Very little green area left on the plant or dead plant.

Means followed by same letter do not significantly differ (P=.05, LSD)
t=Mean descriptions are reported in transformed data units, and are not de-transformed.
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Texas A&M AgriLife Extension

Evaluation of Commercial Miticides When Applied As a Rescue Treatment In Corn

Location: Muleshoe, Texas Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Ludwing, Majure, Perkins

Discipline: A acaricide
Trial Status: F one-year/final **Trial Reliability:** HIGH
Initiation Date: Jul-22-2013
Completion Date: Aug-20-2013

Trial Location

City: Muleshoe
State/Prov.: Texas

Objectives:
Compare Onager with COC and MSO adjuvants to other registered miticides in corn (ONA-13-11-T01)

Conclusions:

Investigator: Monti Vandiver **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas **Mobile No.:** 575-799-1040
Postal Code: 79347 **E-mail:** mrvandiver@ag.tamu.edu

Sponsor: Keith Majure
Organization: Gowan

Cooperator/Landowner

Cooperator: Kelly Kettner
City: Muleshoe
State/Prov: Texas

Crop Description

Crop 1: ZEAMX Zea mays Corn
Row Spacing, Unit: 30 IN
Soil Moisture: NORMAL normal, adequate

Pest Description

Pest 1 Type: O **Code:** OLIGPR Oligonychus pratensis
Common Name: Banks grass mite

Site and Design

Treated Plot Width: 10 FT **Site Type:** FIELD field
Treated Plot Length: 30 FT
Treated Plot Area: 300 FT2 **Tillage Type:** NOTILL no-till
Replications: 4 **Study Design:** RACOBL Randomized Complete Block (RCB)

Application Description

	A
Application Date:	Jul-23-2013
Appl. Start Time:	2
Appl. Stop Time:	4:00 AM
Application Method:	SPRAY
Application Timing:	THRESH
Application Placement:	FOLIAR
Applied By:	Monti
Air Temperature, Unit:	90 F
% Relative Humidity:	46
Wind Velocity, Unit:	5 MPH
Wind Direction:	S
Dew Presence (Y/N):	N no
% Cloud Cover:	10

Texas A&M AgriLife Extension

Evaluation of Comercial Miticides When Applied As a Rescue Treatment In Corn

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Ludwing, Majure, Perkins

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	ZEAMX BCOR
Stage Scale Used:	DESC
Stage Majority, Percent:	grn silk 100

Pest Stage At Each Application

	A
Pest 1 Code, Type, Scale:	OLIGPR O

Application Equipment

	A
Appl. Equipment:	BOH
Equipment Type:	BACCAI
Operation Pressure, Unit:	55 PSI
Nozzle Type:	TwinJet
Nozzle Size:	11002
Nozzle Spacing, Unit:	30 IN
Nozzles/Row:	1
% Coverage:	100
Boom Length, Unit:	60 IN
Boom Height, Unit:	9 FT
Ground Speed, Unit:	3 MPH
Carrier:	WATER
Spray Volume, Unit:	15 gal/ac
Mix Size, Unit:	2.5 liters
Propellant:	COMCO2

Texas A&M AgriLife Extension

Evaluation of Comercial Miticides When Applied As a Rescue Treatment In Corn

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Ludwing, Majure, Perkins

Description				Mites/leaf	Mites/leaf	Mites/leaf	Ear Leaf Damage	Mites/leaf	Ear Leaf Damage	Plot Damage Ra>
Part Rated				MOTILE P	MOTILE P	MOTILE P	LEAEAR C	MOTILE P	LEAEAR C	PLANT C
Rating Type				COUINS	COUINS	COUINS	DAMAGE	COUINS	DAMAGE	DAMAGE
Rating Unit				NUMBER	NUMBER	NUMBER	%AREA	NUMBER	%AREA	1-10
Days After First/Last Applic.				-1 -1	7 7	14 14	15 15	21 21	21 21	28 28
Footnote Number										1
Treatment Name	Rate	Rate Unit	Appl Code							
Untreated				24.3 a	109.6 a	44.2 a	48 a	80.8 a	54.5 a	8.3 a
Oberon	5	oz/a	A	26.3 a	38.8 b	33.6 ab	19 b	18.5 bc	21.0 bc	5.3 c
COC	1	qt/a	A							
Onager	10	oz/a	A	29.1 a	46.9 b	15.5 abc	24 b	20.0 bc	18.1 bc	5.5 bc
COC	1	% v/v	A							
Onager	12	oz/a	A	26.1 a	44.6 b	11.1 bc	24 b	10.5 c	14.6 c	5.3 c
COC	1	% v/v	A							
Portal	32	oz/a	A	31.8 a	71.8 ab	46.4 a	26 b	45.6 ab	30.0 b	6.5 b
NIS	0.25	% v/v	A							
Zeal	2	oz/a	A	41.1 a	54.6 b	10.8 c	24 b	10.5 c	13.1 c	5.8 bc
COC	1	% v/v	A							
LSD (P=.05)				1.47t	0.27t	0.47t	1.0t	0.41t	1.39t	1.02
CV				17.81	10.15	22.48	12.71	19.74	18.77	11.1
Grand Mean				5.48t	1.76t	1.37t	5.22t	1.39t	4.91t	6.08
Replicate F				3.431	0.567	3.849	3.149	3.518	3.470	1.585
Replicate Prob(F)				0.0444	0.6454	0.0317	0.0562	0.0413	0.0430	0.2345
Treatment F				1.197	3.321	3.341	7.395	6.205	9.070	11.780
Treatment Prob(F)				0.3569	0.0323	0.0316	0.0011	0.0026	0.0004	0.0001

Part Rated
MOTILE = motile
LEAEAR = leaf - ear
PLANT = plant
P = Pest is Part Rated
C = Crop is Part Rated

Rating Type
COUINS = count - insect
DAMAGE = damage

Rating Unit
NUMBER = number
%AREA = percent of area
1-10 = 1-10 index/scale

Footnote 1: 1. A few small mite colonies and associated damage (chlorotic spots) along the midrib of the lowest leaves
2. Mite Colonies and damage spread along the midribs on the lowest leaves on the plant.
3. Mite colonies and damage spreading out from the midrib on the lowest leaves and small colonied may occure on leaves up to the ear.
4. Mites and damge cover most of the leaf area on the 1-2 lowest leaves and mite coloonies and damage extend along the midrib to the ear leaf.
5. Mites have killed one leaf, bottom 2-3 green leaves heavily infested and damged, and mite colonies on 1-2 leaves above the ear.
6. Mites have killed or nearly killed the bottom two leaves and colonies and damage extend beyond the midribs on two leaves above the ear.
7. Mites have killed or nearly killed the bottom three leaves, all leaves up to the ear significately damaged, and mite colonies and damge found on most to all leaves on the plant.
8. Mites have killed or nearly killed all leaves up to the ear and mites and damage occur most to all leaves on the plant.
9. Most leaves on the plant killed my mite feeding and only on leaves in upper third of plant alive.
10. Very little green area left on the plant or dead plant.

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Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Texas A&M AgriLife Extension

Evaluation of Adjuvants Added to Miticides Applied to Corn

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Folsom, Majure

Discipline: A acaricide
Trial Status: F one-year/final   **Trial Reliability:** HIGH
Initiation Date: Jul-22-2013
Completion Date: Aug-20-2013

Trial Location

City: Muleshoe
State/Prov.: Texas

Objectives:
Compare Onager with COC and MSO adjuvants to other registered miticides in corn (ONA-13-11-T01)

Conclusions:

Investigator: Monti Vandiver   **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C   **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas   **Mobile No.:** 575-799-1040
Postal Code: 79347   **E-mail:** mrvandiver@ag.tamu.edu

Sponsor: Keith Majure
Organization: Gowan

Cooperator/Landowner

Cooperator: Kelly Kettner
City: Muleshoe
State/Prov: Texas

Crop Description

Crop 1: ZEAMX   Zea mays   Corn
Row Spacing, Unit: 30   IN
Soil Moisture: NORMAL normal, adequate

Pest Description

Pest 1 Type: O   **Code:** OLIGPR Oligonychus pratensis
Common Name: Banks grass mite

Site and Design

Treated Plot Width: 10 FT   **Site Type:** FIELD   field
Treated Plot Length: 30 FT
Treated Plot Area: 300   FT2   **Tillage Type:** NOTILL   no-till
Replications: 4   **Study Design:** RACOBL Randomized Complete Block (RCB)

Application Description

	A
Application Date:	Jul-23-2013
Appl. Start Time:	2
Appl. Stop Time:	4:00 AM
Application Method:	SPRAY
Application Timing:	THRESH
Application Placement:	FOLIAR
Applied By:	Monti
Air Temperature, Unit:	90 F
% Relative Humidity:	46
Wind Velocity, Unit:	5 MPH
Wind Direction:	S
Dew Presence (Y/N):	N no
% Cloud Cover:	10

Texas A&M AgriLife Extension

Evaluation of Adjuvants Added to Miticides Applied to Corn

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Folsom, Majure

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	ZEAMX BCOR
Stage Scale Used:	DESC
Stage Majority, Percent:	grn silk 100

Pest Stage At Each Application

	A
Pest 1 Code, Type, Scale:	OLIGPR O

Application Equipment

	A
Appl. Equipment:	BOH
Equipment Type:	BACCAI
Operation Pressure, Unit:	55 PSI
Nozzle Type:	TwinJet
Nozzle Size:	11002
Nozzle Spacing, Unit:	30 IN
Nozzles/Row:	1
% Coverage:	100
Boom Length, Unit:	60 IN
Boom Height, Unit:	9 FT
Ground Speed, Unit:	3 MPH
Carrier:	WATER
Spray Volume, Unit:	15 gal/ac
Mix Size, Unit:	2.5 liters
Propellant:	COMCO2

Texas A&M AgriLife Extension

Evaluation of Adjuvants Added to Miticides Applied to Corn

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Folsom, Majure

Description Part Rated Rating Type Rating Unit Sample Size, Unit Days After First/Last Applic. Footnote Number	Mites/leaf MOTILE P COUINS NUMBER 1 LEAF -1 -1	Mites/leaf MOTILE P COUINS NUMBER 1 LEAF 7 7	Mites/leaf MOTILE P COUINS NUMBER 1 LEAF 14 14	Ear Leaf Damage LEAEAR C DAMAGE %AREA 1 LEAF 15 15	Mites/leaf MOTILE P COUINS NUMBER 1 LEAF 21 21	Ear Leaf Damage LEAEAR C DAMAGE %AREA 1 LEAF 21 21	Plot Damage Ra> PLANT C DAMAGE 1-10 1 PLOT 28 28 1
Treatment Name / Rate / Rate Unit / Appl Code							
Untreated	24.3 a	109.6 a	44.2 a	48 a	80.8 a	54.5 a	8.3 a
Onager 10 oz/a A COC 1 % v/v A	29.1 a	46.9 a	15.5 a	24 b	20.0 b	18.1 b	5.5 b
Onager 10 oz/a A MSO 1 qt/a A	26.2 a	62.7 a	15.8 a	20 b	14.8 b	19.6 b	5.5 b
Onager 10 oz/a A Masterlock 6.4 oz/a A	35.3 a	50.5 a	22.4 a	23 b	13.6 b	19.7 b	6.3 b
LSD (P=.05)	1.39t	0.28t	0.54t	1.1t	0.42t	1.92t	0.96
CV	16.09	9.56	24.7	13.45	18.97	23.13	9.43
Grand Mean	5.39t	1.81t	1.37t	5.31t	1.4t	5.18t	6.38
Replicate F	5.996	0.699	4.218	2.045	2.807	0.915	2.077
Replicate Prob(F)	0.0157	0.5759	0.0404	0.1781	0.1004	0.4717	0.1736
Treatment F	1.016	3.620	1.466	9.936	6.896	6.235	18.692
Treatment Prob(F)	0.4299	0.0582	0.2880	0.0032	0.0104	0.0141	0.0003

Part Rated
MOTILE = motile
LEAEAR = leaf - ear
PLANT = plant
P = Pest is Part Rated
C = Crop is Part Rated

Rating Type
COUINS = count - insect
DAMAGE = damage

Rating Unit
NUMBER = number
%AREA = percent of area
1-10 = 1-10 index/scale

LEAF = leaf
PLOT = total plot

Footnote 1: 1. A few small mite colonies and associated damage (chlorotic spots) along the midrib of the lowest leaves
2. Mite Colonies and damage spread along the midribs on the lowest leaves on the plant.
3. Mite colonies and damage spreading out from the midrib on the lowest leaves and small colonied may occure on leaves up to the ear.
4. Mites and damge cover most of the leaf area on the 1-2 lowest leaves and mite coloonies and damage extend along the midrib to the ear leaf.
5. Mites have killed one leaf, bottom 2-3 green leaves heavily infested and damged, and mite colonies on 1-2 leaves above the ear.
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Texas A&M AgriLife Extension

Whorl Stage FAW Damage to Non-Bt Corn

Location: Muleshoe, Texas Trial Year:
Investigator: Monti Vandiver

General Trial Information

Investigator: Monti Vandiver **Title:** EA-IPM

Discipline: I insecticide
Trial Status: F one-year/final **Trial Reliability:** GOOD
Initiation Date: May-8-2013
Completion Date: Oct-25-2013

Trial Location

City: Muleshoe
State/Prov.: Texas

Investigator: Monti Vandiver **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas **Mobile No.:** 575-799-1040
Postal Code: 79347 **E-mail:** mrvandiver@ag.tamu.edu

Cooperator/Landowner

Cooperator: Tim Black **Role:** FALDOW
City: Muleshoe
State/Prov: Texas

Other Contacts

Name	Role	Other
Ed Bynum	UNVCOP	Extension Entomologi

Crop Description

Crop 1: ZEAMX Zea mays Corn
Variety: X27768RR
Planting Date: May-8-2013
Planting Rate, Unit: 28000 S/A
Row Spacing, Unit: 30 IN
Harvest Date: Sep-20-2013
Soil Moisture: NORMAL normal, adequate **Harvest Equipment:** Hand

Pest Description

Pest 1 Type: I **Code:** LAPHFR Spodoptera frugiperda
Common Name: Fall armyworm
Artificial Population: X **Establishment Date:** Jun-13-2013
Establishment Method/Description: 1st instar larvae dropped into whorl

Site and Design

Treated Plot Width: 2.5 FT **Site Type:** FIELD field
Treated Plot Length: 10 FT
Treated Plot Area: 25 FT2 **Treatments:** 4 **Tillage Type:** STRTIL strip-till
Replications: 3 **Study Design:** RACOBL Randomized Complete Block (RCB)

Trial Initiation Comments:
1st instar FAW larvae larvae were mixed with corn cob grit and dropped into whorls with bazookas (aproximately 10/drop).

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	ZEAMX BCOR

Pest Stage At Each Application

	A
Pest 1 Code, Type, Scale:	LAPHFR I

Texas A&M AgriLife Extension

Whorl Stage FAW Damage to Non-Bt Corn

Location: Muleshoe, Texas   Trial Year:
Investigator: Monti Vandiver

Part Rated	PLANT C	YIELD C
Rating Date	Jun-27-2013	Oct-25-2013
Rating Type	DAMAGE	WEIGHT
Rating Unit	0-9	lb/ac
Footnote Number	1	
Treatment Name		
Uninfested	0.01 b	13953.3 a
1 drop	7.17 a	14941.7 a
2 drops	6.79 a	14763.7 a
3 drops	7.21 a	13447.3 a
LSD (P=.05)	2.669t	6898.35
CV	11.41	24.18
Grand Mean	11.7t	14276.5
Replicate F	0.686	0.860
Replicate Prob(F)	0.5390	0.4695
Treatment F	92.113	0.123
Treatment Prob(F)	0.0001	0.9429

Part Rated
PLANT = plant
YIELD = yield
C = Crop is Part Rated
Rating Type
DAMAGE = damage
WEIGHT = weight
Rating Unit
0-9 = 0-9 index/scale
lb/ac = pounds per acre

Footnote 1: FAW 0-9 scale:
0. No visible leaf feeding
1. Only pinholes or fine shot-hole injury on whorl leaves
2. Pinholes and small circular lesions present on whorl leaves
3. Small circular lesions and a few small elongated (rectangular) lesions up to 1/2 inch in length present on whorl and furl leaves
4. Several small to mid-sized (1/2 to 1 inch) elongated lesions present on a few whorl and furl leaves
5. Several large elongated lesions greater than 1 inch in length on a few whorl and furl leaves AND/OR a few small to mid-sized uniform to irregular shaped holes (basement membrane consumed, no window-paining) eaten from the whorl AND/OR furl leaves
6. Several large elongated lesions present on several whorl and furl leaves AND/OR several large uniform to irregular shaped holes eaten from the whorl and furl leaves
7. Many elongated lesions of all sizes present on most whorl and furl leaves plus several mid to large-sized uniform to irregular shaped holes eaten from the whorl and furl leaves
8. Many elongated lesions of all sizes present on most whorl and furl leaves plus MANY mid to large-sized uniform to irregular shaped holes eaten from the whorl and furl leaves
9. Whorl and furl leaves almost totally destroyed

Means followed by same letter do not significantly differ (P=.05, LSD)
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Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Texas A&M AgriLife Extension

SmartStax Efficacy for Foliage Feeding Fall Armyworm in Corn

Trial ID: SSX2013 Location: Muleshoe, Texas Trial Year: 2013
Protocol ID: NA13S2J001 Investigator: Monti Vandiver
Crop: Corn Study Director:
Project ID: Sponsor Contact: Mike Lovelace

General Trial Information

Study Director: Mike Lovelace **Title:** Field Research Scientist
Investigator: Monti Vandiver **Title:** EA-IPM

Discipline: I insecticide
Trial Status: E established
Initiation Date: May-8-2013
Completion Date: Oct-18-2013

Trial Location

City: Muleshoe **Country:** USA United States
State/Prov.: Texas

Contacts

Study Director: Mike Lovelace **Title:** Field Research Scientist
Organization: Dow AgroSciences
E-mail: lovelace@dow.com

Investigator: Monti Vandiver **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas **Mobile No.:** 575-799-1040
Postal Code: 79347 **E-mail:** mrvandiver@ag.tamu.edu
Country: USA United States

Cooperator/Landowner

Cooperator: Tim Black **Role:** FALDOW
City: Muleshoe
State/Prov: Texas

Crop Description

Crop 1: ZEAMX Zea mays Corn
Variety: X27768/X20751
Planting Date: May-8-2013
Planting Rate, Unit: 1.75 S/FT **Planting Method:** PLANTD planted
Planting Equipment: CP Cone Planter
Row Spacing, Unit: 30 IN **Emergence Date:** May-17-2013

Site and Design

Treated Plot Width: 10 FT **Site Type:** FIELD field
Treated Plot Length: 40 FT
Treated Plot Area: 400 FT2 **Treatments:** 2 **Tillage Type:** STRTIL strip-till
Replications: 4 **Study Design:** RACOBL Randomized Complete Block (RCB)

Trial Initiation Comments:
70 seed counted and weighed for each hybrid, subsequent seed packets packaged based on weight.
10 consecutive plants in each of the two center rows were artificially infested with10-15 1st instar FAW larvae June 13. Larvae were mixed with corn cob grit and dropped into whorls with bazookas.

No.	Previous Crop	Year
1.	Corn	2012

Soil Description

Description Name: ArA
Texture: FSL fine sandy loam
Soil Name: Arvana fine sandy loam

Texas A&M AgriLife Extension

SmartStax Efficacy for Foliage Feeding Fall Armyworm in Corn

Trial ID: SSX2013 Location: Muleshoe, Texas Trial Year: 2013
Protocol ID: NA13S2J001 Investigator: Monti Vandiver
Crop: Corn Study Director:
Project ID: Sponsor Contact: Mike Lovelace

Description	Plants/plot row	Damage Rating
Rating Date	Jun-5-2013	Jun-27-2013
Rating Unit	plant	0-9
Days After Emergence	19 DE-1	41 DE-1
Footnote Number		1
Entry Name		
X27768 RR	57.3 a	7.3 a
X20751 SSX, LL, RR	50.0 b	0.0 b
LSD (P=.05)	5.26	1.11
CV	4.36	13.49
Grand Mean	53.63	3.65
Replicate F	2.954	1.000
Replicate Prob(F)	0.1987	0.5000
Treatment F	19.260	439.505
Treatment Prob(F)	0.0219	0.0002

Rating Unit
0-9 = 0-9 index/scale

Footnote 1: 14 days after infestation, FAW and BAW 0-9 scale:
0. No visible leaf feeding
1. Only pinholes or fine shot-hole injury on whorl leaves
2. Pinholes and small circular lesions present on whorl leaves
3. Small circular lesions and a few small elongated (rectangular) lesions up to 1/2 inch in length present on whorl and furl leaves
4. Several small to mid-sized (1/2 to 1 inch) elongated lesions present on a few whorl and furl leaves
5. Several large elongated lesions greater than 1 inch in length on a few whorl and furl leaves AND/OR a few small to mid-sized uniform to irregular shaped holes (basement membrane consumed, no window-paining) eaten from the whorl AND/OR furl leaves
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9. Whorl and furl leaves almost totally destroyed

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Ability of SmartStax RIB and Double Pro to protect adjacent strip refuges from corn earworm and fall armyworm, and a look at pollen movement from Bt blocks to adjacent strip refuges

Pat Porter, Ed Bynum and Monti Vandiver, 2013

Cooperator: Daniel Schacher

Summary

The purpose of this research was to determine whether pollen from adjacent Bt corn can protect corn ears in adjacent non-Bt rows. If so, then strip refuges become an option that allows growers to comply with refuge requirements while experiencing less loss from insects than would happen in a large block refuge. 12-row blocks of SmartStax 5% Refuge in a bag and Double Pro Bt corn were able to protect adjacent strip refuge rows from corn earworm (CEW) and fall armyworm (FAW) larvae to different degrees. Double Pro offered adjacent refuge rows no protection from either corn earworm or fall armyworm. SmartStax offered adjacent refuge rows significant protection from fall armyworm but not corn earworm.

1. Corn earworm: Neither type of Bt corn offered significant protection from corn earworm larvae in adjacent refuge rows 1, 4 or 12 (CEW Analysis 6). There was not a significant difference in the number of larvae recovered in refuge rows 1, 4, and 12 (CEW Analysis 5). Taken together, this suggests that neither type of Bt corn is able to protect adjacent strip refuge rows from CEW. However, within the solid blocks of Bt corn, both types of corn had fewer corn earworm larvae in ears than in the refuge rows, and this indicates that both technologies provide significant insect control in block plantings. The SmartStax Bt block had fewer total larvae than the Double Pro Bt block at the 0.07 level of probability (CEW Analysis 2), which is expected since SmartStax contains the toxins in Double Pro and additionally has the Cry1F toxin and should therefore be more effective than Double Pro. Larvae recovered from within the solid plantings were significantly smaller than those recovered from refuge rows (CEW Analyses 3 and 4).

2. Fall armyworm: Refuge rows adjacent to SmartStax had significantly fewer FAW larvae than those more distant from the block planting and those adjacent to Double Pro (FAW Analysis 1), which indicates that there is potential for strip refuges adjacent to SmartStax to receive significant protection. At dough stage the solid SmartStax block planting and refuge row 1 (closest to the SmartStax block) had the lowest numbers of FAW larvae, and the numbers of larvae in refuge rows increased with distance from the solid planted block (FAW Analysis 2A). This trend increased in intensity by early dent stage such that there was a near linear increase in FAW numbers in refuge rows 1, 2, 4 and 12 with distance from the solid Bt block (FAW Analysis 2B). These data suggest that refuge rows 1, 2, and perhaps 4 can be protected by an

adjacent SmartStax block and that 4 – 8 row strip refuges might be adequately protected in production fields when surrounded on both sides by SmartStax corn.

Unlike SmartStax, pollen from Double Pro corn offered refuge rows no significant protection from FAW (FAW Analysis 3).

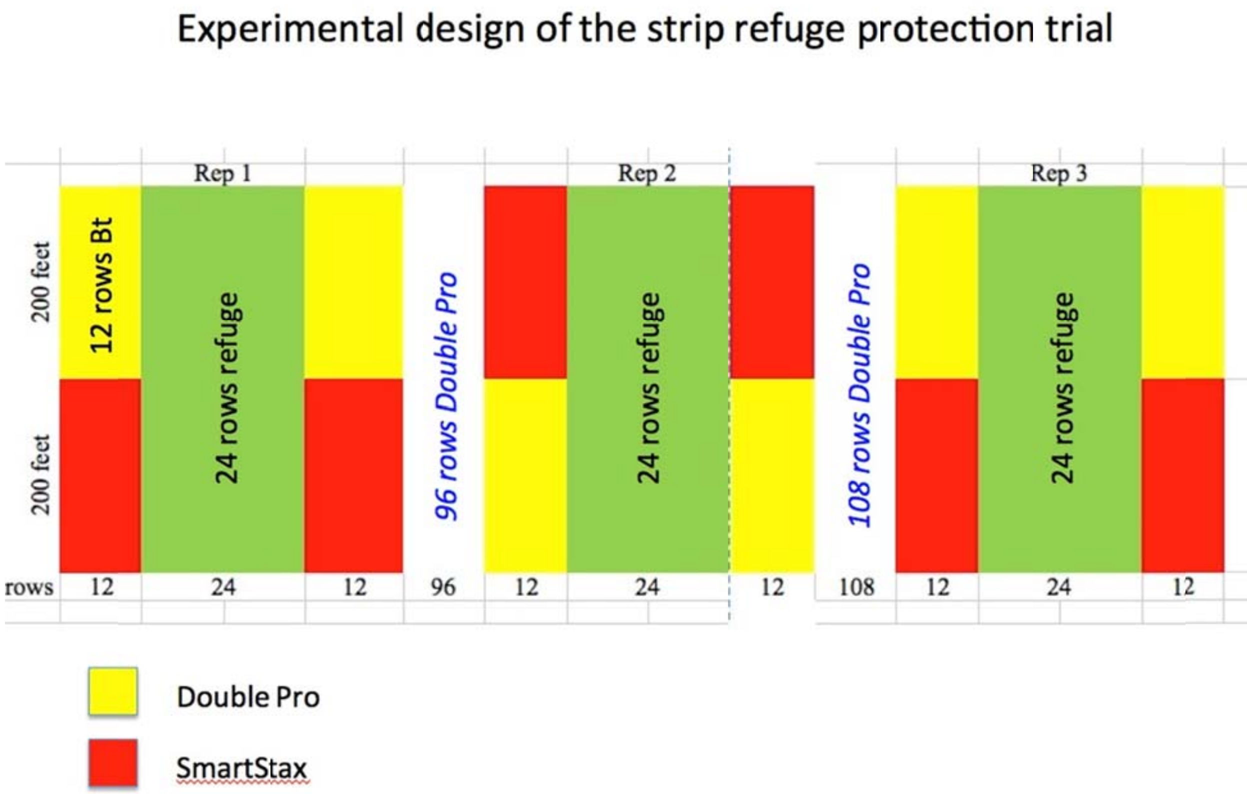
Bt pollen expression in adjacent refuge row non-Bt ears: The data clearly showed that ears in refuge rows closest to the SmartStax block had higher SmartStax toxin expression than ears from more distant refuge rows (Pollen Table 1). While not directly measured kernel by kernel, one can assume (and gene-check quick strip coloration suggests) that ears from refuge rows nearer the SmartStax block had a higher percentage of kernels expressing all of the toxins in SmartStax than ears farther from the refuge block. There was some segregation of SmartStax toxins such that not all of them were present in the top 1/3 of some of the refuge ears tested (Pollen Table 2). Similar trends for decreasing toxin expression with distance from the solid Bt planting and increasing segregation with distance were found for Double Pro (Pollen Table 3).

Toxin assays of individual kernels from SmartStax refuge row 2 revealed that 31.6% of them were positive for at least one toxin active against caterpillars (Pollen Table 4A). Of the 120 individual kernels tested, 5.8% were positive for Cry1F only, 10.8% were positive for Cry2Ab2, and 9.2% were positive for both toxins. Toxins were not detected in the remaining 74.2% of kernels in refuge row 2 (Pollen Table 5).

The presence of toxic kernels in adjacent refuge row non-Bt ears can partially explain the reduced number of FAW larvae in refuge rows closest to the solid Bt block plantings. It is also probable that the presence of the toxic pollen itself helped to kill some of the small caterpillars on refuge row ears. In summary, the results presented here indicate that 4-8 row strip refuges in SmartStax corn will very likely receive protection from fall armyworm larvae.

Methods

Plot arrangement: In 2013 near Muleshoe, Texas, 200-foot long strips of 12 rows of SmartStax RIB or Double Pro corn were planted in a center pivot irrigated field on 30-inch rows oriented north to south. The prevailing winds are usually from the west or southwest. Green refuge seed was observed in the bag of SSTX RIB.



The Bt block plantings were 12 rows wide x 200 feet long. There were 24 rows of non-Bt corn planted between twin blocks of Bt corn. The SmartStax corn was DKC 61-16 RIB (5%). The Double Pro was DKC 63-55 DGVT2P. The refuge corn was DKC 62-95 RR2.

Experimental plots were at the edge of a commercial corn field planted on 30-inch rows and irrigated by center pivot. Insecticides were not applied to this field.

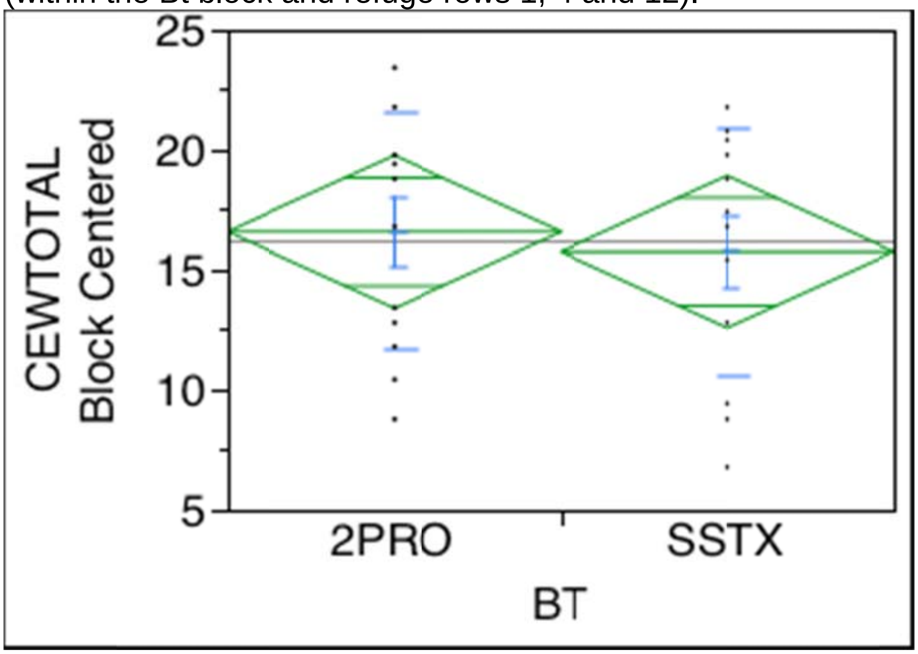
Insects were sampled at dough stage (19 – 20 August) and at early dent stage (6 September).

PART I. Corn Earworm

Ten consecutive ears per refuge row (or in row 6 of the 12-row pure Bt block) were harvested on 19 August at dough stage, removed to the laboratory and dissected. Larvae were scored as small (<¼ inch), medium (1/4 to ¾ inch) or large (> 3/4 inch). There were three replications.

CEW Analysis 1. Mean total number of CEW larvae recovered per 10 consecutive ears in all sampled rows by type of Bt corn. Data include recovery from the Bt block planting and refuge rows 1, 4 and 12. Finding: there were no significant differences in the number of larvae recovered from SmartStax or Double Pro.

Mean total CEW recovered per 10 ears by Bt type at dough stage, all rows included (within the Bt block and refuge rows 1, 4 and 12).



Analysis of Variance

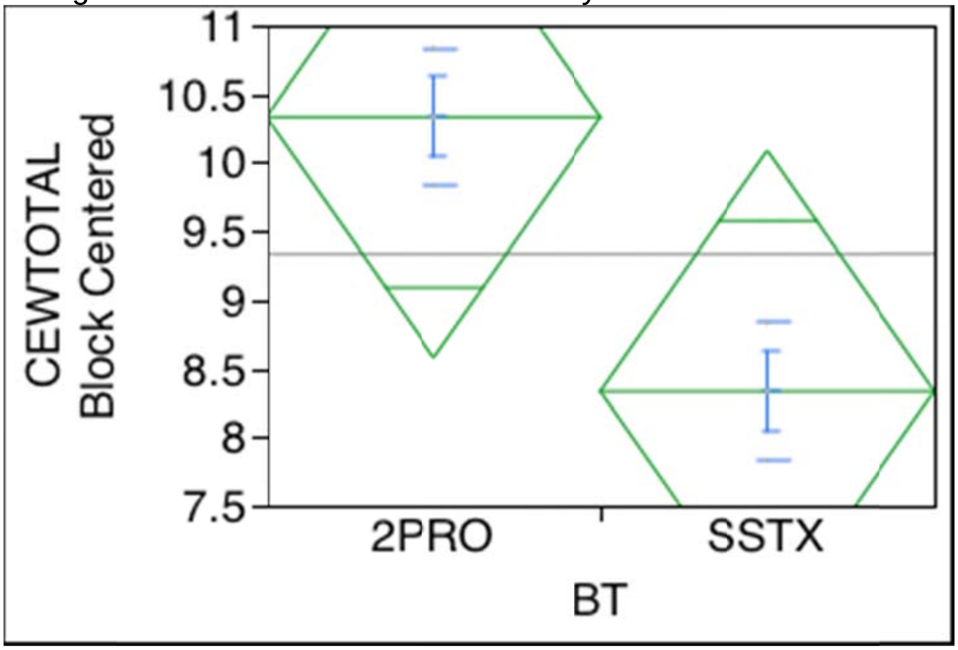
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
BT	1	4.16667	4.1667	0.1485	0.7040
REP	2	170.08333	85.0417	3.0313	0.0708
Error	20	561.08333	28.0542		
C. Total	23	735.33333			

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
2PRO	12	16.5833	4.95701	1.4310	13.434	19.733
SSTX	12	15.7500	5.14156	1.4842	12.483	19.017

CEW Analysis 2. Mean total number of CEW larvae recovered per 10 consecutive ears from row 6 in the Bt block planting (only). Refuge rows are not included in this analysis. Finding: At the 0.074 level of probability, SmarStax had fewer CEW larvae in the Bt block than were recovered from Double Pro.

Mean total number of CEW larvae recovered per ten ears in the Bt block planting (only). Refuge rows are not included in this analysis.



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
BT	1	6.000000	6.0000	12.0000	0.0742
REP	2	52.333333	26.1667	52.3333	0.0187*
Error	2	1.000000	0.5000		
C. Total	5	59.333333			

Replication Means

REP	Mean	Number
1	13.5000	2
2	7.5000	2
3	7.0000	2

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
2PRO	3	10.3333	0.500000	0.28868	9.0913	11.575
SSTX	3	8.3333	0.500000	0.28868	7.0913	9.575

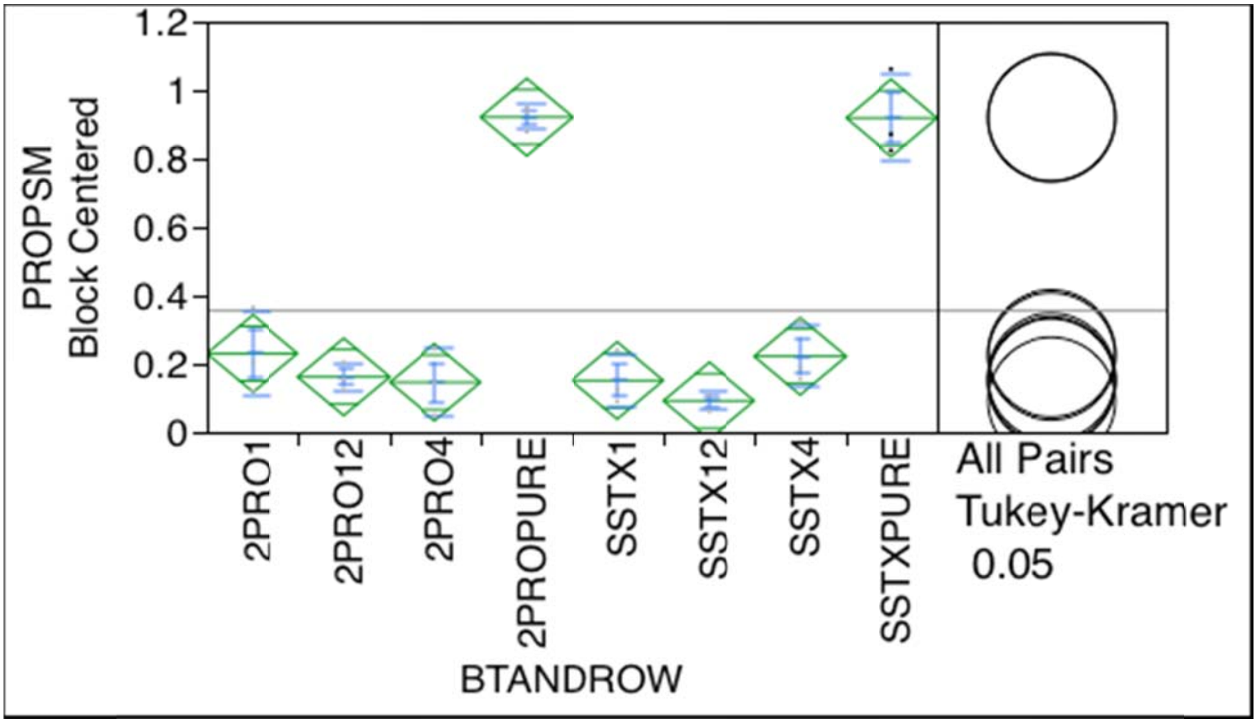
Mean separation by t-Test
SmarStax vs. Double Pro Assuming unequal variances

Difference	-2.0000	t Ratio	-4.89898
Std Err Dif	0.4082	DF	4
Upper CL Dif	-0.8665	Prob > |t|	0.0080*
Lower CL Dif	-3.1335	Prob > t	0.9960
Confidence	0.95	Prob < t	0.0040*

Continues on next page.

CEW Analysis 3. Proportion of small CEW larvae recovered by Bt type and refuge row. The data include sampling in the pure Bt block. Finding: A significantly higher proportion of larvae recovered from the pure Bt blocks were small. This indicates slower development in the pure Bt blocks than in any of the refuge rows for either Bt type.

Mean PROPORTION of CEW larvae that were small (< ¼ inch) by Bt type and refuge row. This analysis includes rows in the solid Bt block and refuge rows 1, 4 and 12. "2PROPURE" is Double Pro pure Bt block and SSTXPURE is the pure stand of SmartStax 5% refuge in a bag. Refuge row location is indicated as the last two digits in the row name.



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
BTANDROW	7	2.5897371	0.369962	44.3118	<.0001*
REP	2	0.0521030	0.026052	3.1203	0.0757
Error	14	0.1168871	0.008349		
C. Total	23	2.7587273			

Means and Std Deviations

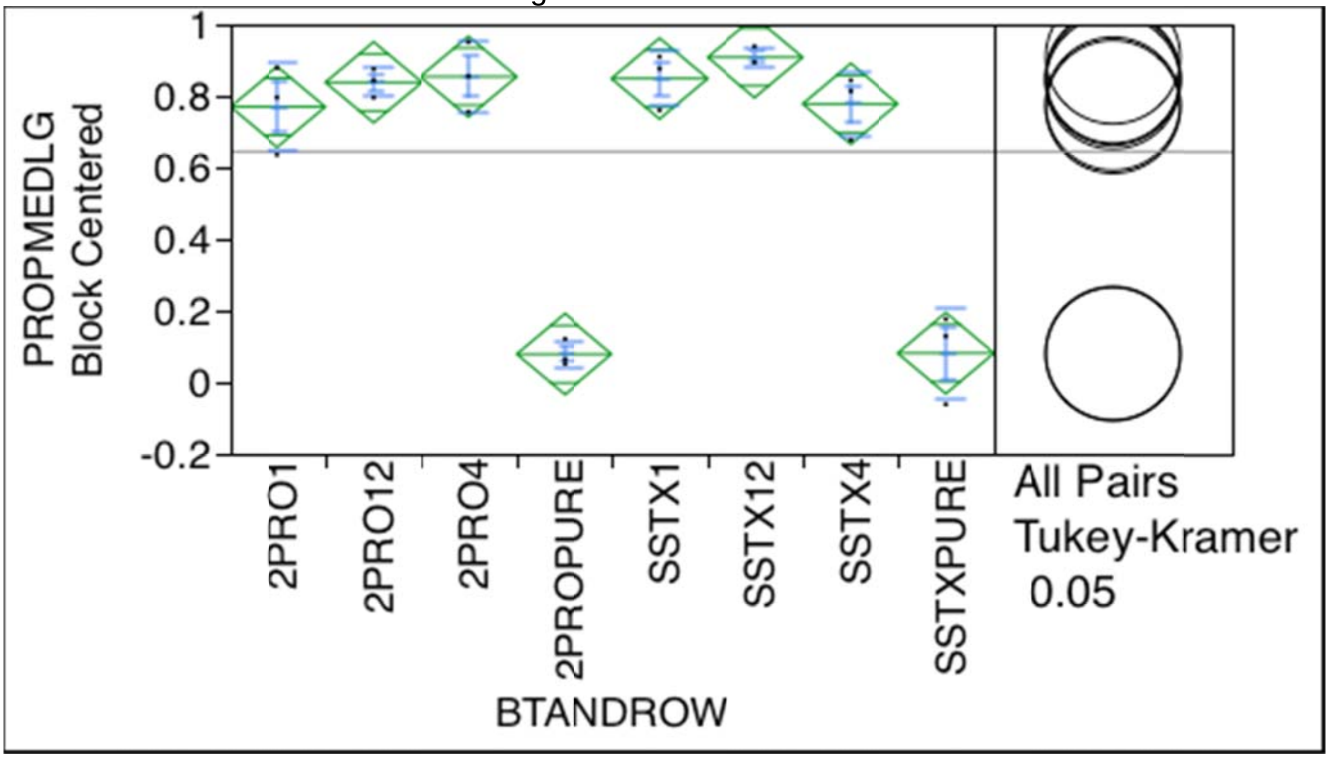
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
2PRO1	3	0.230590	0.123692	0.07141	-0.0767	0.5379
2PRO12	3	0.161998	0.040196	0.02321	0.0621	0.2619
2PRO4	3	0.146151	0.097739	0.05643	-0.0966	0.3889
2PROPURE	3	0.921296	0.036902	0.02131	0.8296	1.0130
SSTX1	3	0.151389	0.078558	0.04536	-0.0438	0.3465
SSTX12	3	0.091847	0.026499	0.01530	0.0260	0.1577
SSTX4	3	0.222222	0.089155	0.05147	0.00075	0.4437
SSTXPURE	3	0.918803	0.125664	0.07255	0.6066	1.2310

Mean separations (Tukey's HSD) 0.05 level of probability
Proportion of CEW larvae that were small by Bt type and row**.**

Level			**Mean**
2PROPURE	A		0.92129630
SSTXPURE	A		0.91880342
2PRO1		B	0.23059006
SSTX4		B	0.22222222
2PRO12		B	0.16199813
SSTX1		B	0.15138889
2PRO4		B	0.14615105
SSTX12		B	0.09184727

CEW Analysis 4. Mean proportion of medium and large CEW larvae recovered by Bt type and refuge row. The data include sampling in the pure Bt block. Finding: A significantly higher proportion of larvae recovered from the refuge rows were medium and large. THIS IS BASICALLY THE INVERSE OF ANALYSIS 3.

Mean PROPORTION of medium and large CEW by row. This analysis includes rows in the solid Bt block and refuge rows 1, 4 and 12. “2PROPURE” is Double Pro pure Bt block and SSTXPURE is the pure stand of SmartStax 5% refuge in a bag. Refuge row location is indicated as the last two digits in the row name.



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
BTANDROW	7	2.5897371	0.369962	44.3118	<.0001*
REP	2	0.0521030	0.026052	3.1203	0.0757
Error	14	0.1168871	0.008349		
C. Total	23	2.7587273			

Means and Standard Deviations

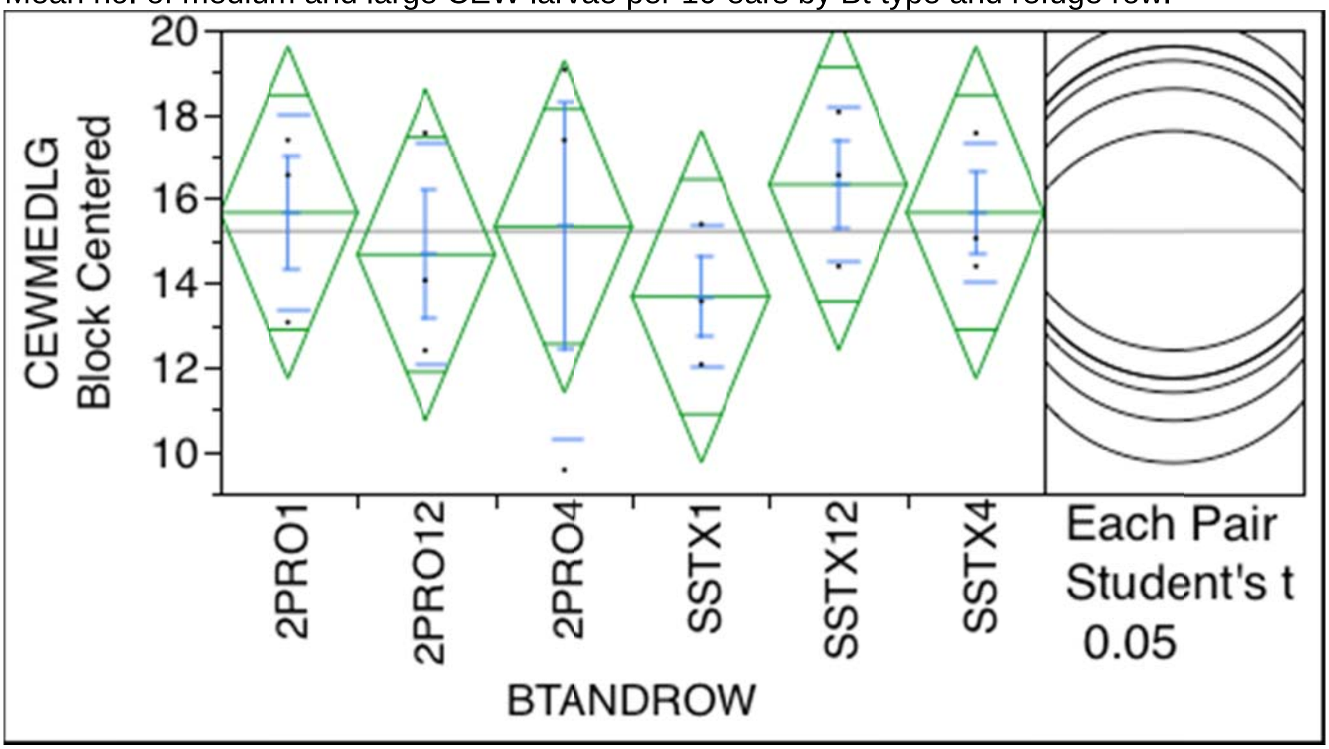
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
2PRO1	3	0.769410	0.123692	0.07141	0.4621	1.0767
2PRO12	3	0.838002	0.040196	0.02321	0.7381	0.9379
2PRO4	3	0.853849	0.097739	0.05643	0.6111	1.0966
2PROPURE	3	0.078704	0.036902	0.02131	-0.0130	0.1704
SSTX1	3	0.848611	0.078558	0.04536	0.6535	1.0438
SSTX12	3	0.908153	0.026499	0.01530	0.8423	0.9740
SSTX4	3	0.777778	0.089155	0.05147	0.5563	0.9993
SSTXPURE	3	0.081197	0.125664	0.07255	-0.2310	0.3934

Mean separation: Tukey’s HSD 0.05 level of probability

Level			**Mean**
SSTX12	A		0.90815273
2PRO4	A		0.85384895
SSTX1	A		0.84861111
2PRO12	A		0.83800187
SSTX4	A		0.77777778
2PRO1	A		0.76940994
SSTXPURE		B	0.08119658
2PROPURE		B	0.07870370

CEW Analysis 5. Mean number of medium and large CEW larvae per ten ears by Bt type and refuge row. This analysis excludes data from within the solid Bt block. No significant differences were found.

Mean no. of medium and large CEW larvae per 10 ears by Bt type and refuge row.



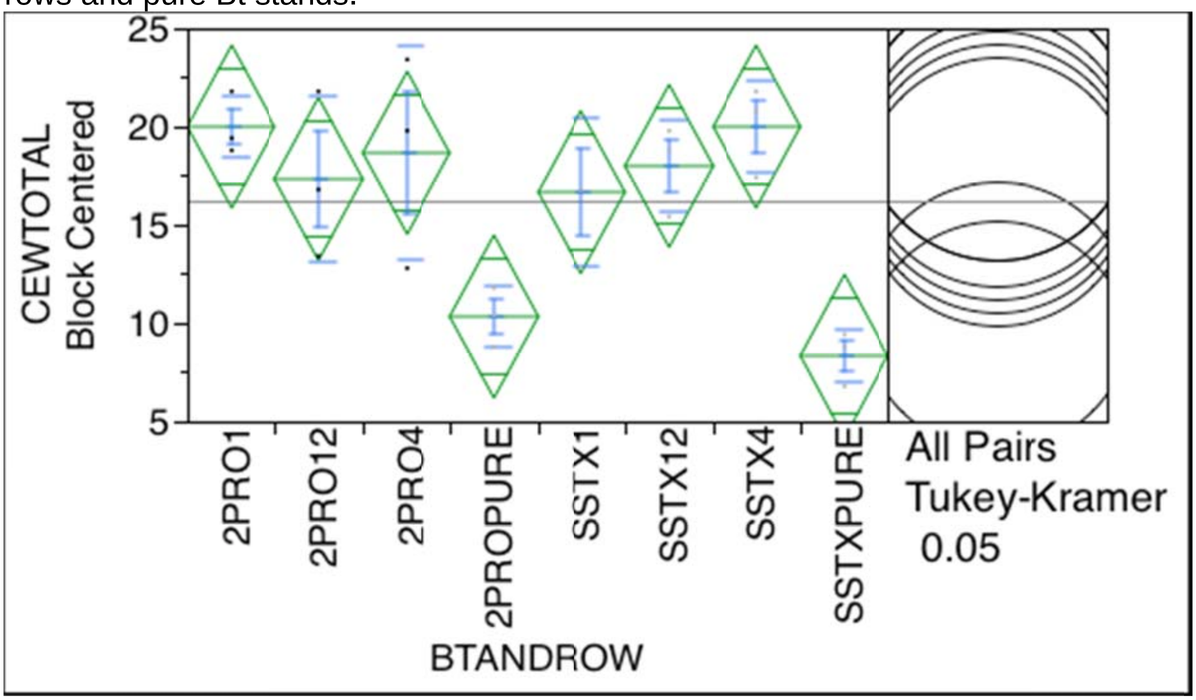
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
BTANDROW	5	13.11111	2.6222	0.2793	0.9141
REP	2	84.11111	42.0556	4.4793	0.0408*
Error	10	93.88889	9.3889		
C. Total	17	191.11111			

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
2PRO1	3	15.6667	2.29936	1.3275	9.955	21.379
2PRO12	3	14.6667	2.63699	1.5225	8.116	21.217
2PRO4	3	15.3333	5.07262	2.9287	2.732	27.934
SSTX1	3	13.6667	1.66944	0.9639	9.520	17.814
SSTX12	3	16.3333	1.84341	1.0643	11.754	20.913
SSTX4	3	15.6667	1.66944	0.9639	11.520	19.814

CEW Analysis 6. Mean total number of CEW larvae recovered per ten ears in refuge rows and pure Bt stands.



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
BTANDROW	7	408.00000	58.2857	5.1892	0.0044*
REP	2	170.08333	85.0417	7.5713	0.0059*
Error	14	157.25000	11.2321		
C. Total	23	735.33333			

Replication Means

REP	Mean	Number
1	19.7500	8
2	13.3750	8
3	15.3750	8

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
2PRO1	3	20.0000	1.58278	0.9138	16.068	23.932
2PRO12	3	17.3333	4.21369	2.4328	6.866	27.801
2PRO4	3	18.6667	5.40110	3.1183	5.250	32.084
2PROPURE	3	10.3333	1.50174	0.8670	6.603	14.064
SSTX1	3	16.6667	3.81404	2.2020	7.192	26.141
SSTX12	3	18.0000	2.29242	1.3235	12.305	23.695
SSTX4	3	20.0000	2.29242	1.3235	14.305	25.695
SSTXPURE	3	8.3333	1.37121	0.7917	4.927	11.740

Mean separations, Tukey's HSD 0.05 level of probability

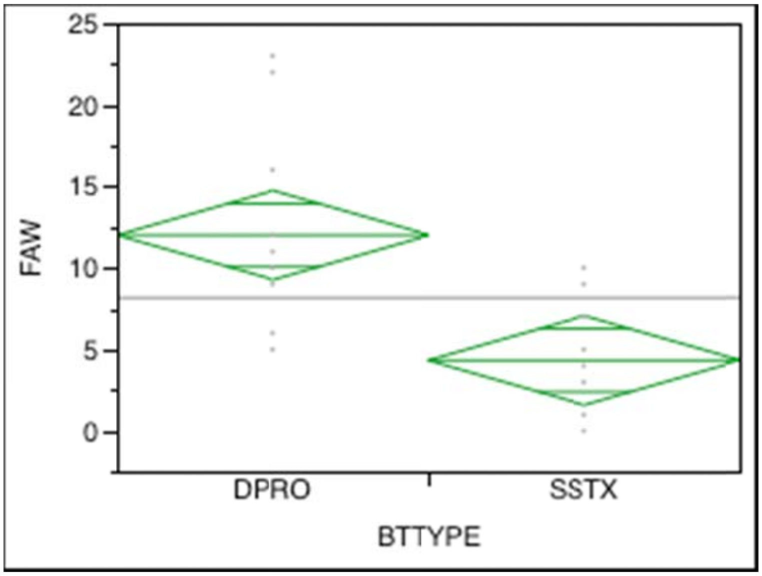
Level				**Mean**
2PRO1	A			20.000000
SSTX4	A			20.000000
2PRO4	A	B		18.666667
SSTX12	A	B		18.000000
2PRO12	A	B	C	17.333333
SSTX1	A	B	C	16.666667
2PROPURE		B	C	10.333333
SSTXPURE			C	8.333333

Because we did not find any ability for either type of Bt corn to protect against corn earworm in strip refuges, we halted further data collection for corn earworm and concentrated our later efforts on fall armyworm.

PART II. Fall Armyworm

FAW Analysis 1 compares the number of FAW larvae recovered on 19 - 20 August (dough stage) from the refuge adjacent to SmartStax and DoublePro solid planting (12 rows of Bt corn). 35 adjacent ears were harvested per refuge row. Data are for combined refuge rows 1, 2, 4, and 12 (hence 140 ears per Bt type x 3 replications = 420 ears per Bt type.) Data from inside the solid Bt block plantings are not included in this analysis. Findings: SSTX had significantly fewer insects in the refuge than did DoublePro. This may result from the presence of Cry1F in SSTX.

FAW larvae per 35 ears in REFUGE ROWS of SmartStax and DoublePro on 8/20/13. Continuous block refuge was planted.



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
BTTYPE	1	352.66667	352.667	16.8423	0.0005*
Error	22	460.66667	20.939		
C. Total	23	813.33333			

Means for Oneway Anova

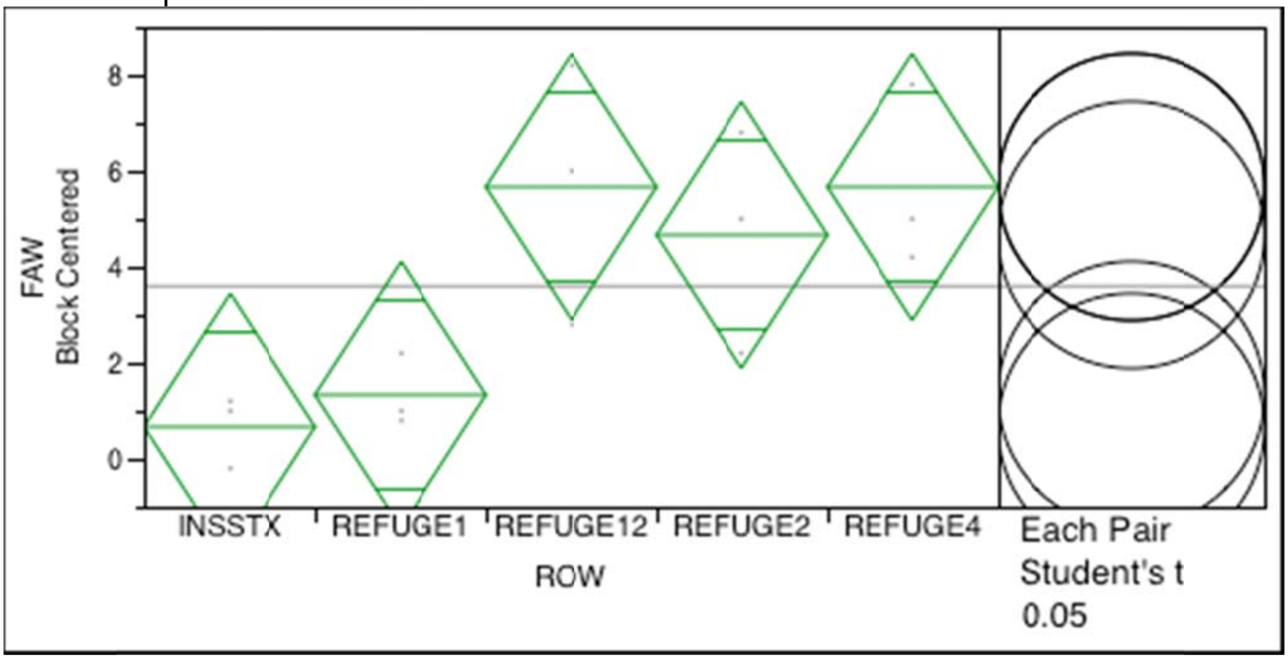
Level	Number	Mean	Std Error	Lower 95%	Upper 95%
DPRO	12	12.0000	1.3210	9.2605	14.740
SSTX	12	4.3333	1.3210	1.5938	7.073

t Test
SSTX-DPRO
Assuming equal variances

Difference	-7.667	t Ratio	-4.10393
Std Err Dif	1.868	DF	22
Upper CL Dif	-3.792	Prob > |t|	0.0005*
Lower CL Dif	-11.541	Prob > t	0.9998
Confidence	0.95	Prob < t	0.0002*

FAW Analysis 2A: Number of FAW larvae recovered on 19 – 20 August (dough stage) in the solid SSTX Bt block planting and adjacent refuge rows 1, 2, 4 and 12. Each mean is composed of 35 ears per row x 3 replications += 105 ears. Finding: this followed an expected trend for fewer larvae in rows closest to the solid Bt planting. It appears that SSTX contributed to lower FAW numbers by wide protection (see analysis 1) and additional specific protection to nearby refuge rows, at least refuge row 1.

SmartStax: FAW Per 35 Ears By ROW. Treatment "INSSTX" is the larval count in the SmartStax pure stand.



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
ROW	4	70.26667	17.5667	4.0229	0.0446*
REP	2	36.40000	18.2000	4.1679	0.0575
Error	8	34.93333	4.3667		
C. Total	14	141.60000			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
INSSTX	3	0.66667	1.2065	-2.115	3.4488
REFUGE1	3	1.33333	1.2065	-1.449	4.1154
REFUGE12	3	5.66667	1.2065	2.885	8.4488
REFUGE2	3	4.66667	1.2065	1.885	7.4488
REFUGE4	3	5.66667	1.2065	2.885	8.4488

Replication Means

REP	Mean	Number
1	2.60000	5

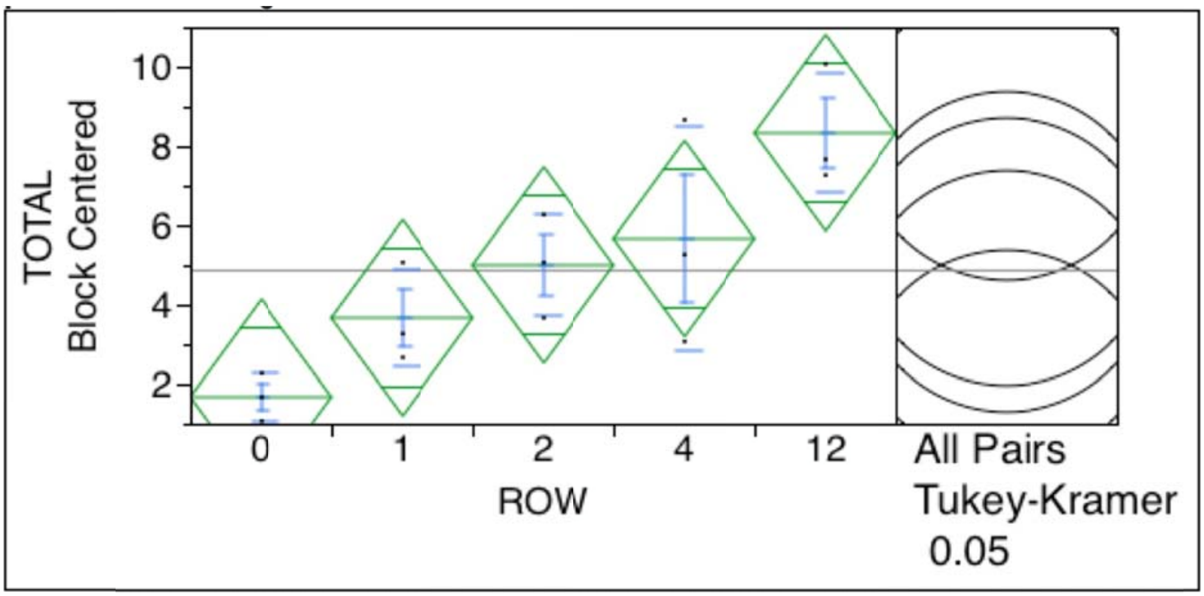
REP	Mean	Number
2	5.80000	5
3	2.40000	5

Mean Separation (t-test)

Level				Mean
REFUGE12	A			5.6666667
REFUGE4	A			5.6666667
REFUGE2	A	B		4.6666667
REFUGE1		B	C	1.3333333
INSSTX			C	0.6666667

Levels not connected by same letter are significantly different.

FAW Analysis 2B: Number of FAW larvae recovered on 6 September (early dent stage) in the solid SSTX Bt block planting and adjacent refuge rows 1, 2, 4 and 12. Each mean is composed of 10 naturally infested ears per row x 3 replications = 30 ears.



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
ROW	4	73.06667	18.2667	5.2692	0.0223*
REP	2	14.93333	7.4667	2.1538	0.1785
Error	8	27.73333	3.4667		
C. Total	14	115.73333			

Block Means

REP	Mean	Number
1	6.20000	5
2	4.60000	5
3	3.80000	5

Means and Std Deviations

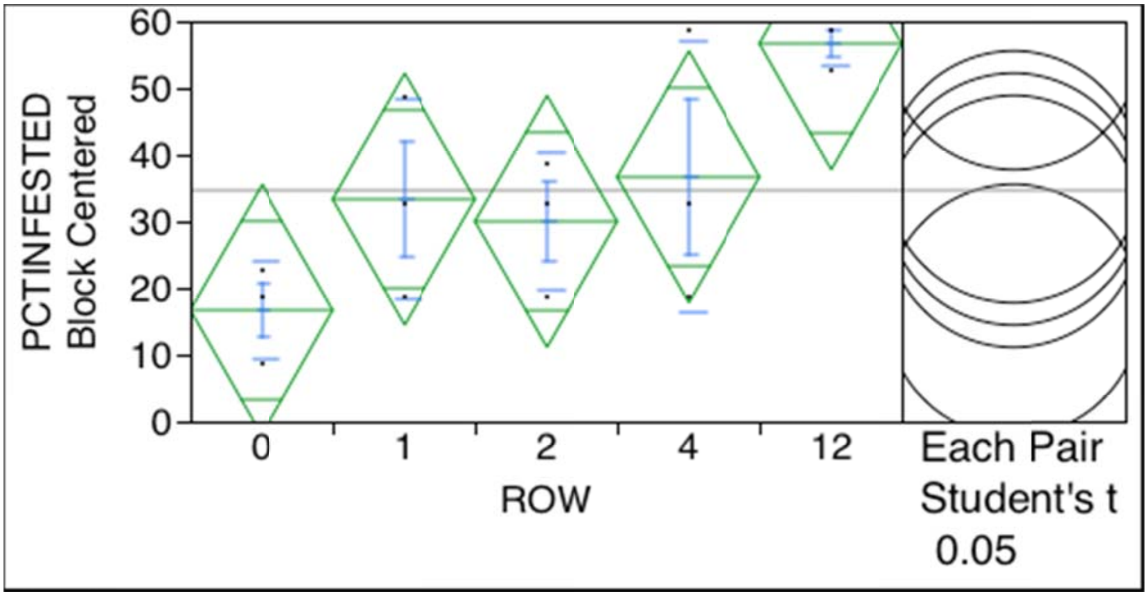
ROW	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	3	1.66667	0.60000	0.3464	0.176	3.157
1	3	3.66667	1.24900	0.7211	0.564	6.769
2	3	5.00000	1.30128	0.7513	1.767	8.233
4	3	5.66667	2.82135	1.6289	-1.342	12.675
12	3	8.33333	1.51438	0.8743	4.571	12.095

Mean separation, t-test

Level			Mean
12	A		8.3333333
4	A	B	5.6666667
2	A	B	5.0000000
1	A	B	3.6666667
0		B	1.6666667

Levels not connected by same letter are significantly different.

FAW Analysis 2C: Mean proportion of ears infested with FAW larvae on 6 September (early dent stage) in the solid SSTX Bt block planting and adjacent refuge rows 1, 2, 4 and 12. Each mean is composed of 10 naturally infested ears per row x 3 replications = 30 ears.



Analysis of Variance for arcsine of the square root transformation of proportion of ears infested per row.

Source	**DF**	**Sum of Squares**	**Mean Square**	**F Ratio**	**Prob > F**
ROW	4	0.30718482	0.076796	3.0432	0.0844
REP	2	0.13578927	0.067895	2.6904	0.1278
Error	8	0.20188339	0.025235		
C. Total	14	0.64485748			

Block Means

REP	Mean	Number
1	46.0000	5
2	32.0000	5
3	26.0000	5

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	3	16.6667	7.2111	4.163	-1.25	34.580
1	3	33.3333	15.0111	8.667	-3.96	70.623
2	3	30.0000	10.2632	5.925	4.50	55.495
4	3	36.6667	20.2978	11.719	-13.76	87.089
12	3	56.6667	3.4641	2.000	48.06	65.272

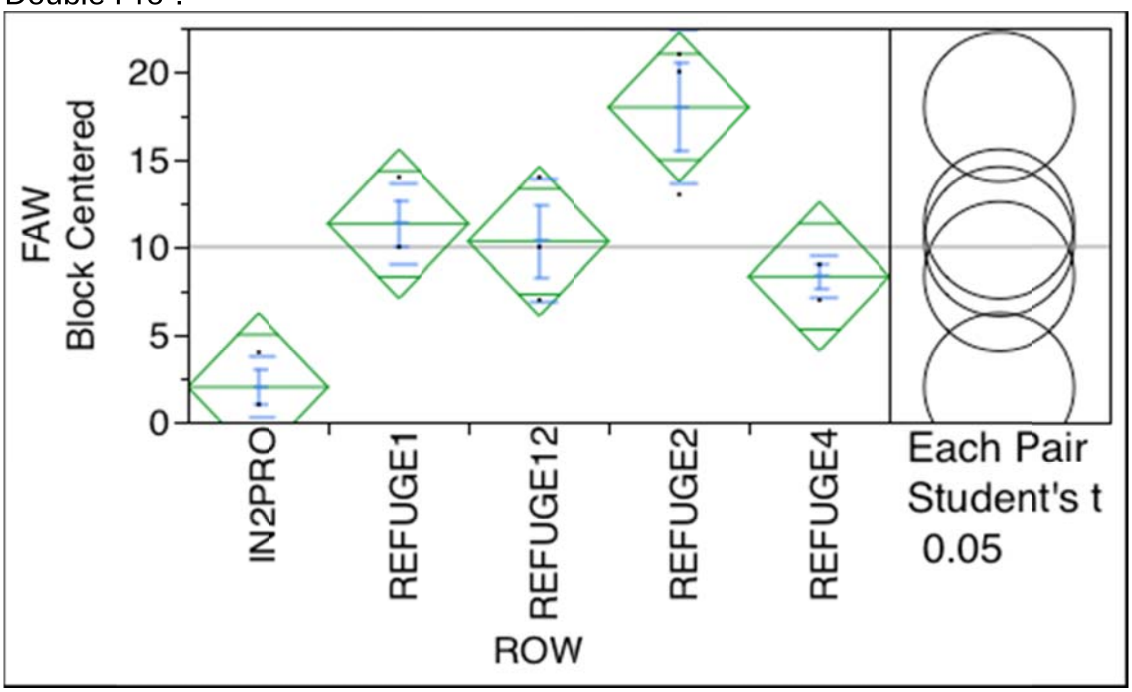
Row mean separations, t-test. Separations shown are for proportion of infested ears as transformed by the arcsine of the square root transformation.

Row			**Mean**
12	A		56.666667
4	A	B	36.666667
1	A	B	33.333333
2	A	B	30.000000
0		B	16.666667

Levels not connected by same letter are significantly different.

FAW Analysis 3: Number of FAW larvae recovered on 19 - 20 August (dough stage) in the solid DOUBLEPRO Bt block planting and adjacent refuge rows 1, 2, 4 and 12. Each mean is composed of 35 ears per row x 3 replications = 105 ears. Finding: Double Pro solid Bt blocks provide no protection for any of the adjacent rows. The high number of insects in refuge row 2 reflects a hotspot in one replication where 23 FAW larvae were found in 35 ears.

DOUBLE PRO FAW Per 35 Ears by Row. IN2PRO indicates “in the pure block of Double Pro”.



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
ROW	4	398.00000	99.5000	9.7073	0.0037*
REP	2	120.00000	60.0000	5.8537	0.0272*

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Error	8	82.00000	10.2500		
C. Total	14	600.00000			

Block Means

REP	Mean	Number
1	12.0000	5
2	6.0000	5
3	12.0000	5

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
IN2PRO	3	2.0000	1.73205	1.0000	-2.303	6.303
REFUGE1	3	11.3333	2.30940	1.3333	5.596	17.070
REFUGE12	3	10.3333	3.51188	2.0276	1.609	19.057
REFUGE2	3	18.0000	4.35890	2.5166	7.172	28.828
REFUGE4	3	8.3333	1.15470	0.6667	5.465	11.202

Mean Separation: t-test

Level				Mean
REFUGE2	A			18.000000
REFUGE1		B		11.333333
REFUGE12		B		10.333333
REFUGE4		B		8.333333
IN2PRO			C	2.000000

Levels not connected by same letter are significantly different.

PART III. Assay of qualitative toxin expression in kernels

Pollen Assay 1: Toxins expressing in bulk ground kernels from the top 1/3 of an ear

Five ears per plot from both SmartStax and Double Pro plots were removed from the field at early dent stage and stored for two weeks in a warehouse. Kernels were removed from the top 1/3 of an ear and ground in bulk in a hand blender. The ground fines for each individual ear were subjected to quick strip assays. The strips could detect Cry34, Cry1F, Cry3Bb1 and Cry2Ab2. This was done individually for 5 ears per plot. There were 3 replications.

The test strips, while not quantitative, showed either strong lines with strong coloration or weak lines that were lightly colored. We recorded the type of line for each positive reading and divided these into "strong expression" or "weak expression" categories.

Pollen Table 1. Toxin expression detected in bulk ground kernels in a SmartStax RIB block and refuge rows 1, 2, 4 and 12. Percentage values are of those ears that expressed all of the SmartStax toxins. Five ears per plot x 3 replications. These data are for complete SSTX toxin suite expression only. Incomplete suite expression is presented in Table 2.

Location	N	No. expressing SSTX (Pct. expressing)	Strong SSTX expression	Weak SSTX expression	Pct. strong expression	Pct. weak expression
In SSTX	15	15 (100)	15	0	100	0
Row 1	15	12 (80)	9	3	75	25
Row 2	15	14 (93)	11	3	79	21
Row 4	15	10 (67)	4	6	40	60
Row 12	15	8	0	8	0	100

Pollen Table 2. Lepidoptera toxins detected in ears that did not express all toxins in SmartStax in a SmartStax RIB block and refuge rows 1, 2, 4 and 12.

Location	N	No. not expressing SSTX	No. expressing Cry1F	No. expressing Cry2Ab2	Pct. expressing Cry2Ab2
In SSTX	15	0	0	0	0
Row 1	15	3	0	2	13.3
Row 2	15	1	0	0	0
Row 4	15	5	0	1	6.7
Row 12	15	7	0	1	6.7

Pollen Table 3. Cry2Ab2 toxin expression detected in bulk ground kernels in a Double Pro block and refuge rows 1, 2, 4 and 12. Five ears per plot x 3 replications.

				---------- Cry2Ab2 expression ----------			
Location	N	No. expressing Cry2Ab2	Pct. expressing Cry2Ab2	No. Strong	No. Weak	Pct. strong	Pct. weak
In 2Pro	15	15	100	15	0	100	0
Row 1	15	15	100	7	8	46.7	53.5
Row 2	15	10	66.7	5	5	50	50
Row 4	15	7	46.7	2	5	28.6	71.4
Row 12	15	10	66.7	6	4	60	40

Pollen Assay 2: Toxins expressing in individual kernels near the ear tip.

We removed 10 individual kernels from as close as possible to the ear tip of each of 4 ears in refuge row 2 of the 3 SmartStax replications. (This assay was not done for the Double Pro blocks.) There was often some tip damage and associated fungi so we chose the intact kernels closest to the ear tip. Each kernel was assayed with quick strips that detect Cry34, Cry1F, Cry3Bb1 and Cry2Ab2.

Pollen Table 4A. Individual toxin expression in tip kernels in SmartStax refuge row 2. Data include kernels that were positive for all SSTX toxins and those that expressed only a subset of toxins. ***See table 5 for explanation of pyramids vs. single toxins detected.***

			Lepidoptera toxins No. of kernels		Percent of kernels positive	Total positive detections	
Rep	No. ears	No. kernels	Negative for toxins	Positive for toxins	for Lepidoptera toxins	Cry1F	Cry2Ab2
1	4	40	28	12	30.0	7	9
2	4	40	31	9	22.5	3	6
3	4	40	23	17	42.5	9	9
Refuge row 2 total values / 120 kernels			82	38	31.6	19	24

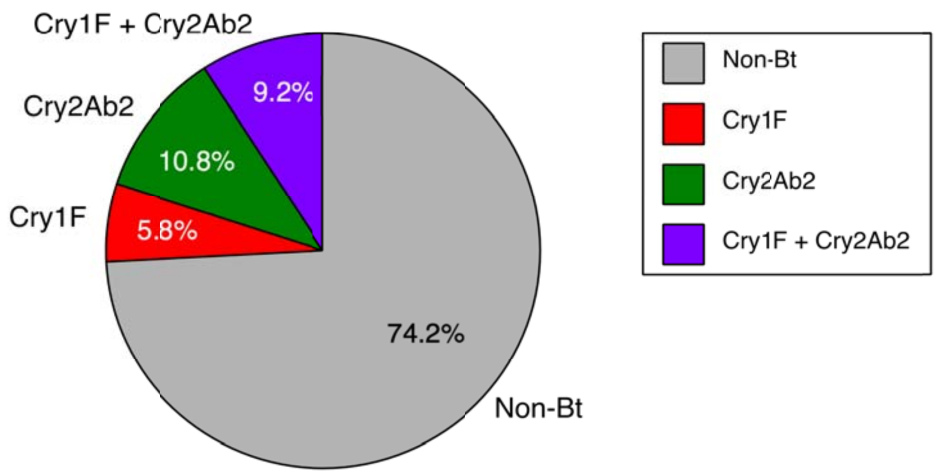
Pollen Table 4B. These are the same data as in Table 4 but with the rootworm toxins presented as well. See table 5 for explanation of pyramids vs. single toxins detected.

			No. of kernels		-- No. of kernels positive for a toxin --			
Rep	No. ears	No. kernels	Negative for toxins	Positive for toxins	Cry34	Cry1F	Cry3Bb1	Cry2Ab2
1	4	40	17	23	5	7	5	9
2	4	40	32	8	3	3	4	6
3	4	40	24	16	5	9	9	9

Pollen Table 5. Expression of single Lepidoptera toxins and a Lepidoptera pyramids in refuge row 2 kernels that contained at least one Lepidoptera toxin. **This table addresses toxins that are apparently segregating as well as those that are not.**

Rep	No. of kernels tested	No. with only Cry1F	No. with only Cry2Ab2 + Cry1A.105	No. with both Cry1F and Cry2Ab2
1	40	3	5	4
2	40	1	4	2
3	40	3	4	5
Pct. of all 120 kernels		5.8	10.8	9.2

Percentage of tip kernels in Refuge Row 2 with various Bt toxin profiles



10 tip kernels / ear x 4 ears per plot x 3 replications = 120 kernels

Soil applied and Seed Treatment Nematicide Evaluation in Corn, Muleshoe, TX, 2013

Terry Wheeler and Monti Vandiver
Texas A&M AgriLife Research and Texas A&M AgriLife Extension

Cooperator: Tim Black

Planting date: 8 May
Plot dimensions: 4 rows wide, 30-inch centers; 40 ft. long with 5 ft. alleys, 6 replications, RCBD
Stand, vigor, and nematode assays: 5 June
Second sampling time: 9 August
Harvest: Sept. 26

Results: Nematicides (seed treatments and infurrow granular at plant (Counter) were tested for their effect on nematodes in corn. There was no significant effect of any of the nematicides on nematode densities or corn yield.

Seed[1]	Counter (lbs/a)	Plants /acre	RK[2] juv	RK[2] Egg	Lesion[2]	RK[3]	Lesion[3]	Bu/acre At 15%	% Lodging
Cruiser	0	29,330	33	720	33	80	2,100	233	4.8
Cruiser	6.5	27,225	17	1,320	100	320	1,900	228	0
Avicta Duo	0	28,024	50	1,380	100	55	2,500	223	0
Poncho	0	29,185	100	2,240	67	105	2,500	237	0
Poncho	6.5	27,007	50	1,680	100	95	1,550	238	1.6
Poncho/Votivo	0	29,708	50	1,560	17	240	2,900	231	2.9

[1]All seed was treated with the fungicides Maxim Quattro.
[2]Soil assays for nematodes were conducted in August and densities are per 500 cm^3 soil, RK juv= root-knot nematode second-stage juveniles, RK egg = root-knot nematode eggs, Lesion = the lesion nematode.
[3]RK = root-knot nematode and Lesion extracted from 1 g root, taken in August.

Texas A&M AgriLife Extension

Evaluation of New and Traditional Insecticides for Bollworm Control in Cotton

Location: Muleshoe, Texas Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Case Medlin/Russ Perkins

General Trial Information

Investigator: Monti Vandiver **Title:** EA-IPM

Discipline: I insecticide
Trial Status: F one-year/final **Trial Reliability:** HIGH
Initiation Date: Aug-15-2013
Completion Date: Sep-4-2013

Trial Location

City: Muleshoe
State/Prov.: Texas

Investigator: Monti Vandiver **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas **Mobile No.:** 575-799-1040
Postal Code: 79347 **E-mail:** mrvandiver@ag.tamu.edu

Sponsor: Case Medlin **Title:** Field Development Rep.
Organization: DuPont Crop Protection

Cooperator/Landowner

Cooperator: Steve Bell **Role:** FALDOW
City: Muleshoe
State/Prov: Texas

Other Contacts

Name	Role
Apurba Barman	UNVCOP
Curtis Preston	UNVCOP
Ed Bynum	UNVCOP
Pat Porter	UNVCOP

Crop Description

Crop 1: GOSHI Gossypium hirsutum American upland cotton
Variety: FM 2011 F
Row Spacing, Unit: 30 IN
Planting Density, Unit: 40000 P/A

Pest Description

Pest 1 Type: I **Code:** HELIZE Helicoverpa zea
Common Name: American bollworm
Artificial Population: X **Establishment Date:** Aug-15-2013
Establishment Rate, Unit: 4 Larvae/Plant
Establishment Method/Description: brushed on 1st instar larvae in terminal

Site and Design

Treated Plot Width: 10 FT
Treated Plot Length: 30 FT
Treated Plot Area: 300 FT2 **Treatments:** 7
Replications: 4 **Study Design:** RACOBL Randomized Complete Block (RCB)

Texas A&M AgriLife Extension

Evaluation of New and Traditional Insecticides for Bollworm Control in Cotton

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Case Medlin/Russ Perkins

Application Description

	A
Application Date:	Aug-21-2013
Appl. Start Time:	4
Appl. Stop Time:	5:30 AM
Application Method:	SPRAY
Application Timing:	THRESH
Application Placement:	FOLIAR
Applied By:	Monti
Air Temperature, Unit:	91 F
% Relative Humidity:	33
Wind Velocity, Unit:	4.5 MPH
Wind Direction:	SE
Dew Presence (Y/N):	N no
% Cloud Cover:	5

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	GOSHI BCOT
Stage Scale Used:	DESC
Stage Majority, Percent:	6.5 NAWF 80
Stage Minimum, Percent:	5 NAWF 10
Stage Maximum, Percent:	8 NAWF 10
Height, Unit:	24 IN
Height Minimum, Maximum:	20 30
Crop coverage (%):	100

Pest Stage At Each Application

	A
Pest 1 Code, Type, Scale:	HELIZE I DESC
Stage Majority, Percent:	1/4 in 75
Stage Minimum, Percent:	1/4 in 75
Stage Maximum, Percent:	3/8 in 25

Application Equipment

	A
Appl. Equipment:	SPPS
Equipment Type:	SPRAYE
Operation Pressure, Unit:	28 PSI
Nozzle Type:	FLAFAN
Nozzle Size:	8002
Nozzle Spacing, Unit:	15 IN
Nozzles/Row:	2
% Coverage:	100
Boom Length, Unit:	10 FT
Boom Height, Unit:	32 IN
Ground Speed, Unit:	3 MPH
Carrier:	WATER
Spray Volume, Unit:	20 gal/ac
Mix Size, Unit:	2 gallons
Propellant:	COMCO2

Texas A&M AgriLife Extension

Evaluation of New and Traditional Insecticides for Bollworm Control in Cotton

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Case Medlin/Russ Perkins

Description	Bollworms/8 pl>	Bollworms/8 pl>	% Control	Bollworms/8 pl>	% Control	Damage/8 plants
Part Rated	LARSMA P	LARTOT P	LARTOT P	LARTOT P	LARTOT P	BOLAIN C
Rating Date	Aug-21-2013	Aug-28-2013	Aug-28-2013	Sep-4-2013	Sep-4-2013	Sep-4-2013
Rating Type	COUINS	COUINS	CONTRO	COUINS	CONTRO	DAMINS
Rating Unit	NUMBER	NUMBER	%UNCK	NUMBER	%UNCK	NUMBER
Days After First/Last Applic.	0 0	7 7	7 7	14 14	14 14	14 14
Treatment Name / Rate / Rate Unit						
Untreated	7.2 a	7.7 a	0.0 c	2.3 a	0.0 b	8.3 a
Prevathon 27 oz/a	5.8 a	0.0 c	100.0 a	0.0 b	100.0 a	0.3 b
Belt 3 oz/a	7.9 a	0.9 b	91.9 b	0.1 b	92.5 a	1.1 b
Baythroid XL 2.6 oz/a	6.3 a	0.2 bc	99.1 ab	0.1 b	81.3 a	0.4 b
LSD (P=.05)	0.22t	0.43t	11.62t	3.72t	28.35	5.18t
CV	15.45	19.06	11.72	80.11	25.89	44.6
Grand Mean	0.89t	1.4t	61.99t	2.9t	68.44	7.27t
Replicate F	0.462	0.753	2.129	1.734	2.194	2.336
Replicate Prob(F)	0.7158	0.5478	0.1667	0.2295	0.1584	0.1420
Treatment F	0.593	56.060	133.000	11.537	27.269	15.966
Treatment Prob(F)	0.6351	0.0001	0.0001	0.0019	0.0001	0.0006

Part Rated
LARSMA = larva - small
LARTOT = larva - total
BOLAIN = boll - larva-infested
P = Pest is Part Rated
C = Crop is Part Rated
Rating Type
COUINS = count - insect
CONTRO = control / burndown or knockdown
DAMINS = damage - insect
Rating Unit
NUMBER = number
%UNCK = percent of untreated check
ARM Action Codes
THT[1,2] = Arcsine square root percent([5])
THT[1,3] = Henderson-Tilton([1],[3])

Means followed by same letter do not significantly differ (P=.05, LSD)
t=Mean descriptions are reported in transformed data units, and are not de-transformed.
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Texas A&M AgriLife Extension

Evaluation of Seed Treatments in Cotton for Emergence, Vigor and Yield

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

General Trial Information

Investigator: Monti Vandiver   **Title:** EA-IPM

Discipline: F/S   fungicide seed treatment
Initiation Date: May-20-2013

Trial Location

City: Muleshoe
State/Prov.: Texas

Investigator: Monti Vandiver   **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C   **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas   **Mobile No.:** 575-799-1040
Postal Code: 79347   **E-mail:** mrvandiver@ag.tamu.edu

Cooperator/Landowner

Cooperator: Kelly Kettner   **Role:** FALDOW
City: Muleshoe
State/Prov: Texas

Crop Description

Crop 1: GOSHI   Gossypium hirsutum American upland cotton
Variety: FM 1944 B2F
Planting Date: May-20-2013
Planting Rate, Unit: 65000   S/A   **Planting Method:** PLANTD planted
Row Spacing, Unit: 30   IN   **Emergence Date:** May-29-2013

Site and Design

Treated Plot Width: 10   FT   **Site Type:** FIELD   field
Treated Plot Length: 100 FT
Treated Plot Area: 1000   FT2   **Treatments:** 9   **Tillage Type:** CONTIL   conventional-till
Replications: 4   **Study Design:** RACOBL Randomized Complete Block (RCB)

Trial Initiation Comments:
1 qt/acre trifluralin PPI; 1qt/acre diuron PRE, previous crop corn

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	GOSHI BCOT

Texas A&M AgriLife Extension

Evaluation of Seed Treatments in Cotton for Emergence, Vigor and Yield

Location: Muleshoe, Texas Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Description			Plants/10 row >	Plants/10 row >	Plant Height	True leaves	Plants/10 row >	Vigor Rating
Rating Type			EMERGE	EMERGE			EMERGE	VIGOR
Rating Unit			PLANT	PLANT			PLANT	
Plant-Eval Interval			10 DP-1	18 DP-1	28 DP-1	28 DP-1	32 DP-1	32 DP-1
Treatment Name	Rate	Rate Unit						
AERIS SEED APPLIED SYSTEM	20	oz/cwt	15.2 ab	17.6 c	3.375 a	3.7	21.8 b	4.0 a
VORTEX FL	0.08555	oz/cwt	15.1 ab	18.8 bc	3.200 a	3.6 a	23.4 b	3.5 a
ALLEGIANCE FL	0.7524	oz/cwt						
SPERA	1.726	oz/cwt						
AERIS SEED APPLIED SYSTEM	20	oz/cwt						
VORTEX FL	0.08555	oz/cwt	15.9 ab	19.5 bc	3.225 a	3.6 a	22.5 b	3.5 a
ALLEGIANCE FL	0.7524	oz/cwt						
BYF14182	0.3195	oz/cwt						
SPERA	1.726	oz/cwt						
AERIS SEED APPLIED SYSTEM	20	oz/cwt						
TRILEX 2000	1	oz/cwt	11.7 c	18.1 c	3.375 a	3.6 a	21.3 b	3.5 a
VORTEX FL	0.08555	oz/cwt						
ALLEGIANCE FL	0.7524	oz/cwt						
BYF14182	0.3195	oz/cwt						
SPERA	1.726	oz/cwt						
AERIS SEED APPLIED SYSTEM	20	oz/cwt						
TRILEX 2000	2	oz/cwt	14.5 bc	18.7 bc	3.200 a	3.6 a	21.1 b	3.5 a
VORTEX FL	0.08555	oz/cwt						
ALLEGIANCE FL	0.7524	oz/cwt						
BYF14182	0.3195	oz/cwt						
SPERA	1.726	oz/cwt						
AERIS SEED APPLIED SYSTEM	20	oz/cwt						
EVERGOL XTEND	0.5	oz/cwt	16.2 ab	18.8 bc	3.250 a	3.5 a	22.0 b	3.8 a
VORTEX FL	0.08555	oz/cwt						
ALLEGIANCE FL	0.7524	oz/cwt						
BYF14182	0.3195	oz/cwt						
SPERA	1.726	oz/cwt						
AERIS SEED APPLIED SYSTEM	20	oz/cwt						
EVERGOL ENERGY	1	oz/cwt	16.6 ab	21.0 ab	3.162 a	3.5 a	26.1 a	3.9 a
VORTEX FL	0.08555	oz/cwt						
ALLEGIANCE FL	0.7524	oz/cwt						
BYF14182	0.3195	oz/cwt						
SPERA	1.726	oz/cwt						
AERIS SEED APPLIED SYSTEM	20	oz/cwt						
EVERGOL ENERGY	2	oz/cwt	17.5 a	22.2 a	3.262 a	3.3 a	26.1 a	2.9 a
VORTEX FL	0.08555	oz/cwt						
ALLEGIANCE FL	0.7524	oz/cwt						
BYF14182	0.3195	oz/cwt						
SPERA	1.726	oz/cwt						
AERIS SEED APPLIED SYSTEM	20	oz/cwt						
TRILEX ADVANCED	1.6	oz/cwt	16.2 ab	21.2 ab	3.262 a	3.7 a	22.5 b	3.2 a
VORTEX FL	0.08555	oz/cwt						
ALLEGIANCE FL	0.7524	oz/cwt						
BYF14182	0.3195	oz/cwt						
SPERA	1.726	oz/cwt						
AERIS SEED APPLIED SYSTEM	20	oz/cwt						
LSD (P=.05)			2.83	2.57	0.1633	0.49	2.44	0.66
CV			12.45	8.93	3.41	9.35	7.23	12.69
Grand Mean			15.43	19.54	3.26	3.53	22.97	3.53
Replicate F			9.417	7.774	3.219	1.766	1.174	2.555
Replicate Prob(F)			0.0004	0.0011	0.0435	0.1897	0.3434	0.0827
Treatment F			2.974	3.229	1.801	0.346	5.251	2.220
Treatment Prob(F)			0.0215	0.0148	0.1335	0.9218	0.0011	0.0685

Means followed by same letter do not significantly differ (P=.05, LSD)
t=Mean descriptions are reported in transformed data units, and are not de-transformed.
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.
Missing data estimates are included in columns:Yates=1,2,3,4,5,6

Texas A&M AgriLife Extension

Evaluation of Seed Treatments in Cotton for Emergence, Vigor and Yield

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Description Rating Type Rating Unit Plant-Eval Interval			Lint WEIGHT lb/ac	Seed WEIGHT lb/ac
Treatment Name	Rate	Rate Unit		
AERIS SEED APPLIED SYSTEM	20	oz/cwt	909.0 a	1939.3 a
VORTEX FL ALLEGIANCE FL SPERA AERIS SEED APPLIED SYSTEM	0.08555 0.7524 1.726 20	oz/cwt oz/cwt oz/cwt oz/cwt	1028.8 a	2283.4 a
VORTEX FL ALLEGIANCE FL BYF14182 SPERA AERIS SEED APPLIED SYSTEM	0.08555 0.7524 0.3195 1.726 20	oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt	954.3 a	2099.8 a
TRILEX 2000 VORTEX FL ALLEGIANCE FL BYF14182 SPERA AERIS SEED APPLIED SYSTEM	1 0.08555 0.7524 0.3195 1.726 20	oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt	972.8 a	2109.0 a
TRILEX 2000 VORTEX FL ALLEGIANCE FL BYF14182 SPERA AERIS SEED APPLIED SYSTEM	2 0.08555 0.7524 0.3195 1.726 20	oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt	1026.8 a	2229.8 a
EVERGOL XTEND VORTEX FL ALLEGIANCE FL BYF14182 SPERA AERIS SEED APPLIED SYSTEM	0.5 0.08555 0.7524 0.3195 1.726 20	oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt	926.0 a	2114.5 a
EVERGOL ENERGY VORTEX FL ALLEGIANCE FL BYF14182 SPERA AERIS SEED APPLIED SYSTEM	1 0.08555 0.7524 0.3195 1.726 20	oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt	952.5 a	2072.0 a
EVERGOL ENERGY VORTEX FL ALLEGIANCE FL BYF14182 SPERA AERIS SEED APPLIED SYSTEM	2 0.08555 0.7524 0.3195 1.726 20	oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt	1073.5 a	2275.4 a
TRILEX ADVANCED VORTEX FL ALLEGIANCE FL BYF14182 SPERA AERIS SEED APPLIED SYSTEM	1.6 0.08555 0.7524 0.3195 1.726 20	oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt oz/cwt	1138.3	2214.9 a
LSD (P=.05) CV Grand Mean			122.96 8.53 980.44	0.06t 1.22 3.33t
Replicate F Replicate Prob(F) Treatment F Treatment Prob(F)			1.464 0.2530 1.858 0.1284	3.863 0.0219 1.267 0.3058

Texas A&M AgriLife Extension

Evaluation of Seed Treatments in Cotton for Emergence, Vigor and Yield

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Rating Type
EMERGE = emergence
VIGOR = vigor
WEIGHT = weight
Rating Unit
PLANT = plant
lb/ac = pounds per acre
Plant-Eval Interval
10 DP-1 = 1 GOSHI May-20-2013
18 DP-1 = 1 GOSHI May-20-2013
28 DP-1 = 1 GOSHI May-20-2013
32 DP-1 = 1 GOSHI May-20-2013

MANAGING THRIPS IN ORGANIC COTTON WITH HOST PLANT RESISTANCE AND SPINOSAD INSECTICIDE

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Muleshoe, TX
Dylan Wann
Apurba Barman
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Texas A&M AgriLife Research and Extension Center
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Abstract

Thrips are a recurring problem to seedling cotton in the Texas High Plains. It has been estimated that thrips impact to the High Plains cotton industry in 2010 was in excess of $6 million. A replicated trial, evaluating 4 cotton cultivars, 2 experimental cultivars, a susceptible check, and a commercial standard was conducted near Muleshoe, TX. Plots were split into 2 foliar regimes, spinosad (Entrust®) at 2 oz/acre and unsprayed. In general thrips pressure was moderate. Spinosad insecticide reduced thrips pressure and subsequent applications appear to be additive. Cultivars did not differ in thrips colonization, but the experimental cultivars did have a significant impact on thrips damage. These data suggest that these cultivars do not express host plant resistance but may have more tolerance to thrips compared to commercial varieties.

Introduction

Thrips are a recurring problem to seedling cotton in the Texas High Plains where the dominant species is western flower thrips, Frankliniella occidentalis (Pergande). More acres of cotton were infested by thrips than any other pest in 2012; in addition more cotton acres were treated for thrips than all other pests combined. It has been estimated that thrips impact to the High Plains cotton industry in 2010 was in excess of $6 million. In irrigated cotton where thrips populations are historically high (usually areas where there is a significant acreage of wheat) many conventional growers may choose to utilize preventative insecticide seed treatments and/or foliar remedial insecticide treatments to suppress thrips. One of the most challenging factors facing organic cotton producers in the Texas High Plains is the effective management of early-season thrips in an organic production system. In 2011 we investigated the efficacy of 13 Organic Materials Review Institute (OMRI) approved insecticides at various rates and combinations for thrips suppression in cotton (Aza-Direct, Bugitol, Cedar Gard, Ecotec, Entrust, Pest Out, Pyganic, Saf-T-Side, SucraShield, and Surround). In 2012 we continued the study but reduced the treatment list to only those products which showed potential to provide significant thrips suppression in 2011 (Aza-Direct, Bugitol, Entrust, and Saf-T-Side+Ecotec). Entrust proved to be most effective in suppressing thrips in 2012 and was selected for continued testing in 2013 along with 3 cultivars with varying degrees of host plant resistance (tolerance) to thrips and a susceptible check. Organic Materials Review Institute (OMRI) provides organic certifiers, growers, manufacturers, and suppliers an independent review of products intended for use in certified organic production, handling, and processing.

Materials and Methods

This trial was conducted in commercial organic cotton field in Bailey County near Muleshoe, TX. Historically western flower thrips have been the dominant thrips species infesting cotton in this area. The trial was planted 13 May, 2013 on 30-inch rows with a John Deere MaxEmerge planter equipped with cone planting units and irrigated using a low elevation spray application (LESA) center pivot irrigation system. Plots were 4-rows wide × 55 ft long and were arranged in a split-plot design with 4 replicates. Treatments included 4 cotton cultivars, two experimental, (07-7-1407 and 07-7-1020), a susceptible check (AT Atlas), and the industry standard (FM 958). Each cultivar plot was split into untreated and treated plots; spinosad (Entrust®) was applied to treated plots at 2 oz/acre. The insecticide application was applied in accordance with label recommendations at 26.4 gallons/acre (GPA) total volume and included AgAid, an OMRI approved adjuvant, at 8oz/100 gallons of water. Three insecticide applications were made weekly, beginning at near 100% emergence, 28 May. Treatments were applied in a 15 inch band directly over the top of the crop row with a CO_2 pressurized backpack sprayer and hand held boom equipped with hollow cone nozzles. The crop stage was noted and thrips were counted at crop emergence and 7, 14, 17, and 21 days after emergence (DAE); all counts were made prior to insecticide applications. Thrips counts were made by collecting ten plants/plot and washing in an alcohol solution; adult and immature thrips collected in solution were filtered out and counted under a dissecting stereo scope. Thrips samples collected were also separated by life stage. Plant damage ratings were assessed at 14 and 21 DAE, the rating scale ranged from 1 to 5, where a rating of 1 indicates no damage and a rating of 5 indicates severe damage. Leaf area was estimated 7, 14, and 21 DAE by collecting 10 plants per plot and measuring the leaf area per plant using a LI-COR, Inc. LI-3100 laboratory area meter. Data were subjected to analysis of variance (ANOVA) and when a significant F test was observed, mean separation was performed using the least significant difference (LSD) at the 5% probability level. Thrips days were calculated by following the methodology described by Ruppel (1983; J. Econ. Entomol. 76:2, pp. 375-377).

Results and Discussion

Environmental conditions at the trial site were windy with temperatures near normal to slightly above normal (Figure 1). Three separate rain events occurred June 3, 6, and 8; a nearby NOAA weather station recorded .38, .88 and .97 inches respectively. Thrips pressure, in general, was moderate. Much of the area wheat, which is an alternative host that normally supports and bridges thrips populations until cotton emergence, had desiccated prematurely due to extreme winter and early spring environmental conditions limiting early season populations.

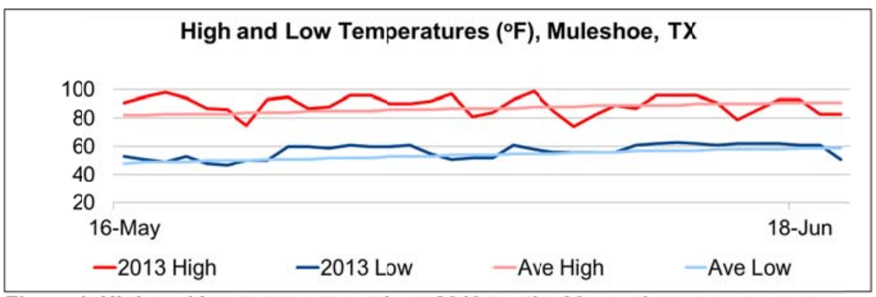


Figure 1. High and low temperatures from 2013 vs. the 30 year long term averages (1980-2010).

The cotton was slow to emerge, 15 days were required to attain near 100% emergence 28 May and an additional 7 days from emergence until a trial average of 1.5 true leaves had developed 4 June. Mean thrips numbers of untreated plots were less than 50% of action threshold when the initial insecticide application was applied (28 May, 100% emergence) but was over 2X the established action threshold of one thrips per true leaf by 7 DAE and maximum pressure, 8X action threshold, was reached 17 DAE 14 June (Figure 2). No differences in thrips densities were observed at any sample date when comparing cotton cultivars within insecticide treatments. A significant difference was only observed when comparing all treatments at the 4 true leaf stage 17 DAE (Figure 3). No statistical differences were noted in plant damage ratings 14 DAE (data not presented) but by 21 DAE significant differences were apparent (Figure 4). The untreated commercial cultivars exhibited the greatest thrips damage; injury was reduced in the experimental cultivars and plots treated with spinosad insecticide. Leaf area measurements revealed significant differences between treatments 21 DAE but no differences were observed on earlier sampling dates (Figure 5). The treated 7-07-1020 cultivar had most leaf area and the untreated 7-07-1020 cultivar had similar leaf area as treated commercial and 7-07-1407 cultivars.

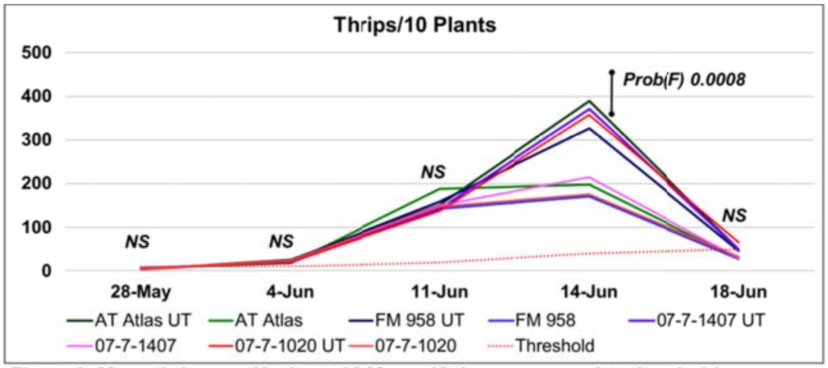


Figure 2. Mean thrips per 10 plants 28 May – 18 June compared to threshold.

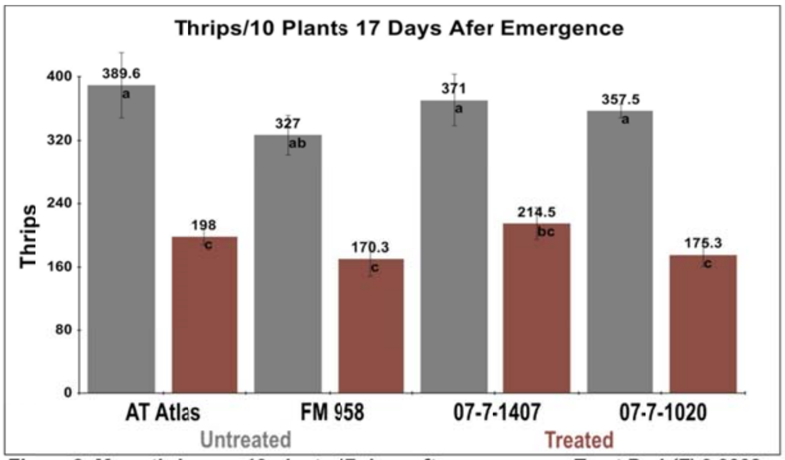


Figure 3. Mean thrips per 10 plants 17 days after emergence, Treat Prob(F) 0.0008.

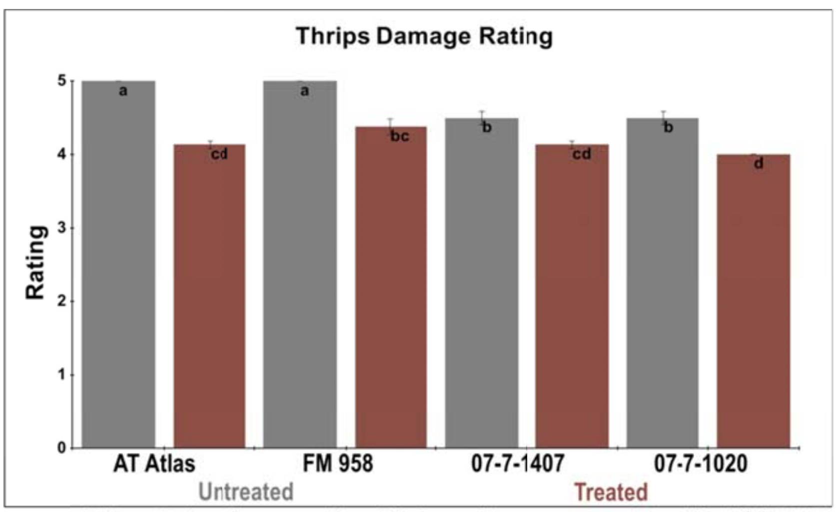


Figure 4. Mean thrips damage ratings 21 days after emergence, Treat Prob(F) 0.0005.

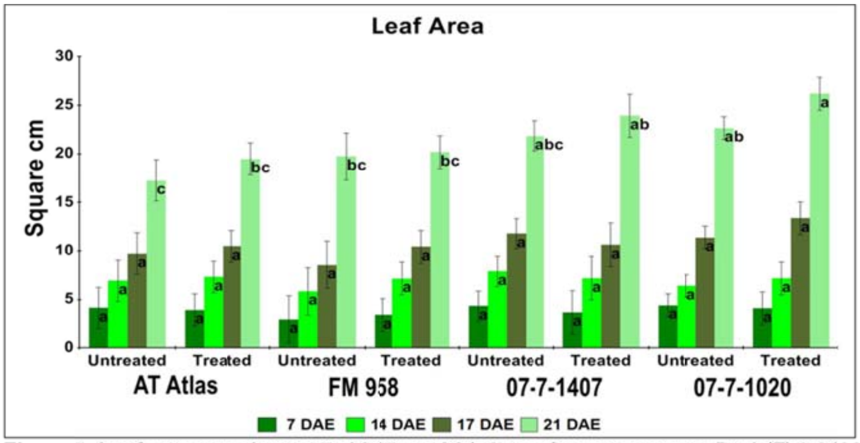


Figure 5. Leaf area per plant at 7, 14 17, and 21 days after emergence, Prob(F) 0.0166 21 DAE.

The percent of a thrips population which is immature is a good indicator of that population's ability to colonize; a higher percentage of immature thrips suggests a higher degree of colonization. When data from all post treatment sampling dates were combined and analyzed, cultivar had no impact on the percentage of the population which was immature (Figure 6). In 2 cultivars, Atlas and 07-7-1020, the Entrust insecticide significantly reduced the immature percentage but only provided slight numeric reductions in the other cultivars. Based on this data, Entrust appears to suppress colonization to a degree but cultivar did not have an impact.

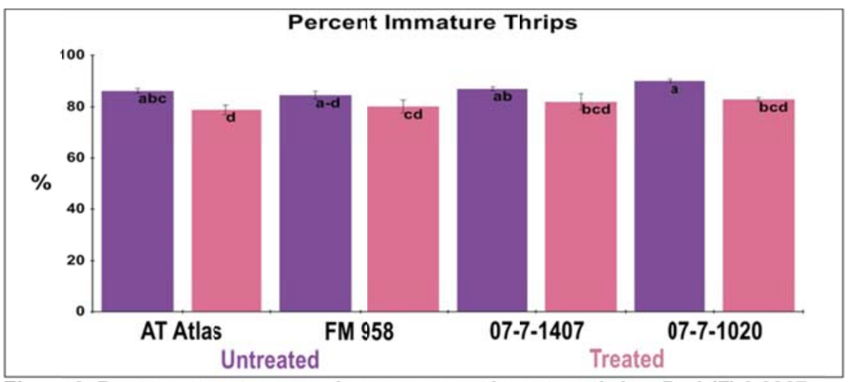


Figure 6. Post treatment seasonal mean percent immature thrips, Prob(F) 0.0367.

Cumulative thrips days can give an indication of thrips pressure over time. No differences in thrips days were observed when comparing cotton cultivars within insecticide treatments but a significant difference was observed when comparing all treatments (Figure 7). Spinosad reduced thrips days by 23.4% when comparing only insecticide treated vs untreated plots. This decrease is an indication of reduced overall thrips pressure and feeding duration.

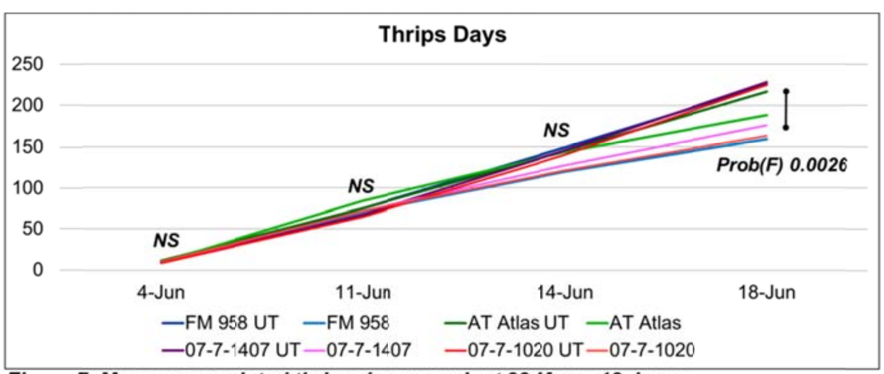


Figure 7. Mean accumulated thrips days per plant 28 May – 18 June.

Conclusions

Thrips pressure was moderate but exceeded action threshold throughout most of the seedling stage. Spinosad insecticide lowered the seasonal mean percent immature thrips, decreased thrips numbers 17 DAE, and reduced accumulated thrips days. Cultivars did not differ in thrips colonization but had a significant impact on thrips damage and leaf area. These data suggest that the new cultivars do not express host plant resistance but may have more tolerance to thrips compared to commercial varieties.

Acknowledgements

The project site was provided by Jimmy Wedel, Muleshoe, TX. This project was funded by the USDA National Institute of Food and Agriculture. We also acknowledge and thank Ray White, Hayden Hadley, Austin Mason, and Cole Miller for their contribution in collecting and processing thrips samples

Evaluation of Insecticide Oversprays for Control of Bollworms in Transgenic BT Cotton

Stephen Biles, Roy Parker, Clyde Crumley, Dale Mott,

Rick Minzenmayer, Kerry Siders, Monti Vandiver

2013 Final Report

OBJECTIVES

Determine if any benefit is gained by treating Bt cotton for caterpillars.

Determine if yield is enhanced by insecticide alone without pest present.

ABSTRACT

A project was initiated to determine if insecticide application for bollworm control can prevent yield losses associated with cotton bollworm feeding on Bt cotton. An additional objective was to see if yield was affected by the insecticide application in the absence of the insect pest. Five treatments were applied at seven locations across Texas in 2012 and 2013. Insect survival was very low to non-existent in the untreated research plots. No yield differences were found between treatments. While the research was unable to evaluate the effects of treating surviving worm populations on Bt Cotton, no yield response was found between treatments in the absence of caterpillar pests.

INTRODUCTION

Field scouting across the cotton belt has found Bt cotton to provide adequate control of cotton bollworm in most cases. However, some caterpillars survive on the Bt cotton and have the potential to cause yield losses. This can be a greater problem in fields where very high egg lay occurs which would theoretically results in greater survivorship.

State Extension cotton pest management guides provide instruction for managing bollworms in Bt cotton. These thresholds use insect counts for worms larger than ¼ inch in length.

A project was initiated to determine if insecticide application for bollworm control can prevent yield losses associated with cotton bollworm feeding. An additional objective was to see if yield was affected by the insecticide application in the absence of the insect pest.

MATERIALS & METHODS

Design: Randomized Complete Block – 4 replications

Locations: Port Lavaca, TX, Corpus Christi, TX, Wharton, TX, College Station, TX, Ballinger, TX, Levelland, TX, Muleshoe, TX

Bt Varieties: 2012 - 4 Bollgard II and 5 Widestrike cotton varieties

2013 - 4 Bollgard II and 3 Widestrike cotton varieties

Treatments: Untreated Control

Prevathon (14 oz/a)

Belt + Mustang Max (2 + 3.6 oz/a)

Besiege (8 oz/a)

Mustang Max (3.6 oz/a)

Data Analysis: Whole plant inspections for worm survival and feeding

injury of 10 plants / plot at 3, 7, 14 and21 DAT

Lint Yield normalized to percent of untreated control.

Pest Populations

2012

Few bollworms and minimal feeding injury was detected in the trial areas. The highest worm population in East Texas and Coastal Bend tests was 2.5 small worms per 100 plants. No worms found in West Texas. One Coastal Bend location found cotton square borers at population below 13 per 100 plants.

2013

Bollworms and minimal feeding injury was detected in the trial areas. College Station trial was only test site to find a large worm where one worm was found larger than ½ inch long. This treatment had 8.5% feeding injury on fruit but the feeding was not a cause of significant fruit loss. Few worms were found in South and West Texas

SUMMARY

The results of this research are unable to determine if any benefit was gained by treating Bt cotton with insecticides for caterpillars because few caterpillars were found in the test areas.

There was no effect on yield when the insecticide was applied in absence of caterpillar pests. When data was combined it did not show yield response to insecticide application. Yield differences were found at individual locations but the results were not consistent across locations.

Table 1. Cotton yields normalized to percent of untreated for nine treatments at nine locations across Texas in 2012.

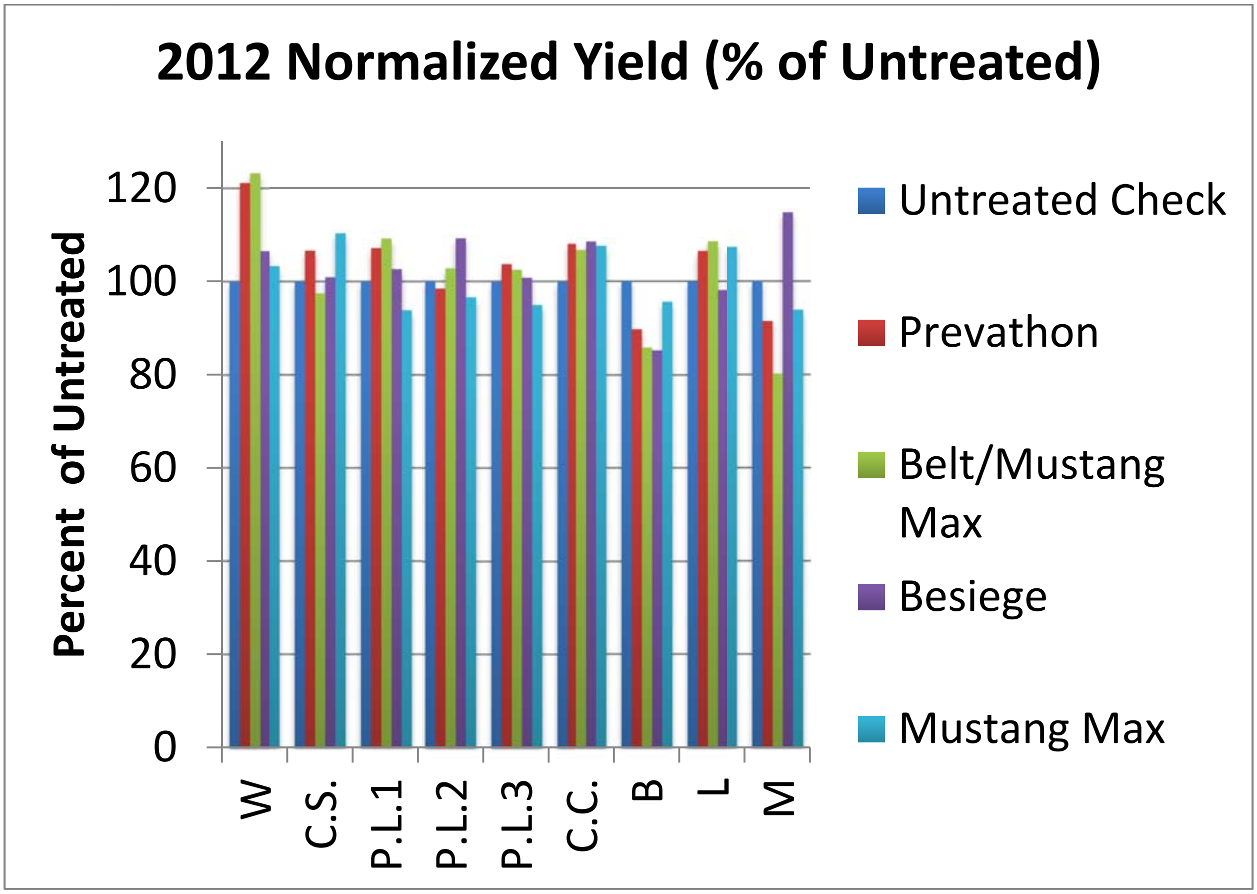


Table 1. Cotton yields normalized to percent of untreated for nine treatments at nine locations across Texas in 2012.

Table 2. Cotton yields normalized to percent of untreated for nine treatments across nine locations across Texas in 2012.

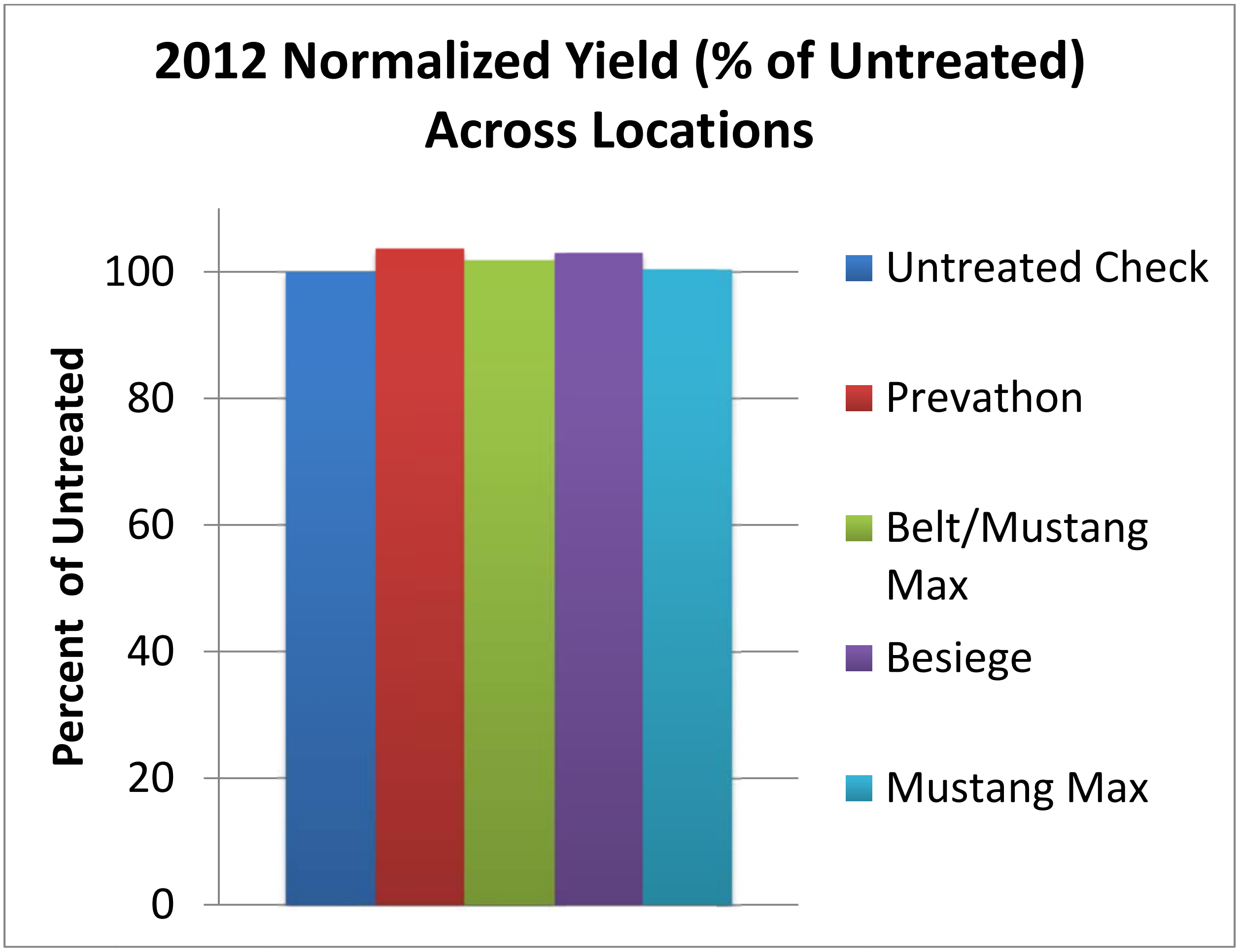


Table 3. Cotton yields normalized to percent of untreated for nine treatments at nine locations across Texas in 2013.

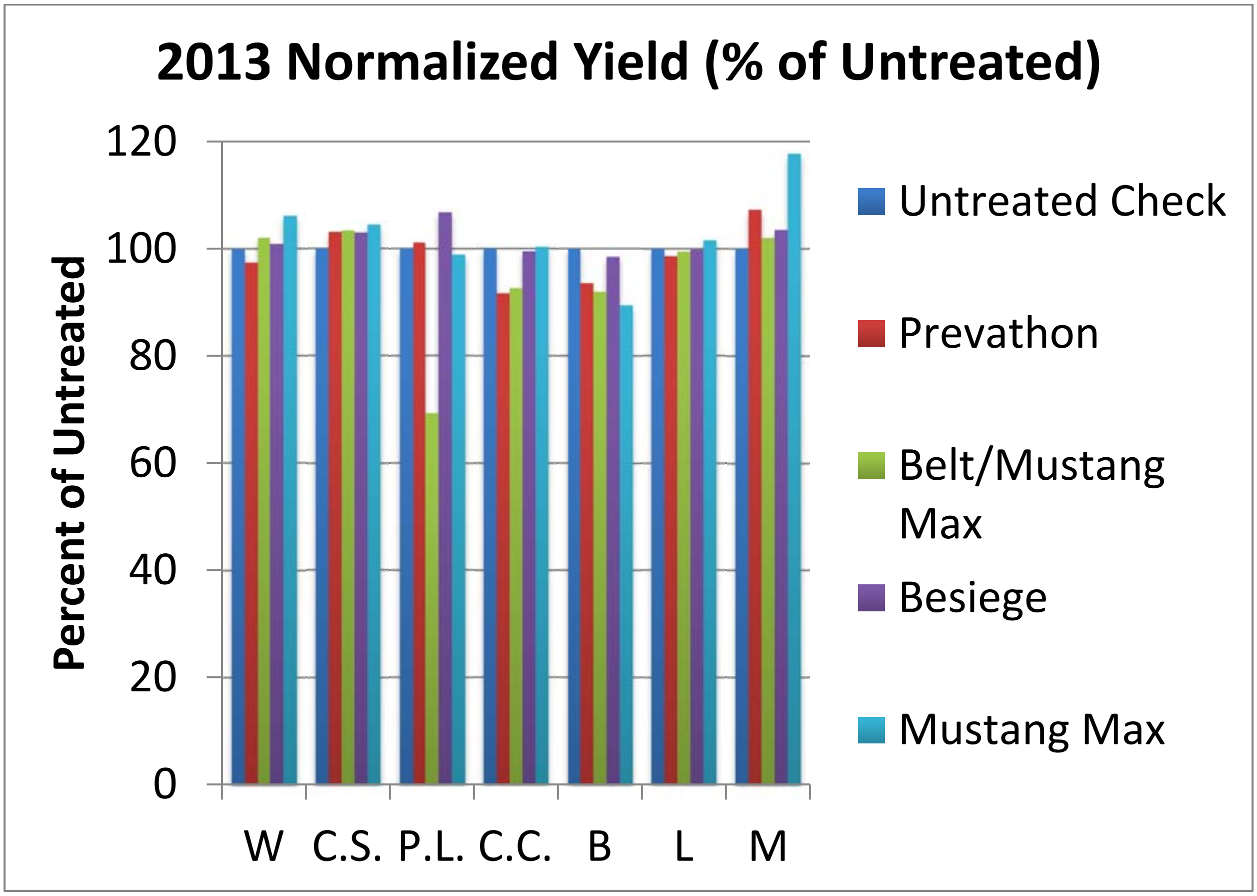
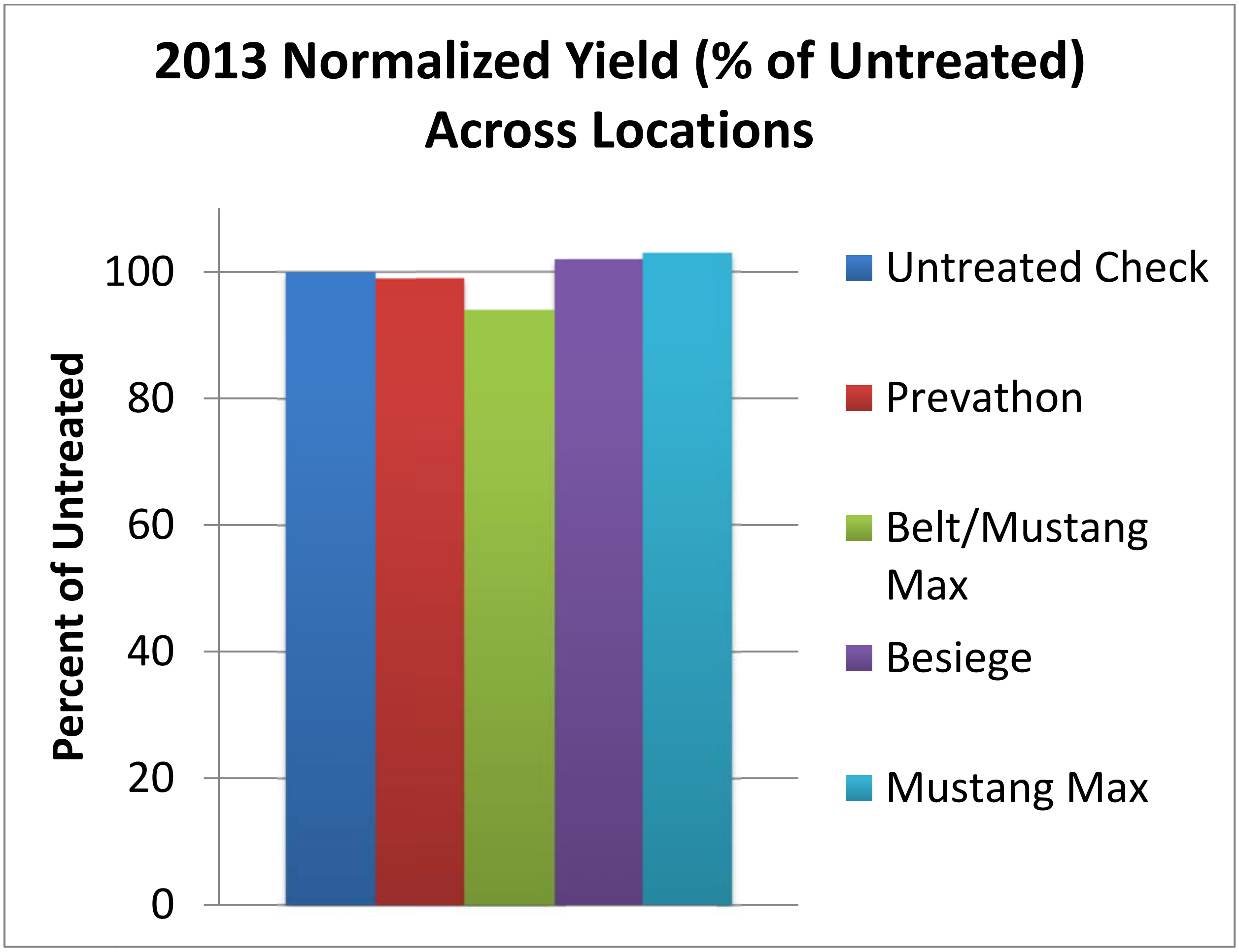


Table 2. Cotton yields normalized to percent of untreated for nine treatments across nine locations across Texas in 2013



MANAGEMENT OF THRIPS ON COTTON IN THE TEXAS HIGH PLAINS: EFFICACY OF SEED TREATMENTS

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Abstract

Three different insecticide seed treatments were evaluated for their efficacy to control thrips in cotton under Texas High Plains growing conditions. Less than optimum growing conditions, mainly temperature and dry weather delayed seedling growth, which might have affected the overall benefit of insecticide seed treatments. Germination was delayed by two weeks and thrips sampling 25 days after planting (DAP) indicated that seedlings receiving insecticide seed treatments were not fully protected from thrips and resulting thrips populations were higher than the recommended economic threshold level at this growth stage. Such a scenario warrants producers to use additional, curative insecticide applications to manage thrips population in cotton. One foliar application of Orthene® or Vydate® at threshold was able to manage the thrips population and thrips number was not significantly different from insecticide seed treatments. The lint yield gain in seed treatments and foliar insecticide application treatments compared to the untreated control was in the range of 5-10 per cent.

Introduction

The Texas High Plains region, which accounts for approximately 66% of the cotton production in Texas, is the most intense cotton growing region in the nation (Williams 2012). Each year, thrips species are the primary pests of cotton in this region, which annually translates into one to two million thrips-infested cotton acres. Until a few years ago, thrips on cotton were effectively managed by the commonly used in-furrow application of aldicarb (Temik®). However, phasing out of this effective product (Temik®) from the market has led to the adoption of alternatives such as seed treatments and increased use of foliar insecticide applications.

Thrips injury can range between simple cosmetic injury to significant yield loss depending upon thrips abundance, weather conditions, plant health, and crop management. One of the resultant effects of thrips injury in cotton is the delay in crop maturity (Cook *et al*. 2013), which is a very important consideration for Texas High Plains producers because of the shorter growing season, as compared to more southern and southeastern cotton growing regions. Therefore, delayed crop maturity as a result of thrips injury can potentially lead to reductions in lint yields and fiber quality. The primary objective of this study was to evaluate three different neonicotinoid seed treatments and two foliar insecticides for their effectiveness in managing early season thrips.

Materials and Methods

This study was conducted at the Texas A&M AgriLife Research farm located at Halfway, TX. Cotton seeds of variety FM1944 B2R were planted on 3 May, 2013. Each plot was 35 row-ft long and 4 rows wide (40-inch seedbed spacing). There were six different treatments: 1) Aeris® seed treatment, 2) Gaucho® + Poncho® seed treatment, 3) Avicta Complete® seed treatment, 4) Orthene® 97S @ 3 oz./A at threshold, 5) Vydate® @ 8.5 fl oz./A at threshold, and 6) untreated control. The initial thrips sampling at the cotyledon stage was conducted 25 days after planting on 28 May. Subsequently, three more weekly thrips counts were preformed to record thrips numbers (both adults and nymphs). From each plot (35 feet by 4 rows), 10 seedlings were visually inspected and numbers were recorded for both adult and immature thrips. In the respective experimental plots, one application of both Orthene® and Vydate® were made as the thrips population was above the recommended threshold level. Insecticides were applied using a hand-held 2-row boom with 40-inch nozzle spacing, flat fan TeeJet XR8003VS nozzles, and 30 psi (resulted in 10 gpa total spray volume). Prior to harvest, plant height and the number/location of 1^{st}-position harvestable and non-harvestable bolls were recorded to evaluate the effect of treatments on plant growth, especially with regard to delayed maturity. Finally, plots were hand harvested from 10 row feet (approximately 20-22 plants) and processed for ginning to obtain the lint yield.

Results and Discussion

Cool weather conditions immediately after planting delayed germination/seedling emergence by more than 2 weeks. The first week of thrips sampling indicated the number of thrips in the three seed treatments were significantly lower than the untreated control (Fig. 1A). Thrips numbers in the two foliar treatments are basically pre-treatment counts (first week of sampling; Fig. 1A). The plots for these two foliar treatments received the first insecticide applications immediately after the pre-treatment count, thus allowing the effect of the foliar application to be observed at the time of the 2^{nd} week sampling (Fig. 1B). Although the number of thrips, especially the adults, during the first week of sampling was lower in the plots with seed treatments than the control, the number of thrips exceeded the recommended economic threshold. This situation would necessitate additional, curative foliar applications on the seed treatment plots. However, limited reproduction, as evident by number of immature thrips, occurred on the seed treatment plots, especially on the Aeris® and Avicta Complete® as compared to the control plots where more than three immature thrips per plant were recorded on the first week of sampling. The second week of sampling revealed that the overall thrips numbers in all the treatments were lower than the previous week and the numbers were not statistically different. It appears that the first applications of the two foliar insecticides (Orthene® and Vydate®) were able to reduce the number of thrips considerably (Fig. 1B). We recorded negligible reproduction of thrips during this period, irrespective of the treatments. Usually it is expected that the number of thrips would increase in the untreated control on the subsequent sampling dates. However, we did not see that trend and we speculate that there was no re-infestation of thrips into the study field and likely the weather conditions, such as low temperature and gusty winds, might have prevented the development of thrips during that period of time.

The number of thrips (adults) observed in the seed treatment plots were approximately two per plant, which suggests that the efficacy of the chemicals on the seed treatments was low. The diminishing efficacy of seed treatments at this stage (33 days after planting) is relatively clear. Several studies conducted across the cotton belt have indicated that seed treatments are not highly effective beyond 3-4 weeks after planting. Therefore, if producers encounter situations where insecticide treated seeds are delayed in their germination and seedling emergence, the seed treatments are likely not able to fully protect the plants from thrips. The third week of sampling indicated that the Orthene® applied plots had fewer thrips than the Aeris® and Gaucho®+ Poncho® treatments (Fig. 1C). The fourth week of sampling indicated that, except for the control, all treatments had significantly lower number of thrips (<1 thrips/plant; Fig. 1D). By this time, the plants were at the 4-true leaf stage, thus plants were beyond cotton plants' thrips susceptibility window.

Pre-harvest plant mapping indicated that there were no significant differences in plant growth among the different treatment plots, as evidenced by the pre-harvest plant heights (Fig. 2). The number of non-harvestable bolls also did not vary significantly among the treatments, which suggests that there were no differences in crop maturity (Fig. 3). Although we observed high thrips numbers early in the season, likely these thrips did not colonize fully in order to cause extensive long-term injury. We observed numerical differences between the treatments and control plots in lint yield, but none of the differences were statistically significant (Fig. 4).

Summary

Based on the results from this study, seed treatments appear to be effective in reducing the number of thrips, especially Aeris® and Avicta Complete®, both performed equally in minimizing immature populations. However, realized protection from seed treatments may be less than expected in the event that seeds do not germinate in a timely manner. Foliar application of Orthene®, when thrips populations were above the action threshold, resulted in good thrips control, which means producers can use Orthene® as remedial applications if seed treatments do not provide adequate control. Outcome of thrips injury in terms of delayed maturity and yield reduction can vary from year to year. This is especially true for thrips since plants have enough time to compensate the injury received early in the season provided that the cotton receives good weather conditions, adequate moisture, and protection from late season pests. However, in the Texas High Plains region, growing conditions are typically characterized by periods of low rainfall and could also be limited by cool temperature during the fall, both of which call for attention in early season thrips management to get the plants off to a good start. This study will be repeated next year in multiple locations to hopefully observe the variation in crop response to thrips injury. Additionally, we will be recording the thrips species composition in our studies to understand if there are any relationships in efficacy of these seed treatments with specific thrips species.

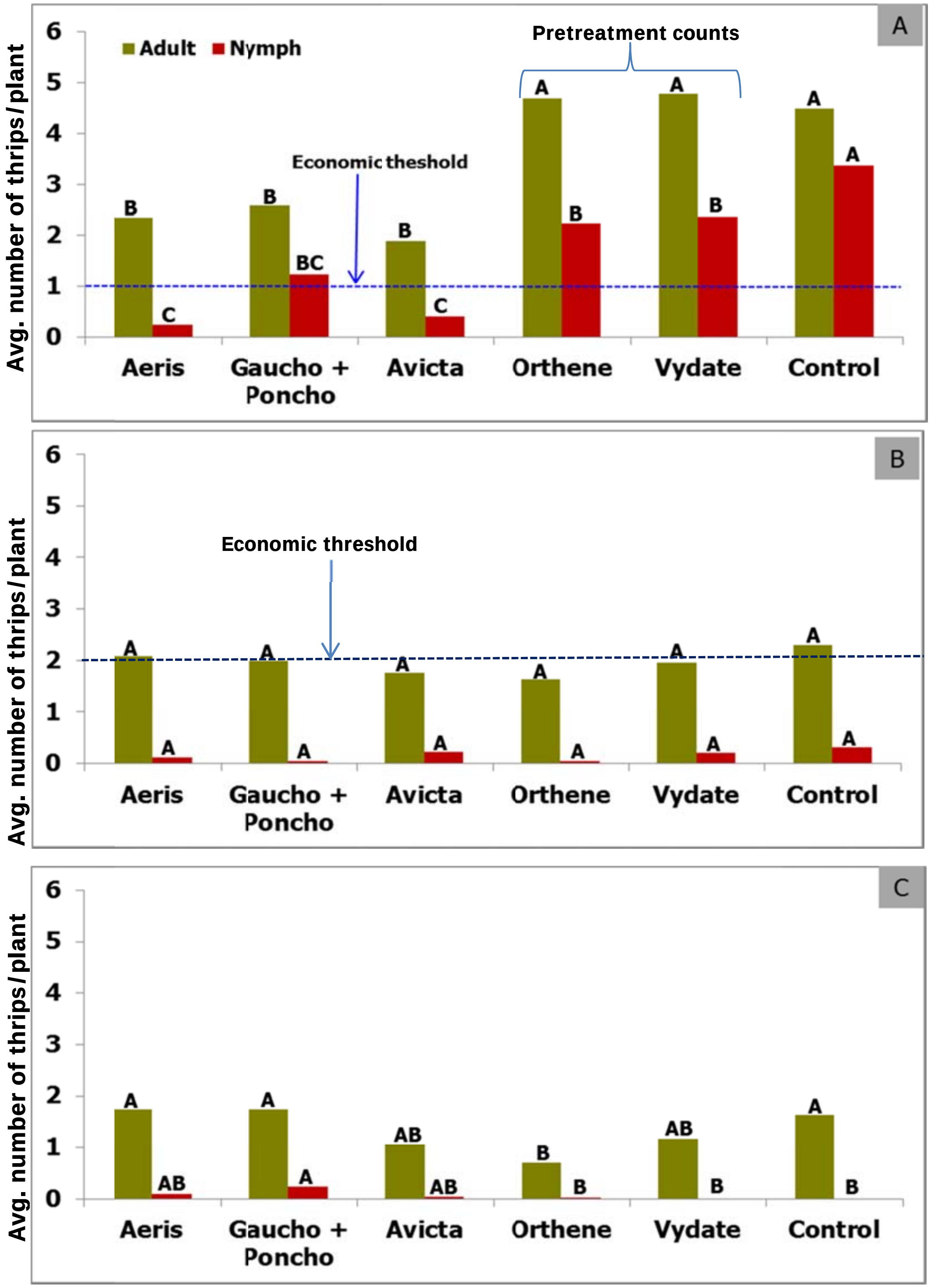
Acknowledgments

This study was funded by Cotton Incorporated Texas State Support Committee and Plains Cotton Growers, Inc. We acknowledge Bayer CropScience for the cotton seeds and partial financial support.

References

Cook, D. R., B. G. Leonard, E. Burris, and J. Gore. 2013. Impact of thrips infesting cotton seedlings on cotton yield distribution and maturity. *Journal of Cotton Science* **17**: 23-33.

Williams, M. R. 2012. Cotton insect loss estimates - 2011, pp. 1001-1012. *In* Proc. Beltwide Cotton Conferences, National Cotton Council of America, Memphis, TN.


A
Adult
Nymph
Pretreatment counts
Economic theshold
Avg. number of thrips/plant
0
1
2
3
4
5
6
B
C
B
BC
B
C
A
B
A
B
A
A
Aeris
Gaucho + Poncho
Avicta
Orthene
Vydate
Control
B
Economic threshold
Avg. number of thrips/plant
A
A
A
A
A
A
A
A
A
A
A
A
Aeris
Gaucho + Poncho
Avicta
Orthene
Vydate
Control
C
Avg. number of thrips/plant
A
AB
A
A
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Gaucho + Poncho
Avicta
Orthene
Vydate
Control

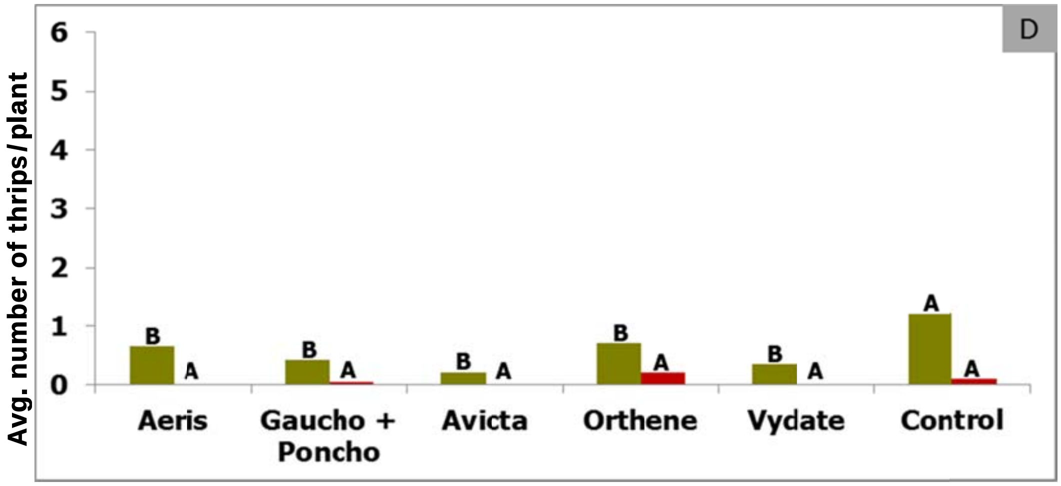


Figure 1. Number of adult and immature thrips per plant at four sampling dates/days after planting (DAP). A. 25 DAP, B. 35 DAP, C. 44 DAP, and D. 51 DAP.

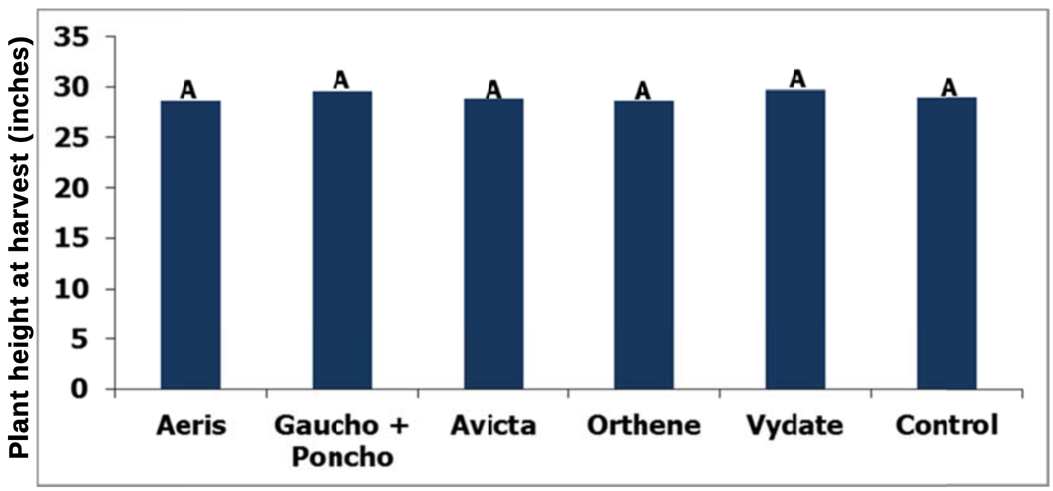


Figure 2. Average plant height (inches) during the pre-harvest crop stage.

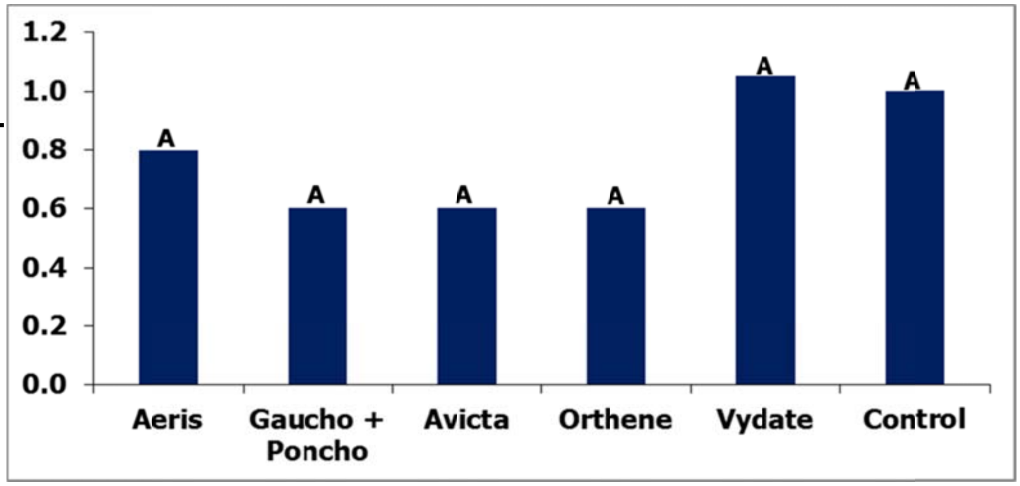


Figure 3. Average number of non-harvestable bolls per plant in different treatments.

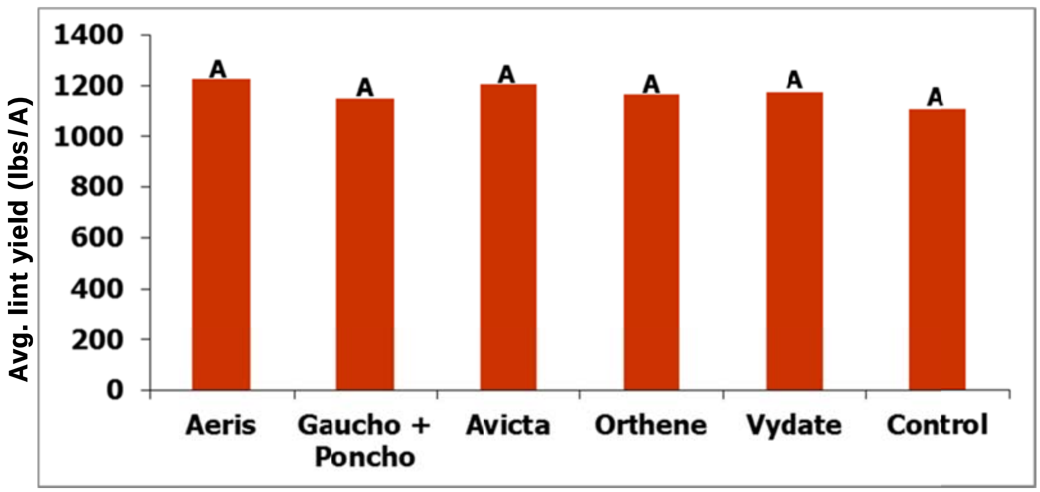


Figure 4. Average lint yield in different treatments.

Texas A&M AgriLife Extension

Evaluation of Huskie Herbicide Crop Safety on Grain Sorghum

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

General Trial Information

Investigator: Monti Vandiver   **Title:** EA-IPM

Discipline: H herbicide
Trial Status: F one-year/final   **Trial Reliability:** HIGH
Initiation Date: Jul-15-2013
Completion Date: Nov-5-2013

Trial Location

City: Muleshoe
State/Prov.: Texas

Investigator: Monti Vandiver   **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C   **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas   **Mobile No.:** 575-799-1040
Postal Code: 79347   **E-mail:** mrvandiver@ag.tamu.edu

Sponsor: Russ Perkins
Organization: Bayer CropScience

Cooperator/Landowner

Cooperator: Shannon Weaver   **Role:** FALDOW
City: Muleshoe, Texas

Crop Description

Crop 1: SORVU   Sorghum vulgare   Grain sorghum
Row Spacing, Unit: 30   IN
Harvested Length, Unit: 17.4 FT
Soil Moisture: NORMAL normal, adequate   **Harvest Equipment:** Hand

Site and Design

Treated Plot Width: 10 FT   **Site Type:** FIELD   field
Treated Plot Length: 40 FT
Treated Plot Area: 400   FT2   **Treatments:** 4   **Tillage Type:** CONTIL   conventional-till
Replications: 4   **Study Design:** RACOBL Randomized Complete Block (RCB)

Application Description

	A
Application Date:	Jul-15-2013
Appl. Stop Time:	4:00 AM
Application Method:	SPRAY
Application Timing:	POEMCR
Application Placement:	FOLIAR
Applied By:	Monti
Air Temperature, Unit:	72 F
% Relative Humidity:	59
Wind Velocity, Unit:	11 MPH
Wind Direction:	ESE
Dew Presence (Y/N):	N no
% Cloud Cover:	70

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	SORVU BGRM
Height, Unit:	12 IN
Height Minimum, Maximum:	12 18
Crop coverage (%):	100

Texas A&M AgriLife Extension

Evaluation of Huskie Herbicide Crop Safety on Grain Sorghum

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Application Equipment

	A
Appl. Equipment:	SPPS
Equipment Type:	SPRAYE
Operation Pressure, Unit:	28 PSI
Nozzle Type:	FLAFAN
Nozzle Size:	8002
Nozzle Spacing, Unit:	15 IN
Nozzles/Row:	2
% Coverage:	100
Boom Length, Unit:	10 FT
Boom Height, Unit:	32 IN
Ground Speed, Unit:	3 MPH
Carrier:	WATER
Spray Volume, Unit:	20 gal/ac
Mix Size, Unit:	2 gallons
Propellant:	COMCO2

Texas A&M AgriLife Extension

Evaluation of Huskie Herbicide Crop Safety on Grain Sorghum

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Part Rated	PLANT C	PLANT C	PLANT C	PLANT C	PLANT C	PLANT C	PLANT C	PLANT C
Rating Date	Jul-19-2013	Jul-19-2013	Jul-19-2013	Jul-24-2013	Jul-24-2013	Jul-24-2013	Jul-24-2013	Jul-24-2013
Rating Type	PHYNEC	PHYDEF	PHYCHL	PHYNEC	PHYDEF	PHYCHL	PHYSTU	HEIGHT
Rating Unit	0-10	0-10	0-10	0-10	0-10	0-10	0-10	IN
Days After First/Last Applic.	4 4	4 4	4 4	9 9	9 9	9 9	9 9	9 9
Treatment Name / Rate / Rate Unit / Appl Code								
Untreated	0.0 c	0.0 a	0.0 d	0.0 b	0.0 a	0.0 c	0.0 c	24.00 a
Huskie 16 oz/a A Atrazine 1 pt/a A Ammonium Sulfate 1 lb/a A	3.5 a	0.0 a	4.3 a	2.8 a	0.0 a	3.5 a	2.8 a	19.00 c
Huskie 16 oz/a A Atrazine 1 pt/a A Ammonium Sulfate 1 lb/a A Iron Chelate 16 oz/a A	2.5 b	0.0 a	2.5 b	2.3 a	0.0 a	2.8 b	2.0 b	19.75 bc
Huskie 16 oz/a A Atrazine 1 pt/a A Ammonium Sulfate 1 lb/a A SoyGreen 2 qt/a A	2.0 b	0.0 a	1.3 c	2.3 a	0.0 a	3.0 ab	2.0 b	21.25 b
LSD (P=.05)	0.53	0.00	0.53	0.93	0.00	0.55	0.40	1.654
CV	16.67	0.0	16.67	32.18	0.0	14.86	14.81	4.92
Grand Mean	2.0	0.0	2.0	1.81	0.0	2.31	1.69	21.0
Replicate F	3.000	0.000	4.500	1.163	0.000	1.941	1.000	0.117
Replicate Prob(F)	0.0877	1.0000	0.0343	0.3763	1.0000	0.1936	0.4363	0.9479
Treatment F	78.000	0.000	118.500	17.816	0.000	83.824	89.000	18.234
Treatment Prob(F)	0.0001	1.0000	0.0001	0.0004	1.0000	0.0001	0.0001	0.0004

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Texas A&M AgriLife Extension

Evaluation of Huskie Herbicide Crop Safety on Grain Sorghum

Location: Muleshoe, Texas Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Part Rated	PLANT C	PLANT C	PLANT C	PLANT C	PLANT C	YIELD C
Rating Date	Jul-30-2013	Jul-30-2013	Jul-30-2013	Jul-30-2013	Oct-10-2013	Nov-5-2013
Rating Type	PHYNEC	PHYDEF	PHYCHL	HEIGHT	HEIGHT	WEIGHT
Rating Unit	0-10	0-10	0-10	IN	IN	/acre
Days After First/Last Applic.	15 15	15 15	15 15	15 15	87 87	113 113
Treatment Name / Rate / Rate Unit / Appl Code						
Untreated	0.5 b	0.0 a	0.5 a	25.8 a	53.0 a	6841.5 a
Huskie 16 oz/a A Atrazine 1 pt/a A Ammonium Sulfate 1 lb/a A	1.8 a	0.0 a	1.5 a	23.3 a	53.5 a	6729.0 a
Huskie 16 oz/a A Atrazine 1 pt/a A Ammonium Sulfate 1 lb/a A Iron Chelate 16 oz/a A	1.8 a	0.0 a	1.5 a	23.8 a	53.5 a	6857.8 a
Huskie 16 oz/a A Atrazine 1 pt/a A Ammonium Sulfate 1 lb/a A SoyGreen 2 qt/a A	0.5 b	0.0 a	0.5 a	26.0 a	53.5 a	6553.8 a
LSD (P=.05)	0.96	0.00	1.07	2.90	1.58	1044.36
CV	53.42	0.0	66.67	7.34	1.85	9.68
Grand Mean	1.13	0.0	1.0	24.69	53.38	6745.5
Replicate F	0.231	0.000	0.000	0.273	3.514	3.908
Replicate Prob(F)	0.8727	1.0000	1.0000	0.8436	0.0622	0.0486
Treatment F	5.769	0.000	3.000	2.353	0.257	0.184
Treatment Prob(F)	0.0176	1.0000	0.0877	0.1402	0.8544	0.9046

Texas A&M AgriLife Extension

Evaluation of Huskie Herbicide Crop Safety on Grain Sorghum

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Part Rated
PLANT = plant
YIELD = yield
C = Crop is Part Rated
Rating Type
PHYNEC = phytotoxicity - necrosis /burn
PHYDEF = phyto. deformation (cupping, epinasty, leaf wrap, wrinkling)
PHYCHL = phytotoxicity - chlorosis
PHYSTU = phytotoxicity - stunting
HEIGHT = height
WEIGHT = weight
Rating Unit
0-10 = 0-10 index/scale
IN = inch
/acre = per acre

Footnote 1: LBS?acre at 14% moisture

Texas A&M AgriLife Extension

Evaluation of Weed Control Efficacy of Huskie Herbicide and Tank Mixes in Grain Sorghum

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

General Trial Information

Investigator: Monti Vandiver   **Title:** EA-IPM

Discipline: H herbicide
Trial Status: F one-year/final   **Trial Reliability:** GOOD
Initiation Date: Jul-16-2013
Completion Date: Oct-10-2013

Trial Location

City: Lazbuddie
State/Prov.: Texas

Investigator: Monti Vandiver   **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C   **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas   **Mobile No.:** 575-799-1040
Postal Code: 79347   **E-mail:** mrvandiver@ag.tamu.edu

Sponsor: Russ Perkins
Organization: Bayer CropScience

Cooperator/Landowner

Cooperator: Sean Mason   **Role:** FALDOW
City: Muleshoe
State/Prov: Texas

Crop Description

Crop 1: SORVU   Sorghum vulgare   Grain sorghum
Row Spacing, Unit: 30   IN
Soil Moisture: NORMAL normal, adequate

Pest Description

Pest 1 Type: W   **Code:** IPOCC Ipomoea coccinea
Common Name: Scarlet morningglory
Description: Red Morningglory

Site and Design

Treated Plot Width: 10 FT   **Site Type:** FIELD   field
Treated Plot Length: 40 FT
Treated Plot Area: 400   FT2   **Treatments:** 10   **Tillage Type:** CONTIL   conventional-till
Replications: 4   **Study Design:** RACOBL Randomized Complete Block (RCB)

Application Description

	A
Application Date:	Jul-16-2013
Appl. Start Time:	4:00
Application Method:	SPRAY
Application Timing:	EAPOWE
Application Placement:	FOLIAR
Applied By:	Monti
Air Temperature, Unit:	72 F
% Relative Humidity:	61
Wind Velocity, Unit:	10 MPH
Wind Direction:	SE
Dew Presence (Y/N):	N no

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	SORVU BGRM
Stage Scale Used:	BBCH
Height, Unit:	12 IN

Texas A&M AgriLife Extension

Evaluation of Weed Control Efficacy of Huskie Herbicide and Tank Mixes in Grain Sorghum

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Pest Stage At Each Application

	A
Pest 1 Code, Type, Scale:	IPOCC W
Height, Unit:	3 IN
Height Minimum, Maximum:	1 5

Application Equipment

	A
Appl. Equipment:	SPPS
Equipment Type:	SPRAYE
Operation Pressure, Unit:	28 PSI
Nozzle Type:	FLAFAN
Nozzle Size:	8002
Nozzle Spacing, Unit:	15 IN
Nozzles/Row:	2
% Coverage:	100
Boom Length, Unit:	10 FT
Boom Height, Unit:	30 IN
Ground Speed, Unit:	3 MPH
Carrier:	WATER
Spray Volume, Unit:	20 gal/ac
Mix Size, Unit:	1.5 gallons
Propellant:	COMCO2

Texas A&M AgriLife Extension

Evaluation of Weed Control Efficacy of Huskie Herbicide and Tank Mixes in Grain Sorghum

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Description / Part Rated / Rating Type / Rating Unit / Days After First/Last Applic.				Crop Burn PLANT C PHYNEC 0-10 3 3	Crop Deformati> PLANT C PHYDEF 0-10 3 3	Crop Chlorosis PLANT - PHYCHL 0-10 3 3	Crop Burn PLANT C PHYNEC 0-10 10 10	Crop Deformati> PLANT C PHYDEF 0-10 10 10	Crop Chlorosis PLANT C PHYCHL 0-10 10 10	Morningglory PLANT P PESCON % 10 10
Treatment Name	Rate	Rate Unit	Appl Code							
Untreated				0.0 f	0.0 c	0.0 e	0.0 g	0.0 c	0.0 d	0.0 b
Huskie	13	oz/a	A	2.0 cd	0.0 c	2.5 c	1.5 e	0.0 c	1.8 c	100.0 a
Atrazine	1	pt/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Huskie	16	oz/a	A	2.7 bc	0.0 c	3.3 b	2.5 c	0.0 c	2.5 b	100.0 a
Atrazine	1	pt/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	16	oz/a	A							
Huskie	16	oz/a	A	3.2 b	0.0 c	4.0 a	3.2 b	0.0 c	2.8 b	100.0 a
Atrazine	1	pt/a	A							
Ammonium Sulfate	1	lb/a	A							
NIS	0.25	% v/v	A							
Iron Chelate	16	oz/a	A							
Huskie	13	oz/a	A	2.0 cd	4.5 a	2.8 bc	1.0 f	3.0 ab	1.5 c	100.0 a
Atrazine	1	pt/a	A							
2,4-D Amine	4	oz/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Huskie	13	oz/a	A	1.7 d	3.3 b	2.3 c	1.0 f	3.2 a	2.5 b	100.0 a
Atrazine	1	pt/a	A							
Banvel	4	oz/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Huskie	13	oz/a	A	1.7 d	0.0 c	2.3 c	2.0 d	0.0 c	1.5 c	100.0 a
Atrazine	1	pt/a	A							
Starane Ultra	3	oz/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Huskie	13	oz/a	A	8.7 a	0.3 c	0.8 d	9.0 a	2.7 b	4.8 a	100.0 a
Atrazine	1	pt/a	A							
Aim EC	0.5	oz/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Atrazine	1	pt/a	AA	0.6 e	0.0 c	1.0 d	0.0 g	0.0 c	0.5 d	98.8 a
Buctril	1	pt/a	A							
Huskie	13	oz/a	A	1.7 d	0.0 c	2.5 c	2.0 d	0.0 c	1.3 c	98.8 a
Atrazine	1	pt/a	A							
Ammonium Sulfate	1	lb/a	A							
SoyGreen	2	qt/a	A							
LSD (P=.05)				0.26t	0.44	0.74	0.13t	0.54t	0.75	1.65
CV				11.06	38.04	24.09	6.09	12.57	27.18	1.27
Grand Mean				1.62t	0.8	2.13	1.52t	2.99t	1.9	89.75
Replicate F				1.047	0.000	8.491	1.072	1.379	1.000	0.643
Replicate Prob(F)				0.3876	1.0000	0.0004	0.3773	0.2703	0.4079	0.5941
Treatment F				46.575	117.480	22.314	217.116	657.814	26.500	3069.429
Treatment Prob(F)				0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Means followed by same letter do not significantly differ (P=.05, LSD)
t=Mean descriptions are reported in transformed data units, and are not de-transformed.
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Texas A&M AgriLife Extension

Evaluation of Weed Control Efficacy of Huskie Herbicide and Tank Mixes in Grain Sorghum

Location: Muleshoe, Texas Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Description				Pigweed	Crop Burn	Crop Deformati>	Crop Chlorosis	Crop Stunting	Weed Control	Lodging
Part Rated				PLANT P	PLANT C	PLANT C	PLANT C	PLANT C	PLANT P	PLANT C
Rating Type				PESCON	PHYNEC	PHYDEF	PHYCHL	PHYSTU	PESCON	LODGIN
Rating Unit				%	0-10	0-10	0-10	0-10	%	percent
Days After First/Last Applic.				10 10	17 17	17 17	17 17	17 17	86 86	86 86
Treatment Name	Rate	Rate Unit	Appl Code							
Untreated				0.0 e	0.0 e	0.0 b	0.0 d	0.0 c	0.0 c	16.6 a
Huskie	13	oz/a	A	92.5 a-d	0.7 cd	0.0 b	0.0 d	0.4 bc	100.0 a	15.4 a
Atrazine	1	pt/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Huskie	16	oz/a	A	89.9 bcd	1.2 bc	0.0 b	0.6 bc	1.1 b	100.0 a	19.4 a
Atrazine	1	pt/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	16	oz/a	A							
Huskie	16	oz/a	A	97.4 abc	1.5 b	0.0 b	1.0 ab	1.2 b	100.0 a	32.4 a
Atrazine	1	pt/a	A							
Ammonium Sulfate	1	lb/a	A							
NIS	0.25	% v/v	A							
Iron Chelate	16	oz/a	A							
Huskie	13	oz/a	A	99.4 ab	0.4 d	1.0 a	0.1 cd	0.4 bc	100.0 a	43.1 a
Atrazine	1	pt/a	A							
2,4-D Amine	4	oz/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Huskie	13	oz/a	A	98.1 abc	0.0 e	1.2 a	0.1 cd	0.7 b	100.0 a	28.9 a
Atrazine	1	pt/a	A							
Banvel	4	oz/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Huskie	13	oz/a	A	95.6 abc	1.0 bc	0.0 b	0.0 d	0.4 bc	97.5 ab	38.9 a
Atrazine	1	pt/a	A							
Starane Ultra	3	oz/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Huskie	13	oz/a	A	100.0 a	2.7 a	0.9 a	2.0 a	3.7 a	100.0 a	9.2 a
Atrazine	1	pt/a	A							
Aim EC	0.5	oz/a	A							
Ammonium Sulfate	1	lb/a	A							
Iron Chelate	13	oz/a	A							
Atrazine	1	pt/a	AA	69.1 d	0.0 e	0.0 b	0.1 cd	0.0 c	100.0 a	23.3 a
Buctril	1	pt/a	A							
Huskie	13	oz/a	A	84.3 cd	0.7 cd	0.0 b	0.1 cd	0.0 c	95.0 b	23.6 a
Atrazine	1	pt/a	A							
Ammonium Sulfate	1	lb/a	A							
SoyGreen	2	qt/a	A							
LSD (P=.05)				18.22t	0.22t	0.18t	2.99t	0.35t	3.39	3.14t
CV				18.34	13.86	14.59	86.1	22.54	2.62	43.64
Grand Mean				68.47t	1.1t	0.87t	2.39t	1.07t	89.25	4.95t
Replicate F				0.900	4.661	1.066	0.712	2.028	1.678	1.125
Replicate Prob(F)				0.4540	0.0095	0.3797	0.5532	0.1337	0.1952	0.3566
Treatment F				17.076	21.396	16.853	7.194	11.282	722.085	1.005
Treatment Prob(F)				0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.4599

Texas A&M AgriLife Extension

Evaluation of Weed Control Efficacy of Huskie Herbicide and Tank Mixes in Grain Sorghum

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver
Sponsor Contact: Russ Perkins

Part Rated
PLANT = plant
C = Crop is Part Rated
P = Pest is Part Rated
Rating Type
PHYNEC = phytotoxicity - necrosis /burn
PHYDEF = phyto. deformation (cupping, epinasty, leaf wrap, wrinkling)
PHYCHL = phytotoxicity - chlorosis
PESCON = pest control
PHYSTU = phytotoxicity - stunting
LODGIN = lodging
Rating Unit
0-10 = 0-10 index/scale
% = percent

Footnote 1: Lodging including plants pulled over by morningglory

Grain Sorghum Hybrid trial (2013)
Chris Bass Farm

Planting Date 5/27/2013
Row Spacing 30 inch

Seeding Rate 43,500 seed/acre

Irrigation capacity 3.3 GPM/acre

Fertility: 120lbs/acre 82-0-0; 5.5 Gal/acre 32-0-0 + iron chelate (strip till band)

Weed management: 1 LB atrazine + 1 pt Dual pre-emerge; cultivation; 1 LB atrazine + 8 oz/acre Sterling Blue layby

Whole plots (.69 acres) were machine harvested for grain, weighed and moisture tested Oct 10.

Potential grain yield, moisture, and bu weight of a grain sorghum hybrid trial, Chris Bass Farm, Muleshoe, TX, 2013.[1]

Hybrid	Moisture %	LBS/bu	lbs/acre @ 14% Moisture
NK 266	13.1	59.9	5541
84P80	13.1	60.3	6751
KS 585	12.9	60.7	6096
7B30	13.1	60.8	6348
TR 4941	14.0	59.6	6792
W 851	14.0	59.5	5789
DKS 49-45	13.7	59.6	6291
W 844-E	13.7	60.1	5945
84G62	13.8	60.1	6743
DKS 53-67	14.3	60.5	7078

[1]Unreplicated data

Grain Sorghum Hybrid trial (2013)
Chris Bass Farm

Planting Date 5/27/2013
Row Spacing 30 inch
Seeding Rate 43,500 seed/acre
Irrigation capacity 3.3 GPM/acre
Fertility: 120lbs/acre 82-0-0;   5.5 Gal/acre 32-0-0 + iron chelate
Weed managemnt: 1 LB atrazine + 1 pt Dual pre-emerge; cultivation; 1 LB atrazine + 8 oz/acre Sterling Blue layby

Small plots were hand harvested and weighed from each hybrid (1 replication)and chopped in a wood chipper to collect silage samples for feed value analysis 9/13/2013.

Potential silage yield and feed value of grain sorghum hybrids.[1]

Company	Hybrid	Moisture %	Tons/acre*	RFV**
Triumph	TR 4941	69.86	12.2	172
Warner	W 851	71.51	13.8	158
Pioneer	84G62	70.64	16.5	157
Dekalb	DKS 53-67	71.74	16.0	158
Sorghum Partners	KS 585	66.92	15.3	171
Channel	7B30	72.96	13.8	140
Sorghum Partners	NK 266	69.61	11.9	156
Pioneer	84P80	67.8	15.2	151
Dekalb	DKS 49-45	70.16	12.9	152
Warner	W 844-E	63.82	15.8	143

[1]Unreplicated data
*Tons/acre at 68% moisture
**Relative Feed Value

Texas A&M AgriLife Extension

Evaluation of Inoculant and Humus Applied at Planting In-Furrow on Green Beans

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver

General Trial Information

Investigator: Monti Vandiver   **Title:** EA-IPM

Discipline: D/P fertilizer/growth regulator
Trial Status: F   one-year/final
Initiation Date: Jul-20-2013
Completion Date: Sep-11-2013

Trial Location

City: Muleshoe
State/Prov.: Texas

Investigator: Monti Vandiver   **Title:** EA-IPM
Organization: Texas A&M AgriLife Extension
Address: 118 West Avenue C   **Phone No.:** 806-272-4583
City+State/Prov: Muleshoe, Texas   **Mobile No.:** 575-799-1040
Postal Code: 79347   **E-mail:** mrvandiver@ag.tamu.edu

Cooperator/Landowner

Cooperator: Jordan Pool   **Role:** FALDOW
City: Muleshoe
State/Prov: Texas

Crop Description

Crop 1: PHSVX   Phaseolus vulgaris   Garden bean
Variety: Roma II
Planting Date: Jul-20-2013
Planting Method: PLANTD planted
Row Spacing, Unit: 30   IN
Harvest Date: Sep-11-2013
Harvested Width, Unit: 30   IN
Harvested Length, Unit: 10   FT
Harvest Equipment: hand

Site and Design

Treated Plot Width: 30   FT   **Site Type:** FIELD   field
Treated Plot Length: 1500 FT
Treated Plot Area: 45000   FT2   **Treatments:** 3   **Tillage Type:** CONTIL   conventional-till
Replications: 3   **Study Design:** RACOBL Randomized Complete Block (RCB)

Application Description

	A
Application Date:	Jul-20-2013
Application Method:	SEEAPO
Application Timing:	ATPLAN
Application Placement:	SEEZON

Crop Stage At Each Application

	A
Crop 1 Code, BBCH Scale:	PHSVX BVBE

Texas A&M AgriLife Extension

Evaluation of Inoculant and Humus Applied at Planting In-Furrow on Green Beans

Location: Muleshoe, Texas   Trial Year: 2013
Investigator: Monti Vandiver

Description			Plants/10ft	Bio Mass lbs/1>	Pods g/10ft	% pods	seed size/10
Rating Date			Jul-29-2013	Sep-11-2013	Sep-11-2013	Sep-11-2013	Sep-11-2013
Rating Type			COUNT	WEIGHT	WEIGHT	PERCEN	LENGTH
Rating Unit			PLANT	LB	g	percent	cm
Plant-Eval Interval			9 DP-1	53 DP-1	53 DP-1	53 DP-1	53 DP-1
Treatment Name	Rate	Rate Unit					
Untreated Check			30.0 a	11.97 a	2285.0 a	0.413 a	8.60 a
Dyna Start Max Humus	0.11 1	gal/a qt/a	34.0 a	12.40 a	2433.3 a	0.433 a	8.77 a
Dyna Start Max Humus	0.055 1	gal/a pt/a	32.3 a	12.83 a	2595.0 a	0.445 a	9.03 a
LSD (P=.10)			8.09	1.837	794.05	0.0999	0.873
CV			14.48	8.51	18.71	13.34	5.7
Grand Mean			32.11	12.4	2437.78	0.43	8.8
Replicate F			1.949	4.392	2.044	0.474	4.821
Replicate Prob(F)			0.2566	0.0979	0.2445	0.6537	0.0860
Treatment F			0.560	0.506	0.347	0.243	0.570
Treatment Prob(F)			0.6102	0.6369	0.7264	0.7953	0.6058

Rating Type
- COUNT = count
- WEIGHT = weight
- PERCEN = percent
- LENGTH = length

Rating Unit
- PLANT = plant
- LB = pound
- g = gram
- cm = centimeter

Plant-Eval Interval
- 9 DP-1 = 1 PHSVX Jul-20-2013
- 53 DP-1 = 1 PHSVX Jul-20-2013

ARM Action Codes
- T1 = [c3]/([c2]*454)

Means followed by same letter do not significantly differ (P=.10, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Appendix

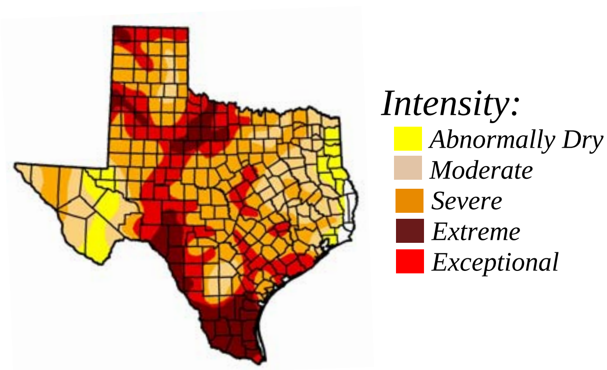
TEXAS A&M AGRILIFE EXTENSION

Texas IPM
Partners With Nature

Northwest Plains Pest Management News

Volume XI Issue 1 Bailey and Parmer Counties April 19, 2013

Area weather conditions have been horrendous; extreme to exceptional drought, high winds and periods of very cold temperatures continue to wreck havoc on the agriculture industry.



Several very cold spells have added insult to injury in area wheat fields. Low temperatures reached potentially damaging levels on several occasions in the last 3 weeks. Assessments of wheat have shown a great deal of variability in damage potential ranging from little to severe. Both stem, head, and growing point damage as well as leaf burn has been observed. Estimates of potential yield loss are very difficult to make at this point, some time to see how the crop will respond will certainly help to get a better estimate.

Potential Weekly Water Use*

Crop	Inches per week
Wheat (stem elong)	2.2
Wheat (flag)	2.4

*Weekly estimated crop water demands (inches of water per week) during the week ending 04/17/2013 based on PET data from Lubbock.

Low temperatures recorded by local weather stations

Date	Clovis	Friona	Muleshoe	MWLR
3/25	13	17	15	16
4/10	16	missing	21	23
4/19	n/a	19	20	n/a

Inspection of growing points and stems are necessary to evaluate potential injury. The growing points can be located by splitting stems longitudinally with a sharp blade. A normal, uninjured growing point is bright white to yellow-green and turgid; freeze injury causes it to become white or brown and water soaked in appearance . This injury can occur even in plants that appear otherwise normal because the growing point is more sensitive to cold than are other plant parts. Growth of stems in which the growing points are injured stops immediately. A chlorotic or dead leaf may appear in the whorl, indicating that the growing point is dead. Growth from later uninjured tillers may obscure damage. Partial injury at this stage may cause a mixture Figure 5. A healthy growing point has a crisp, whitish-green appearance. A growing point that has been damaged loses its turgidity and greenish color within several days after a freeze. A hand lens will help detect subtle freeze damage symptoms. A yellow or nectortic leaf emerging from the whorl indicates the growing point is damaged.

Injury to the lower stems in the form of discoloration, roughness, lesions, splitting, collapse of internodes, and enlargement of nodes frequently occurs at the jointing stage and the following stages after freezing. Injured plants often break over at the affected areas of the lower stem so that one or two internodes are parallel to the soil surface.

Stem injury does not appear to seriously interfere with ability of wheat plants to take up nutrients from the soil

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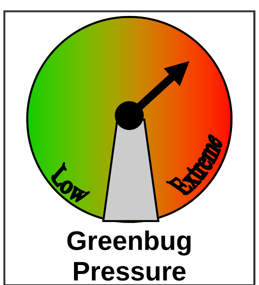
and translocate them to the developing grain. Injured areas might become infected by microorganisms which can cause further stem deterioration. Severe stem injury can affect plant-water relations during the late season. Affected plants can suddenly dry down as evaporative demand exceeds the capacity of the stem to uptake water. Lodging (falling over) of plants is the most serious problem following stem injury. Wind or hard rain can easily lodge the plants, deceasing grain yields and slowing harvest. With severe stem injury, splitting of stems and collapse of internodes is common.

Freezing Temperature Injury Thresholds in Wheat		
Growth Stage	Temp (2 hours)	Yield Effect
Jointing	24°F	Moderate to severe
Boot	28°F	Moderate to severe

Greenbugs continue to persist in many wheat and other small grain fields. The threshold for greenbugs in wheat at this time of the growing season considering a grain value of $6.50 and a control cost of $12/acre is an average 3 greenbugs/tiller. Greenbugs suck plant juices and inject toxins into plants. These aphids are pale green, approximately 1⁄16 inch long, with a dark green stripe on the back.

Greenbug resistance to registered insecticides can cause problems for small grain producers and could be carried over to greenbug management issues in sorghum. A few fields where control problems were observed have been tested using a method developed by Ed Bynum (E. D. Bynum, JR. and T. L. Archer, 2000. Identifying Insecticide-Resistant Greenbugs (Homoptera: Aphididae) with Diagnostic Assay Tests, J. Econ. Entomol. 93 (4):1286Ð1292 (2000)). This testing confirmed clorpyrophos resistant greenbugs in isolated spots.



Surveys in 1990 in High Plains sorghum found insecticide-resistant greenbugs in most counties north of Amarillo. Resistant greenbugs will continue to develop and reproduce after an insecticide treatment; their reproductive potential is extremely high. Every effort should be made to apply insecticide only to fields where economic thresholds have been exceeded to reduce the rate of selection for insecticide- resistant greenbugs and reduced rates should not be used.

English grain aphids and bird cherry-oat aphids have also been observed in area small grains. Populations have ranged from low to relatively high. English grain aphids are usually green with black legs, cornicles and antennae and can be easily confused with greenbugs with out magnification. Bird cherry-oat aphids are yellowish green to dark green to black with a reddish-orange area around the base of the cornicles. Both of these species suck plant juices while feeding but do not inject a toxin like greenbugs do. Chemical control of these aphids is rarely justified as they seldom cause yield loss but each field should be closely monitored. The aphids are normally controlled by many of the same predators and parasites that help control the greenbug.

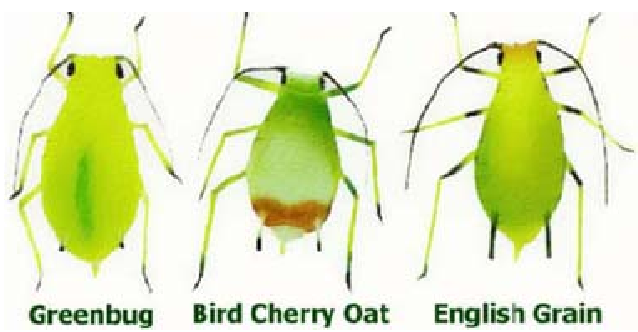


Illustration credit, NDSU

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TEXAS A&M AGRILIFE EXTENSION

Texas IPM
Partners With Nature

Northwest Plains Pest Management News

Volume XI Issue 2 | Bailey and Parmer Counties | May 28, 2013

Environmental conditions continue to be dominated by exceptionally dry conditions. A few scattered showers have at least given an indication that precipitation is possible but the current situation is dire. Wide spread soaking precipitation is critical to salvage any hope for a non-irrigated spring seeded crop.

Area wheat continues to struggle due to harsh environmental conditions. Many fields were hayed, cut for silage or green chopped; which was the original plan in some cases but a salvage harvest due to freeze damage in others. Rumors of planting seed shortages have already started, it may be wise to monitor the situation closely.

Planting operations continue at full speed in spring seeded crops, but currently in most if not all cases only irrigated fields have sufficient moisture to establish a crop. Early planted corn is up and growing . A few cotton fields have emerged while others have yet to be planted. Sorghum planting will ramp up shortly.

There are more than 5,000 species of **thrips** distributed worldwide. The dominate species infesting cotton in the Northwest Plains of Texas is the western flower thrips (WFT) but onion thrips have out numbered WFT on occasion.

Thrips are relatively weak fliers but can drift long distances in the wind. They have an extremely wide host range which includes many cultivated crops, ornamental plants and weeds.

Adult thrips (WFT) are winged slender straw colored insects 1/12 to 1/16 inch long. The wings are fringed and held directly over the body when at rest. Immature thrips look similar to the adult but are generally lighter in color and without wings. Thrips have rasping mouthparts which include a single mandible which the thrips uses to rupture host tissue then the exposed juices are consumed.

Thrips may overwinter in several life stages including hibernating adults, larvae on winter plants or as pupae in the soil. In early spring thrips begin reproducing on available host plants. An adult female will live approximately 60 days during which time she will lay nearly 100 eggs. Depending on species, reproduction may occur sexually or asexually. The thrips life cycle progresses from egg to adult in 8 to 20 days depending on temperature. Multiple generations are produced each year.

Both adults and immature thrips feed on leaves and in the terminal of cotton. Leaf feeding will result in silvering of lower leaf surfaces. Feeding on leaves which have not fully expanded will cause leaves to become distorted. They will be cupped upward and severe infestations will cause the leaves to roll up similar to a clinched fist. The total leaf surface area of the first 5 true leaves may be reduced as much as 50% when severe thrips pressure

Potential Weekly Water Use*

Crop	Inches per week
Corn	.6-.8
Cotton	N/A
Sorghum	N/A

*Weekly estimated crop water demands (inches of water per week) during the week ending 05/27/2013 based on PET data from Lubbock.

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goes untreated. Heavy thrips pressure may result in stunted plants, delayed fruiting and maturity, and terminal loss. Under favorable growing conditions cotton may "outgrow" moderate thrips pressure. Thrips damage is magnified by conditions which inhibit rapid seedling growth and development. Cotton is generally no longer considered susceptible to thrips damage past the 5th true leaf stage.

Total thrips per plant and the presence of immatures must be obtained to make good management decisions. A visual inspection of both upper and lower surfaces of leaves and the plant terminal of at least 10 random plants in several locations within a field should be conducted. The total number of thrips per plant and percent immatures should be recorded. Folded or damaged leaves must be unfurled and the terminal dissected to count hidden thrips. Alternatively, plants can be "beaten" onto an 8 inch white paper plate or into a cup and dislodged thrips counted. This method is quick and easy but may not account for thrips embedded in folded leaves and the terminal.


Adult thrips, J. Reed, MSU

Treatment thresholds for thrips in cotton are based on the number of thrips per plant, presence of immature thrips, and crop stage. A suggested guideline for thrips management is one thrips per true leaf through the 5th true leaf stage. If a residual insecticide, either soil applied, seed treatment, or foliar, application has been previously made the thrips population should contain immatures to justify a sequential foliar insecticide application. The presence of immature thrips is an indication that the residual activity of a previously applied insecticide is beginning to break down. Under poor growing conditions the action threshold should be reduced to 1/2 thrips/true leaf to avoid excessive damage.

Any production practice which stimulates rapid seedling growth and development will reduce cottons susceptibility to thrips damage. In cases where thrips are a perennial pest preventative treatments, ie seed treatment insecticides are recommended. Utilizing soil applied and seed treatment insecticides will reduce the likelihood that foliar insecticide applications will be needed. The reduction of early season foliar insecticides will conserve natural enemies as they begin to build. A purely remedial approach to thrips management will require intense management. Frequent scouting and possible multiple foliar insecticide applications may be necessary to prevent undue thrips damage. Once cotton has reached the 5th true leaf stage and is growing rapidly there is little chance that thrips feeding will impact yield.

HPWD winter water level measurements indicate average decline of -1.87 feet in 2012

Winter water level measurements indicate an average decline of -1.87 feet in the groundwater levels of the Ogallala Aquifer within the 16-county High Plains Underground Water Conservation District No. 1 (HPWD) service area in 2012.

This decline is 0.69 of a foot less than the -2.56 feet decline recorded during extreme drought conditions in 2011.

The 10-year average change (2003-2013) was -0.89 of a foot while the five-year average change (2008-2013) was -1.40 feet.

Each county in the water district had declining groundwater levels in 2012. Locally, groundwater levels changed -1.95 feet in Bailey County and -3.13 feet in Parmer County.

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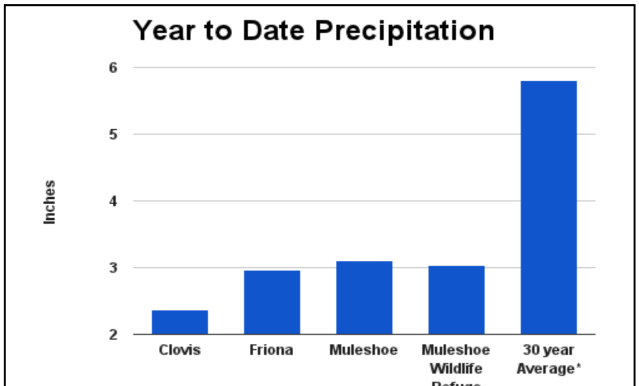
Northwest Plains Pest Management News

Volume XI Issue 3 | Bailey and Parmer Counties | June 6, 2013

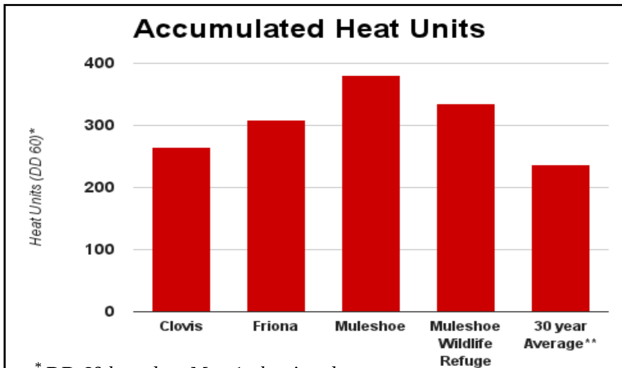
Harsh environmental conditions continue to plague the NWP of Texas. The exceptionally dry conditions have dominated local weather even though some much needed precipitation was received June 5. The NWP is right at 50% of the long term average precipitation year to date while the May 1 to date heat unit accumulations are slightly ahead of the long term average.

Hail and wind damage

Very high winds associated with recent storm fronts have added "insult to injury", damaging crops, sprinkler irrigation systems, and power poles. Precipitation recorded by local weather stations ranged from .5 inch to 1.5 inches; some storms also contained damaging hail. Cotton stand counts less than .2 plants/foot and corn with severe leaf burn have been observed in fields in the path of these storms. The injury to corn at this stage should not result in measurable yield loss. A good article talking about wind and sandblasting damage to corn published by Purdue University can be found at http://goo.gl/ZpQtm . Much of the area cotton on the other had has sustained varying degrees of damage, some of which is severe.



Based on area average long term weather data 1981-2010



DD 60 based on May 1 planting date
** *Based on area average long term weather data 1981-2010*

On the brighter side, irrigated crops not subjected to or more tolerant of the severe conditions associated

Potential Daily Water Use*	
Crop	Inches per day
Corn V4	.15-.24
Cotton emerged	.18
Sorghum emerged	.14

*Daily estimated crop moisture demands (inches of water per day) based on PET data from Halfway.

IPM radio show on Fox Talk 950 AM Wednesdays from 12:30-2:00

http://nwpipm.blogspot.com/

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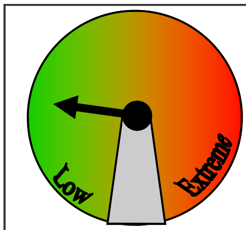
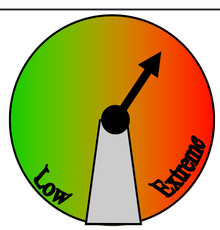
with the recent storms look pretty good and in some cases very good. Crops are behind in development compared to last year, for example most cotton is in the cotyledon to 2 true leaf stage compared to 3-4 true leaf stage for the same time last year. Crop moisture demands remain fairly low but will soon rapidly increase, especially in corn.

Spider mites have been observed in area corn and sorghum, particularly on field margins. Now would be a good time to start developing a spider mite management plan, primary strategies are threshold based curative methods or a preventative approach. Regardless of the management strategy employed it is critical to conserve "beneficials". When considering a preventative miticide application remember current products are not systemic and will only protect the leaves which are sprayed and any subsequent growth will not be protected. Applications to small corn or sorghum are also less cost effective when considering less of the miticide is intercepted by the plant versus an application made to larger crop near canopy closure. The additional application cost of a "dedicated" preventative miticide application would likely be a good trade for the added protection offered by more crop coverage.



Mite Pressure

Thrips pressure in cotton continues to climb. I have observed immature thrips in some cotton which had a seed treatment insecticide applied. If immature thrips are present following seed treatments then the treatment has lost or is losing its effectiveness.



Thrips Pressure

Treatment thresholds for thrips in cotton are dynamic; under good growing conditions a foliar treatment should be considered when 1 thrips/true leaf is present but in cotton which is growing slowly due to poor environmental conditions or other stress the threshold should be reduced by 1/2. Area cotton which has been injured by recent storms should be closely monitored as it cannot afford additional loss of leaf tissue. The lack of leaf surface area will make application coverage even more important.


Environmental damage

I can not stress enough the need make timely insecticide applications for thrips. Insecticide applications made based on visual plant symptoms are late and will not provide the economic benefit of a timely application and is what I like to call a "revenge" treatment.

I have received several reports of potential glyphosate resistant pigweed. We need to be diligent in managing weeds using multiple and timely tactics.

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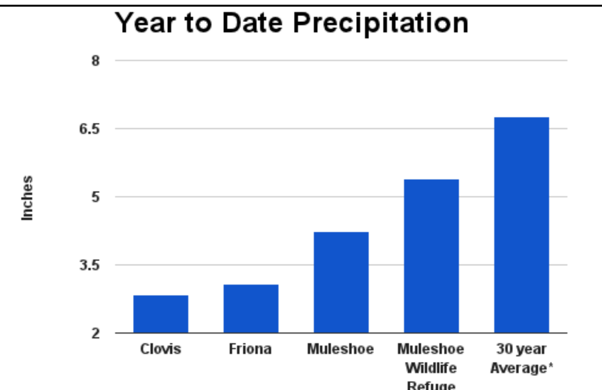
Northwest Plains Pest Management News

Volume XI Issue 4 | Bailey and Parmer Counties | June 17, 2013

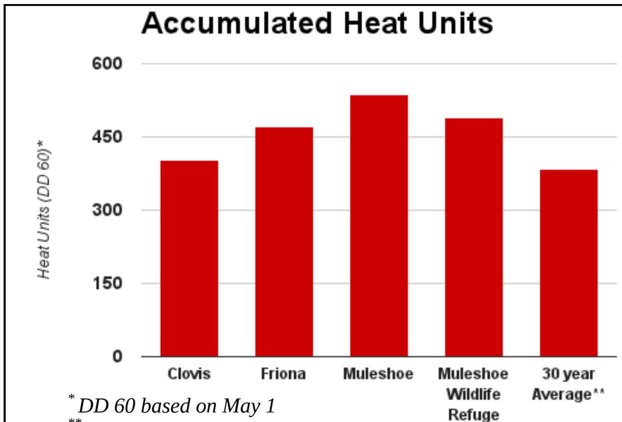
Recent precipitation has certainly been welcomed even though some crops and property have been damaged. Rainfall amounts have varied greatly, individual amounts ranging from a trace to 2+ inches have been reported. NOAA weather stations have recorded 1.19 Clovis, 1.61 Friona, 2.38 Muleshoe, and 3.94 Muleshoe NWR in June. Even with recent precipitation the area continues to be well behind the long term average; currently, comparing the area wide year to date average to the area long term average we are right at 57% of the historical average (see the precipitation figure for more detail).



* *Based on area average long term weather data 1981-2010*

Potential Daily Water Use*	
Crop	Inches per day
Corn	.20-.33
Cotton	.13-.17
Sorghum	.11-.20

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.



* *DD 60 based on May 1*
** *Based on area average long term weather data 1981-2010*

Dryland cotton actually received enough precipitation to emerge in some fields but many are already running out of moisture since we had no sub-soil moisture to base recent precipitation on. In addition, blowing sand has continued to plague area producers. Fields with poor soil tilth as a result of 2+ years of exceptional drought have been particularly difficult to "tie down".

Weeds have really "taken off" after recent precipitation and should be managed aggressively, we do not need to allow them to use precious moisture. Remember many herbicides have crop stage limitations, read labels carefully to avoid risk of crop injury. The key to a successful and sustainable weed management is the use of a multi-tactic approach. When considering herbicide applications try not to rely on a single mode of action. Using herbicides with different modes of action and/or tillage will reduce risks of resistance development. Another consideration when making herbicide applications is off target injury, whether it be drift or spray tank contamination. The following is a quick list of

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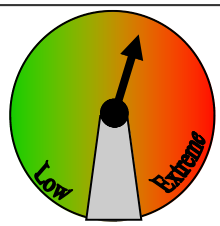
drift related topics to consider: environmental conditions (wind speed, direction, temperature, inversion conditions, etc), herbicide volatility, spray volume and droplet size, ground speed and spray pressure. Sprayer cleanup is critical especially when a spray rig is used with various herbicides and on different crops. A good article published by the University of Missouri on sprayer cleanup can be found at http://goo.gl/ASg0V

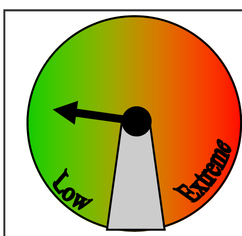
Thrips persist in area cotton at low to high levels depending on previous management tactics. Seed treatments have held up pretty well but have began to loose effectiveness in many fields and may not protect cotton through the key 5th true leaf stage. The tell-tale sign that a seed treatment insecticide is wearing off is the presence of immature thrips. Foliar applications of acephate have been effective but don't expect residual activity past 5-7 days. The accepted treatment threshold is 1 thrips/true leaf but if cotton is slow growing the threshold should be reduced to 1/2 thrips/true leaf.



Thrips Pressure

Spider mite pressure overall has seemed to declined, probably a result of recent showers. Spider mites are very small, 1/32 inch or less, and are difficult to see without magnification unless colonies are well developed. Eggs are very small pearly white spheres. Mites will migrate into corn from wheat or native grasses with the aid of wind. They will lay eggs on the underside of corn leaves which will hatch in 3-4 days. Larvae/nymphs will mature and begin laying eggs in 5-10 days. There may be 7 to 10 overlapping generations per growing season. Hot dry conditions favor rapid development of mite populations particularly after tassel.

Banks grass mites typically infest lower leaves first then move up the plant while two spotted mites may infest any leaf at any time. Banks grass mite and two spotted mite infestations of similar densities will result in similar damage.



Mite Pressure

In fields with established mite colonies and a history of spider mite infestations a preventive miticide application should be considered. There are several foliar miticides which can be applied early season to reduce risks associated with spider mites. Remember current miticides are not systemic and will only protect the leaves which are sprayed and any subsequent growth will not be protected. Some of these pesticides are soft on beneficial organisms and may allow natural enemy populations to become established which will result in a more stable production system.

Fall armyworms (FAW) have been observed in non-Bt corn fields feeding in whorls. Preliminary data from a trial evaluating Double Pro and SmartStax Bt technologies suggest they are both very effective in suppressing foliage feeding FAW, more time to fully evaluate the trial will hopefully confirm early data. FAW moths deposit eggs on leaves. Newly hatched larvae begin to feed in the whorl. Larval feeding will cause the leaves to appear ragged, but insecticide treatments are seldom recommended. In extreme cases where treatment may be justified foliar applications of newer pesticides (Prevathon, Belt) have shown to provide suppression of whorl feeding FAW in a limited number of trials. Chemigation of a labeled insecticide active on FAW may be another management tactic to consider. As sorghum gets larger it will be very attractive to FAW; management options are limited since fewer insecticides are labeled for use in sorghum.

FAW feeding 4 days after hatch

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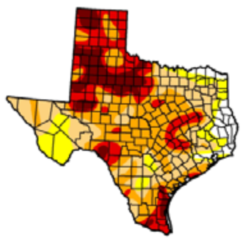
Northwest Plains Pest Management News

Volume XI Issue 5 Bailey and Parmer Counties June 28, 2013

Bailey and Parmer Counties as well as most of the rest of the South Plains and Panhandle of Texas continue to be in extreme to exceptional drought according to the U.S. Drought Monitor (June 25, 2013).

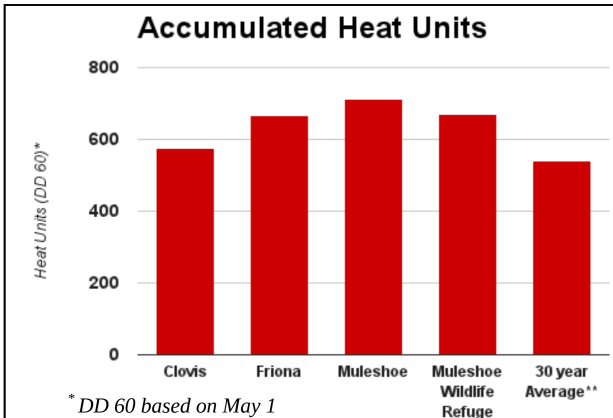


While June precipitation was a definite blessing it has been no where near enough to pull the area out of the extremely dry conditions experienced over the last two and now going on three years.

Area crops look remarkably well considering the harsh environmental conditions thus far, but signs of stress can be seen across the landscape. Year to date local weather stations have only recorded 1 rain event which was equal to or grater than 1 inch each (Friona, Muleshoe, and Muleshoe Wildlife Refuge) while the Clovis, NM site has yet to record an inch or more rainfall.

Corn showing drought stress

Weeds continue to be the primary pests area producers are having to deal with. Producers have continued to report suspected glyphosate resistant pigweed most, of which are small spots within fields. These spots need to be addressed quickly and decisively. Assuming a sprayer glitch could be costly if the weeds turned out to be resistant to glyphosate and are allowed to go to seed.



* DD 60 based on May 1
** Based on area average long term weather data 1981-2010

Potential Dailey Water Use*	
Crop	Inches/Day
Corn	.40-.45
Cotton	.17-.30
Sorghum	14-.26

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.

Most weed control operations have been completed in corn but are on going in sorghum, cotton, and other crops. Hot dry conditions are making weeds tougher to control.

Huskie is a new herbicide for sorghum which has shown to be very effective. Normally a half pound/of atrazine and 1 lb of ammonium sulfate on a per acre basis should be included in the tank mix to enhance weed control. Under good growing conditions ground applications should be made in a minimum of 10 gallons per acre (GPA) total volume and under tough conditions 15-20 GPA. I realize that high volumes of water may slow spray operations but the risk of unsatisfactory weed control should be considered.

Corn is growing rapidly and moisture demands are quickly climbing exceeding .40 inches per day. **Green snap** has been observed in many area fields recently in varying degrees. Green snap may occur when corn is rapidly growing and is exposed to high winds. Several factors contribute to risk of green snap, first and for most is wind velocity and condition of the plant. The faster the corn is growing the more susceptible it is to green snap. The use of phenoxy herbicides (ie dicamba, 2,4-D, ect) may also contribute to green snap. Different corn hybrids may be more or less disposed to green snap; most seed companies rate their hybrids as they are developed.


Green snap in corn

Spider mites have been observed in some area corn but for the most part in fairly low numbers. As corn approaches silk we need to really think about what pest management tactics may be implemented. For example if an insecticide application for corn rootworm beetles will likely be made then that insecticides impact on beneficial arthropods and resulting mite flare up should be considered and a mitigating plan developed. If spider mites are established in a field which will be treated for CRW beetles a preventative miticide application about two weeks prior to silk should be contemplated. Currently labeled miticides are designed to work in concert with natural enemies of spider mites, when these beneficials are removed from the equation the product efficacy may be adversely affected. In research conducted in 2012 under relatively heavy mite pressure and where beneficials were removed from the system with a previous insecticide application I found that miticides struggled to suppress mites below economic threshold. That is not to say they did not work because they did, I had the luxury of an untreated check to compare the miticide treatments too. If it weren't for the untreated check to compare too most would consider the mite suppression unsatisfactory.


Untreated


Treated

The area **cotton** crop is extremely variable ranging from very good to beatup but beginning to turn the corner to just emerged due to late rains. The larger cotton is squaring, the square sets have been near 100% in observed fields. Squaring cotton should be closely monitored for square robbing pests. The cotton **fleahopper** can be a significant pest from 1st square to first bloom in Texas High Plains cotton. Fleahoppers can easily disperse from wild hosts to cotton by flight. The good news at this point is very few have been collected in local surveys sampling weeds growing in ditches and uncultivated land. Adult fleahoppers are yellowish green to almost off white and approximately 1/8 inch long with an oval flattened shaped body. They have piercing and sucking mouthparts. Nymphs, the immature stage, look similar to the adult but smaller and without wings. Cotton fleahoppers, especially nymphs, have a somewhat translucent appearance. Small black spots may also be present on the back, legs, and antennae. Fleahoppers are very flighty and will rapidly move when disturbed. Both adult and immature cotton fleahoppers will feed on tender vegetation including terminal growth, leaf buds and small squares. Pinhead sized squares are most vulnerable and will take on a blasted appearance 1 to 3 days after the feeding occurs. High populations of fleahoppers may cause excessive square shed. Twenty five to thirty cotton fleahoppers per 100 plants and unacceptable square shed (90% square set during the 1st week of squaring and 85% the 2nd week) is the established action threshold.


Cotton fleahopper adult

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Northwest Plains Pest Management News

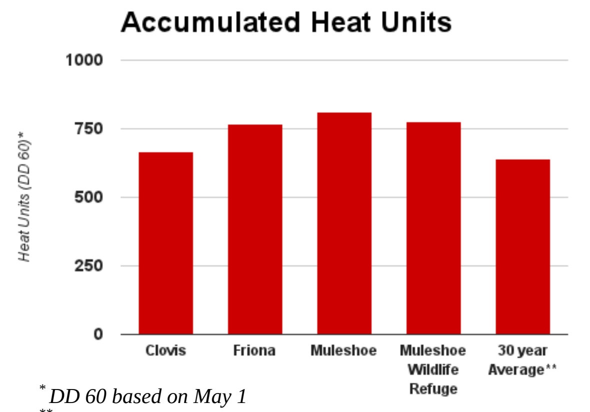
Volume XI Issue 6 | Bailey and Parmer Counties | July 3, 2013

Recent precipitation has provided much needed moisture to the area but did come at a cost. Streaks of hail accompanied some of the storms which damaged and in some cases destroyed crops in their path. Replant decisions are having to be made as quickly as possible as time to mature a subsequent crop is limited.

The growing point of sorghum remains at or near the soil surface and likely avoided catastrophic injury in most cases and should recover. Larger corn was at more risk since the growing point and hardened stalk below it were much more exposed. Damage evaluations should consider crop stage, stand loss, leaf area loss, growing point injury and stalk injury.

Hail damaged corn.

Like many other crop plants, corn does not need all of the leaf surface area that it produces. Corn fields may look ugly and ragged and still be capable of producing an almost normal corn crop. Even shredded and broken leaves are capable of some photosynthesis if they are still connected to the main plant. A strong healthy root system, good soil moisture, and favorable, sunny weather are most important to a rapid recovery. The growth stage of the corn plant and the percent defoliation are important. Hail that is received later in the growing season can be increasingly destructive. Damage tables constructed by University of Minnesota (Page 2) indicate the percent yield reduction observed with various percents of defoliation at defined growth stages. Notice that a near-50 percent leaf loss at the 10th leaf stage results in only a 6 percent yield reduction.



* *DD 60 based on May 1*
** *Based on area average long term weather data 1981-2010*

What about silage production? Leaves only compose 10-15% of total plant weight so yield losses due to actual physical leaf removal may not be has great as one might assume. Most damage will come from the inability of the plant to produce acceptable plant structure and ears. Research conducted by Penn State Extension suggest that corn silage yield losses due to hail are comparable to grain yield losses.

Corn stalk damaged by hail

Potential Dailey Water Use*	
Crop	Inches/Day
Corn	.25-.45
Cotton	.20-.27
Sorghum	.17-.23

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.

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Stage of Growth	Percent Leaf Area Destroyed																		
	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
7 leaf							1	1	2	3	4	4	5	5	6	7	8	9	9
8 leaf							1	2	3	4	5	5	6	6	7	8	9	10	11
9 leaf				1	1	2	2	3	4	5	6	6	7	7	9	10	11	12	13
10 leaf				1	2	3	4	5	6	7	8	8	9	9	11	13	14	15	16
11 leaf			1	1	2	3	5	6	7	8	9	10	11	12	14	16	18	20	22
12 leaf			1	2	3	4	5	7	9	10	11	13	15	16	18	20	23	26	28
13 leaf		1	1	2	3	4	6	8	10	11	13	15	17	19	22	25	28	31	34
14 leaf		1	2	3	4	6	8	10	13	15	17	20	22	25	28	32	36	40	44
15 leaf	1	1	2	3	5	7	9	12	15	17	20	23	26	30	34	38	42	46	51
16 leaf	1	2	3	4	6	8	11	14	18	20	23	27	31	36	40	44	49	55	61
17 leaf	2	3	4	5	7	9	12	16	20	23	27	31	35	40	45	50	56	62	69
18-21 leaf	3	4	5	7	10	13	17	21	26	30	34	39	44	50	56	62	69	76	84
Tasseled	3	5	7	9	13	17	21	26	31	36	42	48	55	62	68	75	83	91	100
Silked	2	4	6	8	11	15	19	23	38	33	38	44	50	57	63	70	78	86	95
Silks Brown	2	4	6	8	11	14	18	22	26	31	36	41	47	53	58	64	71	79	88
Pre-Blister	2	3	5	7	10	13	16	20	24	28	32	37	43	49	54	60	66	73	81

After 4 to 5 days have lapsed since the hail storm, inspect the surviving plants. Some of these plants should be split open to see at what height and condition the growing point is found. If the growing tip is black or brown, the damage is severe and the plant may soon die. Undamaged growing points will be pushing new leaves, and corn will increase in height and leaf area. A "buggy whip" condition can occur when new leaf growth becomes tangled in dead or mangled leaves, normally most plants will break through given enough time. Each field will have to be carefully evaluated to get a best estimate of crop potential and risks associated with keeping the current crop vs. replanting.

Damaged growing point

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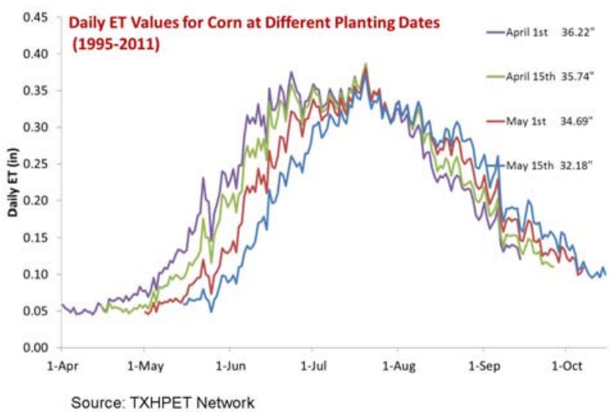
Northwest Plains Pest Management News

Volume XI Issue 7 | Bailey and Parmer Counties | July 11, 2013

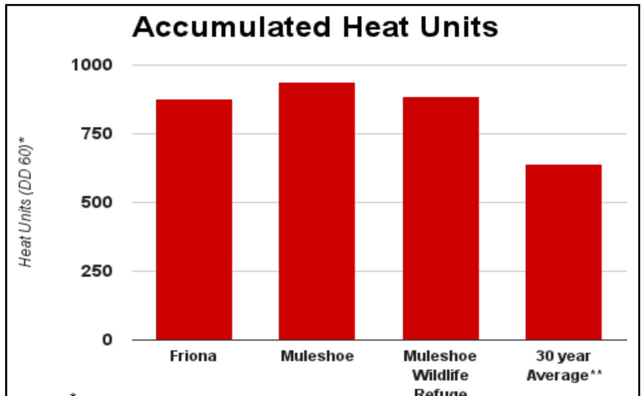
Crops have responded very well to precipitation and cooler temperatures over the last couple weeks. The area **corn** crop has about as wide a range of maturity as I've ever seen this time of year, from just planted to tassel/ silking. More mature corn fields are nearing or at peak moisture demand which could exceed .45 inch/day under hot windy conditions. The following chart graphs daily ET values based on average conditions from various planting dates.



Most **cotton** has "turned the corner" and is squaring but I have not seen a bloom yet. Square sets have been

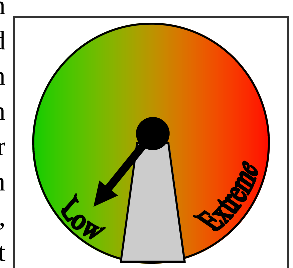
Potential Dailey Water Use*	
Crop	Inches/Day
Corn	.35-.40
Cotton	.17-.30
Sorghum	.17-.24

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.



* DD 60 based on May 1
** Based on area average long term weather data 1981-2010

outstanding ranging from the low 90s to near 100% with most fields around 96%. While we are not behind in heat unit accumulation the cotton crop is behind due to delayed planting and harsh environmental conditions which will likely result in a shorter than normal effective bloom period. Considering this, managing cotton for earliness at this point looks to be even more important. The bulk of nitrogen fertilizer should be applied by early bloom. Pest pressure at this point is very low.



Sorghum is progressing very well, the crop ranges from emerging to growing point differentiation (GPD). It seems some sorghum has taken a bit longer to recover from a phenoxy herbicide application than expected. A wide range of crop response was observed between hybrids in a local trial treated with dicamba + atrazine.

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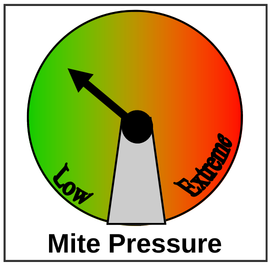
Try to avoid yield robbing moisture and nutrient deficiencies during GPD to maximize yield potential.

Spider mites have been building in some corn fields but remain hard to find in others. Most colonies remain relatively small but have moved up the plant to the upper part of the lower third of the plant. Occasionally we have observed colonies in the middle section of the plant. Remember if spider mites are established in a field which will be likely treated for another pest with an insecticide which is harsh on beneficials then a preventative miticide application about two weeks prior should be considered. Currently labeled miticides are designed to work in concert with natural enemies of spider mites, when these beneficials are removed from the equation miticide performance may not meet expectations. Sixspotted thrips, a key predator of spider mites, have been observed in area corn and will help stabilize mite populations if conserved. Adult sixspotted thrips can be distinguished from other thrips species by the 6 spots on their back (3 on each wing cover). Both adults and larvae are predacious feeding primarily on mites and can be very effective in suppressing mite populations.



Adult sixspotted thrips feeding on mite. Photo by J.K. Clark, UC.

Fall armyworm pressure has picked up in area sorghum and non-Bt corn. Area surveys in sorghum have ranged from 2-11% infested plants. Damaged leaves unfolding from the whorl are ragged with "shot holes." Although this may look dramatic, leaf damage usually does not reduce yields greatly, and control of larvae during the whorl stage is seldom economically justified. Also, larvae within the whorl are somewhat protected from insecticide. Insecticide application may be justified if larval feeding reduces leaf area by more than 30 percent or is damaging the developing grain head or growing point within the whorl.

Plant growth regulators (PGR) in cotton in and of themselves do not "make more cotton" but do allow producers to push a crop with irrigation and fertility while maintaining acceptable plant structure and enhancing earliness. In other words a PGR applied to cotton without adequate moisture and plant nutrients will not enhance yield. A heavy boll load will limit vegetative growth and enhance earliness but in a high input environment where moisture and fertility are not limiting factors a heavy boll load alone may not be enough to adequately control vegetative growth in stripper harvested cotton. Mepiquat chloride (MC) is a foliar applied PGR that is absorbed into leaves and translocated throughout the plant. Since its introduction, MC has been used extensively to manage cotton growth in an attempt to reduce risk associated with a delayed harvest. Mepiquat chloride regulates cell elongation by inhibiting the synthesis of gibberellin. This reduction in cell length in turn reduces overall plant height and internode length. There are numerous PGR options most of which are based on mepiquat chloride but may contain other active ingredients to further enhance effectiveness. Early low rate multiple (LRM) applications during squaring and early bloom have shown to be more effective than later single high rate applications. For example in a local research trial early LRM applications of Stance (4 to 1 ratio of mepiquat chloride and cyclanilide) reduced the number of days to physiological cutout which in turn translated into an earlier harvest while the single high rate application did not differ from the untreated plots.

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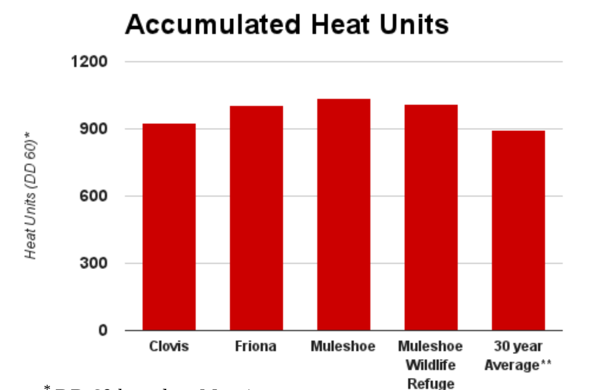
Northwest Plains Pest Management News

Volume XI Issue 8 | Bailey and Parmer Counties | July 18, 2013

The area has been blessed with a wide spread slow soaking rain! The moisture will provide a much needed boost to crop production and has already provided a significant boost in producer optimism. Local NOAA weather stations recorded from near 1 inch to over 2.5 inches over the last several days; individual reports in excess of 3 inches were also received.

Recent precipitation and cooler weather could not have come at a better time for corn which is pollinating. Stress occurring a few days prior to tasseling can cause ear development to slow resulting in a lag between pollen shed and silking which can lead to poor pollination. Moisture demand has decreased from over .40 inch/ day to .13 inch/day during the recent cool humid conditions. Moisture demand will rapidly rebound to previous levels as temperature increases and humidity decreases. Hopefully current soil moisture along with irrigation will get the early corn past peak moisture demand. A good soil moisture profile will also be a good base for later planted corn as moisture demands increase.



*DD 60 based on May 1
** Based on area average long term weather data 1981-2010

Potential Dailey Water Use*

Crop	Inches/Day
Corn	.13-.28
Cotton	.10-.21
Sorghum	.10-.20

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.

Spider mites have continued to progress in many corn fields, cool wet conditions may slow them down but many infestations are well established and will likely require treatment shortly to avoid excessive yield loss. The action threshold for spider mites in corn is based on crop value, percent infested leaves, and leaf area damaged by mites. The following table was developed based on fast acting miticides and may need to be amended slightly for slower acting miticides.

Control cost per acre	Market Value ($) per acre				
	500	550	600	650	700
15	18/9	16/9	15/8	14/7	13/7
20	24/13	21/11	20/10	18/10	17/9
25	29/16	27/14	25/13	23/12	21/11

% infested leaves per plant / % total leaf damage

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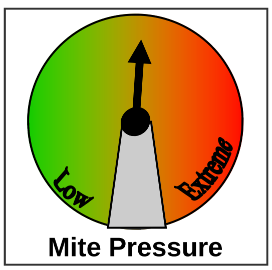
Population dynamics are extremely important in accessing spider mites, regular scouting should be conducted to document population trends and natural enemy activity. A rapidly increasing mite population should be dealt with more aggressively while a slower developing population may allow some flexibility to determine if natural enemies will keep them in check. I've said it before but it's worth repeating the conservation of natural enemies is the corner stone in spider mite management. Key natural enemies include six spotted thrips, spider mite destroyers, minute pirate bugs, and predatory mites. Management of other pest such as corn borer and fall armyworm can significantly impact mite populations.


Six spotted thrips



The use of broad spectrum insecticides can flair mites by removing natural enemies which are suppressing mite populations. Miticides may not provide adequate suppression in the absence of natural enemies which could necessitate multiple applications to get a raging spider mite population under control.

Southwestern corn borer (SWCB) trap captures remain low but I expect the second generation moth flight to pick up shortly. Moths are ¾ inch long, white, with no distinct markings. Eggs are flattened, approximately 1/8 inch in diameter and can be laid singly or in groups of 2 to 3 or more. When in groups, eggs are laid in an overlapping pattern resembling fish scales. Freshly laid eggs are creamy white but develop three parallel red lines in about 24 hours. Small larvae will feed on leaves, ear shoots, husks, and silk for about 5 to 10 days before tunneling into the stalk or ear shank and continuing to feed. Second generation SWCB will lay 75% of their eggs on the upper surface of the middle 7 leaves; the ear leaf, two above and four below. Inspection should be concentrated in this zone. The established economic threshold for second generation SWCB is when 20 to 25% of plants are infested with eggs or small larvae. Bt corn hybrids are extremely effective in suppressing SWCB making insecticide treatments unnecessary.


SWCB eggs

Fall armyworm (FAW) infestations have increased in area sorghum, some fields have as high as 30% of plants infested. Dr. Pat Porter has been monitoring FAW moth activity and has noted that this years population is tracking very similar to 2011. If this trend continues moth activity will begin to increase the latter part of July and peak the second week of August. FAW is a non discriminatory pest which will infest many area crops including corn, cotton, sorghum, blackeyed peas, green beans just to name a few.

Insect pest pressure remains very quiet in the cotton field. square sets are outstanding as we near bloom ranging from 90-98% with most fields 95% or better. Weeds continue to be troublesome in many fields. Remember there are several good residual herbicide products to consider when "laying by" cotton. These layby options are another tool to prevent or manage weed resistance to glyphosate. Some products can be applied over the top while some will need to be directed or applied under a hood. The benefits of a good layby program will far out weigh costs and inconvenience of application especially in light of documented pigweed resistance to glyphosate.

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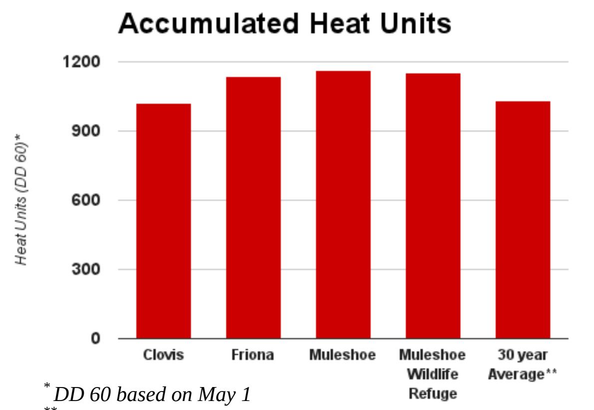
Northwest Plains Pest Management News

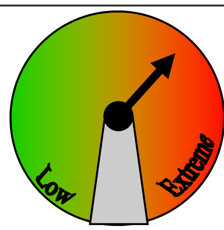
Volume XI Issue 9 | Bailey and Parmer Counties | July 26, 2013

Crops have progressed very well this past week, what a difference a rain makes! The area corn crop ranges from 4 leaf to blister stage and even though some fields have taken a beating from mother nature it looks good on a whole. Much of the area cotton crop is finally blooming; nodes above white flower (NAWF) have ranged from 6-9 indicating good yield potential, time permitting. The crop is about two weeks later than what we would like to see, but currently most fields are progressing at a high pace. The reduced effective bloom period will likely limit top end yield but August and September weather conditions will determine to what extent. Cotton will need to be carefully managed to promote earliness to preserve as much yield potential and fiber quality as possible. Area sorghum is also rapidly growing but, as with cotton, later planted fields are in a race with mother nature to mature before frost.



*DD 60 based on May 1
**Based on area average long term weather data 1981-2010

Spider mites must not have read the text book as they did not seem to slow a bit during recent cooler and more humid conditions. Many field have exceeded treatment thresholds and many more are near it. Even small mite colonies have a tremendous number of eggs indicating the potential for continued rapid population expansion. Treatment threshold at this point can be simplified to an established mite population in the lower 1/3 of the plant with small colonies beginning to develop near the ear leaf with end goal preventing colony establishment on the ear leaf. As I mentioned last week population dynamics are extremely important in managing spider mites, regular field evaluations should be made to document population trends and natural enemy activity. A rapidly developing mite population should be dealt with more aggressively while a slower developing population may allow some flexibility to determine if natural enemies will keep them in check. We



Mite Pressure

Spider mites and eggs.

Potential Dailey Water Use*

Crop	Inches/Day
Corn (silk)	.25
Cotton (1st bloom)	.21
Sorghum (GPD)	.15

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.

have several trials out evaluating different products and rates, hopefully they will provide information that will help make good pest management decisions.

Weeds continue to be problematic and difficult to control. Control problems can be attributed to several reasons and in many cases combinations of factors including environmental conditions, weed size and condition, herbicide coverage, weed resistance to herbicides. As weed management decisions are made consider all management options and don't automatically rule out "low tech" tactics such as cultivation and hand hoeing. To my knowledge no weed has developed resistance to the separation of above ground parts from below ground roots. If weed resistance is suspected deal with it aggressively, make every effort to prevent the loss of herbicide efficacy due to resistance. The following images are a before and after scenario from Georgia.

Weed resistance progression from early detection to catastrophic failure. S Culpepper, UG.

Southwestern corn borer (SWCB) field level infestations have been reported even though moth captures in traps have remained relatively low with slight increases recently. The changing agriculture landscape including planting use of Bt hybrids, as well as previous years use of Bt technology may be making trapping less effective in predicting area wide potential pest activity. Populations of SWCB appear to be much more localized and more difficult to predict than the more uniform infestations of yester year. The established action threshold for SWCB is met when 20% of plants are infested with eggs or small larvae. Most eggs will be laid on the middle 7 leaves; the ear leaf, 2 above and 4 below.

Hatched SWCB eggs

As **cotton** transitions into the early bloom stage we no longer consider cotton fleahopper a risk but we need to continue monitoring cotton for significant Lygus infestations. During the early bloom period the action threshold for Lygus is 15/100 sweeps (4/beat sheet sample) with unacceptable fruit shed. Current Lygus infestation levels remain low. Fields adjacent to weedy areas should be closely monitored when the weeds are destroyed as Lygus will migrate into cotton.

Lygus bug

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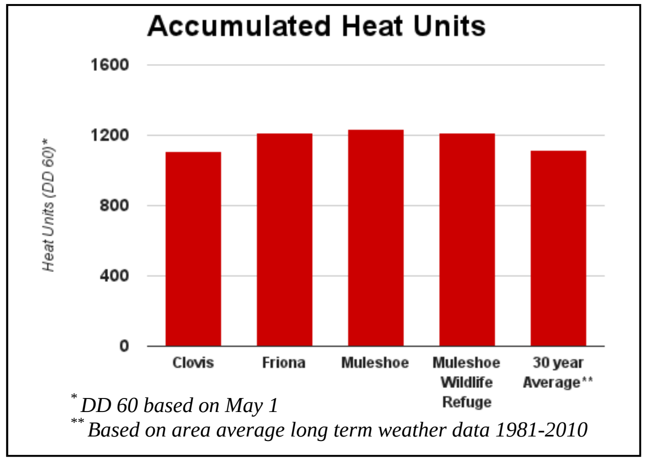
Northwest Plains Pest Management News

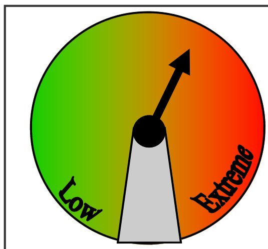
Volume XI Issue 10 | Bailey and Parmer Counties | August 2, 2013

Rainfall blessed portions of the NWP area on the last day of July; NOAA weather stations in Friona and Muleshoe recorded .5 and 1.78 inches respectively. Individual reports in excess of 3 inches were also received. The area corn crop continues to progress very well with a wide range of maturities from less than two feet tall to blister stage. The cotton crop continues to play catch up, but is developing at a good pace. Yield potential is fair to good for the most part. Grain sorghum, as with corn has a wide range of maturities ranging from vegetative to heading and blooming. Most fields are on track to fully mature but late planted fields could be hurt by frost especially if development is slowed by stress.



Corn pest pressure has increased, in addition to existing spider mite issues **Southwestern corn borer** (SWCB) activity has dramatically increased this week; trap captures are up 10 fold compared to last week. Yield losses from SWCB may occur as a direct result of stalk and or ear shank feeding, as well as lodging. Bt hybrids are very effective in controlling Southwestern corn borer but required non-Bt refuge and other non-Bt corn will have to be managed traditionally. The established economic threshold for second generation Southwestern corn borer is when 20% of plants are infested with eggs or small larvae. Timing is critical when making an insecticide application; insecticides must be applied prior to larvae boring into the stalk to be effective. Small larvae will feed on leaves, ear shoots, husks, and silk for about 5 to 10 days before tunneling into the stalk or ear shank and continuing to feed. Insecticides should be selected carefully; some are harsh on beneficial arthropods and may cause a secondary outbreak of spider mites.

SWCB larva



Corn Borer Pressure

Spider mites persist in many fields while others remain nearly mite free. Many fields with established mite populations have exceeded treatment threshold and have

Potential Dailey Water Use*

Crop	Inches/Day
Corn	.30
Cotton	.28
Sorghum	.25

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.

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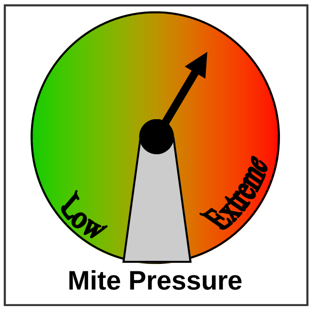
been treated. Current miticides are slower to fully suppress mites than what we see when treating most other insect pests. At 7 DAT it may look like a miticide has had no impact at the field level since there may actually be more mites present than before it was treated. In research conducted locally, labeled miticides averaged about 55% control 7 days after treatment. This is not to say that there are half as many mites in the treated plots than before treatment because mites have continued to develop, but, and it is a big but, the plots treated with miticides have reduced mite pressure compared to that observed in the untreated plots. Remember we want to minimize mite colonization of the ear leaf.



Fall armyworm have been observed feeding in non-Bt corn in varying degrees. Larvae have been observed feeding in silk, behind ears, and behind leaf collars. There is no established treatment threshold for FAW in corn but recent research confirms they can consume a significant amount of grain when feeding in the middle of the ear in addition to ear losses due to ear shank feeding. There is a detailed presentation by Pat Porter which discusses potential grain loss due to FAW feeding in corn, it can be viewed at http://goo.gl/X9jy4O


FAW behind ear leaf

Cotton pests remain quiet even though I observed a "lost" bollworm feeding in a square this week. In corn growing areas, corn continues to be the favored host plant for bollworm/corn earworm at this stage. With recent precipitation plant growth should be closely monitored as we may not have enough boll load at this point to prevent excessive vegetative growth. In fields with good moisture and a later developing boll load a plant growth regulator may be necessary to keep cotton development on track.

Sunflower head moth larvae have been observed feeding in pre-bloom sunflowers which may be an indication of heavy infestations once blooming has commenced. The head moth, is the single most important sunflower pest in Texas. Sunflower moth infestations are usually heaviest early in the growing season, with another smaller moth flight possible later in the season. The adult is a small, slender, silver-to-buff gray moth about 1⁄2 inch long. It is most often seen resting on sunflower heads during the blooming period, especially in early morning and early evening. Moths are highly attracted to plants beginning to bloom. Nearly 80 percent of the eggs are laid on the plant within 4 to 7 days after buds begin to open. Eggs hatch in 24 to 72 hours. Newly hatched larvae are yellowish. Mature larvae are brown with four yellowish-green to cream colored longitudinal stripes. For the first 5 to 6 days after hatching, young larvae are relatively exposed as they feed on pollen and floral parts on the flower surface. Insecticide applications should target the very early bloom period when yellow ray petals are visible.


Head moth larvae in bud

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Northwest Plains Pest Management News

Volume XI Issue 11 | Bailey and Parmer Counties | August 8, 2013

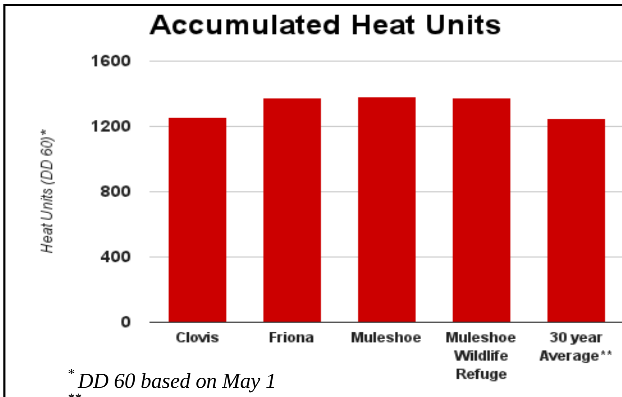
Cotton destroyed by hail.

Last weeks isolated thunder storms carried some baggage; pockets of hail destroyed some area crops. The speed at which moisture has disappeared is a testament to the current moisture demands of crops (and weeds). Corn continues develop at a good pace; some corn is near dent while other fields are growing vigorously. Moisture demands remain near maximum in corn from tassel to milk stage but begin to decline as the crop transitions from milk to the dough stage and continue to decline at a fairly rapid pace through maturity. Much of the area cotton crop is in full bloom and is at or near maximum moisture demand. Irrigation should be carefully managed to promote earliness and maintain fruit load; many times this is walking a fine line. Lower amounts and more frequent irrigation applications will allow producers to speed maturity and maintain yield; adjustments in irrigation frequency and amount should be based on individual field conditions. Much of the grain sorghum is also at or near peak moisture demand which is from boot to heading. Using a moisture probe to monitor soil moisture levels has become futile in many fields with limited irrigation capacity as the probe cannot penetrate the soil.

Potential Dailey Water Use*

Crop	Inches/Day
Corn	.31-.37
Cotton	.30-.34
Sorghum	.20-.29

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.



** DD 60 based on May 1*
*** Based on area average long term weather data 1981-2010*

Weed management has been a continual battle; weed resistance to herbicides, primarily glyphosate resistant pigweed, is a huge concern. Every effort should be made to remove suspected resistant weeds from the production system. Now through harvest will be a good time to make a few notes on field specific weed issues to refer back to as weed management plans for 2014 are developed.

Pigweed killed by glyphosate on right and an unaffected potentially resistant pigweed on the left

Insect pressure remains very light to non-existent in cotton but verticillium wilt has really intensified. Verticillium wilt is a soil born fungus that cause plants to wilt but does not cause root rot. The pathogen in affect

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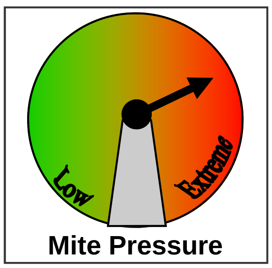
plugs up vascular tissue preventing the translocation of moisture. Stalks of plants can be cut longitudinally and inspected for brown streaking for a quick in field diagnosis. There are no curative treatment for verticillium wilt in cotton, the key management tactic is to plant resistant/tolerant varieties. So, as with weed management make some field notes on "vert" pressure that can be used to help make variety planting decisions next year.

Verticillium Wilt in Cotton

Spider mite pressure remains high in many corn fields and miticide applications are on going. Mite suppression has been good in some fields while others have had to be retreated. Coverage is critical to maximize miticide efficacy. Increased total volume of spray will provide better coverage and penetration into a dense canopy, 5 gallons per acre should be considered minimum. A much higher incidence of spider mite destroyers (Stethorus) have been observed feeding in in mite colonies recently. The spider mite destroyer is a very small beetle in the lady beetle family (Coccinellidae). The beetle is about 1/16 inch long and shinny black; the larvae are gray to brown with a miniature alligator type appearance (minus the teeth :-)). Both the adult and larval forms are key predators of mites and will help stabilize mite populations. Mite management tactics should exploit these natural enemies; avoid pesticide applications which will destroy your partners in mite management.



Spider mite destroyer (Stethorus) adult and larva

An occasional sorghum headworm has been observed in area sorghum. As grain sorghum transitions from vegetative growth to heading whorl feeding pests will shift to feed in developing heads. Corn earworm and fall armyworm commonly referred to as the headworm complex in grain sorghum, rank as the third most damaging insect pests of sorghum in the United States. Treatment thresholds for sorghum headworms are dynamic based on grain value, cost of control, and infestation levels. We have developed a sorghum headworm calculator "app" which is available on the Google Play Store at http://goo.gl/8mXvv The app can also be found by searching for sorghum in the store. The app will run on any android device with an OS of 2.3 or above. Once the app is installed no internet connection is needed. We also have a web app for other operating systems which can be accessed at http://goo.gl/5k7ZtU. The web app will require an internet connection to work. The Android app calculates larvae/10 heads while the web app calculates larvae/head.

Some corn damaged by hail in late June is not pollinating adequately simply due to the lack of pollen production. Injury to the small developing tassel in late June has caused some tassels to be completely bare.

Injured developing tassel (left) barren tassel (right).

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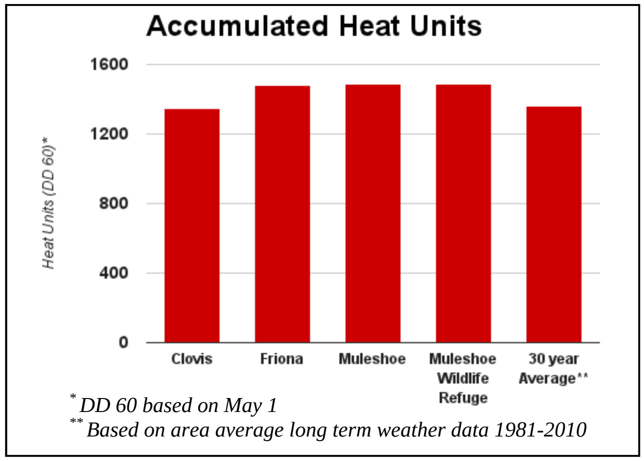
Northwest Plains Pest Management News

Volume XI Issue 12 | Bailey and Parmer Counties | August 16, 2013

Scattered thunderstorms continue to provide much needed moisture to thirsty crops in their paths. Some of the storms contained hail which has caused some crop damage, but for the most part, the benefits of the moisture out weigh losses due to hail. Much of the earlier planted corn is in full dent while the latest planted corn has yet to tassel. Cotton is at peak bloom with most fields between 5 to 6.5 nodes above uppermost white flower (NAWF). Grain sorghum is responding very well to additional moisture from recent storms. Field maturities range from milk stage to those still growing vegetative.

Grain sorghum should be regularly inspected for headworms from head emergence until hard dough. Estimating the economic injury level for headworms is complicated because the potential yield loss varies with the size of the larvae. That is why it is necessary to record the number of small (up to 1⁄4 inch), medium-size (¼ to ½ inch long) and large (1/2 inch long or longer) headworms. Small larvae consume very little grain (about 10 percent of the total) and about 80 percent of them die in this stage. Therefore, small larvae should not be considered in determining the economic injury level. If most headworms are this size, sample the field again in 3 to 4 days. About 19 percent of medium-size larvae survive beyond this stage. Thus, the potential grain loss from medium-size larvae is only 19 percent of the potential loss from large larvae. Most corn earworm larvae larger than ½ inch will survive to complete development, and these large larvae are most damaging; they consume 83 percent of the total grain consumed during larval development. If most of the larvae are larger than ¼ inch, determine which size (medium size or large) is most common and use the corresponding threshold to make treatment decisions. An Android based threshold calculator can be found at the Google Play Store; http://goo.gl/8mXvv . We also have a web app for other operating systems which can be accessed at http://goo.gl/5k7ZtU .

The beat-bucket technique is the best way to estimate the number of headworms in sorghum. Shake sorghum grain heads vigorously into a 2 to 5 gallon plastic bucket (a small white office trash can works well), then count the caterpillars in the bucket. For easy math I like to work



Potential Dailey Water Use*

Crop	Inches/Day
Corn	.20-.27
Cotton	.19-.24
Grain Sorghum	.18-.23

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.

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Beat bucket, TAMU photo

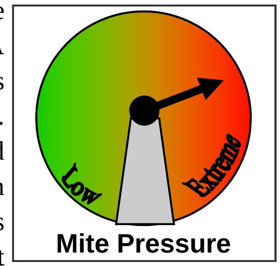
with sets of 10; where I shake ten random heads as I walk down the row then I count and evaluate the size of the larvae. If more heads are sampled in a set there may be too much "trash" in the bucket to efficiently make counts. Record the number of small, medium and large headworms found in the samples. Then use the threshold appropriate for the size of the majority of the headworms. Using the calculator mentioned earlier, where control cost is $15/ac and grain value is $8/CWT an insecticide application should be considered if 19 medium (1/4 to 1/2 inch) or 4 large (>1/2 inch) worms are present per 10 heads (based on 50,000 heads/ac).

Lots of moth activity has been observed in area cotton, most has actually been smartweed borer but the number of bollworm moths has picked up recently. Adults are yellowish brown moths with a wing span of approximately 1.5 inches; considerably larger than the smart weed borer. Eggs are about the size of a pin head, white and somewhat domed shaped with ridges running from top to bottom. Eggs can be easily confused with looper eggs which are flattened on top. Larvae range from 1/16 to 1 5/8 inches long depending on age. They are variable in color including yellowish, greenish, or brownish forms with a tan to brown head. Black bumps with a protruding spine are uniformly distributed over the body. Some may be conspicuously striped. Newly hatched larvae feed on tender vegetation for a short period after emergence. This vegetative feeding is rarely damaging. Larvae then move to and feed on squares and bolls. This direct fruit feeding, often times, will result in economic loss depending on the number of larvae present. Treatment may be justified in conventional cotton if 10,000 small (1/4 inch or less) larvae per acre are present. If larvae are 3/8 inch or more in length then treatment will likely be justified if 5,000 or more larvae per acre are present.


Bollworm moth on bloom

Treatment decisions in Bt cotton should not be made based on small larvae since some feeding must occur before larvae are controlled. Treatment of Bt cotton may be justified if 5,000 or more medium sized larvae (3/8 to ½ inch) per acre are present and square and/or boll damage is observed.

Spider mites persist in many corn fields in varying degrees. Some populations have been held in check by miticides and beneficials while others continue to grow. A miticides residual activity has certainly been tested this year. Some fields have not had beneficials in great enough densities to help suppress mites for an extended period. . Most yield loss is a result of feeding damage at or above the ear leaf. Yield loss is a result of reduced grain fill, premature dry-down, and weaker stalks which may cause lodging. Once corn is fully dented mites will not likely impact grain development but could still impact stalk strength.



Boll Weevil Eradication Changes For 2013

The Commissioner of Agriculture has set the 2013 assessment rate for the NWP Zone at $1 per dryland acre and $2 per irrigated acre. As part of the rate reduction the failed acre credit has been eliminated. So what does this mean? All planted acres of cotton will be assessed. For more information contact the Foundation at 1-800-687-1212 or log on to www.txbollweevil.org.

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TEXAS A&M AGRILIFE EXTENSION

Texas IPM
Partners With Nature

Northwest Plains Pest Management News

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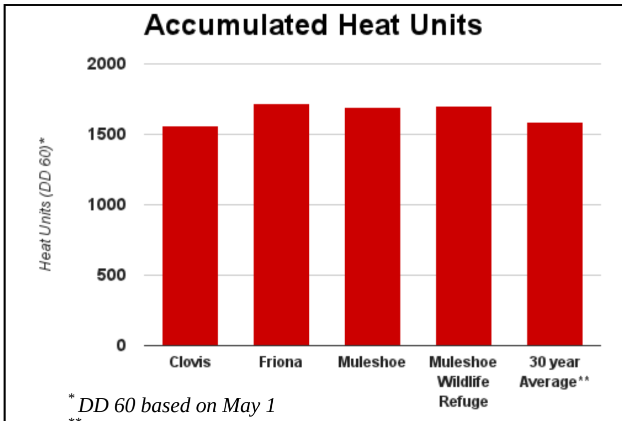
The harvest season is off to a rapid start as silage choppers are rolling in area corn. Conditions are very good and harvest has not been impeded by weather making harvest quick and efficient.

The **irrigation termination** decision making process in corn continues. Assuming an adequate crop condition we normally say that once the starch line has reached 50%, irrigation can be terminated with no detrimental affect. The key to this crop stage irrigation termination point is it assumes a full profile of moisture from which the plant will pull moisture to finish filling grain. If the soil profile is not near capacity at 50% starch line, additional moisture in the form of irrigation or rainfall will be required to finish the crop. With sprinkler and drip irrigation systems we have the capability to tailor late irrigation applications to specific crop needs. Early irrigation termination can significantly reduce corn yield. The starch line is an indicator of crop maturity, corn kernels mature from the outward tip inward toward the cob. A distinct color separation is visible on each kernel and moves down the kernel as it fills. The starch line is easily seen by breaking the ear in half and viewing the cross section.

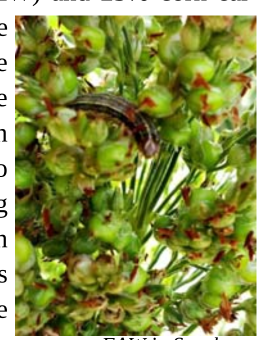
Potential Dailey Water Use*	
Crop	Inches/Day
Corn	.20-.29
Cotton	.27
Sorghum	.23-.26

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.



* *DD 60 based on May 1*
** *Based on area average long term weather data 1981-2010*

Headworm activity in sorghum has really picked up, many observations have revealed headworm numbers 4X the established economic threshold. Current infestation are near 75% fall armyworm (FAW) and 25% corn ear worm. What appears to be happening is the majority of the FAW are hanging out in the foliage until some grain formation appears then they are moving to the head to feed on developing grain. In this scenario fields with few worms in the head a few days ago could be infested with large worms with large appetites very quickly; large larvae consume 83 percent of the total grain consumed during larval development. Treating the worms before they move to the head will not be as effective simply due to the fact that larvae in the heads are directly exposed to the insecticide. A complicating factor in managing headworms is the presence of spider



FAW in Sorghum

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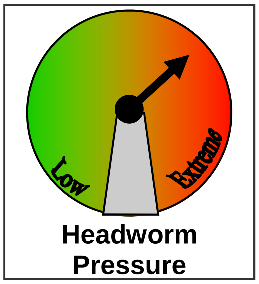
mites. If mites are established then product selection to suppress headworms should be carefully considered as many of the traditional and often cheaper options may flare the mites which could then devastate the sorghum. In situations where mites are present at low levels the use of Belt should provide good headworm control while not flaring mites. If mites are well established then Comite or Onager should be considered as tank mix partners to suppress the mites. Large numbers of spider mites occurring early in kernel development can reduce the ability of sorghum plants to make and fill grain. After kernels reach hard dough, grain is not affected. Additionally, if spider mites are very abundant sorghum plants will have much weaker stalks which and may lodge, which can result in severe harvest losses.



Bollworm moth activity and egg lay has picked up over the last few days. Diligent scouting will be necessary to identify fields with economic levels of bollworms. The decision to treat for bollworm should be based on number of larvae/acre, larvae size, and the maturity of the crop. Most of the area cotton is late and still has a lot of squares and small tender bolls which very suitable for larval development. Most of the small fruit has little if any chance to make a harvestable boll but larvae could become established on this then move to more mature bolls as they gain the ability to penetrate larger fruit. Generally we consider bolls which have gained 450 heat units after bloom to be safe from bollworm damage. The late crop makes determination of which bolls are worth protecting much more difficult; we will likely be tempted to protect a much later boll than what we normally would. This adds significant risk associated with getting a positive return on an insecticide application since the later bolls have less time and probability to mature.

Heat Unit Accumulation from Various Bloom Dates

Aug 1	483
Aug 5	407
Aug 10	310
Aug 15	236

Loopers are common in many cotton fields, they feed on foliage making small holes in the leaves. Very high populations could cause excessive loss of leaf surface area but I have not observed any infestations near that level. There is no established treatment threshold in Texas but NCSU suggests " If the defoliation reaches 25 percent and a significant number of bolls that the producer expects to harvest are still filling out, treatment may be advised. However, remedial sprays may have only marginal effect on the more common soybean looper." To round out the current Lepidopteron spectrum beet armyworm, yellow striped armyworm and Arctiid moths, eggs and larvae have also been observed in area cotton. **Beet armyworms** at present infestations are at tolerant levels but what makes this pest more concerning than other foliage feeders is it may transition to feeding on small bolls.

Looper and feeding damage.

Late planted corn has been and continues to be very attractive to lepidopteron pests. FAW and southwestern corn borer have been observed in alarming numbers in late planted non-Bt corn. FAW will readily feed on emerging silk which can inhibit pollination. In extreme cases I have seen heavy FAW pressure reduce pollination by more than 90%. Any late planted corn should be carefully monitored for these pests.

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TEXAS A&M AGRILIFE EXTENSION

Texas IPM
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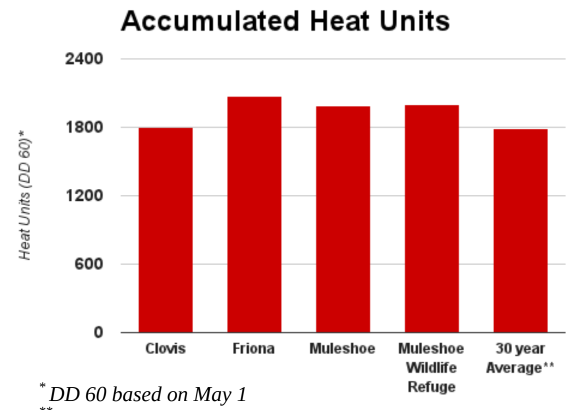
Northwest Plains Pest Management News

Volume XI Issue 14 | Bailey and Parmer Counties | September 24, 2013

Spring seeded crops have progressed to "the short rows". Corn harvest for both silage and grain has commenced; preliminary yields, while not record breaking, are encouraging. Cotton and sorghum have progressed very well. Cotton , for the most part has shed much of the small immature fruit and looks to have a chance to adequately mature the harvestable bolls. Sorghum seems to have really made the most of available moisture , many fields look surprisingly good considering. Winter wheat seeding is off to a rapid start, many of the earlier planted fields have emerged and have began to tiller.

Corn and cotton has matured to the point that pest damage is unlikely. Defoliating pests and aphids could still be problematic in cotton but at this point risk appears to be low. Late maturing sorghum may still susceptible to headworms and should me monitored but once sorghum reaches the hard dough stage it should be safe from headworm damage.

Harvest aids can be applied to sorghum to bring grain to a more uniform moisture level and dry down weed escapes. Timing is very important as an application made to early will reduce yield. Once sorghum has reached physiological maturity a harvest aid can be applied without risking yield. Sorghum is considered physiologically mature when the black layer has formed at the base of the kernels (approximately 30% moisture), at this point the grain has reached maximum weight. Once a harvest aid has been applied harvest should be planned accordingly; under normal conditions harvest aids shouldn't cause a lodging issue for up to 3 weeks but after 30 days lodging could be significant. Ideally sorghum should be harvested 10-14 days after a harvest aid application. Several products are available: sodium chlorate (up to 6 lbs/acre) and glyphosate (up to 2 qt/acre) have been used successfully. Aim is also labeled for use as a harvest aid in sorghum and should be particularly useful in weedy fields.



* DD 60 based on May 1
** Based on area average long term weather data 1981-2010

Potential Dailey Water Use*	
Crop	Inches/Day
Cotton	.15
Sorghum	.14
Wheat	.10

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.

Large areas of dead wheat as a result of white grubs have been observed in a few fields in the area. White grubs are the larval stage of insects commonly known as

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White grub feeding on wheat

May or June beetles. White grubs, sometimes referred to as grubworms, injure wheat by feeding on roots and other underground plant parts.

White grubs require 1 to 4 years to complete their life cycle, depending on species. Local observations have documented both Phyllophaga and Cyclocephala species; infestations with near 80% Phyllophaga species have been identified in some fields. Phyllophaga species may have life cycles exceeding one year in which case larger grubs with larger appetites may be present when wheat is most susceptible, in the seedling stage

The adult stage of the various white grub species are heavy-bodied beetles, 1⁄2 to 5⁄8 inch long, brown, with long, spindly legs. In summer adult beetles lay eggs in the soil, within about two weeks the eggs hatch into small white grubs that feed on plant roots.

White grub larvae are creamy white and C-shaped, with three pairs of legs and tan to brown heads. Larger larvae (1⁄2 to 1 inch-long) are responsible for most damage due to their large size and voracious appetites. Feeding by large numbers of large white grubs can quickly destroy root systems, killing seedlings.

Small and large white grub

While there are no registered insecticides for white grub control in wheat, limited field tests suggest that Gaucho® and Cruiser® seed treatments which target aphids and greenbugs may provide some suppression of small larvae but will not likely provide desired results if larvae are large. Lorsban, also labeled for aphid control in wheat, may provide suppression when chemigated.

Fall armyworms, beet armyworms and/or army cutworms have been found in a few area wheat fields, most infestation have not justified treatment at this point but should be monitored closely. Small larvae are feeding on leaves, creating tiny "window panes" in the leaves Control is suggested when there are four or more larvae, 1 inch or longer, per square foot, and their damage is threatening the stand. Wheat which is not well established (newly emerged, thin, etc.) may not be able to tolerate as many foliage feeding worms and is at greater risk of damage. If other species of foliage feeding worms are present, then an aggregate larval population should be considered when making management decisions.

Beet armyworm feeding on emerging wheat.

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TEXAS A&M AGRILIFE EXTENSION

Texas IPM
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Northwest Plains Pest Management News

Volume XI Issue 15 | Bailey and Parmer Counties | October 4, 2013

A fast and furious corn harvest continues, most of the area corn silage has been harvested and grain harvest is progressing rapidly. Reported yields have been variable but most reports have been encouraging. Some sorghum has been harvested but for the most part the area crop is just reaching physiological maturity. Harvest aid application decisions to prepare the area cotton crop for harvest are being deliberated.

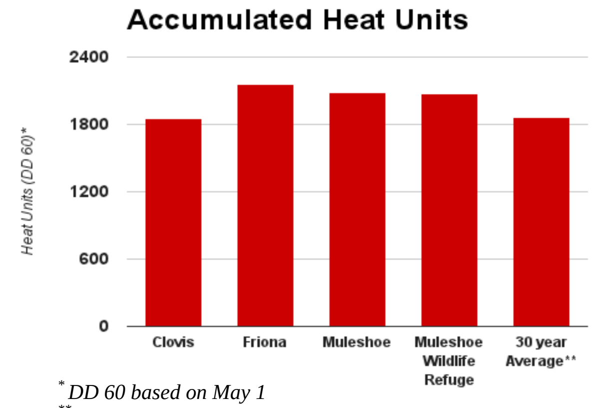
At this point cotton harvest aid applications will be weather driven, as it is unlikely that significant heat unit (HU) accumulations to further develop fiber will occur. Using historical weather data from 1980-2010 only 14 total HU are expected in October (14 HU is less than one normal August day). For best results harvest aid applications should be made on warm sunny days with an extended outlook of warm conditions.

Some factors that increase the performance of harvest-aid chemicals include the following:

- Warm, calm, sunny weather
- Soil moisture relatively low but sufficient to maintain cotton plant without moisture stress
- Soil nitrogen levels relatively low
- Leaves active and uniformly expanded on plants
- Little or no secondary growth evident on plants

Potential Dailey Water Use*	
Crop	Inches/Day
Wheat	.10
Sorghum	0-.20

*Daily estimated crop water demands (inches of water per day) based on PET data from Halfway.



*DD 60 based on May 1
**Based on area average long term weather data 1981-2010

- Plants with a high percentage of open bolls that have shed some mature leaves

Conversely, some of the factors which negatively affect harvest-aid chemical performance include:

- Applications made under cool (below 60o F), cloudy conditions
- Prolonged periods of wet weather following treatment
- Plants in vegetative growth state with low fruit set
- Plants severely moisture stressed at time of treatment
- High soil moisture and nitrogen levels
- Plants exhibiting secondary growth
- Poor spray coverage

Harvest-aid product selection, tank mix partners and rates vary with environmental and crop conditions. The following table is an excerpt from the "2013 High Plains and Northern Rolling Plains Cotton Harvest-Aid Guide". The full guide can be viewed at http://goo.gl/WkxFz4

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