New Mexico State University

Agricultural Science Center at Artesia

New Mexico State University
Agricultural Science Center at Artesia
67 E. Four Dinkus Road, Artesia, NM 88210

2018
Annual Progress Report

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NOTICE TO USERS OF THIS REPORT

This report has been prepared to aid Science Center Staff in analyzing results of the various research Projects from the past year and to record data for future reference. These are not formal Agricultural Experiment Station Report research results.

Information in this report represents only one-year's research. The reader is cautioned against drawing conclusions or making recommendations as a result of data in this report. In many instances, data represents only one of several years' results that will constitute the final format. It should be pointed out, that staff members have made every effort to check the accuracy of the data presented.

This report was not prepared as a formal release. None of the data is authorized for release or publication, without the prior written approval of the New Mexico State University Agricultural Experiment Station.

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Acknowledgements

Several individuals and companies donated products and service to the Artesia Agricultural Science Center during 2018. Appreciation is expressed to the following persons and organizations for their contribution.

Southeastern New Mexico Agricultural Research Association

Chaves County	Eddy County	Lea County
James Jones, Treasurer	David Torres	Bruno Bruelhart
Travis Gray	James Walterscheid	John Norris
Doug Whitney	Dean Calvani, Vice Chairman	Todd Roberson, Chairman
	Doug Lynn, Associate Board Member	
	Extension Agents	
Sandra Barraza	Woods Houghton	Wayne Cox

2017 HOWARD STROUP SCHOLARSHIP RECIPIENT
Joyce Anne Cooper, Hondo Valley High School
Major in Animal Science

INTRODUCTION

The New Mexico State University Agricultural Science Center at Artesia is located 7 miles south of Artesia just off of US 285 on County Road 229. The center is located in the Pecos Valley in the Artesian Conservancy District. The center is comprised of 150 acres of land located at 35.13N, -106.50W at an elevation of 3,700 feet above sea level. The Ag Science Center has several of the major soil types found in the Pecos Valley consisting of Harkey very fine sandy loam, Karro loam, Pima silt loam, Reagan loam, and Reeves loam. The farm utilizes Artesian water rights using flood, furrow, sideroll sprinklers, and linear move irrigation systems. There are currently 5 acres of Western Shley and 5 acres of Pawnee pecan trees. Perennial crops of alfalfa, grapes, blue grama, and a demonstration orchard of Jujube trees and Paulownia trees. Annual crops include cotton, small grains for silage, forage corn, sorghum and sudangrass.

Selected Center Events, Activities and Outreach

Field Day was held on August 23, 2018.

The advisory board held an annual Field day meeting and elected three new members. The board of directors will be meeting in January to elect officers.

Pierce , J. and P. Monk (Organizers and presenters) Insect pinning workshop (July 18, 2018)

Pierce, J. and P. Monk "Introduction to Environmental Science "NMSU-C Environmental Science 101 Workshop and Field Tour September 19, 2018
Flynn, R. , J. Pierce and P. Monk "Ag Day" Park Junior High May 3. Invited presentations.

P. Monk and J. Pierce. "Bugs, Bugs, Bugs". Hermosa Elementary School Artesia, NM (December 2018)

NMSU ACES Open house. April 2018 Poster Presentations by. Robert Flynn, Jane Pierce.

Annual Weather Summary

Table 1. Historical monthly precipitation (in.) for the Agricultural Science Center at Artesia

Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
January	0.00	0.00	0.63	0.00	1.32	0.00	0.89	.10
February	0.18	0.17	0.00	0.21	0.23	0.31	0.41	.31
March	0.00	0.06	0.00	0.42	0.12	0.00	0.02	.03
April	0.00	0.02	0.00	0.80	0.92	0.53	1.09	0.00
May	0.00	3.19	0.73	0.85	2.47	0.98	0.30	1.89
June	0.70	0.18	0.10	1.12	0.83	1.02	1.83	1.67
July	0.53	2.33	3.20	2.21	1.19	0.43	1.49	1.72
August	0.12	0.97	0.06	1.09	0.38	4.17	3.15	1.38
September	2.13	1.38	3.65	7.37	0.93	5.93	1.92	1.92
October	0.50	0.26	0.06	0.50	4.49	1.42	0.43	3.01
November	0.00	0.11	0.80	1.63	0.35	0.73	0.31	0.23
December	0.68	0.01	0.46	0.22	0.50	0.76	0.07	.77
Total	4.84	8.68	9.69	16.42	13.73	16.28	11.91	13.03

Table 2. Average monthly temperatures (°F) for the Agricultural Science Center at Artesia.

Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
January	39.1	43.9	40.0	38.8	36.5	37.7	43.9	38
February	41.2	44.5	43.6	45.1	44.4	46.9	50.4	46.1
March	56.1	55.4	52.6	51.4	50.8	55.0	57.7	54.0
April	64.1	64.6	59.4	59.7	59.8	60.6	62.8	60.5
May	68.4	70.9	70.0	68.7	65.6	67.3	68.0	73.0
June	81.3	81.0	81.4	80.7	78.1	79.1	68.0	80.1
July	84.1	80.2	78.1	80.7	81.7	85.2	79.6	80.7
August	84.9	80.4	79.9	77.8	80.6	78.0	77.9	79.5
September	72.6	71.7	72.2	69.9	76.0	71.8	73.4	71.7
October	61.7	61.0	58.8	62.2	62.7	64.6	61.6	58.9
November	49.6	52.3	46.7	45.5	49.1	52.1	53.2	46.0
December	32.0	41.0	38.9	42.6	41.6	41.9	43.2	41.2
Average	64.0	64.2	62.1	61.9	62.3	63.5	62.4	60.8

Table 3. Historical average monthly maximum temperatures (°F) for the Agricultural Science Center at Artesia.

Year	2011	2012	2013	2014	2015	2016	2017	2018
January	60.0	62.9	56.9	59.0	50.0	53.3	59.4	57
February	61.3	61.7	61.9	61.6	60.6	66.8	69.4	64.0
March	78.5	77.0	72.8	71.7	68.0	74.4	78.3	72.0
April	84.4	85.2	77.9	78.5	77.4	79.7	80.1	79.8
May	87.5	87.7	88.2	86.8	81.7	83.9	86.1	91.9
June	101.5	98.4	98.3	97.7	93.2	102.0	96.2	96.1
July	100.3	94.4	90.9	95.0	96.7	85.2	95.4	94.8
August	101.1	96.4	95.2	90.9	96.7	91.4	90.9	93.2
September	89.3	88.4	86.1	79.8	91.5	84.8	88.9	84.9
October	80.9	78.5	77.5	79.1	75.7	83.0	78.3	70.2
November	67.5	72.0	62.2	61.1	65.4	67.3	69.5	62.0
December	46.4	61.6	53.6	57.8	58.0	56.8	61.1	54.5
Average	82.9	82.1	78.9	78.3	77.9	80.2	79.5	76.7

Table 4. Historical average monthly minimum temperatures (°F) for the Agricultural Science Center at Artesia.

Year	2011	2012	2013	2014	2015	2016	2017	2018
January	18.2	25.0	23.1	18.5	23.1	22.2	28.4	18
February	21.1	27.3	25.4	28.7	28.3	27.0	31.4	28.1
March	34.8	33.7	32.5	31.2	33.5	35.7	37.1	35.9
April	43.7	44.1	40.8	40.8	42.2	41.5	45.4	41.1
May	49.4	54.0	51.8	50.6	49.5	50.8	49.9	54.1
June	61.0	63.6	64.6	63.6	62.9	62.1	62.9	64.2
July	67.9	65.9	65.3	66.4	66.6	68.3	66.8	66.5
August	68.7	64.4	64.5	64.6	64.6	64.7	64.8	65.7
September	55.9	54.9	58.3	60.1	60.5	58.8	58.0	58.4
October	42.4	43.5	40.2	45.3	49.6	46.2	44.8	47.6
November	31.7	32.5	31.2	29.8	32.8	36.9	36.9	30.0
December	23.5	20.4	24.3	27.4	25.2	27.0	25.4	27.9
Average	45.0	46.3	45.2	45.4	44.9	46.7	46.0	44.8

Weather plays a major role in profitable agricultural production. Accurate weather data is critical and requires diligence and dedication to collect weather readings every day of the year. In 2018 the ASC Artesia was recognized for 50 years of service recording daily measures of temperature, wind, evaporation, precipitation and soil temperature. NMSU-ASC data is added to other records from the area to develop a better understanding of regional climate variation. For example, this area has experienced a ten year rolling average temperature increase of 2.9°F. Field trials in water management, crop yield, variety selection, soil management, and insect pressure assist southeastern NM growers to adapt to both this warming trend and manage their field for resilience in a changing landscape.

Financials

FY ("17-"18)	Sales	Operations Enhancements	Land Use	Tractors Vehicles	Grant	TOTAL
REVENUE						
17-18 Carry Over	28000		36299		8087	72386
Appropriation		101392	18000	2000	24900	146292
Grants & Gifts						0
Sales & Fees	19007					19007
Irrigation Usage						0
Tractor/vehicle Usage						0
Lab Usage						0
Indirect Cost						0
TOTAL REVENUE	47007	101392	54299	2000	32987	237685.61
SUPPLIES						
Auto Repairs						0
Fuel		6784		1484	151	8419
Office		503				503
Other	1686	12915			4087	18688
Other Fed Excl,		264				264
Lab						0
Computer					1095	1095
Cleaning						0
Photo						0
Safety		473				473
Seed/Feed/Ferrtilizer	2492	376				2867
BusinessMeals/Food		786				786
Books		108				108
Furniture &Equipment		3092				3092
Building R&M Parts		1086				1086
Equipment R & M Parts	916	11988				12904
Vehicle R & M Parts		308		577		885
Computer R&M Parts						0
Furniture &Equip 5000						0
SUPPLIES TOTAL	5093	38683	0	2061	5333	51170.67

SERVICES						
Training						0
General Services		6574			178	6752
Postage	592	571				1163
Phone/Cell		4225				4225
Internet		3737				3737
Advertising		74				74
Insurance				837		837
Harware & Equip Rental		3432				3432
Non Building RM Services	2034	5044		13		7091
Building R &M		648				648
Electric		12213				12213
Propane		3722				3722
Utiltities Water		1179				1179
Dues, Fees & Tax		40				40
Prof. contracted Serv.		602				602
Pest Control		262				262
Lab Analysis	6348	85			153	6586
Farm and Ranch					742	742
Freight						0
Grant overrun					365	365
SERVICE TOTALS	8974	42408	0	850	1437	53669
						0
Travel Totals		2008			7879	9887
						0
Inter Dept Transfers						0
Subcontract						0
Indirect Gerneral					7586	7586
Non Mand transfer			29500			29500
Furniture & Equip.						0
Inter Dept. Transfer Total	0	0	29500	0	7586	37086
						0
TOTAL REVENUE	47007	101392	54299	2000	32987	237685.61
TOTAL EXPENSES	14067	83100	29500	2911	14356	143934.08

The 2018 New Mexico Alfalfa Variety Test Reports

Leonard Lauriault, Ian Ray, Chris Pierce, Owen Burney, Koffi Djaman, Robert Flynn, Mark Marsalis, Samuel Allen, Gasper Martinez, Charles Havlik, and Margaret West[1]

Introduction

In 2018, 180,000 acres of alfalfa (*Medicago sativa*) were in production in New Mexico, which was a 10,000-acre decrease from 2017. Hay production was estimated at 918,000 tons reflecting another 2% increase in yield/acre. At a January through August 2018 average of $215/ton (up from $180/ton in 2017), estimated gross returns from alfalfa hay produced in 2018 will total just over $197 million, a $26 million increase over 2017. Besides its value for hay, alfalfa also is the legume of choice in irrigated perennial pastures. Whether used as pasture or hay, the value of alfalfa to New Mexico is greatly magnified by its contribution to live- stock production and receipts from the sale of meat, milk, and other products generated by livestock enterprises.

Choosing a good alfalfa variety is a key step in establishing a highly productive stand of alfalfa, whether for hay or pasture. Differences be- tween the highest- and lowest-yielding varieties in established irrigated tests included in this report ranged from 0.99 to 2.41 tons per acre in 2018. If sold as hay, this translates to a potential difference in returns of

$213 to $518 per acre due to variety, or an increase of at least $38 million for the industry in 2018 alone.

This report, which is a collaborative effort of New Mexico State University scientists at agricultural science centers throughout the state, pro- vides yield data for alfalfa varieties included in yield trials in New Mexico. While consistently high yields compared to other varieties over a number of years and locations within a region is the best indication of varietal adaptation and persistence, other factors should be considered in the variety selection process (see NMSU’s Cooperative Extension Service Circular 654, Selecting alfalfa varieties for New Mexico). In addition to fall dormancy and winter hardiness, high levels of pest resistance are critical to protecting an alfalfa stand for long-term production. Alfalfa grown in New Mexico should have at least a resistant (R) rating for bacterial wilt, Fusarium wilt, anthracnose, Phytophthora root rot, spotted alfalfa aphid, blue alfalfa aphid, pea aphid, stem nematode, and southern rootknot nematode. Seed quality also should be high. Selecting an alfalfa variety based on seed cost is a gamble producers often lose. To be assured of achieving a long-lasting, highly productive stand, buy either certified or Plant Variety Protected (PVP) seed, which guarantees the genetics and performance. The best choice of seed of any variety is one that was treated with a fungicide and nitrogen-fixing bacteria before it was bagged.

Description of Tests

Replicated alfalfa variety tests included in this report were con- ducted under research controls at NMSU’s Agricultural Science Centers at Artesia [2016 (late summer planted) and 2018 (spring planted)], Tucumcari (2015 irrigated with treated municipal wastewater), Los Lunas (2016), and Farmington (2014). Weather data for 2018 and the long-term averages from all locations are presented in table 1.

Yield data (on a dry matter basis) are presented in tables 2-6. Varieties are listed in order from highest to lowest average annual production. Yields are given by cutting for 2018 and by year for each production year. Statistical analyses were performed on all alfalfa yield data (including experimental entries) to determine if the apparent differences are truly due to variety or just to chance. The variety with the highest numerical yield in each column is marked with two asterisks (**), and those varieties not significantly different from that variety are marked with one asterisk (*). Those are the varieties from which to make an initial selection. Other- wise, to determine if two varieties are truly different, compare the difference between the two varieties to the Least Significant Difference (LSD) at the bottom of the column. If the difference is equal to or greater than the LSD, the varieties are truly different in yield when grown under the conditions at a given location. If NS is given for the LSD, there was no statistical difference between the highest and lowest yielding varieties. The Coefficient of Variation (CV), which is a measure of the variability of the data, is included for each column of means. Low variability (<20 per- cent) is desirable, and increased variability within a study results in higher CVs and larger LSDs. There might be a difference between previously published data and the data given in this publication for the same tests because of differences in the programs used for statistical analysis.

Table 7 summarizes information about proprietors, Roundup Ready genetics, fall dormancy, winter survival (measured in the northern United States), pest resistance, and yield performance across years and locations for all varieties currently included in NMSU's alfalfa variety testing program. For information about other varietal characteristics, such as grazing, salt, or traffic tolerance or GMO traits besides Roundup Ready® genetics, check the National Alfalfa and Forage Alliance website for the Alfalfa Variety Leaflet (https://www.alfalfa.org/varietyLeaflet.php). In Table 7, varieties are listed alphabetically by fall dormancy category. As in the data tables, the variety with the highest numerical yield in each column is marked with two asterisks (**), and those varieties not significantly different from that variety are marked with one asterisk (*). Remember good performance across several years and locations is the best indicator of broad adaptation, pest resistance, and persistence.

Seed labeled "common," "variety not stated," or "variety unknown", particularly that from other states, is of unknown genetic background and may or may not have the necessary disease or insect resistance. New Mexico Common and African Common seed used in all tests throughout the state has come from the same supplier and seed fields in New Mexico. Seed purchased from other dealers may or may not be of the same quality and performance.

Summary

Consistent production of high alfalfa yields is the result of selecting good varieties and implementing good management techniques. Soil fertility should be maintained at recommended levels based on soil tests, irrigation should be properly applied, weeds and insects should be con- trolled using appropriate cultural and/or chemical methods, and harvest management should allow sufficient time to restock root energy prior to winter. For dormant (FD 1 to 3) and semi dormant (FD 4 to 6) varieties, a 6-week rest period before a dormancy-inducing freeze (27°F) is recommended to allow plants to replenish root reserves for winter survival and initiate spring growth, after which harvesting might be done either mechanically or by grazing. Non-dormant (FD 7 to 9) varieties also might benefit from this rest period. Removing fall growth is beneficial to reducing weevil populations the following year as eggs are laid in and overwinter in stems. Harvesting established stands at early bloom would result in 3 to 5 cuttings per year before initiation of the rest period in most areas of New Mexico. More dormant varieties might not produce yields that can be baled during the rest period; however, these can still be grazed. For additional information about alfalfa management, refer to the other NMSU Agricultural Experiment Station and Cooperative Extension Service publications listed in table 8.

Acknowledgements

The authors express appreciation to the following for their significant contribution to The New Mexico Alfalfa Variety Testing Program by helping with planting, maintaining, harvesting, or other data collection, and data entry: Dallen Begay, Nathan Begay, Jason Box, Servando Bustillos, Patty Cooksey, Josh Foster, Lorenzo Gallegos, Christopher Hill, Jared Jennings, Shane Jennings, Jonah Joe, Ruben Pacheco, Tom Place, Dennis Price, Franklin Jason Thomas, Anthony Williams, and the staff at University Marketing and Communications who make publications such as this possible. Salaries and research support were provided by state and federal funds appropriated to the New Mexico Agricultural Experiment Station. Federal funds included those appropriated through the Hatch Act of 1887.

Table 1. Temperature and precipitation data for 2018 and the long-term averages for the New Mexico Alfalfa Variety Test locations.

Location	Artesia				Tucumcari				Los Lunas				Farmington			
Elevation	3366 ft.				4091 ft.				4840 ft.				5640 ft.			
Latitude	32° 45' N				35° 12' N				34° 46' N				36° 41' N			
	Temp. (°F)		Precip. (in.)		Temp. (°F)		Precip. (in.)		Temp. (°F)		Precip. (in.)		Temp. (°F)		Precip. (in.)	
Month	2018	Avg.	2018	Avg.	2018	Avg.	2018	Avg.	2018	Avg.	2018	Avg.	2018	Avg.	2018	Avg.
n	53	49	0.31	0.53	54	48	0.01	0.74	49	44	0.00	0.46	48	41	0.14	0.65
	43	41	0.28	0.51	41	39	0.00	0.60	35	35	0.00	0.52	35	31	0.00	0.47
	38	40	0.10	0.39	38	38	0.00	0.42	35	35	0.02	0.38	35	30	0.25	0.51
	46	45	0.10	0.42	43	42	0.03	0.50	43	40	0.35	0.41	39	36	0.09	0.49
	54	42	0.03	0.43	52	49	0.16	0.78	50	47	0.12	0.47	44	44	0.09	0.62
	60	60	0.00	0.62	56	58	0.51	1.18	61	55	0.00	0.47	55	51	0.20	0.60
	73	69	1.89	1.20	72	66	1.82	1.99	69	63	0.07	0.47	64	60	0.32	0.55
	81	78	1.67	1.40	81	76	0.56	2.00	78	73	1.30	0.55	74	70	0.80	0.25
	81	80	1.72	1.76	81	79	1.16	2.77	79	77	1.14	1.37	80	76	0.60	0.84
	80	78	1.38	1.67	78	77	3.63	2.88	76	75	0.65	1.69	76	74	0.21	1.03
	72	71	1.92	1.81	72	71	0.78	1.65	69	67	0.78	1.18	69	66	0.14	1.10
	59	61	3.01	1.16	58	60	4.27	1.37	56	56	2.22	1.04	53	54	0.81	0.93
Annual	62	60	12.41	11.90	61	58	12.93	16.88	58	56	6.65	8.97	56	53	3.65	8.04

Table 2. Dry matter yields (tons/acre) of sprinkler-irrigated alfalfa varieties sown September 16, 2016, at NMSU's Agricultural Science Center at Artesia†.

	2017	2018 Harvests					2018	2-Yr
Variety Name	Total	8-May	7-Jun	3-Jul	6-Aug	17-Sep‡	Total	Average
SW 7408	9.41**	1.72**	1.54*	1.62*	2.00**	1.69*	8.28*	9.05**
NuMex Bill Melton	9.16*	1.59*	1.71*	1.62*	1.82*	1.61*	8.22*	8.64*
MS sunstra 155203	8.67*	1.61*	1.76**	1.63*	1.87*	1.66*	8.42*	8.60*
African Common	8.05*	1.60*	1.51*	1.69*	1.95*	1.83**	8.45**	8.36*
SW 8412	8.09*	1.34*	1.58*	1.82**	1.92*	1.63*	8.20*	8.32*
SW 8476	8.29*	1.65*	1.63*	1.48*	1.61*	1.76*	7.96*	8.18*
Zia	7.64*	1.34*	1.56*	1.71*	1.70*	1.64*	7.77*	7.88*
MS sunstra 155204	7.99*	1.64*	1.47*	1.33*	1.59*	1.78*	8.06*	7.87*
SW 8409	8.08*	1.45*	1.48*	1.48*	1.61*	1.32*	7.75*	7.69*
55ER08	7.78*	1.57*	1.45*	1.29*	1.79*	1.58*	7.70*	7.69*
SW 7473	7.78*	1.14*	1.43*	1.60*	1.80*	1.66*	7.64*	7.63*
New Mexico 11-1	7.63*	1.38*	1.02*	1.63*	1.75*	1.71*	7.98*	7.62*
NM Common	7.36*	1.44*	1.78*	1.54*	1.62*	1.50*	7.71*	7.55*

Dona Ana	7.82*	0.78*	1.18*	1.32*	1.69*	1.60*	6.67*	7.19*
Mean	8.13	1.45	1.51	1.55	1.77	1.64	7.92	8.02
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS
CV%	10.50	32.70	27.10	15.44	14.76	12.00	9.93	9.25

†Data were analyzed using analysis of covariance where check plots of AmeriStand 803T were used as the covariate.

2017 Harvest dates:16-May, 22-Jun, 21-Jul, 24-Aug, and 16-Oct.

‡The sixth harvest was not taken due to excessive precipitation.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 3. Dry matter yields (tons/acre) of sprinkler-irrigated alfalfa varieties sown April 18, 2018, at NMSU's Agricultural Science Center at Artesia†.

	2018 Harvest
Variety Name	12-Sep‡
SW 8476	1.44**
SW 7408	1.43*
SW 8412	1.26*
MS sunstra 155203	1.24*
SW 8409	1.19*
Hi-Gest 660	1.14*
Zia	1.14*
SW 8421S	1.07*
SW 7473	1.07*
Dona Ana	1.01*
NM Common	0.90*
African Common	0.89*
Mean	1.15
LSD (0.05)	NS
CV%	26.68

†Data were analyzed using analysis of covariance where check plots of Pioneer 55VR08 were used as the covariate

‡A prior harvest was not measured due to excessive weeds.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties at the 5% level.

New Mexico 2018
Corn and Sorghum Performance Tests

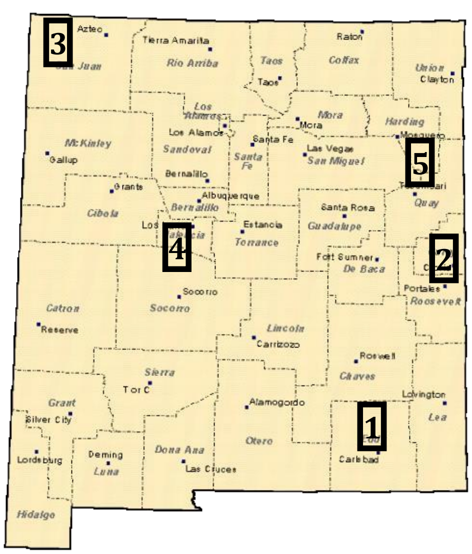
M.A. Marsalis[1], R.P. Flynn[2], L.M. Lauriault [3], A. Mesbah[4], and K. Djaman[5]

INTRODUCTION

Performance tests for grain corn, grain sorghum, forage corn, forage sorghum and sorghum sudangrass were conducted at the Agricultural Science Centers at Artesia, Clovis, Farmington, and Tucumcari New Mexico in 2018 (Figure 1). This report contains information from all Agricultural Science Center corn and sorghum tests; however, it is possible that not all locations contain every test listed above.

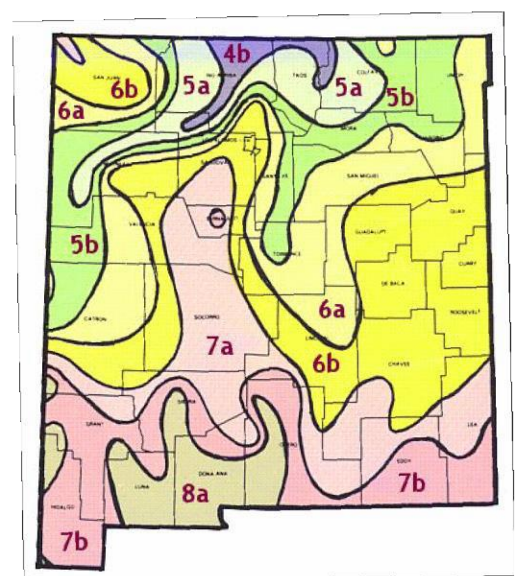
The New Mexico corn and sorghum performance testing program is part of an ongoing program to provide farmers, Extension workers and seed industry personnel with reliable, unbiased, information that will allow a valid comparison of corn and sorghum varieties/hybrids at various locations throughout the state. The state of New Mexico encompasses eight climate zones, all of which have some form of agricultural production (Figure 2). Variability in climate, soils, water and local production practices contribute to the need for crop performance tests throughout the state. Climate data for the Agricultural Science Center testing locations are shown in Table 1. Growers who use this report to make cropping decisions should rely primarily on results from tests near their location or in comparable climate zones

Figure 1. Corn and sorghum testing locations



1. Agricultural Science Center at Artesia
2. Agricultural Science Center at Clovis
3. Agricultural Science Center at Farmington
4. Agricultural Science Center at Los Lunas
5. Agricultural Science Center at Tucumcari

Figure 2. Climate zones in New Mexico



4	-25 to 20F
5	-20 to –15 / -15 to –10F
6	-10 to –5 / -5 to 0F
7	0 to –5 / -5 to 10F
8	10 to 15F

Table 1. Historical average monthly precipitation (inches) and temperatures (°F) for cooperating agricultural science centers.					
	Artesia	Clovis	Farmington	Los Lunas	Tucumcari
	Precipitation (inches)				
January	0.39	0.36	0.56	0.38	0.37
February	0.41	0.40	0.54	0.41	0.46
March	0.41	0.69	0.65	0.47	0.74
April	0.62	0.78	0.63	0.47	1.09
May	1.07	1.99	0.58	0.46	1.97
June	1.38	2.38	0.24	0.56	1.87
July	1.78	2.84	0.87	1.37	2.60
August	1.69	3.07	1.09	1.67	2.69
September	1.82	1.94	1.07	1.17	1.55
October	1.18	1.71	0.87	1.06	1.29
November	0.54	0.51	0.69	0.46	0.64
December	0.50	0.46	0.52	0.52	0.59
Total	11.64	17.10	8.32	8.95	15.90
	Average Temperature (°F)				
January	40.5	37.6	30.4	35.5	38.5
February	45.2	41.2	36.3	40.2	42.3
March	52.0	48.0	44.0	47.2	49.4
April	60.5	56.1	51.1	54.8	57.7
May	69.2	64.6	60.1	63.4	66.3
June	77.7	74.0	70.6	72.7	75.8
July	79.8	76.5	75.8	77.0	79.2
August	78.4	74.8	73.4	74.8	77.4
September	71.7	68.5	66.1	67.4	70.8
October	61.0	58.2	54.0	55.9	59.7
November	48.8	46.4	41.1	43.6	47.6
December	40.8	38.8	31.3	35.1	39.3
Average	60.4	57.0	52.8	55.7	58.7
Source: Western Region Climate Center: http//www.wrcc.dri.edu/summary/climsmnm.html					

TEST LOCATIONS

The New Mexico corn and sorghum performance testing program is supported by paid fees from the cooperating companies. Personnel at each location determine which tests will be conducted at their site and seed companies are invited to participate in those tests. Because seed company participation in individual tests and locations is voluntary, many of the hybrids/varieties that are grown in the state are not included in the tests, and different groups of hybrids/varieties are evaluated at the different locations.

TEST PROCEDURES

In an effort to provide readers with easily accessible information, procedural data for individual tests are presented in the 'Test Description' tables that immediately precede the summary tables of results for the tests. The 'Test Description' tables contain information on location, test design, management practices and growing conditions.

Test description tables are designated with an 'A' suffix.

All of the Agricultural Science Center performance tests were replicated randomized complete block designs (RBD). Where appropriate, statistical analyses were used to calculate measures of least significant difference (LSD), coefficient of variation (CV) and F test values. All LSD's are reported at the 95% probability level. If the F test value is greater than 0.05 the LSD is not used. When the F test value is less than 0.05, it is appropriate to use the LSD value as a measure of the magnitude by which one entry must differ from another to be considered significantly different. The CV is a measure of variability relative to the mean. A CV below 10 generally indicates reliable data or methodology. CV's of 10 to 20 are indicators of normal variability for grain and forage tests.

Yields for the grain tests are presented on a bushel-per-acre or pound-per-acre basis, adjusted to a standard moisture content and bushel weight. Corn yields are calculated at a standard moisture of 15.5% and a bushel weight of 56 lb. Grain sorghum yields are calculated at a standard moisture of 14% and a bushel weight of 56 lb.

Dry and green (fresh) forage yields reported for the forage tests are in tons per acre. Moisture at harvest was calculated from a representative sample (approximately 1 lb.) from harvested plots. Samples from variety tests at the Agricultural Science Centers were dried in a forced air oven (125-150°F) for determination of moisture content. Sub- samples of the dried material from all locations were submitted to an NFTA-certified forage testing laboratory for nutrient composition analysis using near infrared reflectance spectroscopy (NIRS). For these trials, milk production estimates were calculated using the University of Wisconsin Milk2000 and Milk2006 spreadsheet programs

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RESULTS

Results for the 2018 corn and sorghum variety tests performed in Artesia are shown in Tables below. Test procedures for each test are presented in tables designated with an ‘A’. Results are presented in tables designated with ‘B’ or ‘C’ suffixes. Within tables, hybrids and varieties are ranked according to grain yield or total dry forage yield

Table 1A. New Mexico 2018 Irrigated Forage Corn Performance Test - Agricultural Science Center at Artesia

Investigators: R. Flynn, R. Pacheco, S. Bustillos, M. Lopez, and C. Hill

Test Description

Location:

County/Area: Eddy
Longitude: -104.22
Latitude: 32.45
Elevation: 3356 ft.
Soil Name: Pima
Soil Texture: silt loam
Soil Depth: 32 in.

Test Design:

Replications: 4
Plot Length: 20 ft.
Rows per Plot: 2
Row Spacing: 40 in.
Seeding Rate: 32,000 seed/a

Management Practices:

Previous Crop: cotton
Planting Date: 16-May
Harvest Date: 24-Aug

Production Inputs	Rate	Date
Fertilizer:		
Nitrogen	20 lb/a	25-Apr
Nitrogen	225 lb/a	23-Jul
P_2O_5	96 lb/a	25-Apr
Herbicides:		
Rifle	16 oz/a	13-Jun
Insecticides:		
None		

Growing Conditions:

	Average Temp. °F	Precip. in.	Irrigation in.
January	37.5	0.10	
February	46.1	0.31	
March	54.0	0.03	
April	60.5	0.00	1.55
May	73.0	1.89	4.12
June	80.1	1.67	8.74
July	80.7	1.72	9.93
August	79.5	1.38	3.61
September	71.7	1.92	
October	58.9	3.01	
November	46.0	0.23	
December			

Seasonal Precipitation: 7.00 in.
Total Irrigation: 27.94 in.
Date of Last Spring Frost: 21-Mar
Date of First Fall Frost: 12-Nov
Frost Free Period: 236 days

Table 1B. New Mexico 2018 Irrigated Forage Corn Performance Test - Agricultural Science Center at Artesia

Results

Brand/Company Name	Hybrid/Variety Name	Dry Forage	Green Forage	Moisture at Harvest	CP	NDF	NDFD 30hr	Ash	Starch	NE_l	Milk/ Ton	Milk/ Acre
		t/a	t/a	%	%	%	%	%	%	Mcal/lb	lb/t	lb/a
Golden Acres Genetics/LG Seeds	LG68C88 VT2PRO	7.8	22.5	65.2	9.4	41.6	48.5	4.2	19.2	0.437	2419	18780
Golden Acres Genetics/LG Seeds	ES7667 VT2PRO	7.3	21.4	65.8	10.2	41.7	58.5	4.6	14.7	0.433	2392	17590
Dyna-Gro Seed	D57VC17	7.3	21.2	65.6	9.5	41.0	49.3	4.1	19.2	0.452	2439	17794
Dyna-Gro Seed	D55VP77 VT2P	7.2	21.1	65.7	9.8	40.6	51.5	3.9	19.4	0.447	2499	18115
Dyna-Gro Seed	D58SS65	7.0	19.3	63.6	10.0	40.5	52.5	4.2	18.3	0.441	2481	17346
Dyna-Gro Seed	D55SS45	7.0	21.3	67.3	9.8	42.4	54.5	4.4	14.9	0.425	2311	16221
Golden Acres Genetics/LG Seeds	LG68C22 VT2PRO	6.8	18.7	63.9	10.2	40.4	52.8	4.3	18.9	0.448	2517	17019
Dyna-Gro Seed	D58RR70 RR	6.4	17.8	63.7	9.7	39.5	50.3	4.3	19.7	0.438	2441	15610
	Trial Mean	7.1	20.4	65.1	9.8	41.0	52.2	4.2	18.0	0.440	2437	17309
	LSD (P < 0.05)	NS	NS	NS	NS	NS	4.3	NS	3.8	NS	122	NS
	CV	17.9	15.3	3.9	5.3	4.8	5.6	11.8	14.3	2.9	3.4	18.8
	F Test	0.8640	0.4146	0.4160	0.3016	0.5590	0.0022	0.6299	0.0493	0.1274	0.0479	0.9182

Table 2A. New Mexico 2018 Irrigated Forage Sorghum Performance Test - Agricultural Science Center at Artesia

Investigators: R. Flynn, R. Pacheco, S. Bustillos, M. Lopez, and C. Hill

Test Description

Location:

County/Area:	Eddy	
Longitude:	-104.22	
Latitude:	32.45	
Elevation: Soil	3356	ft.
Name: Soil	Pima	
Texture: Soil	silt loam	
Depth:	32	in.

Test Design:

Replications:	3	
Plot Length:	30	ft.
Rows per	2	
Plot: Row	40	in.
Spacing:		
	85,000	seed/ a
Seeding Rate:		

Management Practices:

Previous Crop:	cotton
Planting Date:	1-Jun
Harvest Date:	19-Sep

Production Inputs

Rate		Fertilizer:	Date
Nitrogen	20	lb/a	
Nitrogen	225	lb/a	25-
P2O5	96	lb/a	Apr
			23-Jul
			25-
			Apr

Herbicides:

None

Insecticides:

None

Growing Conditions:

Average	Temp.	Precip.	Irrigation
	°F	in.	in.
January	37.5	0.10	
February	46.1	0.31	
March		0.03	
		0.00	1.55
54.0		1.89	2.79
April	60.5	1.67	8.74
May		1.72	5.14
73.0		1.38	7.23
June	80.1	1.92	2.30
July	80.7	3.01	
August	79.5	0.23	
September	71.7		
October	58.9		
November			
46.0		8.92	in.
		27.74	in.
December			
		21-Mar	
		12-Nov	
		236	days
Seasonal Precipitation			
Total Irrigation			
Date of Last Spring Frost:			
Date of First Fall Frost:			
Frost Free Period:			

Table 2B. New Mexico 2018 Irrigated Forage Sorghum Performance Test - Agricultural Science Center at Artesia

Results

								65% Adj Moisture							
Brand/Company	**Hybrid/Variety**	**Sorghum† Maturity§**													
Brown		**Dry**			**Green**	**at**	**NDFD**					**Milk/**	**Milk/**		
Name	**Name**	**Type**	**Group**		**Midrib**	**Forage**	**Forage**	**Harvest**		**CP**	**NDF**	**30hr**	**Ash**		
	TDN	**NEl**			**Ton**	**Acre**									
					t/a	t/a	%	%	%	%	%	%	Mcal/lb	lb/t	lb/a
Advanta Seeds	AF 8301	FS	M	N	4.9	19.4	74.9	7.6	60.4	55.0	8.5	63.2	0.643	2411	11711
Dyna-Gro Seed	Super Sile 20	FS	ML	Y	4.6	18.1	74.7	7.5	59.9	52.7	7.6	62.9	0.637	2305	10557
Advanta Seeds	ADV XF033	FS	ML	N	4.5	16.6	72.7	7.9	58.4	57.3	6.9	65.4	0.677	2527	11358
Dyna-Gro Seed	F74FS23 BMR	FS	ML	Y	4.5	18.9	76.0	8.1	58.1	63.0	6.6	66.7	0.697	2656	12044
Dyna-Gro Seed	705F	FS	ME	N	4.2	16.0	73.5	7.9	59.4	55.0	8.2	62.9	0.643	2487	10599
Dyna-Gro Seed	Super Sile 30	FS	ME	N	4.1	17.4	76.5	8.5	61.6	55.7	8.5	62.4	0.630	2505	10158
Dyna-Gro Seed	F76FS77 BMR	FS	ML	Y	4.0	17.3	77.1	8.7	62.9	57.3	10.0	61.7	0.620	2627	10464
Advanta Seeds	ADVXF372	FS	M	Y	3.6	15.2	76.0	8.9	56.7	62.7	9.4	64.9	0.667	2651	9726
Dyna-Gro Seed	Dual Forage SCA	FS/GS	ML	N	3.5	11.6	69.2	8.0	62.1	53.7	10.1	59.5	0.590	2418	8358
Dyna-Gro Seed	FX 18811	FS	M	N	3.5	13.9	75.3	8.1	58.8	58.3	7.4	65.4	0.677	2597	9054
Advanta Seeds	AF 7401	FS	ML	Y	3.4	14.1	76.3	8.1	58.0	63.3	10.1	63.5	0.643	2678	8989
Mojo Seed Enterprises	Opal	FS	ML	N	3.4	13.1	74.0	8.3	59.2	56.0	8.2	63.9	0.653	2478	8579
Dyna-Gro Seed	FX18851 BMR	FS	ML	Y	3.2	14.6	77.7	9.3	59.3	60.7	9.5	64.5	0.663	2816	9141
Dyna-Gro Seed	FX18878 BMR	FS	M	Y	2.7	11.1	75.3	8.8	57.5	61.7	8.2	65.9	0.680	2667	7275
Dyna-Gro Seed	GX 16921	FS/GS	ML	N	2.4	8.7	72.6	8.6	61.1	55.7	9.8	61.2	0.613	2567	6112
		Trial Mean			3.8	15.1	74.7	8.3	59.6	57.8	8.6	63.6	0.649	2559	9608
		LSD (P < 0.05)			1.5	5.5	2.9	NS	NS	4.7	1.6	NS	NS	239	NS
		CV			23.8	22.0	22.2	11.2	4.6	4.9	11.3	3.8	5.5	5.9	23.9
		F Test			0.0721	0.0168	0.0003	0.5675	0.2745	0.0002	0.0006	0.0699	0.0715	0.0191	0.1651

† Sorghum Type: FS=Forage Sorghum, BD = Brachytic Dwarf, GS = Grain Sorghum, SxS = Sorghum-Sudangrass Hybrid

§Maturity Group: E = Early, M = Medium, L = Late,

PS = Photoperiod Sensitive Brown Midrib Trait:

BMR = Brown Midrib, Conv = Conventional

Table 3A. New Mexico 2017 Irrigated Forage Sorghum & Sorghum Sudangrass (Multi-Cut) Performance Test - Agricultural Science Center at Artesia

Investigators: R. Flynn, R. Pacheco, S. Bustillos, M. Lopez, and C. Hill

Test Description

Location:

County/Area:	Eddy
Longitude:	-104.22
Latitude:	32.45
Elevation:	3356 ft.
Soil Name:	Pima
Soil Texture:	silt loam
Soil Depth:	32 in.

Test Design:

Replications:	3
Plot Length:	30 ft.
Rows per Plot:	2
Row Spacing:	40 in.
Seeding Rate:	85,000 seed/a

Management Practices:

Previous Crop: cotton

Planting Date: 1-Jun

Harvest Date: 21-Aug 1st cut; 10-Oct 2nd cut

Production Inputs	Rate	Date
Fertilizer:		
Nitrogen	20 lb/a	25-Apr
Nitrogen	50 lb/a	22-Aug
P_2O_5	96 lb/a	25-Apr

Herbicides: None

Insecticides: None

Growing Conditions:

Month	Average Temp. °F
January	37.5
February	46.1
March	54.0
April	60.5
May	73.0
June	80.1
July	80.7
August	79.5
September	71.7
October	58.9
November	46.0
December	

Precip (in.), as printed: 0.10, 0.31, 0.03, 0.00, 1.89, 1.67, 1.72, 1.38, 1.92, 3.01, 0.23

Irrigation (in.), as printed: 1.55, 2.79, 8.74, 5.14, 2.68, 7.32

Seasonal Precipitation: 11.93 in.

Total Irrigation: 28.22 in.

Date of Last Spring Frost: 21-Mar

Date of First Fall Frost: 12-Nov

Frost Free Period: 236 days

Table 3B. New Mexico 2018 Irrigated Forage Sorghum & Sorghum Sudangrass (Multi-Cut) Performance Test - Agricultural Science Center at Artesia

Results			Harvest 1					Harvest 2					Total	
Brand/Company Name	Hybrid/Variety Name	Type[1]	Dry Forage	Green Forage	Harvest Moisture	Milk/Ton	Milk/Acre	Dry Forage	Green Forage	Harvest Moisture	Milk/Ton	Milk/Acre	Dry Forage	Milk/Acre
			t/a	t/a	%	lb/t	lb/a	t/a	t/a	%	lb/t	lb/a	t/a	lb/a
Dyna-Gro Seed	FX18843SS BMR	SxS	4.5	21.0	78.2	2520	11472	1.8	13.3	86.3	2638	4867	6.4	16340
American Hybrids	Lincoln	SxS	4.2	22.7	81.3	2433	10206	2.2	17.0	87.1	2626	5842	6.4	16048
Dyna-Gro Seed	FX18835SS	SxS	3.9	19.4	79.3	2295	9145	2.4	16.1	84.8	2535	6016	6.3	15161
Brownig Seed, Inc.	Sweet Sioux BMR	SxS	3.9	17.7	76.2	2557	9921	2.3	16.0	85.7	2701	6184	6.2	16105
American Hybrids	Brighton	SxS	3.3	18.0	81.6	2341	7834	2.5	15.0	83.3	2568	6488	5.9	14322
Dyna-Gro Seed	Danny Boy BMR	SxS	3.7	18.3	79.0	2639	9848	2.1	16.6	87.2	2534	5407	5.8	15255
Dyna-Gro Seed	Full Graze BMR	SxS	3.9	20.3	80.1	2573	9978	2.0	13.7	85.8	2638	5158	5.8	15136
Brownig Seed, Inc.	Cadan 99B	SxS	3.9	17.6	77.4	2206	8137	1.9	11.5	83.9	2637	4952	5.7	13089
American Hybrids	Navion	SxS	3.1	16.0	81.1	2359	7286	2.5	16.7	84.9	2584	6509	5.6	13795
Dyna-Gro Seed	Danny Boy II BMR	SxS	3.2	16.7	80.2	2405	7659	2.1	17.0	87.9	2562	5307	5.3	12966
Advanta Seeds	S6504	SxS	3.2	18.9	80.8	2505	8146	2.0	16.4	87.8	2542	5120	5.2	13266
	Trial Mean		3.7	18.9	79.6	2439	9057	2.2	15.4	85.9	2597	5623	5.9	14680
	LSD		NS	NS	NS	NS	NS	NS	NS	1.5	NS	NS	NS	NS
	CV		41.0	42.3	7.0	8.1	41.3	19.4	17.4	1.2	3.5	20.7	25.6	26.1
	F Test		0.9615	0.9881	0.9419	0.1063	0.8735	0.2553	0.1012	0.0001	0.2262	0.4047	0.9804	0.9204

[1]FS and SxS signify forage sorghum and sorghum x sudangrass, respectively.

Table 3C. New Mexico 2018 Irrigated Forage Sorghum & Sorghum Sudangrass (Multi-Cut) Performance Test - Agricultural Science Center at Artesia

Results

			Harvest 1						Harvest 2					
Brand/Company Name	**Hybrid/Variety Name**	**Type [1]**	**CP**	**NDF**	**NDFD 48hr**	**RFQ**	**TDN**		**CP**	**NDF**	**NDFD 48hr**	**RFQ**	**TDN**	**NE$_l$**
			%	%	%	%	%	Mcal/lb	%	%	%	%	%	Mcal/lb
Dyna-Gro Seed	FX18843SS BMR	SxS	7.6	69.8	58.3	97	57.8	0.589	12.5	65.0	63.8	110	60.2	0.616
American Hybrids	Lincoln	SxS	9.5	60.5	57.8	112	61.3	0.627	13.1	62.0	64.0	111	61.3	0.628
Dyna-Gro Seed	FX18835SS	SxS	6.6	73.0	52.5	83	55.3	0.561	11.9	66.2	59.3	102	59.2	0.605
Brownig Seed, Inc.	Sweet Sioux BMR	SxS	8.8	58.9	59.0	120	64.1	0.660	13.2	61.2	64.5	117	62.6	0.643
American Hybrids	Brighton	SxS	7.1	68.1	51.8	92	57.5	0.586	12.4	65.2	58.8	104	60.2	0.616
Dyna-Gro Seed	Danny Boy BMR	SxS	8.7	64.7	62.8	115	60.2	0.616	13.1	64.5	65.0	104	59.0	0.602
Dyna-Gro Seed	Full Graze BMR	SxS	8.4	67.8	59.8	100	57.7	0.588	13.0	61.6	65.5	115	61.7	0.632
Brownig Seed, Inc.	Cadan 99B	SxS	7.4	64.1	52.8	92	58.6	0.598	12.0	65.1	60.0	106	60.1	0.614
American Hybrids	Navion	SxS	9.3	66.7	57.3	91	56.4	0.573	13.7	61.7	62.0	104	60.2	0.616
Dyna-Gro Seed	Danny Boy II BMR	SxS	7.1	71.0	59.3	86	54.7	0.555	11.8	64.1	64.3	107	59.8	0.611
Advanta Seeds	S6504	SxS	8.7	68.8	59.5	96	57.3	0.584	12.9	63.5	63.8	105	60.1	0.615
	Trial Mean		8.1	66.7	57.3	98	58.2	0.594	12.7	63.6	62.8	108	60.4	0.618
	LSD		1.6	4.2	3.4	18.0	NS	0.044	NS	2.9	2.2	NS	NS	NS
	CV		14.0	4.3	4.2	12.8	4.7	5.1	7.4	3.1	2.4	6.7	3.0	3.3
	F Test		0.0098	0.0001	0.0001	0.0028	0.2556	0.0015	0.1327	0.0071	0.0001	0.1080	0.2366	0.2417

[1]FS and SxS signify forage sorghum and sorghum x sudangrass, respectively.

2018 Cotton Yield Trial at Artesia

Variety	Company	pFibr	TotalYld	LintYld	SeedYld	Bales	TrashC	TrashA	TrashPrt	Length	Unif
Bx1971GLTP	Bayer	46.6	2516	1192	1324	2.51	3.0	0.3	7.0	1.22	86.8
Bx1972GLTP	Bayer	42.8	2777	1204	1573	2.44	3.0	0.5	13.0	1.29	87.1
DP1612B2XF	Monsanto	45.0	2156	976	1181	2.12	3.0	0.4	8.0	1.19	84.6
DP1646B2XF	Monsanto	45.8	1940	892	1048	1.86	3.0	0.4	8.0	1.26	84.9
DP1820B3XF	Monsanto	46.8	1805	850	955	1.83	3.0	0.3	7.0	1.23	86.1
DP1845B3XF	Monsanto	46.3	2401	1113	1288	2.30	2.0	0.3	7.0	1.28	86.2
DP341FRPIMA	Monsanto	42.3	1801	749	1052	1.55	3.0	0.3	8.0	1.34	87.3
DP348RFPIMA	Monsanto	43.4	1679	722	956	1.48	3.0	0.3	10.0	1.31	87.1
FM2498GLT	Bayer	45.5	1626	760	865	1.58	2.0	0.2	6.0	1.20	86.2
FM2574GLT	Bayer	47.9	1940	958	981	1.99	2.0	0.2	4.0	1.22	86.6
PHY250W3FE	phytogen	41.9	2887	1224	1663	2.54	2.0	0.3	8.0	1.24	86.5
PX2A31W3FE	phytogen	45.3	1826	823	1003	1.70	3.0	0.3	7.0	1.23	86.8
PX2B04W3FE	phytogen	45.6	2528	1159	1369	2.38	2.0	0.3	5.0	1.18	84.8
PX2B10W3FE	phytogen	43.4	1756	764	992	1.57	3.0	0.4	8.0	1.29	86.2
PX2B12W3FE	phytogen	46.8	2507	1171	1337	2.51	3.0	0.3	8.0	1.18	84.0
PX3B07W3FE	phytogen	46.8	2389	1152	1237	2.35	3.0	0.3	7.0	1.19	85.6
PX3C06W3FE	phytogen	45.6	1674	756	918	1.60	3.0	0.3	9.0	1.23	85.6
Phy300W3FE	phytogen	46.1	1813	828	985	1.71	2.0	0.3	6.0	1.18	86.4
Phy320W3FE	phytogen	44.4	2418	1075	1343	2.23	3.0	0.3	7.0	1.20	85.9
Phy350W3FE	phytogen	45.3	2961	1340	1621	2.71	3.0	0.3	9.0	1.18	85.1
Phy440W3FE	phytogen	46.7	2798	1315	1483	2.84	3.0	0.3	8.0	1.19	85.3
Phy480W3FE	phytogen	45.6	1438	657	781	1.35	3.0	0.3	6.0	1.24	87.0
ST2334GLT	Bayer	45.1	2279	1046	1233	2.14	3.0	0.3	7.0	1.24	85.6
ST4946GLBZ	Bayer	45.5	2414	1092	1322	2.26	3.0	0.3	9.0	1.22	85.4
phy499	phytogen	46.2	1785	830	955	1.73	3.0	0.3	7.0	1.26	86.0
	Trial Mean	45.3	2164	986	1178	2.05	2.5	0.3	7.5	1.23	86.0
	LSD P < 0.05	NS	NS	NS	NS	NS	NS	NS	NS	0	NS
	CV	5.7	38.1	40.1	36.5	38.1	28.4	45.9	58.9	5.8	1.9
	F Test	0.1428	0.2988	0.4312	0.1788	0.2897	0.7331	0.5317	0.9112	0.0808	0.2923

Variety	Company	SFI	Str	Elg	Mic	Maturity	Rd	Yellow	color	grade	NetLoan	GrossRtn
Bx1971GLTP	Bayer	6.6	32.8	5.4	5.3	84	77.4	7.4	36	2	53.09	1667
Bx1972GLTP	Bayer	7.0	37.4	5.5	4.5	82	75.3	7.6	36	2	55.11	1918
DP1612B2XF	Monsanto	7.4	32.3	6.3	5.0	83	76.7	6.9	39	2	54.49	1458
DP1646B2XF	Monsanto	7.4	30.8	6.1	4.8	82	78.2	6.9	36	1	55.38	1334
DP1820B3XF	Monsanto	7.2	33.0	4.2	5.1	84	78.0	7.4	34	2	54.84	1254
DP1845B3XF	Monsanto	6.7	32.7	6.7	4.7	82	78.6	6.9	36	1	56.28	1671
DP341FRPIMA	Monsanto	6.3	41.9	4.8	4.5	83	75.2	8.5	32	2	54.29	1214
DP348RFPIMA	Monsanto	6.9	41.1	5.1	4.6	83	74.6	8.9	34	2	53.33	1112
FM2498GLT	Bayer	7.0	33.2	4.7	5.3	85	76.7	7.9	34	2	53.63	1088
FM2574GLT	Bayer	6.3	34.1	4.6	4.9	84	80.8	7.4	26	2	55.49	1341
PHY250W3FE	phytogen	7.0	36.9	4.3	4.5	83	76.4	7.9	34	2	55.19	1985
PX2A31W3FE	phytogen	6.4	33.4	4.4	4.9	84	79.9	6.9	34	1	55.64	1254
PX2B04W3FE	phytogen	7.1	31.6	5.0	4.8	83	78.8	7.2	34	2	56.51	1760
PX2B10W3FE	phytogen	7.1	37.4	4.4	4.4	83	76.9	8.1	34	1	55.23	1193
PX2B12W3FE	phytogen	8.2	31.6	6.2	4.7	82	78.4	7.4	34	2	55.31	1719
PX3B07W3FE	phytogen	7.2	33.0	4.7	4.6	83	79.1	6.9	34	2	56.60	1671
PX3C06W3FE	phytogen	7.1	31.6	5.3	5.0	83	77.1	6.9	39	1	53.50	1105
Phy300W3FE	phytogen	6.7	33.3	6.1	5.2	83	78.0	7.5	34	1	54.08	1218
Phy320W3FE	phytogen	7.3	32.3	5.0	4.6	83	76.4	7.3	36	1	55.56	1648
Phy350W3FE	phytogen	6.9	32.1	5.7	5.0	83	79.0	7.1	34	1	53.89	1980
Phy440W3FE	phytogen	7.7	32.6	5.5	4.8	83	76.7	7.3	36	2	55.50	1923
Phy480W3FE	phytogen	6.3	32.0	6.4	4.8	82	77.8	7.3	34	2	56.14	997
ST2334GLT	Bayer	7.2	32.2	5.1	4.8	83	79.1	6.9	36	1	55.21	1555
ST4946GLBZ	Bayer	7.3	32.0	6.1	4.9	82	77.6	6.8	36	2	55.38	1654
phy499	phytogen	6.5	32.9	5.4	4.8	83	77.0	7.2	39	2	54.64	1217
	Trial Mean	7.0	33.8	5.3	4.8	83	77.6	7.4	4	1	54.97	1477
	LSD P < 0.05	NS	NS	NS	0	NS	3	NS	NS	NS	NS	NS
	CV	13.7	15.2	22.5	6.5	1.4	3.1	14.5	15.8	40.6	3.1	38.4
	F Test	0.6021	0.2171	0.1105	0.0021	0.1296	0.0831	0.4711	0.6454	0.8463	0.1956	0.2818

TRIAL	Variety	Company	pFibr	TotalYld	LintYld	SeedYld	Bales	TrashC	TrashA	TrashPrt	Length	Unif
NMSU	NM17T1069	NMSU	41.7	1830	764	1066	3.81	3.0	0.3	5.0	1.20	85.9
NMSU	NM17T1125	NMSU	38.1	2009	766	1243	4.19	3.0	0.3	8.0	1.23	86.4
NMSU	NM17T1217	NMSU	40.5	2189	884	1305	4.56	3.0	0.3	6.0	1.24	87.0
NMSU	NM17T1249	NMSU	40.1	2214	893	1321	4.61	3.0	0.3	8.0	1.26	86.0
NMSU	NM17T1290	NMSU	42.0	2638	1109	1529	5.50	2.0	0.3	7.0	1.25	85.3
NMSU	NM17T1327	NMSU	45.5	1854	843	1011	3.86	2.0	0.2	4.0	1.18	85.0
NMSU	NM17T1355	NMSU	36.7	1944	723	1221	4.05	3.0	0.4	10.0	1.28	86.0
NMSU	NM17T1364	NMSU	40.9	1601	657	944	3.34	3.0	0.4	7.0	1.21	85.0
NMSU	NM17T1428	NMSU	41.5	2124	880	1244	4.42	3.0	0.3	10.0	1.22	86.1
NMSU	NM17T1452	NMSU	40.3	2459	990	1469	5.12	3.0	0.3	8.0	1.24	86.4
		Trial Mean	4.7	2896	851	1235	4.34	2.8	0.3	7.3	1.23	85.9
		LSD P < 0.05	2.5	NS	NS	NS	NS	NS	NS	NS	0.04	NS
		CV	4.2	27.8	29.3	27.0	27.8	27.4	50.1	44.9	2.2	1.5
		F Test	0.0001	0.3783	0.3747	0.3006	0.3784	0.4017	0.5371	0.3076	0.0010	0.4265

Variety	Company	SFI	Str	Elg	Mic	Maturity	Rd	Yellow	color	grade	NetLoan	GrossRtn
NM17T1069	NMSU	6.9	30.6	3.8	5.1	85	77.6	7.2	39	1	53.69	1230
NM17T1125	NMSU	5.9	36.7	4.3	4.7	84	77.0	7.9	34	1	56.84	1406
NM17T1217	NMSU	5.9	36.4	4.4	4.7	83	76.4	7.4	41	1	55.40	1499
NM17T1249	NMSU	6.0	38.2	4.7	4.8	84	75.7	7.8	41	1	54.78	1505
NM17T1290	NMSU	6.4	36.8	4.6	4.8	84	76.8	7.8	34	2	56.76	1842
NM17T1327	NMSU	7.0	32.0	4.4	5.4	85	78.3	7.5	34	1	53.19	1230
NM17T1355	NMSU	6.0	37.7	4.5	4.4	83	75.1	7.6	41	1	55.35	1331
NM17T1364	NMSU	7.0	34.0	4.9	4.7	83	76.5	7.2	39	1	55.74	1108
NM17T1428	NMSU	6.2	36.9	4.5	4.9	84	76.8	7.5	36	2	56.25	1472
NM17T1452	NMSU	6.1	37.1	4.2	4.8	84	77.0	7.7	36	2	56.33	1706
	Trial Mean	6.3	35.6	4.4	4.8	84	76.7	7.6	37	1	55.43	1433
	LSD P < 0.05	0.8	1.7	NS	0.2	1	1.3	NS	6	NS	NS	NS
	CV	9.3	3.2	12.0	2.9	0.6	1.2	7.1	11.4	34.0	1.9	28.4
	F Test	0.0377	0.0001	0.2817	0.0001	0.0001	0.0032	0.5908	0.0518	0.2749	0.2559	0.3278

	Bench 13	Growth, yield and Fiber Quality of Glandless Cotton as affected by Potassium Rates					
	1st Span						
	Rep 2			Rep 4			
	K100	**K0**	**K200**	**K0**	**K200**	**K100**	
20'	STV (5008)	Acala-GLS (5009)	1517-18 (5024)	1517-18 (5025)	13P1117 (5040)	13P1117 (5041)	
20'	13P1117 (5007)	1517-18 (5010)	Acala-GLS (5023)	Acala-GLS (5026)	1517-18 (5039)	STV (5042)	
20'	Acala-GLS (5006)	STV (5011)	13P1117 (5022)	STV (5027)	Acala-GLS (5038)	1517-18 (5043)	
20'	1517-18 (5005)	13P1117 (5012)	STV (5021)	13P1117 (5028)	STV (5037)	Acala-GLS (5044)	
Alley 1'	**K0**	**K100**	**K200**	**K200**	**K0**	**K100**	
20'	Acala-GLS (5004)	13P1117 (5013)	13P1117 (5020)	Acala-GLS (2029)	STV (5036)	STV (5045)	
20'	STV (5003)	Acala-GLS (5014)	1517-18 (2019)	13P1117 (5030)	1518-18 (5035)	Acala-GLS (5046)	
20'	13P1117 (5002)	STV (5015)	Acala-GLS (5018)	STV (5031)	Acala-GLS (5034)	13P1117 (5047)	
20'	1517-18 (5001)	1517-18 (5016)	STV (5017)	1517-18 (5032)	13P1117 (5033)	1517-18 (5048)	
	REP 1			REP 3			

REP	ArtFldID	TRT	Variety	Plotwt lbs	Xboll wt_g	pSeed	Fiber	bollyield	lint	seed	UniqueID	Trash C	grade
1	5001	K0	1517_18	2.2	5.9	55.6	42.1	910.3	383.0	505.8	882105001	4	1
1	5002	K0	13P1117	3.9	6.4	54.8	44.1	1347.1	594.7	738.1	882105002	3	7.4
1	5003	K0	STV	2.8	5.8	56.3	40.2	1226.5	493.6	690.9	882105003	2	8.9
1	5004	K0	Acala_GLS	3	6.9	59.7	39.7	1268.1	503.2	756.7	882105004	3	7.3
1	5013	K100	13P1117	2.1	5.5	56.9	42.8	1450.7	621.4	826.1	882105013	3	7.5
1	5014	K100	Acala_GLS	1.8	5.3	59.5	39.9	521.8	208.1	310.5	882105014	3	7.8
1	5015	K100	STV	1.5	5.4	62.1	37.3	595.5	221.8	369.7	882105015	2	7.4
1	5016	K100	1517_18	0.6	6.0	58.5	40.7	169.5	69.0	99.3	882105016	3	7.1
1	5017	K200	STV	0.9	6.2	60.5	38.8	361.0	140.2	218.4	882105017	2	7.8
1	5018	K200	Acala_GLS	1.1	5.7	61.4	37.8	556.4	210.3	341.4	882105018	3	7.1
1	5019	K200	1517_18	1.1	5.4	57.9	41.0	431.2	176.8	249.6	882105019	3	7
1	5020	K200	13P1117	1.2	6.0	56.2	43.5	480.0	208.8	269.9	882105020	3	8.3
2	5005	K100	1517_18	2.7	6.0	56.9	41.6	1182.7	492.0	673.3	882105005	3	8.6
2	5006	K100	Acala_GLS	6.4	6.3	58.6	40.1	2553.7	1024.1	1495.5	882105006	3	7.8
2	5007	K100	13P1117	5.1	5.8	54.3	44.9	2416.2	1083.7	1310.8	882105007	2	7.1
2	5008	K100	STV	0.31	5.6	58.9	41.4	118.9	49.3	70.0	882105008	2	6.8
2	5009	K0	Acala_GLS	0.9	6.3	60.3	39.1	361.9	141.5	218.3	882105009	3	6.8
2	5010	K0	1517_18	4.5	5.7	58.8	41.0	1680.2	688.1	987.4	882105010	2	6.7
2	5011	K0	STV	3.7	5.6	58.5	40.9	1139.9	466.2	667.3	882105011	2	7.7
2	5012	K0	13P1117	2.8	5.9	55.5	43.7	883.5	386.1	490.8	882105012	3	7.5
2	5021	K200	STV	2.8	5.8	60.6	39.3	997.9	392.1	604.5	882105021	2	8
2	5022	K200	13P1117	3.5	6.3	56.1	43.0	1368.7	589.2	768.2	882105022	3	6.9
2	5023	K200	Acala_GLS	1.8	6.2	58.8	40.5	737.0	298.4	433.4	882105023	3	6.6
2	5024	K200	1517_18	2.2	6.1	55.9	43.1	1854.8	799.6	1036.8	882105024	2	7.9
3	5029	K200	Acala_GLS	2.1	6.7	59.0	40.0	767.6	307.2	453.1	882105029	2	7.8
3	5030	K200	13P1117	1.1	5.5	56.7	42.3	473.9	200.3	268.5	882105030	2	7.1
3	5031	K200	STV	1	5.5	59.9	38.7	319.4	123.6	191.3	882105031	3	7.2
3	5032	K200	1517_18	1.2	6.1	56.5	42.5	1039.7	442.0	587.5	882105032	3	8.2
3	5033	K0	13P1117	0.6	5.4	55.2	43.6	213.8	93.2	118.1	882105033	3	7.4
3	5034	K0	Acala_GLS	3.4	6.1	59.2	40.0	1090.3	435.8	645.1	882105034	4	8.2
3	5035	K0	1517_18	3.5	5.8	56.1	42.8	1177.8	504.2	660.6	882105035	2	7.6
3	5036	K0	STV	5	5.6	59.5	39.6	2545.7	1008.5	1515.5	882105036	4	6.5
3	5041	K100	13P1117	1.3	5.8	55.7	43.9	516.1	226.3	287.6	882105041	2	7.7
3	5042	K100	STV	2.3	5.5	59.1	39.8	806.9	320.8	476.7	882105042	3	7.4
3	5043	K100	1517_18	1.3	6.0	59.3	40.1	409.4	164.0	242.6	882105043	3	5.6
3	5044	K100	Acala_GLS	1	5.8	60.3	38.9	332.9	129.5	200.7	882105044	3	6.7
4	5025	K0	1517_18	0.8	6.4	58.6	40.9	572.8	234.4	335.5	882105025	3	8.1
4	5026	K0	Acala_GLS	2.3	6.4	59.4	40.1	772.3	309.5	458.9	882105026	4	6.7
4	5027	K0	STV	1.3	5.9	59.9	40.0	398.2	159.2	238.5	882105027	2	8.2
4	5028	K0	13P1117	4.8	6.3	55.1	44.1	1703.0	750.4	937.5	882105028	2	7.3
4	5037	K200	STV	2.7	5.7	60.2	39.0	1015.4	395.9	611.5	882105037	2	9.1

4	5038	K200	Acala_GLS	2.6	5.8	60.4	38.9	1266.2	492.4	765.0	882105038	2	7.8
4	5039	K200	1517_18	2.2	5.8	57.3	41.6	1277.8	530.9	732.7	882105039	2	7.7
4	5040	K200	13P1117	0.3	6.0	54.5	44.5	155.1	69.0	84.5	882105040	3	7.7
4	5045	K100	STV	0.5	5.0	5.9	37.4	160.7	60.0	9.5	882105045	2	6.5
4	5046	K100	Acala_GLS	1.2	6.3	60.5	38.8	413.6	160.5	250.2	882105046	2	8.3
4	5047	K100	13P1117	1.8	5.9	55.4	43.9	804.2	352.9	445.2	882105047	2	7
4	5048	K100	1517_18	2	5.7	55.7	43.6	633.6	276.1	352.6	882105048	2	7.7

REP	ArtFldID	TRT	Variety	Trash A	Trash Part.	Length	Unif.	SFI	Str	Elg	Mic	Maturity	Rd	Yellow	Color	grade
1	5001	K0	1517_18	0.6	16	1.21	85.6	6	36.1	5	4.7	83	75.8	7.4	41	1
1	5002	K0	13P1117	0.3	6	1.16	83.8	6.7	30.2	4.5	4.9	84	78.5	7.4	31	2
1	5003	K0	STV	0.2	6	1.21	85.1	7.7	28.3	3.6	4.2	82	76	8.9	31	3
1	5004	K0	Acala_GLS	0.5	16	1.28	88.5	5.4	38.3	3.4	4.2	83	74.4	7.3	41	2
1	5013	K100	13P1117	0.3	8	1.12	85.2	7.9	31.2	3.6	5.1	85	75.7	7.5	41	1
1	5014	K100	Acala_GLS	0.3	8	1.2	83.9	7.3	36.8	2.6	4.2	83	75.3	7.8	41	1
1	5015	K100	STV	0.2	4	1.18	84.1	8.1	30.7	3.1	4.3	83	76.2	7.4	41	1
1	5016	K100	1517_18	0.3	8	1.19	83.9	8.1	34	4.5	4.7	83	76.4	7.1	41	1
1	5017	K200	STV	0.2	8	1.14	84.5	8.6	28.5	3.1	4.4	83	76.5	7.8	31	2
1	5018	K200	Acala_GLS	0.4	13	1.25	85.2	7	39.6	2.4	4	83	74.6	7.1	41	2
1	5019	K200	1517_18	0.3	10	1.19	85	7.7	30.6	3.4	4.7	84	75.6	7	41	1
1	5020	K200	13P1117	0.4	7	1.15	87.2	6.7	31.3	5.1	4.8	83	77.2	8.3	31	1
2	5005	K100	1517_18	0.3	6	1.2	85.8	6.8	32.8	4.3	4.6	83	75.1	8.6	31	4
2	5006	K100	Acala_GLS	0.3	10	1.28	87.8	5.1	40.3	3.9	4.1	82	77.6	7.8	31	2
2	5007	K100	13P1117	0.2	6	1.14	85.7	7.9	27.7	4.8	4.8	83	79.2	7.1	31	2
2	5008	K100	STV	0.2	4	1.19	84.4	7.9	27.4	3.8	4.6	83	80.2	6.8	31	2
2	5009	K0	Acala_GLS	0.4	12	1.22	87	5.6	40.9	2.7	3.9	83	76.4	6.8	41	1
2	5010	K0	1517_18	0.2	4	1.17	85.8	7	38.9	3.5	4.4	83	77	6.7	41	1
2	5011	K0	STV	0.2	8	1.16	82.9	8.7	27.3	4.4	4.6	83	75	7.7	41	1
2	5012	K0	13P1117	0.3	8	1.12	83.9	7.8	31.5	4.5	4.8	83	78.7	7.5	31	2
2	5021	K200	STV	0.2	6	1.14	85.7	8.8	27.1	3.5	4.4	83	79.2	8	31	1
2	5022	K200	13P1117	0.4	9	1.07	82.8	8.2	31.9	4.9	5.1	84	74.9	6.9	41	2
2	5023	K200	Acala_GLS	0.4	8	1.24	88.3	5.7	38.6	2.7	4.2	83	74.9	6.6	41	2
2	5024	K200	1517_18	0.2	5	1.15	83.2	8.6	33.4	4.5	4.9	84	78.4	7.9	31	1
3	5029	K200	Acala_GLS	0.2	6	1.27	87.6	6.2	40.6	3.1	4	83	78.1	7.8	31	2
3	5030	K200	13P1117	0.2	5	1.14	83.3	9.1	30.2	3.7	5	84	75.6	7.1	41	1
3	5031	K200	STV	0.3	8	1.12	81.7	10	28.6	3.6	4.7	84	74.6	7.2	41	2
3	5032	K200	1517_18	0.3	4	1.13	83.6	8.3	31.2	5.2	4.9	83	77.7	8.2	31	1
3	5033	K0	13P1117	0.3	7	1.1	82.3	9.1	32.8	3.8	5.1	85	73.5	7.4	41	2
3	5034	K0	Acala_GLS	0.6	10	1.29	87.8	5.8	39.7	2.7	4.2	83	74.2	8.2	41	1
3	5035	K0	1517_18	0.2	7	1.12	85	8.1	32.6	4.7	4.7	83	72.6	7.6	41	2
3	5036	K0	STV	0.6	14	1.19	82.7	9.6	28.4	3.4	4.7	84	74.1	6.5	41	2
3	5041	K100	13P1117	0.2	3	1.08	82.6	8.7	31.3	4.7	4.9	83	78.1	7.7	31	2
3	5042	K100	STV	0.4	14	1.14	84.1	9.9	27.4	3.5	4.5	83	75	7.4	41	1
3	5043	K100	1517_18	0.4	10	1.2	85.3	6.9	32.7	3.6	4.6	84	73.8	5.6	51	1

3	5044	K100	Acala_GLS	0.3	8	1.25	88.3	5.7	39.4	2.8	4.3	84	76.8	6.7	41	1
4	5025	K0	1517_18	0.3	10	1.15	85.4	7.6	35.6	4.4	4.6	83	78.1	8.1	31	1
4	5026	K0	Acala_GLS	0.7	20	1.24	87.9	6.3	42	2.7	4	83	74.6	6.7	41	2
4	5027	K0	STV	0.2	6	1.12	83.3	10	29.1	3.1	4.2	83	78.5	8.2	31	1
4	5028	K0	13P1117	0.2	4	1.13	83.8	7.2	31.6	4.6	5.3	84	77.8	7.3	31	2
4	5037	K200	STV	0.2	6	1.18	85.4	8.8	28.4	3.6	4.2	82	77	9.1	31	3
4	5038	K200	Acala_GLS	0.2	6	1.21	84.5	6.2	38.6	2.8	4.4	84	75.2	7.8	41	1
4	5039	K200	1517_18	0.2	4	1.16	84.2	7.2	33.3	5.1	4.7	83	76.8	7.7	31	2
4	5040	K200	13P1117	0.4	12	1.07	84.6	9.7	30	3.9	5	84	77.3	7.7	31	2
4	5045	K100	STV	0.2	6	1.16	84.3	8.7	32.8	2.8	4.6	84	73.6	6.5	41	2
4	5046	K100	Acala_GLS	0.2	4	1.28	87.6	6.1	39.2	3.2	4.1	83	76.5	8.3	31	2
4	5047	K100	13P1117	0.2	4	1.09	82.4	9.5	28.9	4.3	5	84	78.6	7	31	2
4	5048	K100	1517_18	0.2	7	1.15	84.5	7.9	32.8	5.5	5.2	84	75.2	7.7	41	1

Guar:

We worked with Dr. Grover in hopes that he could augment his efforts in understanding guar yield response to the soils and climate of southeastern NM. He put in two trials that his graduate student had at other locations. One was a plant density x variety trial and the other was an irrigation trial x variety evaluation. We used our Sentrak Diviner probe to follow soil water content with depth for the duration of the trial. The project also had an ARS researcher come to fly drones over the fields of guar for various metrics.

Artesia guar irrigation trial (2018)

							Alonso	AFdeliv	Area	AF	AI
7/12/2018	5	299.834	299.862	jh	b7 guar5	12-Jul	5	0.028	0.0704	0.3977	4.773
7/12/2018	4	299.862	299.892	jh	b7guar4	12-Jul	4	0.03	0.0704	0.4261	5.114
7/12/2018	3	299.892	299.918	jh	b7 guar3	12-Jul	3	0.026	0.0704	0.3693	4.432
7/12/2018	2	299.918	299.935	jh	b7 guar2	12-Jul	2	0.017	0.0704	0.2415	2.898
7/12/2018	1	299.935	299.958	jh	b7 guar1	12-Jul	1	0.023	0.0704	0.3267	3.920
7/27/2018	5	304.584	304.645	rp	b7 guar5	7/27/2018	5	0.061	0.0704	0.8665	10.398
7/27/2018	4	304.645	304.692	rp	b7guar4	7/27/2018	4	0.047	0.0704	0.6676	8.011
7/27/2018	3	304.692	304.747	rp	b7 guar3	7/27/2018	3	0.055	0.0704	0.7812	9.375
7/27/2018	2	304.747	304.787	rp	b7 guar2	7/27/2018	2	0.040	0.0704	0.5682	6.818
7/27/2018	1	304.787	304.851	rp	b7 guar1	7/27/2018	1	0.064	0.0704	0.9091	10.909
17-Aug	5				b7 guar5	17-Aug	5	0.000			
17-Aug	4				b7guar4	17-Aug	4	0.000			
17-Aug	3	307.642	307.714		b7 guar3	17-Aug	3	0.036	0.0704	0.5114	6.13628
17-Aug	2	307.642	307.714		b7 guar2	17-Aug	2	0.036	0.0704	0.5114	6.13628
17-Aug	1	307.715	307.777		b7 guar1	17-Aug	1	0.062	0.0704	0.8750	10.4999

Total Flood Irrigation

Plot			AF Delivered	AF delivere	AI delivered
b7 guar5	limited w/bioge	5	0.089	1.264	15.170
b7guar4	limited no bioge	4	0.077	1.094	13.125
b7 guar3	1/2 irr	3	0.117	1.662	19.943
b7 guar2	3/4 irr	2	0.093	1.321	15.852
b7 guar1	Full Irr	1	0.149	2.111	25.329

Notes:
Trt 3 and 2 had a border break.
The total water delivered to both irrigation treatments were divided by 2
September rains made it difficult to get into the field.
Future studies will identify irrigation triggers based on agreed upon soil moisture levels.

Good vs Saline Water:

Along with Dr. Ulery we have a study to evaluate energy crops in good vs saline water conditions. These plots were also tracked for amount of water ineach profile during their active season. We will continue this project next year to see the effects on canola.

ASC Artesia Annual Report: Entomology

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EVALUATING EFFICACY OF SELECTED SEED TREATMENTS AGAINST THRIPS IN SEEDLING COTTON IN NEW MEXICO

Introduction

Early season control of thrips is important. Thrip feeding in the terminal bud of cotton cause leaves to have a crinkled, tattered appearance as they expand and heavily damaged foliage often is stunted and curls upward at the margins. Another characteristic of thrip damage is a silvery appearance of leaves at the feeding sites. Cotton damaged by thrips may have reduced photosynthesis capacity, attenuated growth, and plant death (Boyd et al. 2004). Reductions in stand density, poor early-season crop growth, and delayed crop maturity can reduce lint quality and cotton yields. These reductions have been observed to vary across cotton production regions, justifying a region-wide study. Historically, thrips and pink bollworm were considered the most significant insect pests of cotton in New Mexico and the vast majority of growers used Temik for thrip control. More recently growers in New Mexico have been using seed treatments to control thrips.

Early-season pest management in cotton was historically achieved with an in-furrow treatment of aldacarb (Temik®). In 2010, the Environmental Protection agency and Bayer CropScience reached an agreement to terminate production and use of aldacarb in the United States (EPA Newsroom, 2010). Consequently, alternative practices for early-season pest management were needed. Neonicotinoid insecticide seed treatments have become the primary solution to managing early-season pests of cotton in this region. Thiamethoxam and imidacloprid are two common systemic insecticide seed treatments applied to commercial cotton seed. Although the two insecticides belong to the same insecticide group, their physical and chemical properties vary and they may exhibit differential mortality among target pests.
A secondary objective is to identify thrips to document baseline species in NM compare to species composition in the rest of the region and over time document changing species composition.

Materials and Methods

Cotton seeds treated with two different neonicotinoid insecticides (imidacloprid and thiamethoxam) were used to evaluate their efficacy against thrips. Field plots were also checked routinely for whiteflies and cotton aphid populations. Similar trials were conducted in multiple locations in Texas. Seeds of FM2334GLT, a widely adapted cotton variety, were treated with imidacloprid and thiamethoxam. An additional seed treatment, the check, had no insecticide seed treatment, but did include a base fungicide for protection against fungal pathogens. The selected variety, FM2334GLT, has some level of inherent tolerance to rootknot nematodes. No nematicide was added to the seed treatment in order to avoid possible interactions with the insecticide seed treatments.

Five cotton producing locations in Texas and one location in New Mexico conducted similar trials. This report focuses on results from New Mexico. The New Mexico trial included three different treatments (two insecticide seed treatments and one untreated control), replicated four times. The main treatment plot size was eight rows by 50 feet. Each main plot was split into two four-row plots, with one plot scheduled to receiving foliar applications of Orthene if needed. Planting date and other agronomic management decisions were chosen in accordance with the conventional agronomic practices for the Pecos Valley in NM.

After planting and seedling emergence, thrips were recorded using a washing technique. Plants were also scouted for the presence of cotton aphid, whitefly so counts could be made if there was sufficient pressure using visual in-field assessments of 10 randomly selected plants per plot at different growth periods. The washing method was used to determine thrips populations instead of a visual sampling method in order to reduce sampling variability. Thrips were collected from plant samples at four different time period/growth periods; cotyledon, 2-leaf, 3-leaf, and 4-leaf stages. For each sampling date and experimental plot, 10 randomly selected cotton seedlings of each respective growth stage, were cut above the soil and preserved in a quart size glass jar, half-filled with 75% ethanol. The samples were brought to the laboratory and processed to extract thrips (both adults and immatures) for each sampling date. Adult and nymph counts were recorded separately for each plot. Fourth leaf stage cotton plant height was measured from 10 random plants per plot. Later in the season, delays in plant maturity were assessed by counting nodes above white flower (NAWF). Plots were harvested by cotton picker and seed cotton yield was compared among the treatments using Tukey's Comparison of Means (SAS JMP version 13).

Adult thrips from early season samples were held in order to determine species composition infesting cotton seedlings for comparison with different geographic regions of Texas and southeastern New Mexico.

Results

In 2017, there were significantly fewer thrips in the thiamethoxam plots on 5/26 the first reading with 0.25 thrips per plant compared to 3.5 thrips per plant in the check but there was no clear activity after the first date (Table 1). Part of the difficulty in discerning differences was due to relatively low thrip pressure. We have, in the past few years, recorded higher thrip pressure in Las Cruces so, in 2018, we will do this trial in both Artesia and Las Cruces NM.

Table 1. Efficacy of imidacloprid and thiamethoxam seed treatments for thrip control in New Mexico.

	Number of thrips per ten plants			
Seed Treatment	5/26/17	5/30/17	6/5/17	6/12/17
Check	3.5a	1.7a	1.2a	1.5a
Imidacloprid	1.7ab	2.0a	2.5a	1.5a
Thiamethoxam	0.25b	1.2a	2.0a	0.5a

Means with similar letters are not significantly different by Tukey (SAS-JMP)

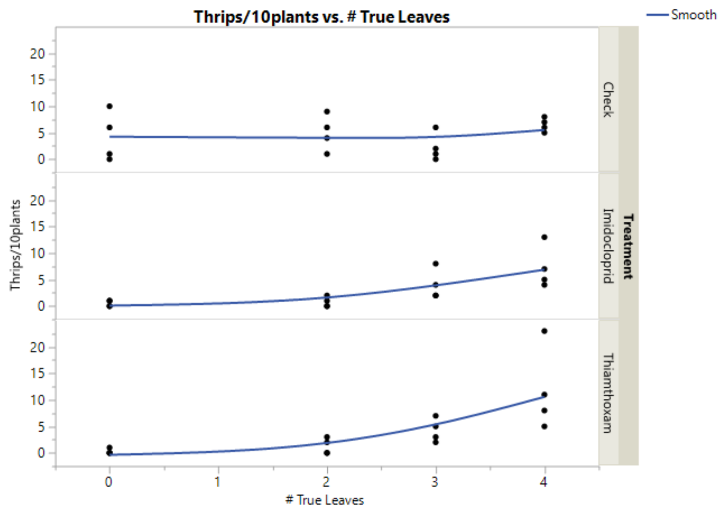

Figure 1. Thrip number per 10 plants by number of true leaves in seed treated plots.

Table 2. Impact of imidacloprid and thiomethoxam on plant height and nodes above white flower in 2016 trial to evaluate seed treatments for early season thrip control.

Seed Treatment	Plant ht	s.e	Nodes Above White Flower			
			7/25/16	s.e	8/1/16	s.e
Check	6.2a	.28	6.8a	.15	4.8a	.09
Thiomethoxam	6.8a	.25	7.0a	.20	4.9a	.15
Imidacloprid	6.2a	.26	6.4a	.18	4.3b	.15

Means with similar letters are not significantly different by Tukey (SAS-JMP)

In 2016, there were significantly more thrips in control plots compared to both imidacloprid and thiamethoxam seed treatment plots on two dates when plants had 0-2 true leaves (df 2,21 F=7.7 $P<0.003$) (Fig. 1). There was no significant difference among the seed treated plots or the control plots on two later dates when plants had 3-4 true leaves. There were significantly more thrips in older cotton plants compared to the younger plants with an average of 8.5 thrips per 10 plants with 4 true leaves vs.1.7-3.5 in plants with 0-3 true leaves.

There were significantly fewer nodes above white flower in the imidacloprid treatment with 4.3 NAWF on 8/1/16 compared to 4.8 and 4.9 for the check and thiomethoxam treatments in 2016. Plant height at 4 true leaves ranged from 6.2 to 6.8 inches and were not significantly different in 2016 (Table 2)

Unlike 2016, NAWF were not significantly different on any date or in any treatment in 2017 with NAWF 6.5-6.9 on 7/17/17 and 4.5-4.7 on 7/24/17 (Table 3). Plant height was also not significantly different in any treatment with plant height at 4 true leaves from 6.3 to 6.6 inches tall.

Yields in the 2016 seed treatment trial were not significantly different (df 2,47 F=1.2 *P*<0.30) (Table 4). Yields ranged from 1815-2175 lb/A or 3.8-4.5 bales/A.

Table 3. Impact of imidacloprid and thiomethoxam on plant height and nodes above white flower in 2017 trial to evaluate seed treatments for early season thrip control.

Seed Treatment	Plant ht	s.e	Nodes Above White Flower			
			7/17/17	s.e	7/24/17	s.e
Check	6.6a	.26	6.9a	.13	4.5a	.09
Thiomethoxam	6.3a	.24	6.7a	.12	4.7a	.15
Imidacloprid	6.3a	.28	6.5a	.13	4.5a	.15

Means with similar letters are not significantly different by Tukey (SAS-JMP)

Table 4. Yields in Seed Treatment Field Trial for Early-Season Thrip Control, Artesia, NM 2016

Treatment	Yield (lb seed cotton /A	s.e.	Yield (bales/A)	s.e.
Check	2175a	179	4.5a	.37
Imidacloprid	2130a	179	4.4a	.37
Thiomethoxam	1815a	172	3.8a	.36

Means followed by similar letters are not significantly different by Tukey's test (SAS-JMP)

Yields in the 2017 seed treatment trial were not significantly different (df 2.45 F=0.3 *P*<0.72) (Table 5). Yields ranged from 2615 to 2589 lb/A or 5.4 to 5.6 bales/A. Since thrip counts were very low in 2017 there was unlikely to be any impact of thrips on yield of untreated plants.

Table 5. Yields in Seed Treatment Field Trial for Early-Season Thrip Control, Artesia, NM 2017

Treatment	Yield (lb seed cotton /A	s.e.	Yield (bales/A)	s.e.
Check	2589a	108	5.4a	0.2
Imadicloprid	2707a	100	5.6a	0.2
Thiomethoxam	2615a	115	54a	0.2

Means followed by similar letters are not significantly different by Tukey's test (SAS-JMP)

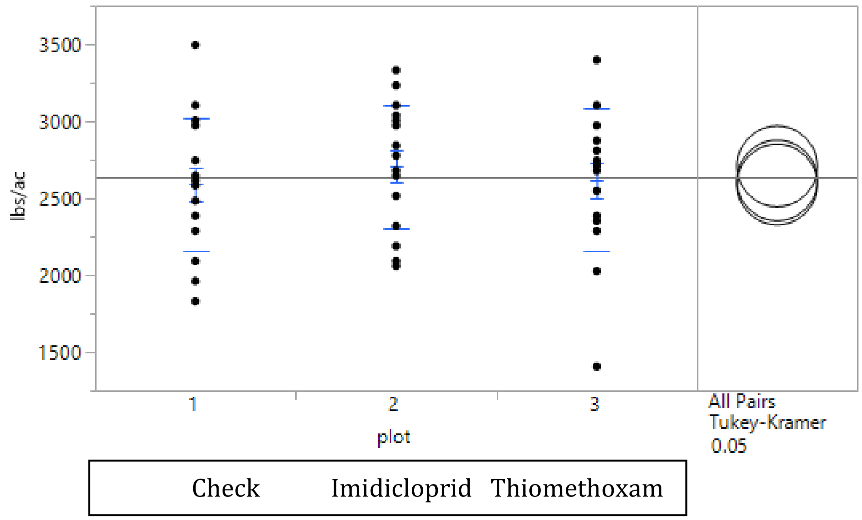

Figure 2. Yields in Seed Treatment Field Trial for Early-Season Thrip Control, Artesia, NM 2017

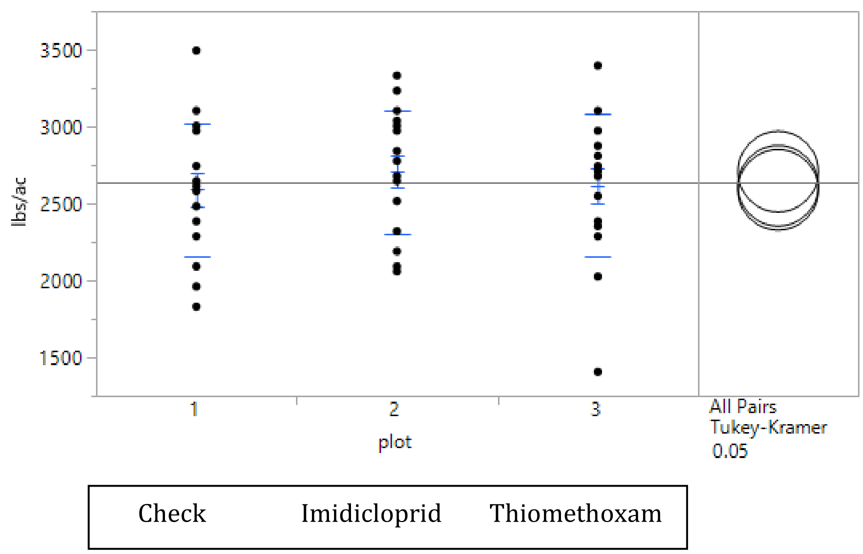

Figure 3. Yields in Seed Treatment Field Trial for Early-Season Thrip Control, Artesia, NM 2016.

IDENTIFYING CULTIVARS RESISTANT TO COTTON FLEAHOPPER FOR PEST MANAGEMENT PROGRAMS IN TEXAS AND NEW MEXICO.

This project was being conducted in conjunction with Texas A & M University. Our trials for plant resistance to cotton fleahopper have been conducted at the New Mexico State University Agricultural Science Center farm near Artesia, NM

Introduction

The cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter) (Hemiptera: Miridae), can cause excessive loss of cotton squares, resulting in reduced yield and harvest delays. In nearby Texas, cotton fleahopper is a key insect pest of cotton causing estimated yield losses of up to 6 percent (Williams 2000). Damage to individual fields may vary from none to extremely high square loss when heavy populations develop and are left uncontrolled. The reason for variability in losses caused by the cotton fleahopper is not understood but may, in part, be associated with cultivar differences (Holtzer and Sterling 1980, Barman et al. 2012). Understanding cotton fleahopper response to cotton varieties will allow better management strategies for managing this pest on cotton. The primary objective of this study is to identify potential plant resistance to cotton fleahopper for use in pest management programs in the Southwest region (Texas, New Mexico, Oklahoma) and to allow for follow up determinations of the mechanisms of resistance to help breeders develop additional resistant varieties.

Materials and Methods:

In 2017, eight cotton varieties with unique genetic backgrounds were planted on May 4 in Artesia, NM. In 2016, four cotton varieties, DP1219, PHY333, PHY444 and Stoneville 4946GLB2 were planted on May 6. Procedures were similar both years. Cotton fleahoppers were sampled weekly beginning at pinhead square using the beat bucket technique. Samples were taken from the middle two rows of the plots by folding over 5 plants per sub-sample into a five-gallon bucket, beating the plants onto the side of the bucket, and immediately counting fleahoppers. After each subsample was collected the row was alternated with each sub-sample for a total of 5 samples of 5 plants each or 25 plants per plot. Fleahopper counts were divided into adults and nymphs. Sampling for fleahoppers was discontinued after plants began blooming. Yield was collected from 5 reps with 2 subplots of 50 feet. Data was analyzed using SAS JMP with LSMeans for fleahopper number and abcissed sites by variety nested within reps.

Results

In 2016, there were significantly more fleahoppers on 7/12 compared to 7/5 with 1.3 fleahoppers/sample on 7/12 compared to 0.7 fleahoppers per sample on 7/5 (Table 6). Adults and nymphs were combined in the analysis since there were the same number of adults and nymphs (21 vs 20) and insect numbers were low. There were no significant differences between the 4 varieties in either fleahopper number or abscission sites.

Variety	Abscised Sites	s.e.	# fleahoppers	s.e.
DP1219	1.0	0.2	1.2	0.7
PHY333	0.7	0.1	1.3	0.6
PHY444	1.3	0.2	0.8	0.6
Stoneville 4946GLB2	1.2	0.2	1.8	0.6

Table 6. Evaluation of Plant Resistance 7/12 to Fleahopper in Artesia, NM 2016

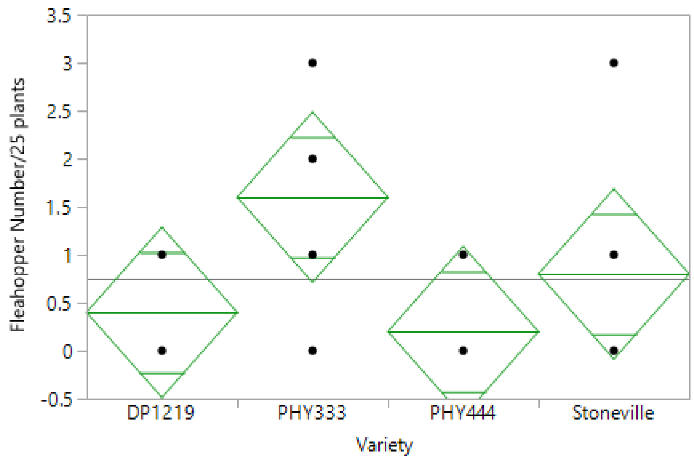

Figure 4. Fleahopper number July 5, 2016 in 4 cotton varieties in Artesia, NM

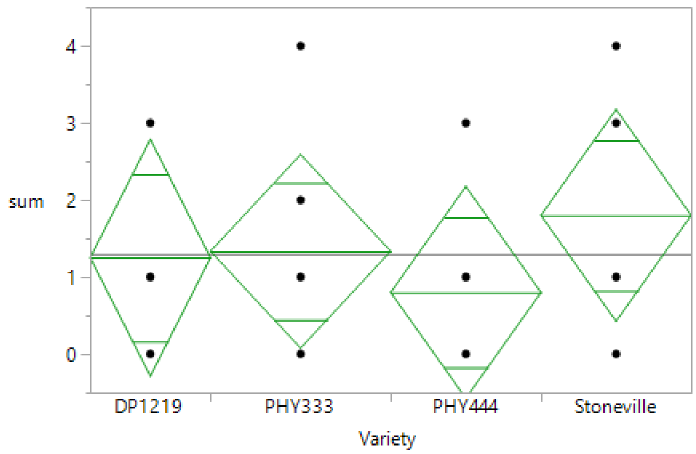

Figure 5. Mean fleahoppers across all dates, Artesia, NM

Table 7. Mean fleahoppers (adults and nymphs) per 25 plants

Variety	7/5	7/12
DP1219	0.4a	1.0a
PHY333	1.6a	1.6a
PHY444	0.2a	0.8a
Stoneville 4946GLB2	0.8a	1.8a

Means followed by similar letters are not significantly different by Tukey's test (SAS-JMP)

Table 8. Yield of cotton cultivars evaluated for plant resistance to cotton fleahopper.

Variety	Yield (lb/A)	
	2016	2017
PHY333	1374a	1324a
Stoneville 4946GLB2	1427a	1262a
PHY444	1116a	1227ab
DP1219	1373a	1183ab
DP1522		1176ab
DP1518		1167ab
DP1649		1104ab
DP1725		880 b

In 2016 there were no significant differences in yield among the four cultivars with yield ranging from a high of 1427 lb/A in Stoneville 4946GLB2731 to 1116 lb/A in PHY444 (Table 8).

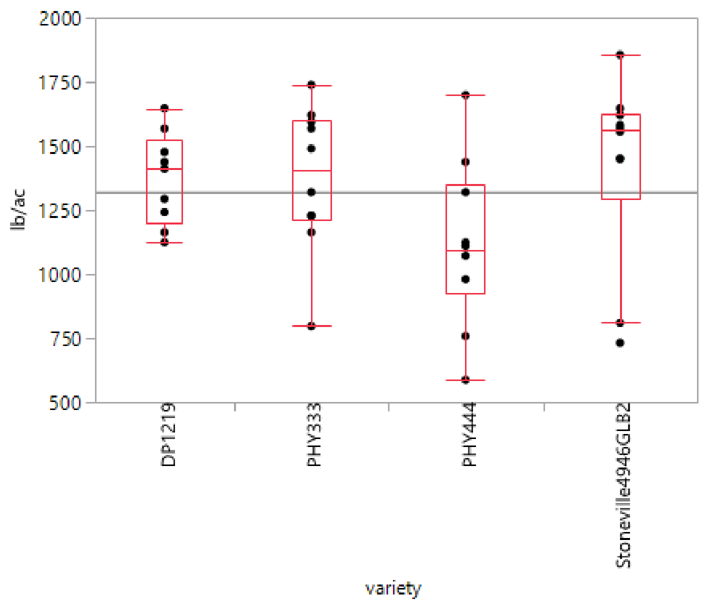

Figure 6. Yield of four varieties in fleahopper plant resistance 2016 trial

In 2017, PhytoGen 333 and Stoneville 4946GLB2 had significantly higher yields with 1324 and 1262 lb/A than DP 1725 with 880 lb/A (Table 8). Fleahopper populations were so low the differences are likely due to genetic differences in the cultivars**.** The performance of PhytoGen 333 and Stoneville 4946GLB2 are consistent with other locations. The performance of DP1725, a relatively new variety, was surprisingly low considering reported performance in other locations.

IMPACT OF REDUCED TILLAGE ON INSECT PESTS AND BENEFICIALS

Introduction

New recommendations being developed should be evaluated for their potential impact on insect pests. Tillage management is an issue worth considering since soil degradation is a major challenge associated with cotton production under conventional tillage practices in the Southwest. Reducing tillage in arid soils of southwestern USA is necessary, due to accelerated soil erosion, especially by wind and soil quality degradation prominent in conventionally tilled agricultural soils of this region. Conventional land preparation for cotton production in southern New Mexico is based on the plow-till system, which involves following practices - plowing, deep-ripping, multiple disking and shaping of soil into beds, to provide an optimum seedbed for emerging cotton seedlings.

Materials and Methods

A study was conducted in New Mexico in 2017, to evaluate the effects of different tillage systems on growth and yield of cotton. Tillage treatments tested included plow-till without beds (cotton planted on flat), plow-till with beds (cotton planted on beds) and strip-till systems. The strip tillage involved only one single pass to create about 10 inches' zone for seed placement. NM 13P1117 a glandless cotton that is highly susceptible to insect pests was planted in May 2017.
Plots were sampled four times inspecting squares for damage for insect pests. In the first sample sweep net samples were also collected to determine if there were differences in either pests or beneficials.

Results

Square damage was recorded on 4 dates ranged from 0-5% with no significant differences among the three treatments. The sweep net samples of pests and beneficials are still being processed. A separate economic analysis of the net returns after deducting land preparation costs, indicated that the strip tillage system was more profitable than both conventional tillage treatments due to much lower land preparation cost. The lack of higher insect pressure in this more susceptible cultivar indicates that insect pressure should not be a problem with considering this option to reduce input costs and increase soil retention particularly since the cultivar used was highly susceptible to insect pests and was more likely to show if issues would develop.

YIELD PARTITIONING AND COMPENSATION IN A1517-08

Introduction

In 2000-2006, we did extensive work on yield partitioning and compensation with selected varieties of transgenic and conventional cotton varieties. Varieties have changed since that time so this year we revisited this concept evaluating a locally adapted variety 1517-08.

Materials and Methods

Cotton was planted in 4 row plots by 40 feet and managed by local agronomic standards. To mimic insect damage late season when we are most likely to see damage we removed 2 or 4 squares then 2 or 4 bolls for a total of 5 treatments including the control.

Results

The majority of yield from undisturbed plants was from the first position squares. In this trial 76.9% of bolls were from position 1 vs. 20.5%, 6.7%, 1.5 and 0.6% from positions 2, 3, 4, and 5 respectively (Fig. 7). The highest producing first position nodes were 7-10 which ranged from 6.9-7.3% of bolls and produced a total of 28.7% of bolls. The last four nodes including both first and second positions produced only 2.6% of total bolls. The last positions 4 and 5 produced only 1.1% of bolls.

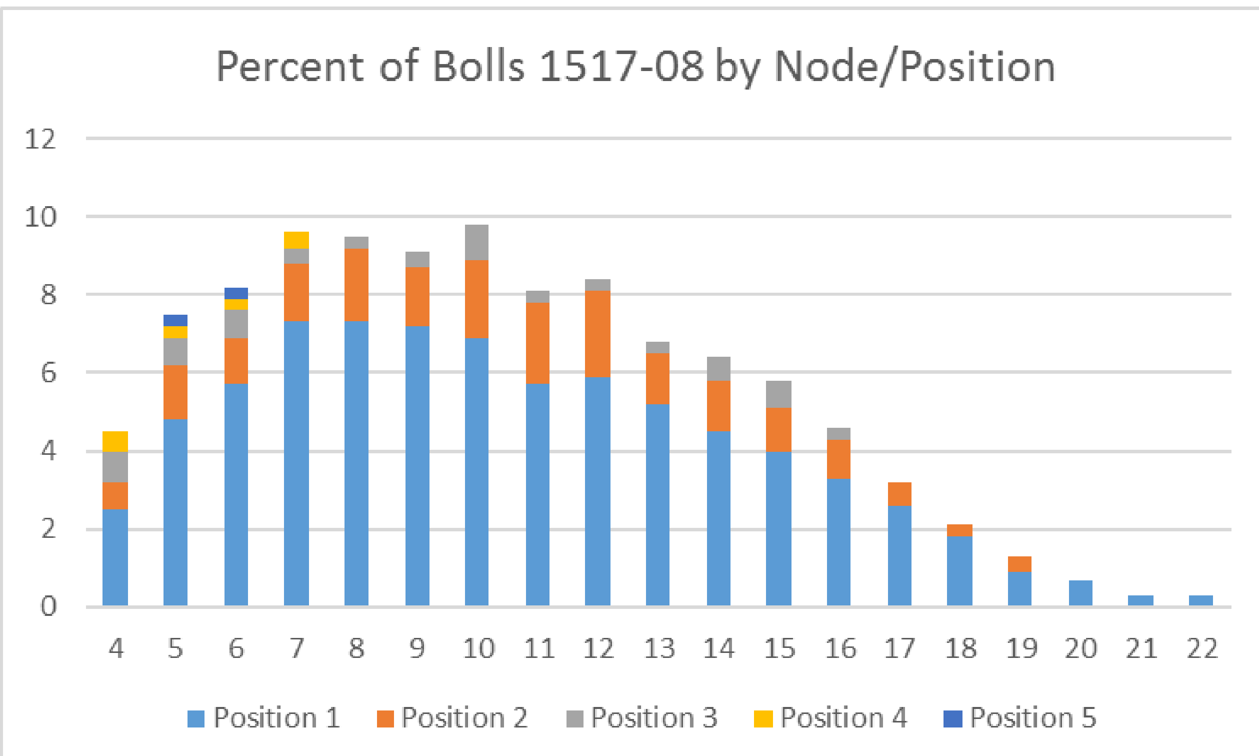

Figure 7. Production of bolls in 1517-08 by each node and position in Artesia field trial,.

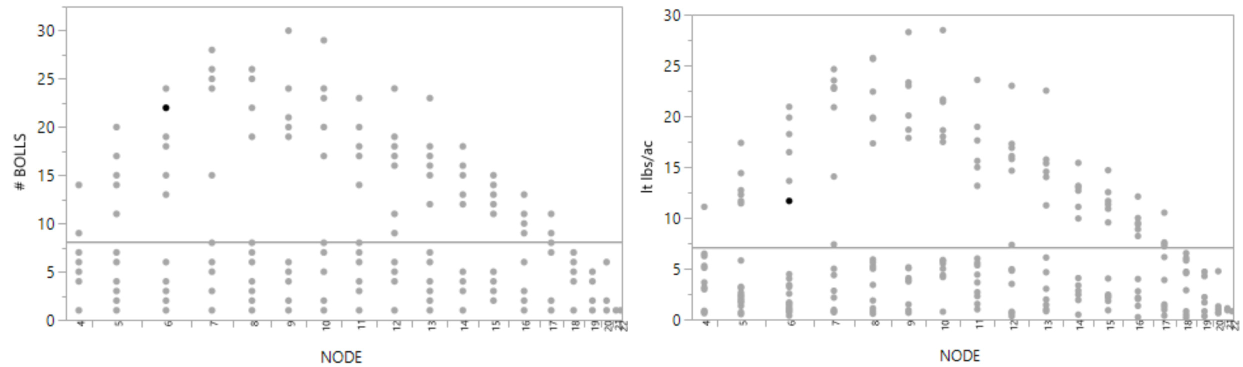

Figure 8. Influence of node on lint weight and lint weight per boll in 1517-08

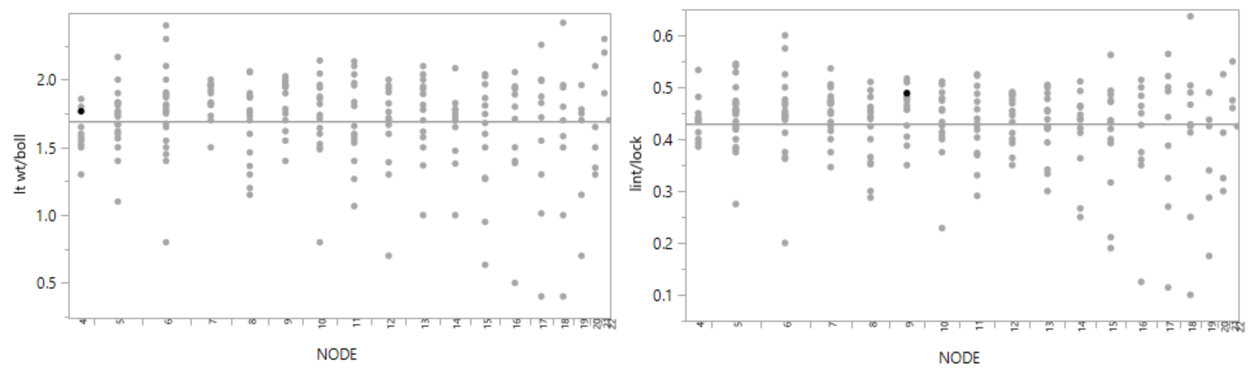

Figure 9. Influence of node on lint weight per boll and per lock in 1517-08, Artesia, NM

The node location has a dramatic impact on number of bolls and yield. First position bolls have a curvilinear response with node while 2nd-5th postion bolls have far less impact and populate the lower third of the graphs. (Figure 8) There was no correlation between node and lint/boll or lint/lock (Figure 9). In previous trials there was often a significant correlation between node and lint/lock with reduced lint in bolls in the last few nodes. There were compensation trials about 2001 that had similar graphs where plants reallocated resources to the remaining squares increasing the size of the locks.

In the compensation trial removal of 4 or 8 squares did not result in significantly fewer bolls/A with 31.9 bolls /ft in the check and 28.5 and 26.2 in plots with 4 and 8 squares removed respectively (Table 9). Although losses were not significant there was a trend with numerical losses of 11-18%. Further data analysis of lint yield or lint yield per lock might have significant differences based on previous trials.

Plots with bolls removed did have significantly fewer bolls at harvest with 24.1 and 20.0 bolls/foot in plots with 4 and 8 bolls removed respectively. Losses from bolls were, not surprisingly much higher than losses from squares with 24-37% loss in boll yield compared to the check.

Table 9. Total number of bolls per plot after simulated late season injury.

Treatment	Bolls/ft	s.e.	% loss
check	31.9a	1.3	
4 squares removed	28.5ab	1.8	11
8 squares removed	26.2abc	0.7	18
4 bolls removed	24.1 bc	1.4	24
8 bolls removed	20.0 c	2.3	37

Means followed by similar letters are not significantly different by Tukey's test (SAS-JMP)

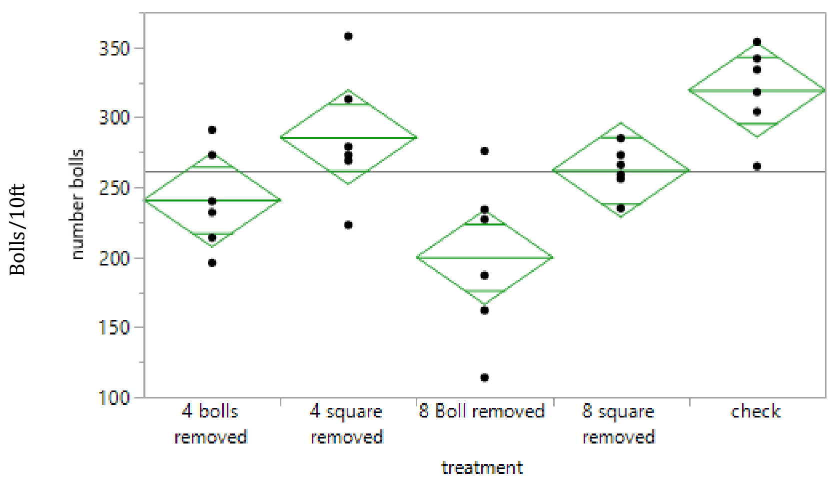

Figure 10. Number of bolls per 10feet after simulated late season injury.

SEASONAL ACTIVITY OF COTTON BOLLWORM AND TOBACCO BUDWORM DETECTED BY PHERMONE TRAPS

Introduction

Cotton bollworm, *Helicoverpa zea* Boddie and Tobacco budworm *Heliothis virescens* F. male moth activity was monitored in 2016-2017 in sex pheromone traps in Artesia, NM.

Materials and Methods

Two traps were set up for each species at the Agricultural Science Center near Artesia, NM. Each trap was checked weekly. Each trap was baited every other week with fresh lure (Alpha Scents Inc., West Linn, OR)

Results

Cotton bollworm are more prevalent than tobacco budworm with cotton bollworm representing 84-92% of total trap captures. Tobacco budworm were 8-14% of trap captures. Moths were active from early July to mid- September both years. Average trap captures were 7/week for bollworm vs 1/week for tobacco budworm between 6/22 to 9/20 in 2017. The highest trap capture was 37 per week for cotton bollworm on 8/8/17. The highest trap capture for tobacco budworm was 6/week on 8/8 in 2017.

Mean bollworm per night showed one peak in Artesia in 2016 and 2017 (Fig. 13, 14) with the majority of bollworm moths collected between 8/5-9/1, 2016 and 8/2-8/22, 2017.

The profile of activity overall is similar to that reported earlier in the Texas High and Rolling Plains. (Parajulee et al 1998, Parajulee at al 2004) However earlier trap captures reported that tobacco budworm represented 2-7% of trap captures which is at least half of the 14% collected in 2017 in Artesia, NM On the other hand tobacco budworm captures were 8% of the total moths collected in Artesia, NM in 2016. It is not yet clear if the tobacco budworm proportion of the complex is actually higher than in the High Plains or Rolling Plains of Texas.

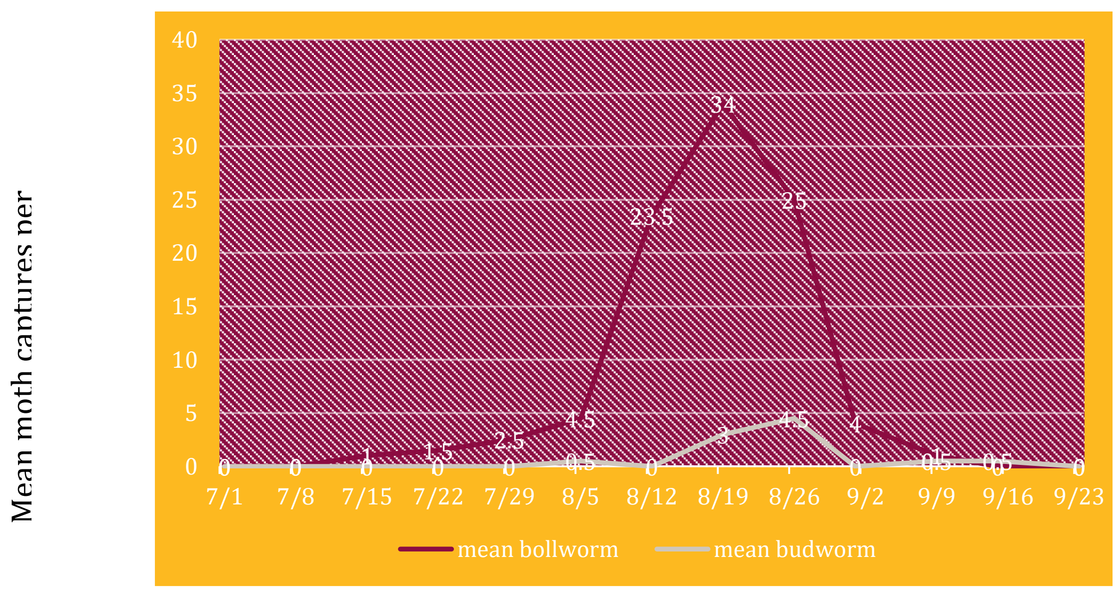

Figure 11. Cotton bollworm and tobacco budworm mean trap captures in 2016, Artesia, NM

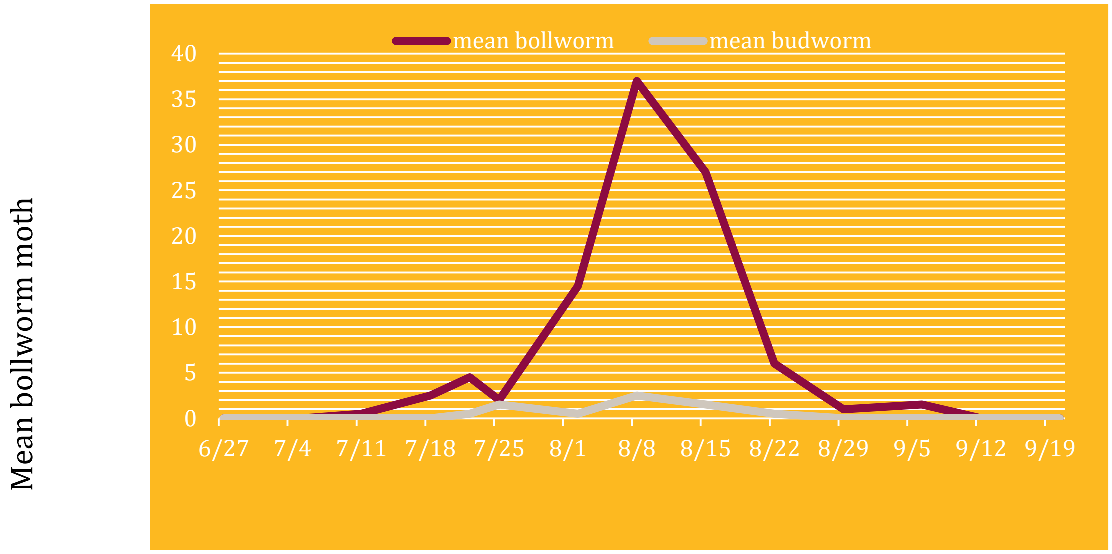

Figure 12. Cotton bollworm and tobacco budworm mean trap captures in 2017, Artesia, NM

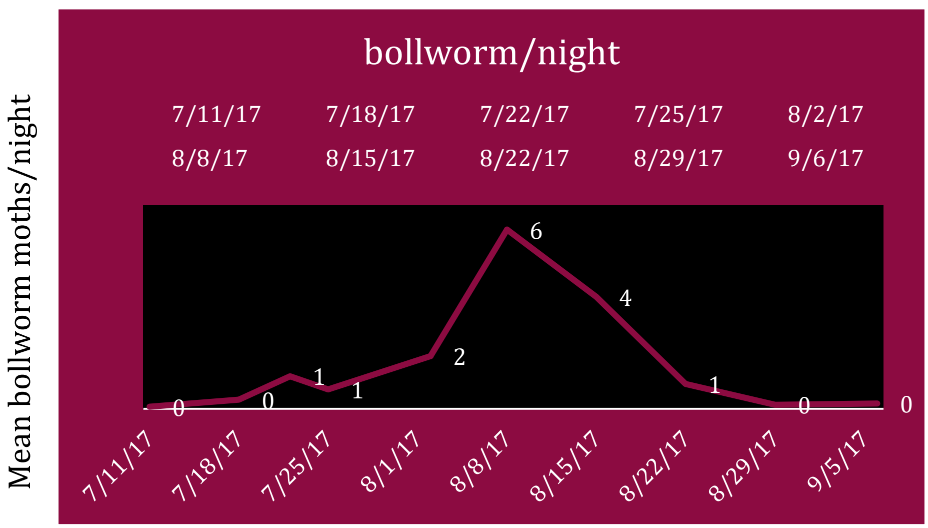

Figure 13. Bollworm pheromone trap captures in Artesia, NM 2017

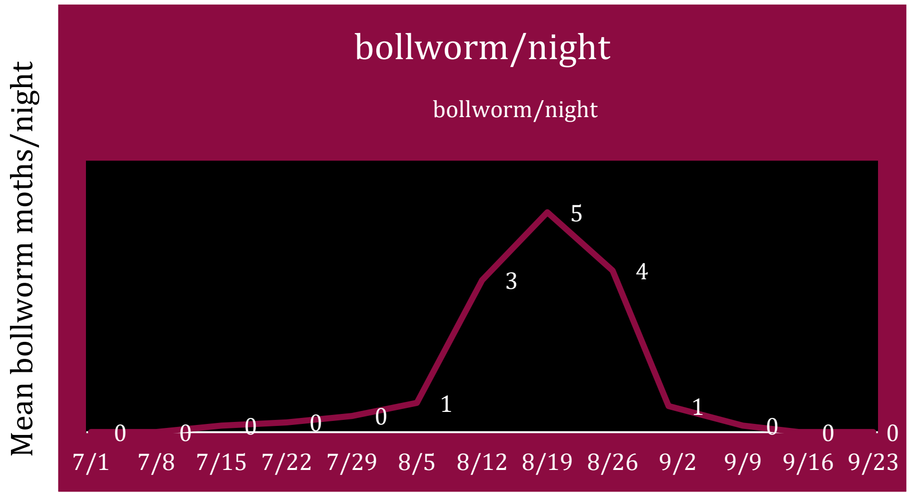

Figure 14. Bollworm moth pheromone trap captures in Artesia, NM 2016

SENTINEL BOLLWORM EGG PREDATION IN FOUR COTTON VARIETIES

Abstract

In 2017, there were no significant differences in overall predation determined by microscopic examination of sentinel eggs after 48 hours in field plots. Predation ranged from 39-64% relatively low compared to other years and other crops in the same location where 70-90% predation is not uncommon. For a second year direct observations indicated that sweep net samples are not completely predictive of actual impact of predators since ants and hooded beetles were 50% of direct observations of predation but rarely represented in sweep samples in 2011-2016. (2017 samples in process). An understanding of the source of predation in this area with high levels of predation will help us develop techniques to optimize predation not only here but in areas where predation currently has less of an impact on control.

Introduction

Insect pest pressure is somewhat lower in NM than nearby areas of the High Plains of Texas. Past experiments have indicated that the prevalence of alfalfa hay is an important factor providing beneficial predators to cotton which help keep damage from insect pests low in many locations in southeast NM (Pierce et al. 2009, 2010)

Predation was often significantly higher in alfalfa compared to cotton. Mean predation in alfalfa in one commercial field trial was 78% compared to 48-58% in cotton. The primary predators were ladybug adults, nabids and various spiders. At very high predation rates, there was little difference in predation rates between adjacent alfalfa and cotton fields with 85-97% predation in alfalfa and up to 300 feet into cotton. However, there was significantly less predation 1000 feet into the cotton field with 67% predation on one date suggesting that close proximity may have the highest impact. After cutting and cooler weather, predation rates declined in the commercial field with a mean 65% predation in alfalfa but only 28% predation in the commercial cotton field. A reduction of hay acreage in NM and the opportunity to determine ways to enhance predation not only here but in other areas such as the nearby Texas High Plains justify evaluating predation. Our objective is to evaluate predation rates, the management practices and landscape impacts that can affect predation and the best methodology to evaluate predation. In 2017, field trials were conducted to evaluate predation of sentinel bollworm eggs in conventional and glandless cotton varieties. A variety of techniques were used in order to evaluate the best methods for evaluating and quantifying predation and determining key predators and their impact.

Material and Methods

In 2017, four varieties, A1517-08, PhytoGen 499, New GLS and AcalaGLS were planted in plots with 32 rows by 100 feet replicated 4-6 times. Predation was evaluated in 3 ways, with sweep net samples of predators through the season, with sentinel egg trials to determine total predation and by direct observation of predation for 24 hour periods.

Sweep net samples were collected weekly with the number of pests and predators recorded. Sentinel bollworm, *Heliocoverpa zea* (Boddie) eggs were attached to plants in each plot on three dates and examined after 48 hours to determine predation levels. Early flowering was recorded and direct observations of predation over 24 hours in 4 varieties were recorded in 2017 and compared to 2016 results.

Results and Discussion

Predation of sentinel eggs was generally similar in glanded and glandless cotton in 2016 and 2017. Predation levels were relatively low compared to previous trials however. Predation ranged from 39-59% in 2017 and 35-71% in 2016. (Table 10). There was no significant difference in predation among the four cultivars in 2017
including a comparison of glanded and glandless cultivars. There was also no significant difference in predation among dates in 2016 or 2017. Predation was significantly higher in glanded Acala 1517-08 on one date in 2016,
but not significantly higher in the other glanded cultivar PhytoGen 499 in 2016 or 2017. This indicated that the higher predation is not due to the presence of glands.

Table 10. Sentinel Bollworm Egg Predation in Four Cotton Varieties						
		Year 1			Year 2	
Variety	7/20	8/7	8/26	7/17	8/7	9/11
Acala 1517-08	52a	35a (3)	71a (6)	58a	55a	39a
Acala GLS	59a	55a (4)	55b (7)	51a	44a	46a
New GLS	55a	41a (4)	55b (7)	55a	60a	56a
PhytoGen 499	65a	44a (4)	56b (7)	59a	64a	50a

Direct Observations of Predation

Often the highest number of predators collected in sweep net samples is spiders, nabids and lacewings. Direct observations were not consistent with this expectation. In 2017, ants and hooded beetles alone produced 50% of observed predation. Ants and hooded beetle were with lady beetles the top three predators producing 75% of total observed predation. (Figure 15)

Surprisingly, no ladybugs were observed in the 2017 trial. Nabids represented 10-11% of predators while big eyed bugs were 4-8% in 2016-2017. Spiders were 3% of predator observations both years. Lacewings usually are a significant predator were not observed at all in 2016 but were 19% of observations in 2017. Collops beetles were observed 8% of the time in 2017 but not at all in 2016.

Observed predation was not completely consistent with expectations from sweep net samples. Ants were commonly observed feeding on sentinel eggs with 5-30% of total predation in the four cultivars (Fig. 16). Ants were rarely collected in sweep net samples from 2011-2016. Similarly, collops and hooded beetles were represented more frequently in direct observations than from previous sweep net collections. Collops were 6-20% of total predation in the four cultivars while hooded beetles were 21-35% of observations. Ladybugs represented 10-38% of observations consistent with both previous sweep net collections and examinations of egg debris after feeding. Nabids and spiders however were under-represented in direct observations with only 6-15% predation by Nabids and only 0-10% predation by spiders.

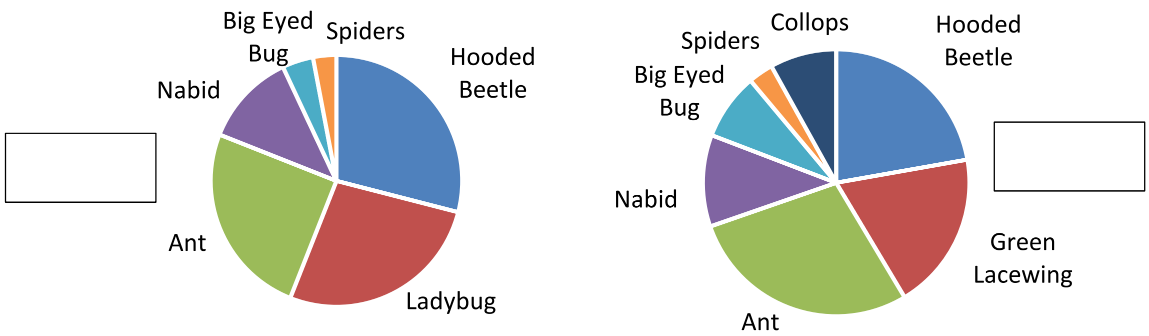

Figure 15. Percent of insects directly observed on Sentinel eggs.

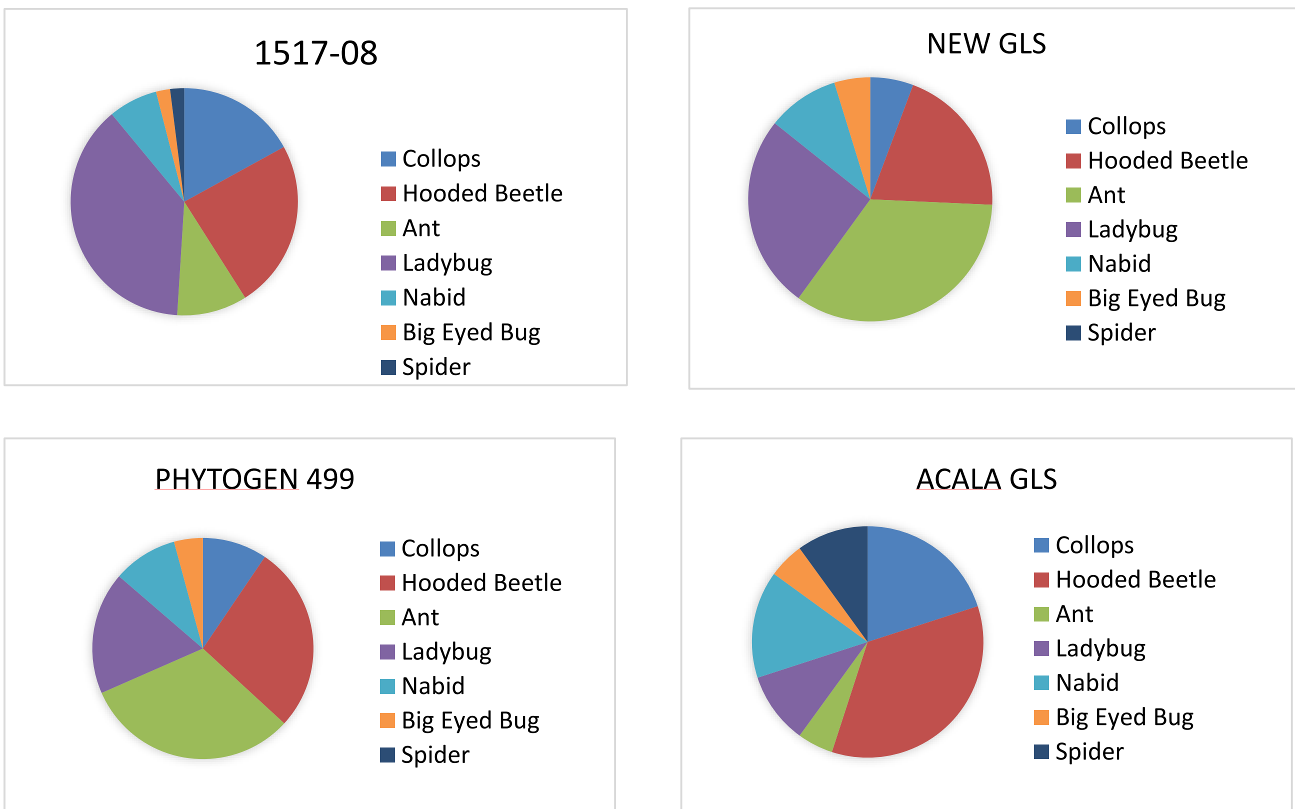

Figure 16. Percent of Insects Observed by Variety

Predation was observed directly for 24 hours with observations recorded every two hours. Acala 1517-08 had the highest predation representing 35% of the total (Fig 15). There was no apparent relationship to glands however as the other glanded cultivar PhytoGen 499 had only 19% of predation observations.

This was consistent with direct examination of sentinel eggs after 48 hours of feeding. There predation is evaluated by microscopic examination of egg debris after 48 hours in a separate trial the same day. In this examination of eggs, 30% of total predation was in Acala 1517-08 consistent with the 35% of total predation in direct field observations.

<u>Conclusion</u>

Direct observations of predation in 2016 and 2017 indicate that sweep net samples can underestimate predation by predators that are less likely to be collected in such samples. Collops, hooded beetle and ant predation is underestimated based on sweep net samples. Also, the presence of predators does not guarantee predation on pests or take into account the amount of predation by each predator.

Sentinel egg predation gives a better estimate of actual predation levels than both collections of predators and direct observation since higher numbers of eggs can be used. While we can narrow the source of such predation at least to chewing vs sucking predators and to some degree more characteristic damage by specific predators, it may not always be possible to identify the genus, let alone species, of predator though examination of the egg residue as damage by insects with similar feeding patterns appears similar. While it is unreasonable to direct observe large numbers of eggs, a combination of direct observations, collections of predators and microscopic examination of sentinel eggs provides a broader and more precise understanding of predation. However tremendous variation in predation among locations and over time even within a season mean these more accurate measures should not be too broadly interpreted.

There are some interesting differences at times in level of predation by specific predators in different cultivars. These differences however seem to be related to specific cultivar differences rather than to the presence of glands which was a concern in earlier field trials. Field and lab data suggests that glandless cotton will require close monitoring but that development of insect pest management strategies can make it a viable niche option in areas with lower insect pest pressure. Overall predation levels are not lower in glandless cotton, so predation will be a significant source of control of insect pests.

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Field and lab data suggests that glandless cotton will require close monitoring but that development of insect pest management strategies can make it a viable niche option in areas with lower insect pest pressure. Overall predation levels are not lower in glandless cotton so predation will be a significant source of control of insect pests.

REFERENCES

Barman **A., M. Parajulee, C. Sansone, and R. Medina. 2012.** Host Preference of Cotton Fleahopper, *Pseudatomoscelis seriatus* (Reuter) is not Labile to Geographic Origin and Prior Experience. Environ. Entomol. 41(1): 125-132.

Boyd**eers, E. H., J. F. Brunner, J. E. Dunley, M. Doerr, and K. Granger. 2005.** Role of neonicotinyl insecticides in Washington apple integrated pest management. Part II. Nontarget effects on integrated mite control. *J. Insect Sci. 5*: 16.

Boyd, M., B. Phipps, J. Wrather. 2004. *Cotton Pests: Scouting and Management. 4pp.* http://extension.missouri.edu/p/IPM1025-2.

Burris E., K. J. Ratchford, A. M. Pavloff, D. J. Boquet, B. R. Williams, and R. L. Rogers. 1989. Thrips on seedling cotton: Related problems and control. *Louisiana Agricultural Experiment Station Bulletin* 811. LSU AgCenter, Baton Rouge, LA.

EPA Newsroom. 2010. Bayer Agrees to Terminate All Uses of Aldicarb. 1 pp. http://yosemite.epa.gov/opa/admpress.nsf/e51aa292bac25b0b85257359003d925f/29f9dddede97caa88525778200590c93!OpenDocument.

Holtzer, T.O., and W.L. Sterling. 1980. Ovipositional preference of the cotton fleahopper, *Pseudatomoscelis seriatus*, and distribution of eggs among host plant species. Environ. Entomol. 9:236–240.

Li, J., Okin, G.S., Alvarez, L. and Epstein, H., 2007. Quantitative effects of vegetation cover on wind erosion and soil nutrient loss in a desert grassland of southern New Mexico, USA. Biogeochemistry, 85(3), pp.317-332.

Licht, M.A. and Al-Kaisi, M., 2005. Strip-tillage effect on seedbed soil temperature and other soil physical properties. Soil and Tillage research, 80(1), pp.233-249.

Pierce, J.B. and P. Monk. 2010. Impact of Alfalfa on Predation of Cotton Insect Pests in New Mexico. *In* Proceedings 64th Beltwide Cotton Conference, National Cotton Council, New Orleans, LA pp 962-965

Pierce, J.B. and P. Monk. 2009. Impact of Alfalfa on Biological Control of Cotton Insect Pests in New Mexico. *In* Proceedings 63rd Beltwide Cotton Conferences, National Cotton Council, San Antonio, Texas. pp 830-833.

Pierce, J. and P. Monk. 2008. Yield compensation for simulated bollworm injury in New Mexico. Lubbock World Cotton Research Conference-4. Refereed Proceedings: Omnipress, Madison, WI p1826.

Pierce, J. Breen, R. Flynn, C. Ellers-Kirk and C. French. 2001. Variation in plant resistance to cotton bollworm *Helicoverpa zea* in selected Bt cotton varieties. Southwestern Entomologist. 26: 353- 363.

Pierce, J. Breen, R. Flynn, C. Ellers-Kirk, and C French. 1999. Variation in beet armyworm susceptibility and expression of resistance in selected Bt varieties. Southwestern Entomologist 24: 183-92

Prasifka, J.R. K.M Heinz, R. R. Minzenmayer. 2004. Relationship of landscape, prey and agronomic variables to the abundance of generalist predators in cotton (Gossypium hirsutum) fields. Landscape Ecology 19: 709-717

Stern, V. M R van den Bosch, T.F Leigh, O.D. McCutcheon. W.R.Sallee, C.E Juston and M.J Graber. 1967. Lygus control by strip cutting alfalfa. Calif. Agric. Ext. Serv. Bul. AXT 241. 13 pp.

Vineyard, C.J. H. Kelly, L. Steckel, and S. Stewart 2017. Potential Interaction of Pre-emergence Herbicides and the Efficacy of Insecticide and Fungicide Seed Treatments in Cotton. Journal of Cotton Science. 21: 284-295.

Williams, M. R. 2000. Cotton insect losses - 1999, Pp. 887-913. *In* P. Dugger and D. Richter [eds.], Proc., Beltwide Cotton Conf., National Cotton Council, Memphis, TN.

Grants and Sponsored Activities

INPUT OPTIMIZATION AND INSECT PEST MANAGEMENT IN NEW MEXICO

<u>Background and Significance</u>

One of the biggest issues facing growers is the cost of inputs. Areas where inputs could be reduced include insecticides, fertilizers and expensive transgenic cultivars. In 2018, we looked at a number of areas to reduce these inputs

Input costs are one of the biggest issues facing cotton farmers. Reductions in unnecessary inputs directly impact profitability. Relating input rates to increases or decreases in insect damage will further allow growers to make informed decisions to keep cotton profitable.

Significant inputs, for example, in transgenic seed or fertilizer costs may be unjustified. Previous trials in Artesia indicated fertilizer and moisture inputs may place cotton at risk for increased insect damage with related crop losses and/or additional inputs in insecticide applications. High rates of N and high moisture resulted in lower mortality in some Bt cotton cultivars. Other fertilizers may produce similar effects. Understanding the impact of fertility on insect pests will help us optimize cotton management for maximum profit as opposed to maximum yields.

Prior testing for Cotton Incorporated in Artesia NM also indicated that yields of non Bt cultivars were generally equal to transgenic cultivars in SE New Mexico unless inputs are excessive. Newer cultivars have been developed since these trials were conducted and in 2018 we evaluated some of those cultivars.

VARIATION IN PLANT INJURY AND YIELD BY LEPIDOPTEROUS PESTS IN SELECTED CULTIVARS OF BT COTTONS IN NEW MEXICO

<u>Summary</u>

As part of a regional collaborative project with Cotton Incorporated and Texas A & M University, seven varieties of Bt +/- cotton were planted in a field trial in Artesia, NM. Damage to squares and bolls was compared weekly. Yields were picked from two 50ft center rows. Plants were also removed for yield partitioning comparisons by position and node. A field to lab bioassay compared survival of bollworm larvae at 48 and 96 hours feeding on field collected squares.

Square damage to conventional cotton was significantly higher than cultivars with 2-3 Bt genes with 9% square damage in non Bt squares vs 3% in the Bt varieties. Boll damage was high ranging from 16-40% boll damage with the more notable differences among Bt products. Non Bt cotton had 38% boll damage comparable to the 36-40% damage in Widestrike and Widestrike 3. Twinlink and Twinlink Plus had 21-26% boll damage. Bollgard 2 and 3 had the least damage with 16-17% boll damage.

There were no significant differences in yield. Raw cotton yields ranged from 1412 lb/A in the non Bt cotton variety and 1557 to 1993 lb/A in the Bt cotton varieties. There was no significant regression between the percent damaged bolls and yield.

Material and Methods

Seven varieties of cotton with 0-3 Bt genes were planted in 4 row, 100 ft plots in Artesia, NM. Squares and bolls were sampled for damage from the middle two rows weekly. The outer two rows were mechanically harvested and weighed. Ten feet of plants of one outer row were cut and brought to the lab to record lint weight by position and node.

Table 1. Cotton Varieties in Trial 2018, Artesia, NM

Trait	Variety	# Genes
Non-Bt	FM2322 GL	0
Widestrike	PHY333 WFE	2
Bollgard 2	DP1522 B2XF	2
Twinlink	ST5122 GLT	2
Twinlink Plus	ST5471 GLPT	3
Bollgard 3	DP1845 B3XF	3
Widestrike 3	PHY330 W3FE	3

Results

There was significantly higher square damage in cotton varieties with 2-3 Bt genes compared to non Bt check variety cultivars until late July (Figure 1-3). Although squares were collected until mid-August the only differences between Bt and non Bt cotton were in the first two dates July 7 and 23. In those first two dates there was 9.2% damaged squares in non Bt cotton compared to 2.8 and 2.6% damaged squares in varieties with 2 and 3 genes respectively. (df 2,53 F=8.3 P<0.0007)

There were some interesting numerical trends among products as opposed to number of genes. Widestrike and Widestrike 3 had 4.1 and 3.3% damage, Bollgard 3 and Bollgard 2 had 2.8% and 2.2%

damage respectively. Twinlink and Twinlink Plus had 2.1and 1.8% damage respectively. (Table 2) Bollgard 2, Twinlink and Twinlink Plus had significantly less square damage then the check.
enes

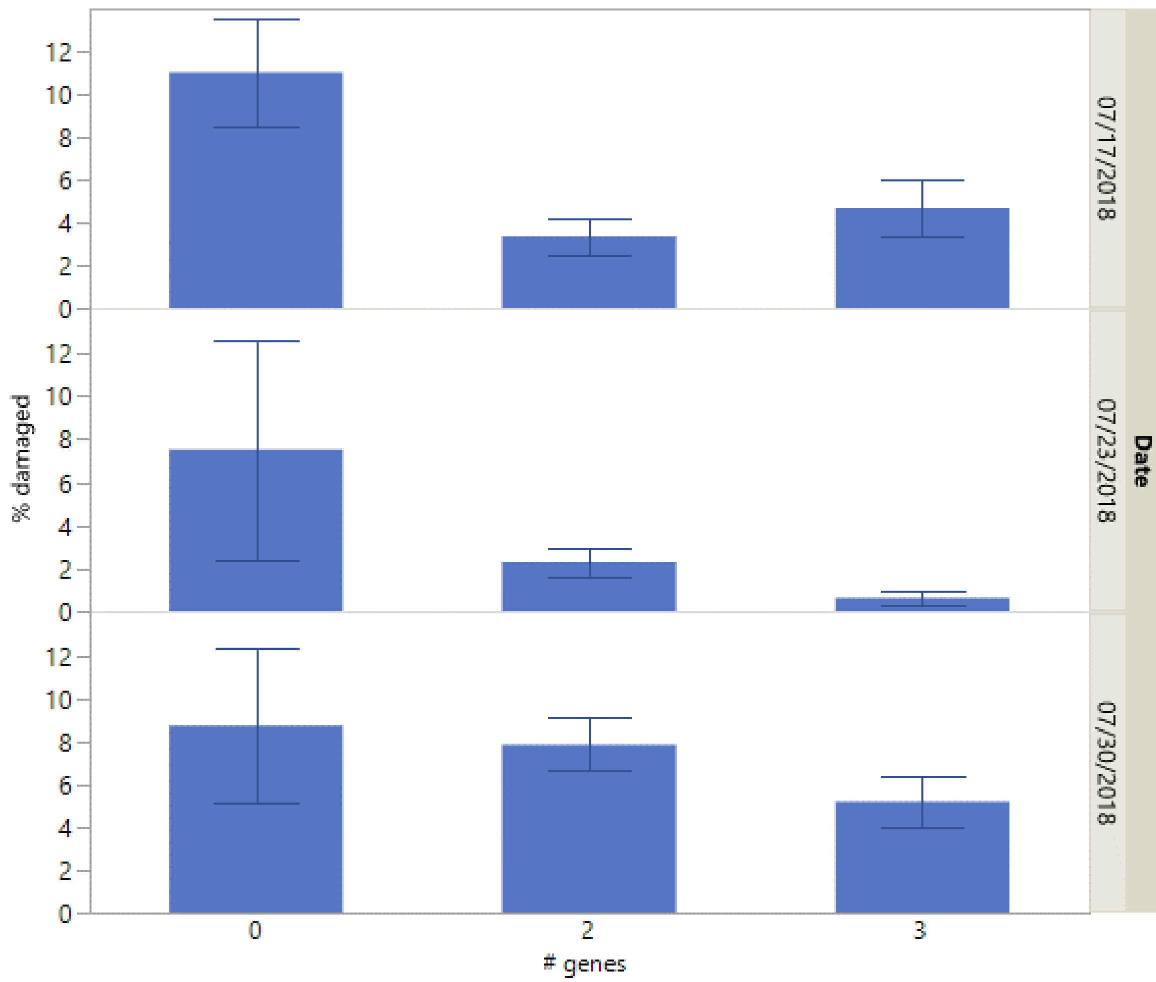


Figure 1. Square damage in July from 7 Bt+/- varieties with 0 or 2-3 genes

Table 2. Mean percent damaged squares on 7/17/18 and 7/23/18 in 7 varieties of 2-3 gene Bt products and one non-Bt variety, Artesia, NM

Variety	Mean % damaged squares	(standard error)	Product
FM2322 GL	9.2a	2.7	Non-Bt
Phy333 WFE	4.1ab	0.8	Widestrike
Phy330 W3FE	3.3 ab	1.6	Widestrike 3
DP 1845 B3XF	2.8 ab	1.2	Bollgard 3
DP1522 B2XF	2.2 b	0.7	Bollgard 2
ST5122 GLT	2.1 b	1.1	Twinlink
ST5471 GLTP	1.8 b	1.5	Twinlink Plus

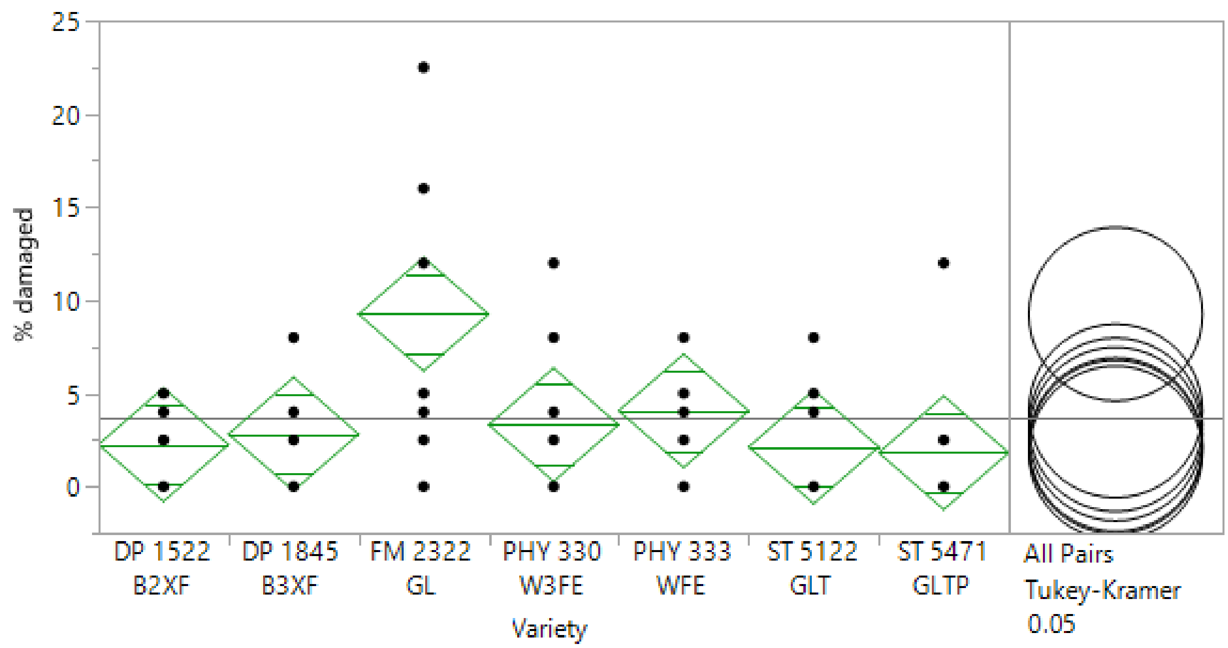


Figure 2. Mean percent square damage 7/7 and 7/23/18 in Bt +/- field trial Artesia, NM

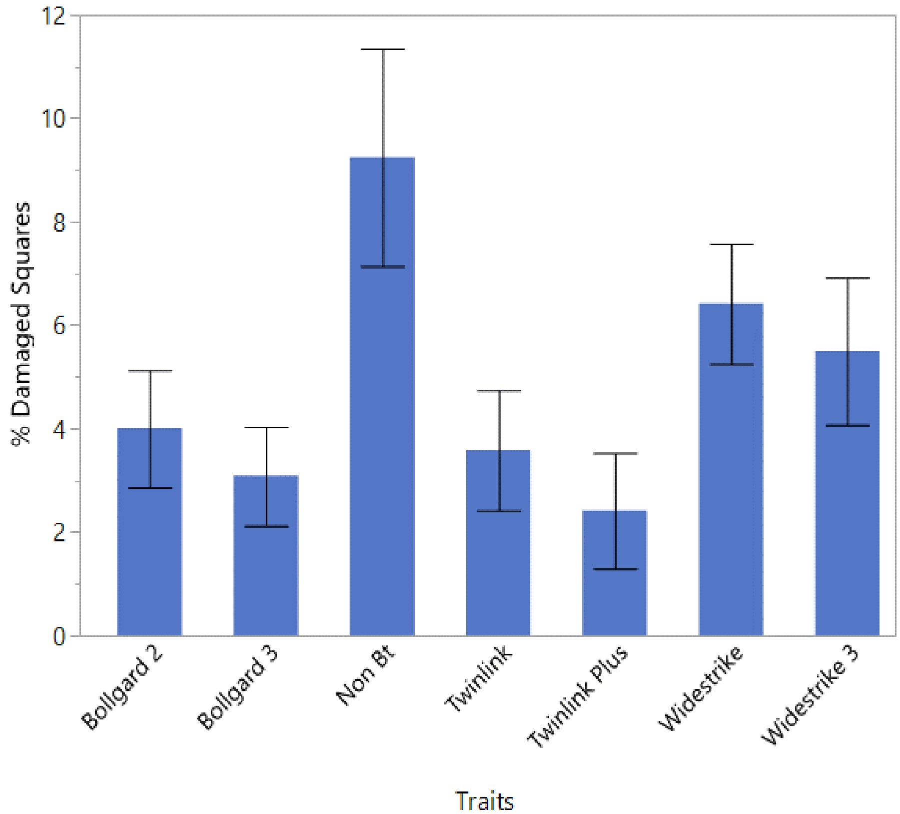


Figure 3. Season long mean percent damaged squares in 7 varieties of Bt +/- cotton Artesia, NM

<u>Boll Damage</u>

There was a difference in boll damage between non Bt and Bt cotton varieties, but there was no difference between the 2 and 3 gene cottons. (Figure 4) Instead, surprisingly, there were larger differences among the products. Non Bt cotton had 38% boll damage comparable to the 36-40% damage in Widestrike and Widestrike 3. Twinlink and Twinlink Plus had 21-26% boll damage. Bollgard 2 and 3 had the least damage with 16-17% boll damage
(Table 3 and Figure 5).

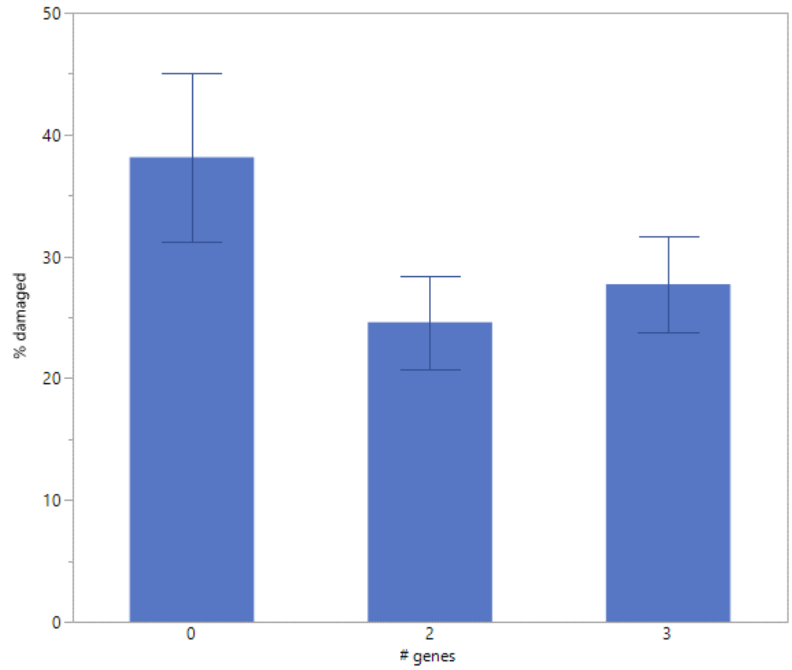


Figure 4. Percent damaged bolls by Bt gene number in 7 varieties of Bt +/- cotton in field trial Artesia, NM.

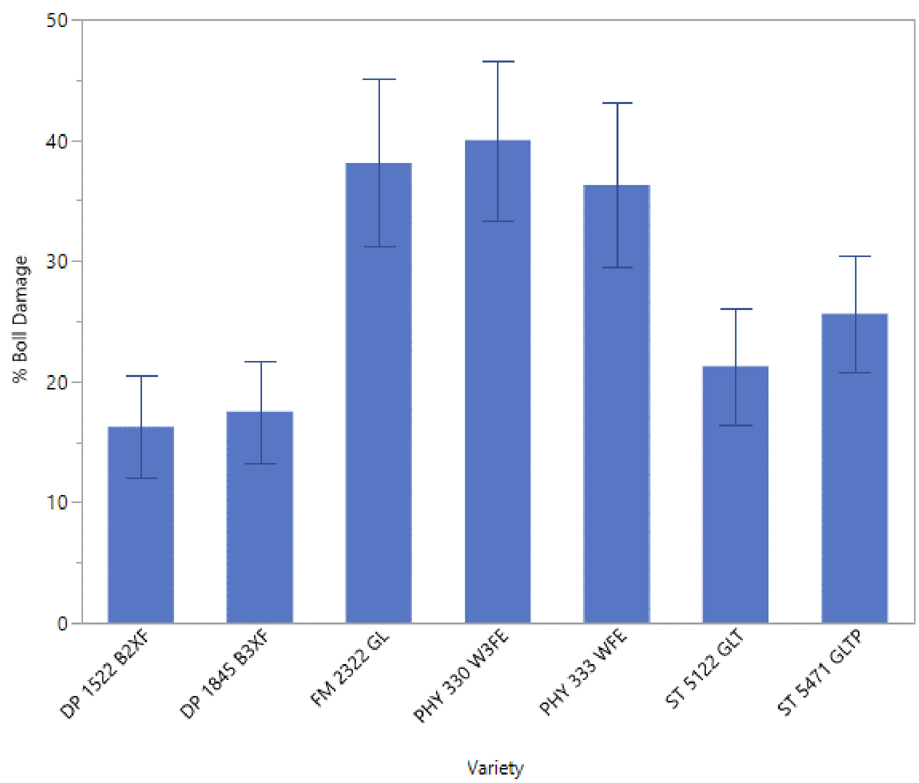


Figure 5. Mean percent boll damage on August 6, 2018 in Bt +/- field trial, Artesia, NM

Yield from Bt Cotton Field Trial

There was no significant difference in yield in any of the varieties. (Figure 6) There was a trend with numerically lower yield in the non Bt cotton compared to the Bt cotton varieties. With 1412 lb/A in the non Bt cotton variety and 1557 to 1993 lb /A in the Bt cotton varieties.

There was no significant difference in yield among varieties. (Figure 6) There were trends where the 2 and 3 gene cotton varieties were not significantly higher field weight than the conventional cotton despite significantly higher damage in squares. (Figure 7) We will compare this yield data to the yield of 10 ft of plants collected which will have raw cotton weight, lint weight per plot, per boll and per lock. That work is in progress.

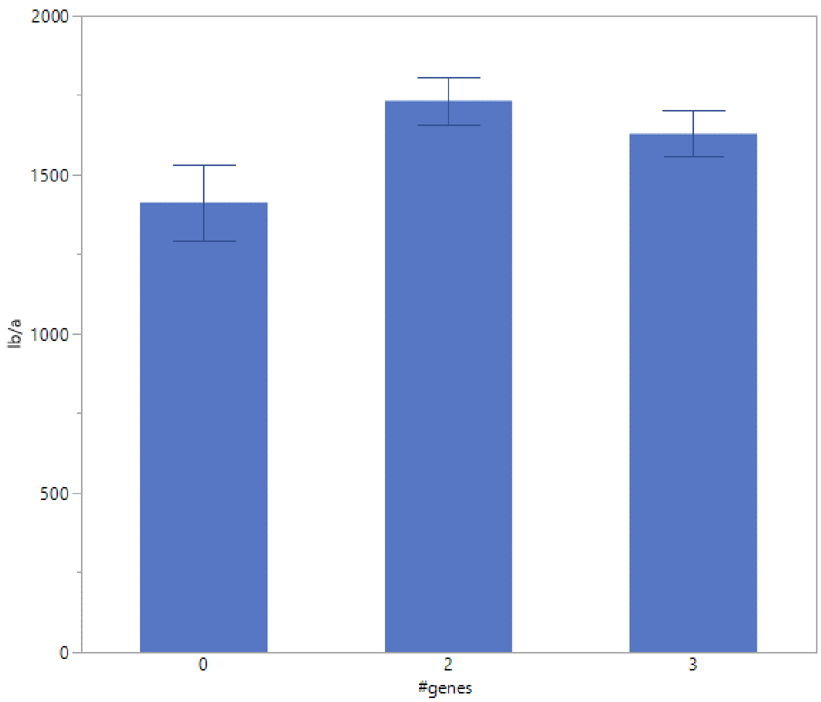


Figure 6. Yield (lb/A) of seven cultivars in Bt +/- field trial by number of Bt genes

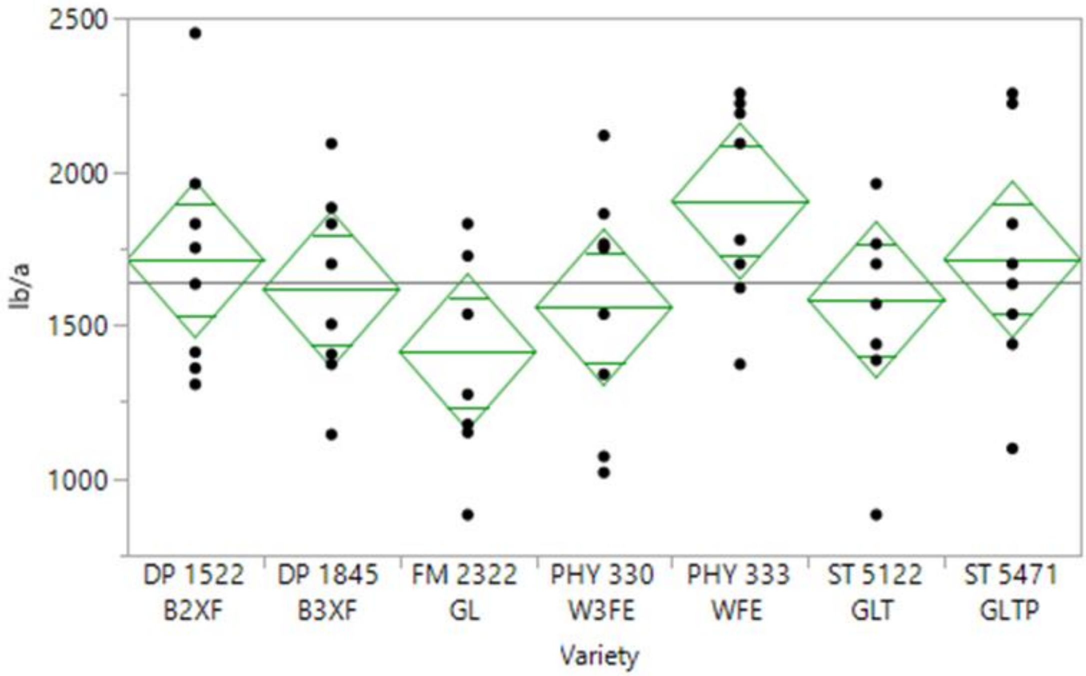


Figure 7. Field weight of seven varieties of Bt +/- cotton in Artesia 2018 Bt trial.

Yields per plot were regressed on boll damage which would be useful in predicting yield losses. However, there was not a significant response (df 1,26 F = 0.04 *P*<0.83). While some of the varieties with high damage had higher yield losses, one variety in particular had an unexpected response. Widestrike had 36% boll damage but had the highest yield. (Table 4). The wide variation among varieties made determining any relationship difficult (Figure 8)

Table 4. Comparison of Boll Damage and Yield from Bt Field Trial

Product	% Boll Damage	Difference in Yield from non Bt Cotton
Non Bt	38.1	0
Widestrike	36	491
Widestrike 3	40	146
Twinlink	21.2	170
Twinlink Plus	25.6	302
Bollgard 2	16.2	301
Bollgard 3	17.5	204

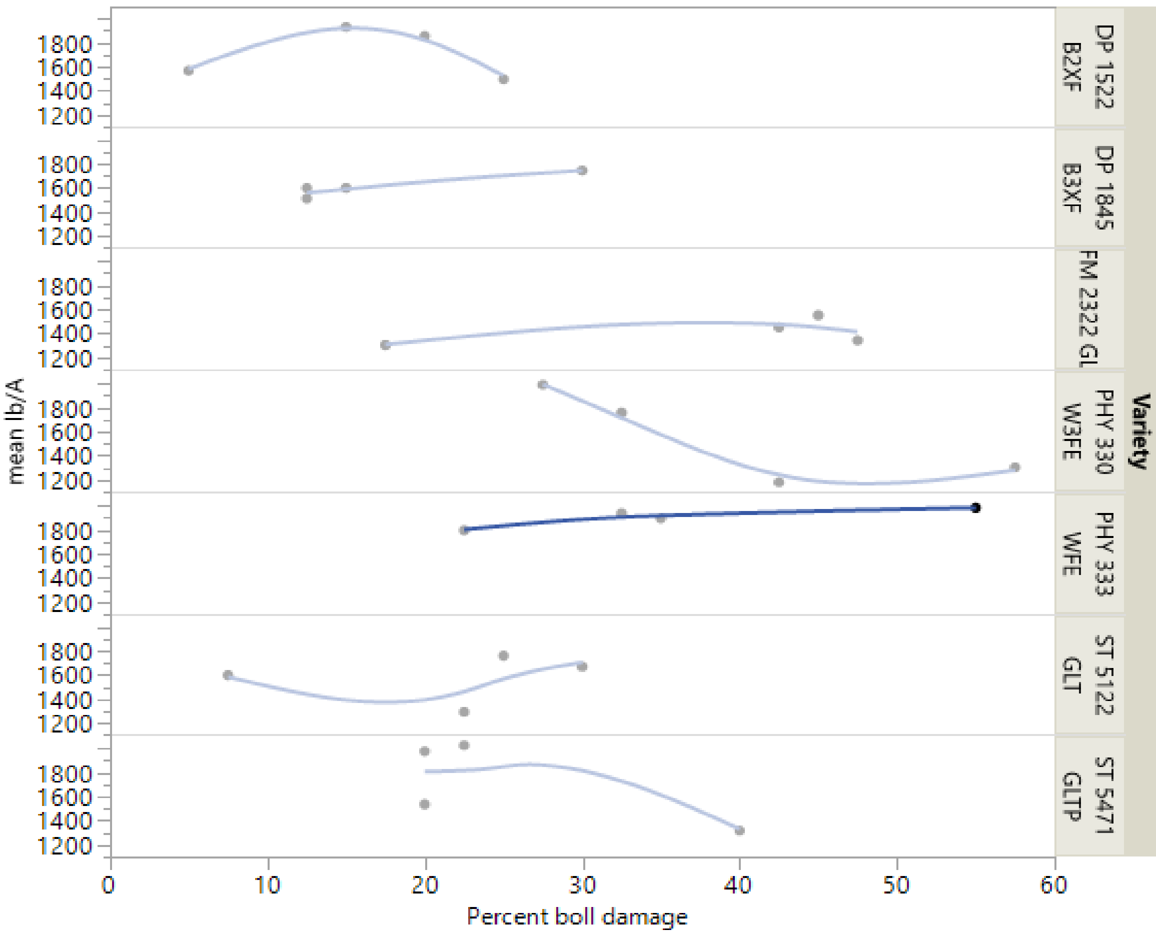


Figure 8. Potential Impact of boll damage on yield

<u>Field to Lab Assay Evauations of Survival on Bt+/- Squares</u>

Field to lab assays were conducted with neonate larvae. Ten neonate larvae were placed in petri dishes with 4 squares from each plot. Larvae were evaluated at 48 and 96 hours and survival was recorded.

Results of the field to lab assay were consistent with field damage. Survival was higher in non Bt squares compared to the Bt variety squares. Two Bt gene squares had significantly lower survival, 32%, compared to non Bt squares with 56% survival at 96 hours. (Figure 9) (df 2,97 F=25 P<0.001) Three Bt gene squares had 5% survival.

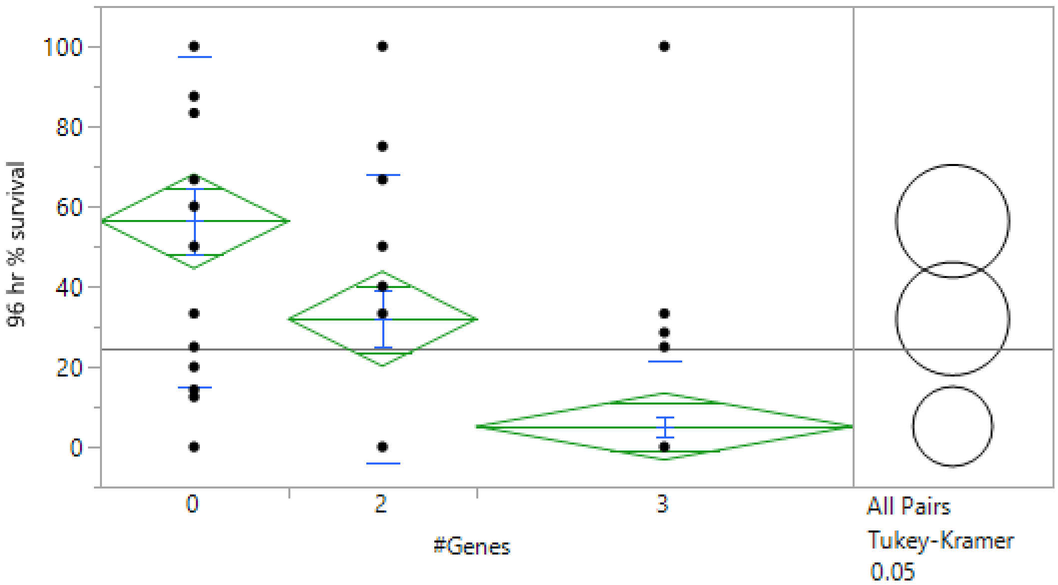


Figure 9. Percent survival of bollworm larvae at 96 hours when fed field collected squares of Bt=/-cotton
(df 2,97 F=26 *P*<0.0001)

There was little impact at 48 hours in terms of survival with a 86-96% survival at 48 hours. (Figure 10)

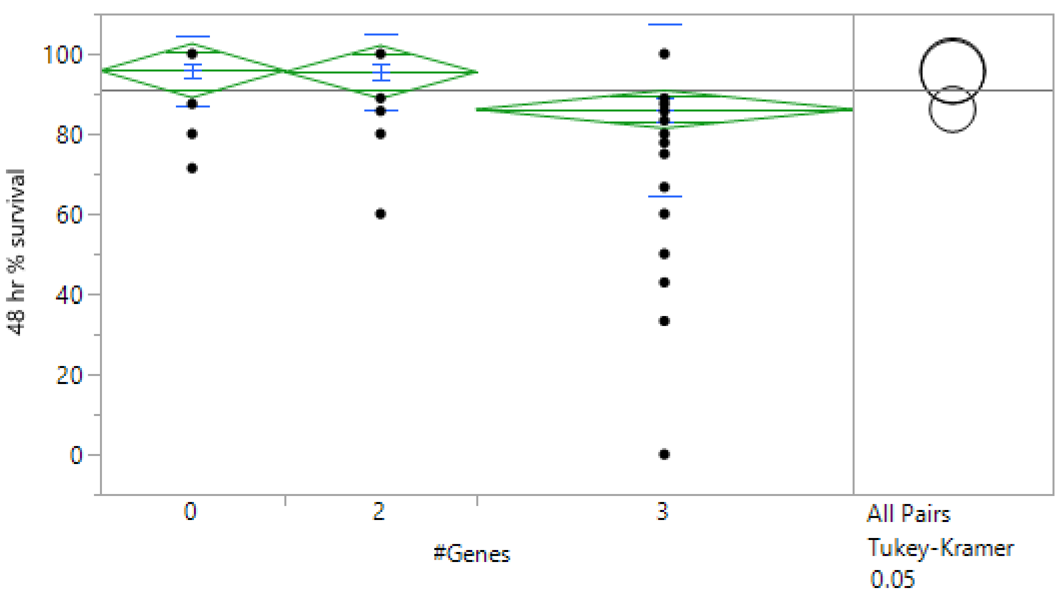


Figure 10. Percent survival of bollworm larvae at 96 hours when fed field collected squares of Bt=/-cotton (df 2,97 F=40 *P*<0.0001)

CONCLUSIONS

Results from 2018 indicated bollworm damage in conventional cotton resulted in higher damage and likely yield losses compared to some Bt cottons.

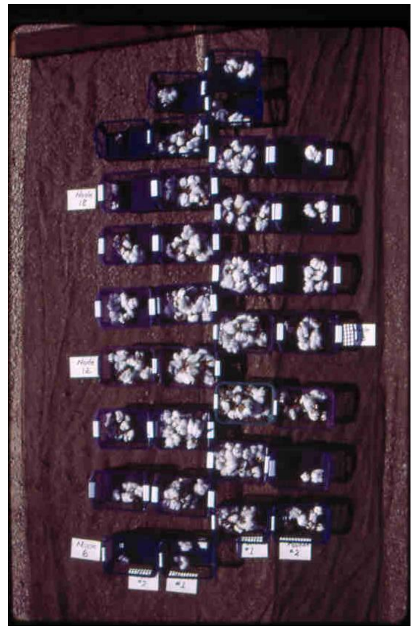
Although yield losses could not be demonstrated statistically from field plots picked mechanically, numerically the yield of the non Bt cotton was 10-34% less than the Bt cotton varieties. Based on previous work we did on yield partitioning and compensation with Cotton Incorporated we would not expect significant yield losses from 3% square damage to Bt cotton. However 40% loss of bolls even late season, August 8, should produce significant yield losses since it is difficult for cotton to compensate for boll losses.

Typically, bollworm damage is not extremely high in NM. The last year that had bollworm damage as high was 20 years ago in 1998. However, the degree of damage noted here and the likelihood of some yield losses demonstrates the need to monitor bollworm in both transgenic and conventional cotton cultivars.

YIELD PARTITIONING OF BT VS NON BT CULTIVARS

Varieties used for the previous trial had subplots to accommodate yield partitioning evaluations. In 2002-2006 we conducted similar trials with earlier varieties (Pierce et al. 2008). As in other locations late season cotton particularly late season squares which are the usual target of bollworm in New Mexico has low value. Bolls are higher value but damage is not commonly found at economic levels in New Mexico.

All seven varieties used for the Bt +/- field trail are being evaluated by yield partitioning which will help determine where we lost cotton and where we made cotton. One of the varieties had 40% yield loss but the highest yield. It will be interesting to see where it made cotton if it was all in early bolls or if it made more late season than other varieties that had similar late season boll losses. We are in the process of processing the plants. They were hand cut and removed from the field and have been separated by node and position but are awaiting ginning in the laboratory. It is a very labor intensive process that we generally finish during the winter/early spring when there are multiple varieties. The results will be reported when available in 2019 reports. Ultimately, we will have lint weight per boll and per lock for each node and position.



EFFECT OF VARYING RATES OF POTASSIUM ON INSECT PESTS

A number of papers have indicated that potassium can affect insect pest populations. (Gormus 2002, Amtmann et al 2008, Sarwar 2011, Myers 2006) One 2017 trial in New Mexico indicated that 240 Kg/ha K2O/ha potassium levels produced 42% higher yields than 120Kg/ha K2O/ha. In 2018 we compared 0,100 and 200 lb potassium fertilizer treatments using 4 varieties. Plots were sampled for insect pests and damage both foliar and square damage and insect numbers were recorded.

There was no significant difference in square damage in plots treated with 0, 100 or 200 lb of potassium. No other insects or damage sampled are reported as scouting indicated there was not enough to justify intensive sampling. We plan to try this field trial one last time in 2019.

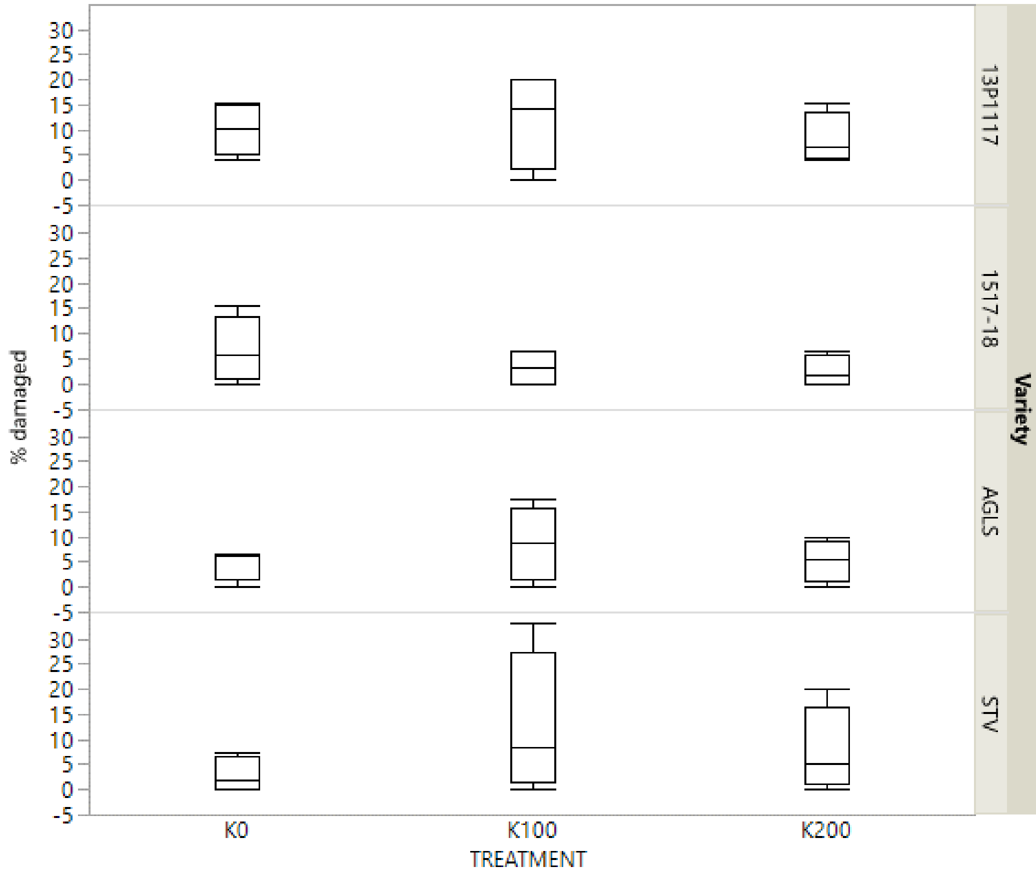


Figure 11. Percent damaged squares of four varieties of cotton treated with different rates of potassium.

PREDICTING CUTWORM OUTBREAKS

Cutworms, particularly granulate and variegated cutworm are sporadic but, occasionally serious pests in cotton and alfalfa in New Mexico. Traps were maintained on the NMSU farm in Artesia and on commercial farms in Eddy Co to monitor the status of variegated cutworm to determine if we can correlate trap captures with outbreaks. We suspect that any correlation will be limited as empirical evidence and some of our field to laboratory experiments have indicated that outbreaks are most likely triggered by rainfall and related high relative humidity. In at least one recent occasion high trap captures were not associated with outbreaks but a combination of weather forecasts and trap captures might be predictive.

Results

Cutworm moths were captured from 5/21 – 9/17 with peak captures of 2.2 moths/night from 7/16-7/23. (Figure 12)

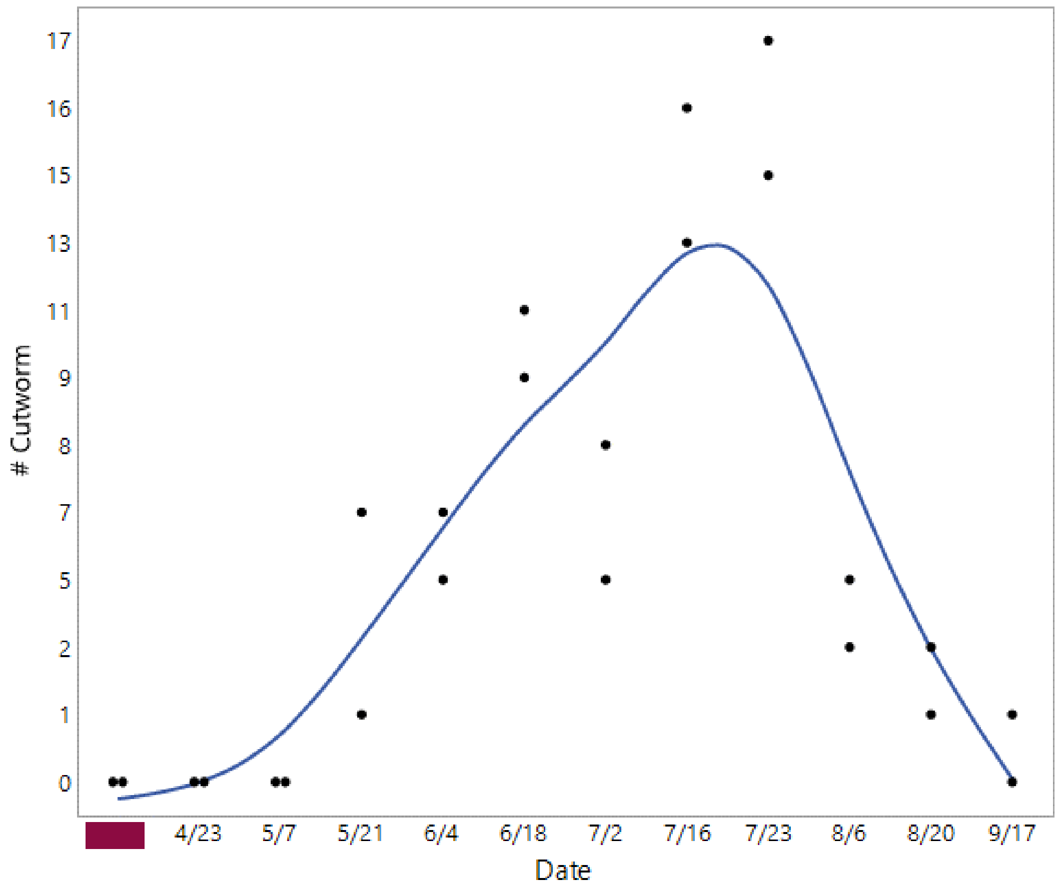
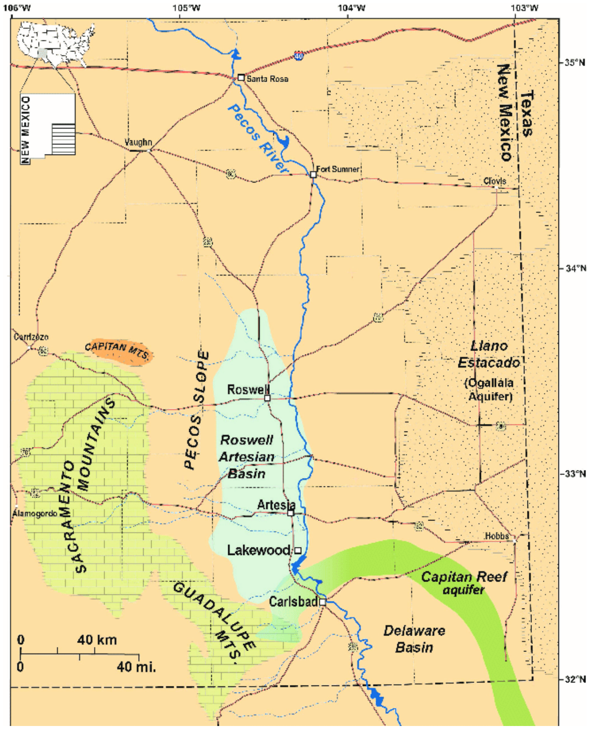


Figure 12. Cutworm trap captures in 2018, Artesia, NM.

PINK BOLLWORM ERADICATION, TRAPPING AND REFUGE REQUIREMENTS

A trap line with 34 traps from Roswell to south of Carlsbad, NM was monitored for pink bollworm activity from August to November in 2018. We anticipated using this data to help growers justify changes in Bt cotton refuge requirements. The last captures in New Mexico were in 2006. However, in 2009, there was an outbreak of pink bollworm in West Texas. In collaboration with APHIS and Texas A & M University we monitored trap lines near the outbreak until we recorded zero captures (Pierce et al 2013).



However, on October 19, 2018 the US Secretary of Agriculture declared the United States free of pink bollworm so it was fortunate that we did not capture any pink bollworms.

In 2018, I was also asked to work with entomologists from industry U. Arizona and Texas A & M University to work on a request to EPA to amend registrations of commonly registered Bt cotton products to allow exemptions for refuge requirement since pink bollworm is eradicated. This is a requirement that is particularly a concern to the growers on the Texas border who often farm both sides of the border and have no such requirement on the Texas side despite Texas having had pink bollworm outbreaks more recently than New Mexico.

MONITORING CHANGES IN HELIOTHINE POPULATIONS

Heliothis populations in SE NM: *Helicoverpa armigera* is a growing concern for New Mexico particularly since it was intercepted at least once in El Paso Texas which borders New Mexico. Long term information is also needed on the relative proportion of *Helicoverpa zea* vs. *Heliothis virescens*.

Data was collected from traps in 2016-2018 to determine baseline levels of *H. zea* and *H. virescens,* in part, to have a comparison if *H. armigera* makes an incursion into NM and also to document changes in populations

Bollworm and tobacco budworm were collected in pheromone traps over the growing season to collect baseline information which will be important with the ultimate incursion of *H. armigera*. At the same time, this will allow us to look at potential changes in populations particularly the rate of tobacco budworm vs bollworm.

<u>Results</u>

Trap captures do not reflect the intensity of bollworm pressure we experienced in 2018. Typically, mortality of eggs is high with approximately 40-60% mortality from desiccation and approximately 35-90% mortality from predation. This is based on earlier work funded by Cotton Incorporated (Pierce and Yates 2003). Typically few eggs hatch until late in the season when the cotton canopy provides higher relative humidity and predator populations' decrease.

Cotton bollworm are more prevalent than tobacco budworm with cotton bollworm representing 94% of total trap captures in 2018 while tobacco budworm was 6% of captures. Moths were active from 7/9 -9/17. The highest trap captures of bollworm was 7.7 moths/night the week ending 8/13 and 0.6 moths/night for tobacco budworm. (Figure 13 and 14) Peak activity was from 7/30 -8/27/18. Peak activity started a few days earlier in 2018 compared to 2016 and 2017.

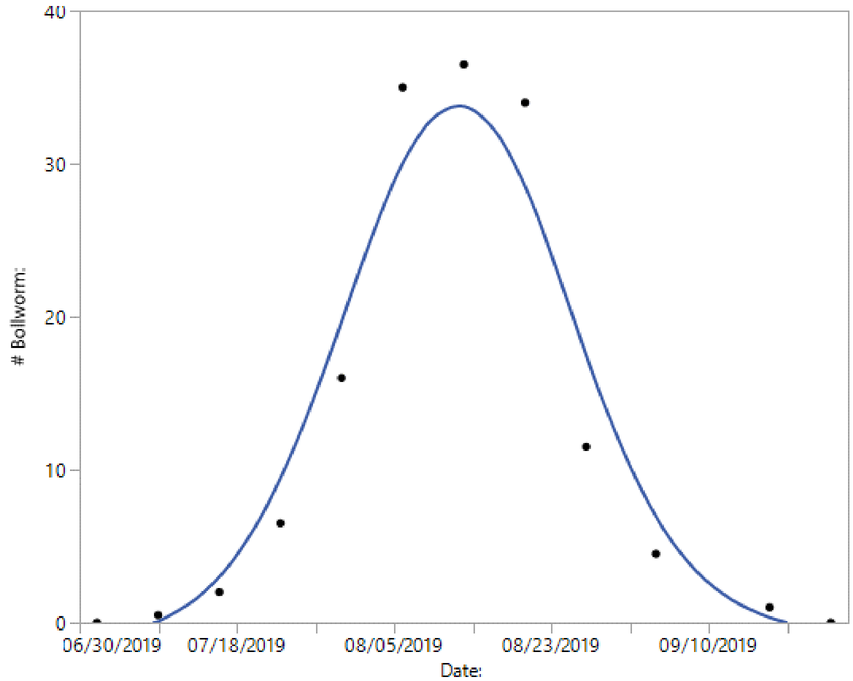


Figure 13. Bollworm pheromone trap captures in Artesia, NM 2018

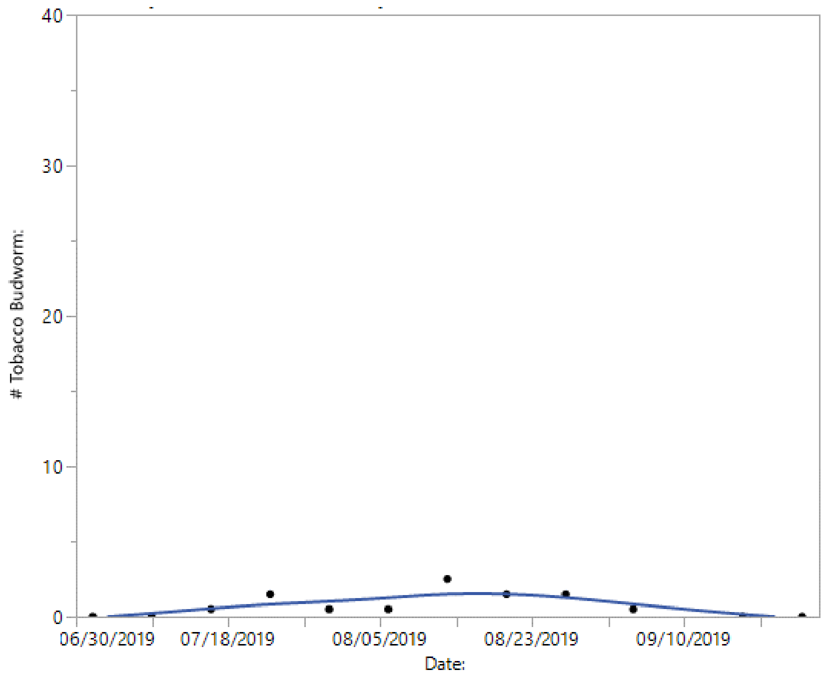


Figure 14. Tobacco Budworm pheromone trap captures in Artesia, NM 2018

In 2017, data suggested that budworm populations might be higher in NM than West Texas or budworm populations might be increasing since 14% of total captures were budworm. (Figure 15) However, in 2016 budworm captures were only 8% and in 2018 budworm captures were only 6% which are comparable to historical data in West Texas **(**Parajulee et al 1998, Parajulee at al 2004**.** (Figure 16).

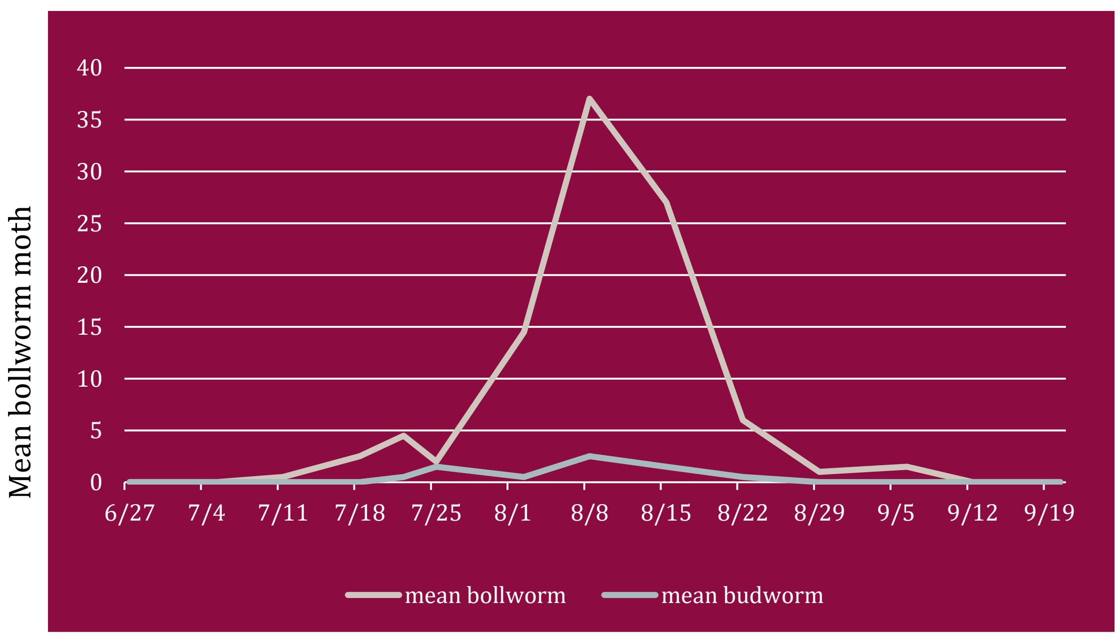


Figure 15. Cotton bollworm and tobacco budworm mean trap captures in 2017, Artesia, NM

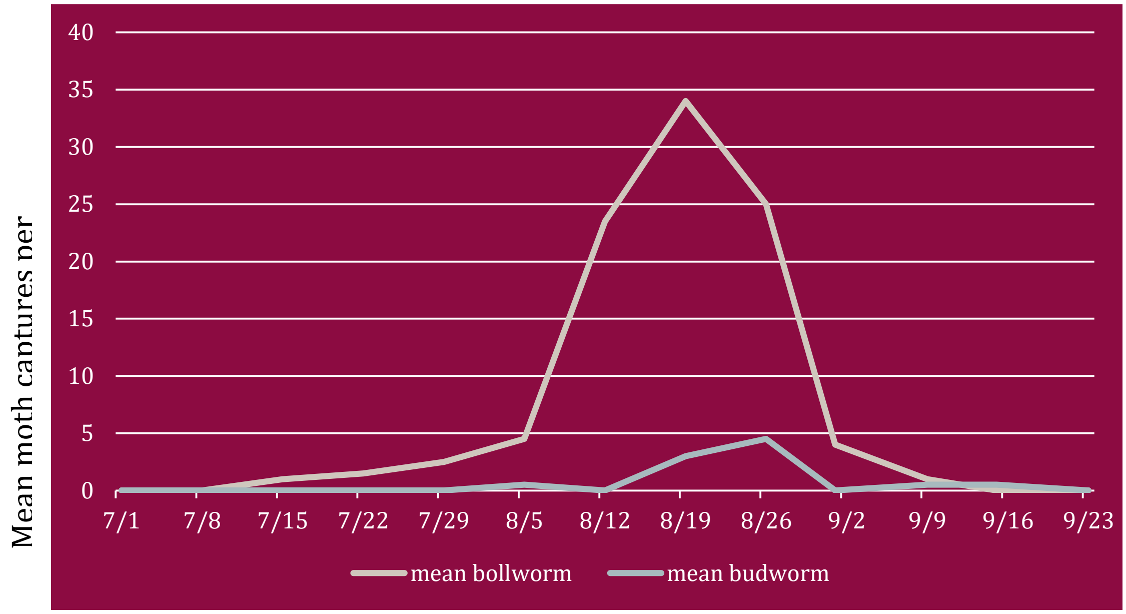


Figure 16. Cotton bollworm and tobacco budworm mean trap captures in 2016, Artesia, NM

ACKNOWLEDGEMENTS

Support for this project by Cotton Incorporated and New Mexico State University Agricultural Experiment Station is gratefully acknowledged. A special thanks to Texas A & M University entomologists who had input into the experimental design and acquiring seed.

REFERENCES

Amtmann A, Troufflard S, Armengaud P. 2008. The effect of potassium nutrition on pest and disease resistance in plants. Plant Physiology, 133: 682-691

Cassman, K.G., Kerby, T.A., Roberts, B.A., Bryant, D.C. and Higashi, S.L. 1990. Potassium nutrition effects on lint yield and fiber quality of Acala cotton. Crop Science, 30(3), pp.672-677.

Gormus, O., 2002. Effects of rate and time of potassium application on cotton yield and quality in Turkey. Journal of Agronomy and Crop Science, 188(6), pp.382-388.

Myers SW, Gratton C. 2006. Influence of potassium fertility on soybean aphid, Aphid glycines Matsumura (Hemiptera: Aphididae), population dynamics at a field and regional scale. Environmental Entomology, 35: 219-227

Sarwar M, Ahmad N, Tofique M. 2011. Impact of soil potassium on population buildup of aphid (Homoptera: Aphididae) and crop yield in canola (Brassica napus L.) field. Pakistan Journal of Zoology, 43(1): 15-19

Parajulee, M, Rummel, D, Arnold, A, and Carroll, S. 2004. Long-Term Seasonal Abundance Patterns of *Helicoverpa zea* and *Heliothis virescens* (Lepidoptera: Noctuidae) in the Texas High Plains. Journal of Economic Entomology, 97(2):668-77.

Parajulee, M. Slosser, J. and E. Boring. 1998. Seasonal Activity of *Helicoverpa zea* and *Heliothis virescens* (Lepidoptera: Noctuidae) Detected by Pheromone Traps in the Rolling Plains of Texas. Environmental Entomology 27(5):1203-1219.

Pierce, J. B., C. Allen, W. Multer, T. Doederlein, M. Anderson, S. Russell, et al. 2013. Pink Bollworm (Lepidoptera: Gelechiidae) in the Southern Plains of Texas and New Mexico: Distribution; and Eradication of a Remnant Population. Southwestern Entomologist, 38(3), 369-378.

Pierce, J.B. and P. Monk. 2010. Impact of Alfalfa on Predation of Cotton Insect Pests in New Mexico. In Proceedings 64th Beltwide Cotton Conference, National Cotton Council, New Orleans, LA pp 962-965

Pierce, J.B. and P. Monk. 2009. Impact of Alfalfa on Biological Control of Cotton Insect Pests in New Mexico. In Proceedings 63rd Beltwide Cotton Conferences, National Cotton Council, San Antonio, Texas. pp 830-833.

Pierce, J. and P. Monk. 2008. Yield compensation for simulated bollworm injury in New Mexico. Lubbock World Cotton Research Conference-4. Refereed Proceedings: Omnipress, Madison, WI p1826.

Pierce, J. Breen and P. Yates. 2003. Impact of management practices on crop microclimate and control of cotton bollworm and boll weevil. In 57th Proceedings Beltwide Cotton Conferences. National Cotton Council. Nashville, TN. pp. 1500-1505.

Pierce, J. Breen, R. Flynn, C. Ellers-Kirk and C. French. 2001. Variation in plant resistance to cotton bollworm Helicoverpa zea in selected Bt cotton varieties. Southwestern Entomologist. 26: 353- 363.

Pierce, J. Breen, R. Flynn, C. Ellers-Kirk, and C French. 1999. Variation in beet armyworm susceptibility and expression of resistance in selected Bt varieties. Southwestern Entomologist 24: 183-92

ACTIVITIES 2018

In addition to our usual presentations at grower and professional meetings, the following activities are where Cotton Incorporated projects were highlighted.

Field Day 2018 Presented Results of cotton trials and had an insect safari for young students.

STEM summer Workshop: Had a summer field workshop with Jr High Students where we did a short field trial and analyzed the results.

JMP Discovery Summit: Won a top three poster award with presentation on Cotton Inc data at the JMP 2018 Discovery Summit

Field day activities Artesia NM 2018. Growers in barn to listen to keynote address and visit booths. Children collected insects in alfalfa and cotton as part of an insect safari.

"Insect Pest Management-Plan of Work 2012-2017" (January 1, 2018 - December 30, 2018).

Major Program Area: Global Food Security and Hunger

Why is this program important?

Purpose: Insects impact humans in their personal environment (home/landscape) and in food production. Management of insect pests and beneficials increases health, safety and quality of life for individuals and families and increases profits for growers. Insecticides are part of control efforts but are often overused. In the home this can become a health issue. In agriculture, insecticides and fees for transgenic crops are expensive inputs. In some cases input costs are increasing to a point where it is resulting in a reduction in acreage of some crops in NM. Our purpose is to increase knowledge in our clientele so that insecticides and insect resistant transgenic crops are used only when justified. Part of this effort is to conduct applied research to learn how to manage crops to keep insect pests below economic thresholds under New Mexico conditions. This will increase profits for growers and ensure sustainability of crops that are most at risk the low water use crops like sorghum and cotton. Sustainability of low water use crops is becoming increasingly important as some of our sources of water are depleted. Increased safety and environmental benefits are additional impacts.

Annual Accomplishments:

The specialist will conduct insect pest management training sessions as requested by extension agents other department personnel or other clientele including commodity groups.

The specialist will conduct survey programs in the field to respond to agricultural, forestry or health threats from invasive arthropods. The specialist will estimate state crop losses from insects in cotton yearly as part of a Beltwide effort, and respond to other paper surveys as requested.
The specialist will identify specimens submitted to the extent of her ability and submit when necessary to other CES/NMSU personnel and provide advice on biology, life cycles and when necessary control efforts.

The specialist will speak as requested on the general topic of entomology to a variety of audiences and act as judge/ advisor for students youth groups on the topic of entomology.

The specialist will conduct releases and follow up of parasitoids or predators as appropriate for control of arthropod pests

The specialist will provide support for eradication programs as needed and coordinate needs with other CES staff, NMDA, control districts, USDA-APHIS national and field offices, national commodity organizations (eg Cotton Incorporated, Cotton Foundation), and ARS and APHIS laboratories and associated industries (ie see and insecticide companies).
The specialist will report results of NMSU research and other recent results at local grower meetings, control district meetings, extension agent meetings, or commodity conferences. These results will also be communicated to clientele via press releases, radio or TV interviews and extension publications including guides, circulars, newsletters and websites and social media sites like Facebook.

The specialist will report research results from our program at regional and national professional meetings. These results will also be published in a variety of print/web sources including abstracts from professional meetings, NMSU publications, proceedings and research journals.

Objectives:

1. At least 70% of participants in insect pest management and pesticide trainings will increase their awareness of insect pest management and/or insecticide issues and increase their knowledge of insect pest management, or insecticides

2. At least 50% of participants in insect pest management or pesticide training classes will learn about new and effective strategies to manage insect pests and beneficials and reduce crop losses caused by arthropod pests or more effective/safer ways to work with insecticides.

3. At least one parasitoid will become established in at least two more counties for control of alfalfa weevil as a result of multiyear releases by the specialist and county agents.

4. At least two field surveys will be conducted on emerging pests. Traps will be maintained for variegated cutworm which has periodically caused severe losses in hay. Traps will also be maintained for bollworm and budwom which are pests of cotton and in the case of H. zea also corn. Support will be provided to eradication programs with field data collection if necessary. At least one detailed survey will be completed on crop losses from arthropod pests and reported to a national Conference yearly.

5. The potential for insect damage to glandless cotton will be evaluated and reported to growers in New Mexico and to national commodity support groups.

6. At least two pests of concern to cotton, alfalfa or pecan will be monitored, in detail, in collaboration with county agents and consultants.

Evaluation Plan: A brief quiz on the primary points of the training session may be given prior to and after educational programs. These pre and post training tests help assess knowledge of insect pest management topics before and after training and assess attitudes regarding insect pest management strategies and options.

Establishment of parasitoids, incidence and range of arthropod pests, and monitoring of existing pests will be determined from field collections.

Actual or Anticipated Impacts:

In 2018 identified over 200 insects for county agents, growers, homeowners or crop consultants.

In 2018 made 13 extension presentations with 204 attendees at presentations that allowed pesticide applicators in New Mexico to earn CEUs to maintain their licenses.

Insect losses in cotton in New Mexico were evaluated and communicated to growers nationally and in New Mexico.

We are monitoring crops for invasive pests as well as established pests that can produce outbreaks. Traps have been maintained for cotton bollworm, tobacco budworm, pecan nut casebearer, and variegated cutworm in 2018

Alfalfa Weevil parasitoids were released in 2 counties in NM. We have recovered *O. incertus* from two counties, Eddy and Chaves Counties where it is fairly well established but with highly variable populations. Last year an insectovac was acquired which will be used to increase sample sizes and to develop protocols for mass rearing to increase success rates.

Alfalfa weevil continues to be a very serious pest in most of New Mexico. In 2015-2016 it caused up to 100% loss of first cuttings in some areas with the highest losses in the upper Rio Grande Valley. In 2016 growers were more aware of the issue and were able to maintain control but many growers made multiple application to control alfalfa weevil which was rare ten years ago. There are also reports of insecticide resistance to alfalfa weevil insecticides. Presentations to growers are focused on awareness of potential insect pests but also control strategies that are more sustainable, such as conservation of beneficials and use of insecticides that are soft on beneficials. There has been some success in convincing growers and agronomists to consider 'softer" insecticides but the greater expense is a valid concern.

Program Products:

1. CES publications will be written / revised each year.

2. The specialist will participate in national /regional surveys as professional evaluations or field surveys for specific arthropod pests as requested by grower commodity organizations, or collaborative agencies /cooperative extension cooperators.

3. Research results and recommendations for managing arthropod pests and beneficials will be communicated to growers/consultants/industry through newsletters, radio interviews/reports, press releases/interviews, commodity reports and presentations and posters at grower meetings.

4. Research results will be presented at regional and national professional meetings

5. Research results will be reported in experiment station reports, proceedings and relevant journals.

Agent/Specialist Interaction: Agent /Specialist interactions include specialist participation in agent planned trainings as requested. Identification of arthropod pests or beneficials, development of appropriate management plans for insect pest and beneficials, and assistance with arthropod pest /beneficial questions. Collaboration will also include surveys for invasives, monitoring of existing insect pests, releases of beneficial parasitioids and coauthoring extension publications.

Partnering Agencies and Organizations: The Animal Plant Health Inspection Service of the United States Department of Agriculture, Agricultural Research Service of the United States Department of Agriculture, Texas A & M University, University of New Mexico, University of Arkansas, Cotton Incorporated, Pecos Valley Farmers Association, New Mexico Cotton Growers Association. New Mexico boll weevil and pink bollworm control districts, NM Hay Association.

Impact Statements (Pierce)

Economic Entomology

Environmental Stewardship

Biological Control of Insect Pests in Key New Mexico Crops

Biological Control has the potential to control many insect pests but is frequently undervalued. Control of insect eggs alone is often 80-90% when populations of predators are not disrupted by frequent insecticide applications. Control of alfalfa weevil with parasitoids and predators will save New Mexico growers over $2Million per year. Our NMSU farm has maintained good control of alfalfa weevil with biological control for 20 years. Replicating this type of control in just alfalfa, sorghum and pecan will save growers $6.5 Million per year in reduced losses and control costs.

Ladybug consuming an alfalfa weevil larva

Patricia Monk, NMSU research assistant, sets up insect predation study in Artesia NM

Food and Fiber Production and Marketing

Sugarcane Aphid Pest Management in Sorghum

A sugarcane aphid management program is being developed based on biological control, cultural controls and host plant resistance. Implementation will save growers in New Mexico $4.6 Million per year in reduced costs and losses as well as $20 Million in adjacent Texas counties.

Ladybug consuming a sugarcane aphid in

Sugarcane aphid in a New Mexico sorghum

Glandless Cotton

Glandless cotton cultivars can increase gross returns from $876 to $1,576 per acre. This $700 increase per acre is due to seed that is free of gossypol which can be used for shrimp feed or even as a protein source in food for human consumption. One of the issues with production of glandless cotton is that gossypol protects cotton from insect pests. Our project is evaluating risk and developing tools to manage this new crop for New Mexico.

Beet armyworm damage to glandless cotton. This foliar damage was not associated with decreased

Evaluating insect damage in NMSU cotton research trials in Artesia NM

Evaluating beet armyworm damage to glandless cotton at the Agricultural Science Center near Artesia, NM

PUBLICATIONS, PRESENTATIONS and GRANTS

NMSU Agricultural Science Center at Artesia
Publications, Presentations and Grants, 2018

TEACHING

Guest Lecture, Audience: Internal to New Mexico State University, 18 participants, NMSU-C. ES110 Intro To Environmental Science. **1 lecture and workshop on Biological Control and Soil Remediation.** (2018).

NMSU-C Early College Intern Supervisor **-** Jordan Martinez, August 2017-May 2018

NMSU informal advisor/supervisor – NMSU student Darren Hoff, January 2018-December 2018.

ARTISTIC AND PROFESSIONAL PERFORMANCES AND EXHIBITS

Original Farm Commodity Map of New Mexcio. ASC Artesia Field Day. Artesia, NM August 2018.

BOOKS, JOURNALS AND OTHER TEXT-BASED CONTRIBUTIONS

a. Publications

1. Editor Reviewed Conference Proceedings

Idowu, J. J. Zhang; **J Pierce**, M. Omer, T. Wedegaertner (2018*).* Impacts of potassium fertilization on new glandless cotton cultivars developed for New Mexico. *In* National Cotton Council of America (Ed*)* Beltwide Cotton Conferences. San Antonio, TX pp. 153-156.

Pierce, J.B. New Mexico Cotton Insect Losses. (2018). *In* Don Cook 2017 Cotton Insect Loss Estimates. *In* National Cotton Council of America. Beltwide Cotton Conferences. San Antonio, TX. pp. 720-780.

Pierce, J.B., P. Monk and S.Biles. (In Press). Variation in Plant Injury and Yield by Lepidopterous Pests in Selected Cultivars of Bt Cottons in New Mexico. *In* National Cotton Council of America. Beltwide Cotton Conferences. New Orleans, LA.

Vyavhare. S., M. Parajulee, D. Kerns,B. Reed, J.D. Gonzales, M. Brewer, D. Sekula, T. Mays, T. Doederlein, A. Hakeem, **J.B. Pierce** and A. Kesheimer. (In Press). Evaluating Efficacy and Economic Profitability of Preventive Insecticidal Seed Treatments in Cotton. *In* National Cotton Council of America. Beltwide Cotton Conferences. New Orleans, LA.

2. Conference Proceedings (not refereed)

Pierce, J. B., Monk, P., Idowu, O. J. (2018). Predation of Sentinel Eggs in Cotton and Sorghum in New Mexico. Albuquerque, NM. Entomological Society of America, Southwestern Branch Annual Meeting. (Abstract)

Pierce, J. B., Monk, P., N. Guillermo and A. Pierce. (2018). Predation of Sentinel Lepidopteran Eggs in New Mexico Pecan Orchards. Albuquerque, NM. Entomological Society of America, Southwestern Branch Annual Meeting. (Abstract)

3. Peer Reviewed Experiment Station Publications

Pierce, J. B. (in press). *Pink Bollworm Distribution and Eradication in Southeastern New Mexico and adjacent areas of the TexasTrans Pecos and Edwards Plateau 2009-2017*. Las Cruces, NM: New Mexico State University Experiment Station., Item applies to Promotion and Tenure criteria: Extension, Scholarship and Creative Activity.

4. Peer Reviewed Extension Publications

J. Pierce. *Beet Armyworm in New Mexico Hay.* Guide A-334. August 2018. Las Cruces, NM. New Mexico State University Cooperative Extension Service

J. Pierce. *Harlequin Bug*. Guide H-259. August 2018. New Mexico State University Cooperative Extension Service

Lauriault, L. M., Thompson, D, **Pierce, J.** B., Bennett, A., Schutte, B. J., Beck, L. L., Sutherland, C. A., Jimenez, D. D., Hamilton, W. V. Circular 600: August 2018*. Aceria malherbae gall mites for control of field bindweed*. Las Cruces, NM: NMSU Cooperative Extension Service.,

J. Pierce. *Variegated Cutworm in New Mexico Hay*. Guide A-335. July 2018. Las Cruces, NM. New Mexico State University Cooperative Extension Service.

J. Pierce. *Conchuela Stink Bug in New Mexico Cotton*. Guide A-238. In Press. Las Cruces, NM. New Mexico State University Cooperative Extension Service.

5. Non Peer Reviewed Extension Publications

Idowu, O. J., Zhang, J., Flynn, R. P., **Pierce, J. B**., Beck, L. L., Sullivan, P. (2018). *Cotton Newsletter Volume 9, Number 3* (ed., vol. Volume 9). NMSU, Extension Plant Sciences.

Idowu, O. J., Zhang, J., Flynn, R. P., **Pierce, J. B**., Beck, L. L., Sullivan, P. (2018). *Cotton Newsletter Volume 9, Number 2* (ed., vol. Volume 9). NMSU, Extension Plant Sciences.

Idowu, O. J., Zhang, J., Flynn, R. P., **Pierce, J. B**., Beck, L. L., Sullivan, P. (2018). *Cotton Newsletter Volume 9, Number 1* (ed., vol. Volume 9). NMSU, Extension Plant Sciences.

6. Other Publications Not Noted Above

Sansone, C. Allen C.**, Pierce, J.** and Ellsworth, P. 2018. Continuation of the 100% Bt Cotton Option after Declaration of Eradication of *Pectinophora gossypiella*. (Proposal to EPA regarding refuge requirement with Bt cotton given eradication declaration for pink bollworm)

Pierce, J. B. (2018) Input Optimization and Insect Pest Management in New Mexico *In Grower Annual Report*. Cotton Incorporated.

Pierce, J. B. (2018). *Cotton Incorporated 4th Quarter Report*. Cotton Incorporated., Item applies to Promotion and Tenure criteria: Scholarship and Creative Activity.

Pierce, J. B. (2018). Cotton Thrip Seed Treatment Efficacy in NM. Cotton Incorporated Regional Task Force. Item applies to Promotion and Tenure criteria: Scholarship and Creative Activity.

Pierce, J. B. (2018). *Cotton Incorporated 3rd Quarter Report*. Cotton Incorporated., Item applies to Promotion and Tenure criteria: Scholarship and Creative Activity.

Pierce, J. B. (2018). *Cotton Incorporated 2nd Quarter Report*. Cotton Incorporated., Item applies to Promotion and Tenure criteria: Scholarship and Creative Activity.

Pierce, J. B. (2018). *Cotton Incorporated 1st Quarter Report*. Cotton Incorporated., Item applies to Promotion and Tenure criteria: Scholarship and Creative Activity.

7. **Research Presentations**

Pierce, J.B. and P. Monk. (2018). Optimizing Control of Insect Pests: Reducing Insecticide Use and Minimizing Economic Injury with JMP. JMP Summit. Carey, NC. (Received 2nd place award for professional presentations)

Idowu, J. J. Zhang; **J Pierce**, M Omer, T Wedegaertner (2018). Impacts of Potassium fertilization on new glandless cotton cultivars developed for New Mexico. *In* National Cotton Council of America (Ed) Beltwide Cotton Conferences. San Antonio, TX

Pierce, J. B., Monk, P., Idowu, O. J. (2018). Predation of Sentinel Eggs in Cotton and Sorghum in New Mexico. Albuquerque, NM. Entomological Society of America, Southwestern Branch Annual Meeting.

Pierce, J. B., Monk, P., N. Guillermo and A. Pierce. (2018). Predation of Sentinel Lepidopteran Eggs in New Mexico Pecan Orchards. Albuquerque, NM. Entomological Society of America, Southwestern Branch Annual Meeting.

Pierce, J. B., Monk, P. and O.J. Idowu, NMSU ACES Open House. Predation of Sentinel Eggs in Cotton and Sorghum in New Mexico, Poster Presentation. (April 2018)

Monk, P. and **Pierce J.B.** 2018. Evaluating Efficacy of Selected Seed Treatments against Thrips in Seedling Cotton in Artesia, New Mexico. Cotton Incorporated State Support Board Meeting. Ruidoso, NM.

8. **Extension Presentations/Workshops**

a. **Workshops**

Pierce, J. B. Pesticide Applicators Workshop, NMSU, "Insect Issues in Southeastern New Mexico. Artesia, NM (August 2018) NM CEU available

J. Pierce. Insect Pinning Workshop. Artesia, NM. (July 2018).

J. Pierce. Workshop. Biological Control in Southeastern New Mexico. STEM Summer Program. Artesia, NM (May 2018)

b. **Presentations**

Pierce, J. B., 9th Annual Forage Growers Workshop, New Mexico State University, Los Lunas, NM, Alfalfa Weevil Update and White Fringed Beetle in New Mexico, Scope: Regional, Invited. (December 2018). NM CEU available

Pierce, J. B. Artesia Field Day. Thrips and Bt Cotton. Artesia, NM (August 2018)

Pierce, J.B. Artesia Field Day. Insect Safari. Artesia, NM (August 2018)

Pierce, J.B. ACES Advisory Team Meeting. Southern New Mexico Agricultural Science Center Evaluations and Metrics. Los Lunas, NM. (April 2018)

Pierce, J. B, Pecan Roundtable. Pecan Weevil Biology. Carlsbad, NM. (March 2018).

Monk, P. and **Pierce, J. B**. Boll Weevil Eradication Program Meeting. Pink bollworm and boll weevil update. Artesia, NM. (March 2018)

Pierce, J.B. New Mexico Hay Association Annual Meeting. Alfalfa Weevil Update. Ruidoso, NM. Scope:

Regional, Invited (January 2018).

Barraza, S. and **Pierce J.B.** Bugs, Bugs, Bugs. Roswell Science and Art Festival. Roswell, NM. (October 2018).

Pierce, J. B., All about Science/ Ag in the Classroom, Park Jr High, Artesia, NM, "Introduction to Entomology", Scope: Invited. (May 2018).

Monk, P. and **J.B. Pierce.** How to pin insects. Cottonwood 4H monthly meeting guest speaker. (February 2018)

9. Extension Meetings Attended/Participation

Industrial Hemp Meeting. Las Cruces, NM. (December 2018)

ASC Artesia Field Day Meeting. Artesia, NM. (August 2018)

ACES Advisory Team Meeting. Bernalillo, NM. (July 2018)

ACES Advisory Team Meeting. Los Lunas, NM. (April 2018)

Listening Session with Dean Flores. Roswell, NM (March 2018)

SENMARA board meeting. Artesia, NM (February 2018)

New Mexico Organic Conference. Albuquerque, NM (February 2018)

b. Other Scholarly Activities

1. Newspaper Articles/Editorials

Pierce, J.B. (November 2018) *Cotton Harvest and Final Victory over Pink Bollworm*. Hagerman Hogwash.

Pierce, J.B. (August 2018) *A Field Day for Growers and Gardeners.* Roswell Daily Record.

Pierce, J.B. (August 2018) *NMSU Hosts Field Day in Artesia.* Carlsbad Current Argus.

Pierce, J.B. (August 2018) *NMSU Ag Science Center's Field Day slated for Aug. 23.* Artesia Daily Press.

2. Other Professional Development Activities (seminars, continuing education, faculty internships)

JMP Discovery Summit. Carey, NC. (October 2018)

Annual Compliance Training Certification. Online. (October 2018)

Extension In-Service. NMSU ACES, Las Cruces, NM (January 2018)

3. Professional Certifications

"Pesticide Applicator License", NM Department of Agriculture. (January 1, 2018 - Present).

4. Selected Outreach/Recruiting Activities

Mentor for junior high student working on NM Science Fair honeybee foraging behavior project, 2017-2018

Barraza, S. and **J.B. Pierce**. Bugs, Bugs, Bugs. Roswell Science and Art Festival. Roswell, NM. (October 2018).

J. Pierce. Insect Pinning workshop. Artesia, NM. (July 2018).

J. Pierce. Biological Control in Southeastern New Mexico. STEM Summer Program. Artesia, NM (May 2018)

Pierce, J. B., All about Science/ Ag in the Classroom, Park Jr High, Artesia, NM, "Introduction to Entomology", Scope: Invited. (May 2018).

Monk, P. and **J.B. Pierce.** How to pin insects. Cottonwood 4H monthly meeting guest speaker. (February 2018)

5. Publication Works in Progress (not included in determination of academic or professional qualification. Include description of progress made on this work during the past year.)

J. Pierce. *Biological Control of Pecan Nut Casebearer and Aphids in New Mexico Pecans.* Circular H-653. Las Cruces, NM. New Mexico State University Cooperative Extension Service

Pierce, J. B. and P. Lujan. Extension Pesticide Applicator Training Series #1: Pest Identification. Guide A-610.

Pierce, J. B. and P. Lujan. Extension Pesticide Applicator Training Series #2: Pest Management Practices. Guide A-611.

Pierce, J. B. and P. Lujan. Extension Pesticide Applicator Training Series #3: Treatment Area Measurements. Guide A-612.

Pierce, J. B., Monk, P. Influence of alfalfa on predation of Lepidopterous eggs in southern New Mexico.

Pierce, J. B., Monk, P., Bendixsen, D., Bendixsen, D. Influence of Tree Size on Lepidopteran Egg Predation in New Mexico. *Environmental Entomology*.

Bundy, C. S., **Pierce, J. B**. Seasonal phenology of the alfalfa weevil in New Mexico. *Journal of Economic Entomology.*

c. Contracts, Grants, and Sponsored Research
(Total Funds: $485,864.25. Total new funds in 2018: $68,100. In progress: Two grants total $60,900)

Pierce, J. Comparing potential resistance to seed treatments for thrips in the Mesilla and Pecos Valleys. Current Status: Funded January 1, 2018-December 31, 2018. Sponsoring Organization: Cotton Incorporated, (State Support) Sponsoring Organization Is: Private. Research Credit: $6,000

Pierce, J. B. (Principal), Sponsored Research, "Input Optimization and Insect Pest Management in New Mexico", Sponsoring Organization: Cotton Incorporated, Sponsoring Organization Is: Private, Research Credit: $56,700.25, PI Total Award: $56,700.25, Current Status: Funded. (January 1, 2016 - December 31, 2018).

Bowling, C. Allen, C. Vyavhare, S, Kerns, D**. Pierce, J.** Evaluating Tools for Cotton Insect Pest Management in the Southwest Region. Sponsoring Organization: Cotton Incorporate, Sponsoring Organization Is: Private $42,000. Funded. (January1, 2018-December 31, 2018)

Pierce, J.B. Integrated Pest Management of Insects in Bt Cotton. Sponsoring Organization: Dow AgroSciences. Sponsoring Organization is: Private. Research Credit: $1,200.00, PI Total Award: $1,200.00. Current Status: Funded (January 1, 2018-December 31, 2018)

Pierce, J. B. (Principal), Sponsored Research, "Input Optimization and Insect Pest Management in New Mexico-2019", Sponsoring Organization: Cotton Incorporated, Sponsoring Organization Is: Private, Research Credit: $18,900, PI Total Award: $18,900, Current Status: Under Review

Bowling, C. Allen, C. Vyavhare, S, Kerns, D**. Pierce, J.** Evaluating Tools for Cotton Insect Pest Management in the Southwest Region 2019. Sponsoring Organization: Cotton Incorporate, Sponsoring Organization Is: Private $42,000. Under Review

IV. PROFESSIONAL SERVICE

a. Institutional Service (Internal)

1. Department Service

P & T Committee, Committee Member, approximately 120 hours spent per year, were you elected or appointed? No, neither, was this compensated or pro bono? Pro Bono.

2. College Service

AES Research Advisory Team.
Co-Chair of ASC Subcommittee for South and Eastern Ag Science Centers

NMSU Hemp Task Force
Hemp Education and Extension Subcommittee
Hemp Research Subcommittee

3. University Service

NMSU-C Advisory Board, Committee Member.

4. International Service

National Academy of Sciences Georgia, Reviewer Grant Proposals, Georgia, Asia, (January 2006 - Present).

b. Professional Activities (External)

1. Academic and Professional Organizations

Chair: SW Branch Awards Committee Entomological Society of America, (2016 - Present) Scope: National.

NM Cotton Losses Coordinator for Cotton Foundation (1996 - Present)

Southwest Sorghum Sugarcane Aphid Task Force (2016 - Present)

NM representative: National Consortium for Sugarcane Aphid Research (2015 - Present)

International Organization for Biological Control. (2011 - Present).

New Mexico Hay Association. Scope: State (1999 - Present).

New Mexico Agricultural Production Association, Scope: State. (1996 - Present).

Southwestern Entomological Society. (1996 - Present).

2. Professional Service

National Academy of Sciences Georgia, Reviewer Grant Proposals, Georgia, Asia, (January 2006 - Present).

Entomology Society of America, Southwest Branch Awards Committee. Appointed, International, Member of awards committee. Committee's Key Accomplishments: Award scholarships nationally and science fair awards for the state of New Mexico. (2000 - Present) (Chair: 2016 – Present).

Entomological Society of America National Meeting, Appointed. International, Judge research posters at ESA annual meeting (November 2011 - Present).

Entomological Society of America Youth Committee, International (January 2009 - Present).

Pink Bollworm Technical Advisory Committee, Agricultural Advisory Board, Las Cruces, New Mexico, Responsibilities: Meet periodically to evaluate program progress and vote on protocols for coming year. (February 2001 - Present).

Southwest Branch Entomological Society of America, Judge research presentations or posters at annual meeting (February 2000 - Present).

New Mexico Boll Weevil Technical Advisory Board, Agricultural Advisory Board, Las Cruces, NM. Meet periodically to determine protocols for boll weevil eradication programs in NM (February 1998 - Present).

3. Consulting

Arthropod Identification, members of the public, farmers, United States, Number of Samples Processed per year: 268. Description: Identification of arthropods via submitted samples, or emailed photos

Grower or Site Visits, Non-Governmental Organization (NGO), members of the public, farmers, New Mexico, Number of Direct Contacts per year: 233.

Heliothis spp. distribution tracking group: member of University and Chemical Company group compiling national databases of *Heliothis* spp trap counts.

4. Media Contributions

Audio/Video Production, Biological Control in Southeastern NM, NMSU STEM summer program. Artesia, NM May 2018. https://www.facebook.com/NMSU.extension.entomology/videos/2049720251960112/

Audio/Video Production, Insect Safari. ASC Artesia Field Day. August 2018. https://www.facebook.com/NMSUNews/videos/2159596947610800/

Pierce, J.B. (November 2018) *Cotton Harvest and Final Victory over Pink Bollworm*. Hagerman Hogwash.

New Mexico Farm & Ranch Newsletter. *Advances in Ag, the Agricultural Science Center in Artesia.* September 2018.

Identified a *Ceratopogonid* (midge) from the El Paso news. They initially reported on TV as a *Simulid* (black fly)

5. Community service (related to academic discipline)

Chichuahuan Desert Conservation Alliance, Program Coordinator, Salt Cedar Control and Remediation Carlsbad, NM, (2015 - Present).

Carlsbad Community Theater, Judge, Carlsbad, NM, (January 1, 2004 - Present).

Advisory Board. Carlsbad Municipal Schools. Special Education Department.

V. COMMUNITY ENGAGEMENT, EXTENSION, AND OUTREACH ACTIVITIES (generally educational programs (not single events) delivered to external constituents) – describe extension and outreach programs and your involvement in same

1. Cooperative Extension Service

"Insect Pest Management-Plan of Work 2012-2017" (January 1, 2018 - December 30, 2018).

Major Program Area: Global Food Security and Hunger

Why is this program important? Purpose: Insects impact humans in their personal environment (home/landscape) and in food production. Management of insect pests and beneficials increases health, safety and quality of life for individuals and families and increases profits for growers. Insecticides are part of control efforts but are often overused. In the home this can become a health issue. In agriculture, insecticides and fees for transgenic crops are expensive inputs. In some cases, input costs are increasing to a point where it is resulting in a reduction in acreage of some crops in NM. Our purpose is to increase knowledge in our clientele so that insecticides and insect resistant transgenic crops are used only when justified. Part of this effort is to conduct applied research to learn how to manage crops to keep insect pests below economic thresholds under New Mexico conditions. This will increase profits for growers and ensure sustainability of crops that are most at risk the low water use crops like sorghum and cotton. Sustainability of low water use crops is becoming increasingly important as some of our sources of water are depleted. Increased safety and environmental benefits are additional impacts.

Annual Accomplishments: The specialist will conduct insect pest management training sessions as requested by extension agent's other department personnel or other clientele including commodity groups.

The specialist will conduct survey programs in the field to respond to agricultural, forestry or health threats from invasive arthropods. The specialist will estimate state crop losses from insects in cotton yearly as part of a Beltwide effort, and respond to other paper surveys as requested.

The specialist will identify specimens submitted to the extent of her ability and submit when necessary to other CES/NMSU personnel and provide advice on biology, life cycles and when necessary control efforts.

The specialist will speak as requested on the general topic of entomology to a variety of audiences and act as judge/ advisor for student's youth groups on the topic of entomology.

The specialist will conduct releases and follow up of parasitoids or predators as appropriate for control of arthropod pests

The specialist will provide support for eradication programs as needed and coordinate needs with other CES staff, NMDA, control districts, USDA-APHIS national and field offices, national commodity organizations (eg Cotton Incorporated, Cotton Foundation), and ARS and APHIS laboratories and associated industries (ie see and insecticide companies).

The specialist will report results of NMSU research and other recent results at local grower meetings, control district meetings, extension agent meetings, or commodity conferences. These results will also be communicated to clientele via press releases, radio or TV interviews and extension publications including guides, circulars, newsletters and websites and social media sites like Facebook.

The specialist will report research results from our program at regional and national professional meetings. These results will also be published in a variety of print/web sources including abstracts from professional meetings, NMSU publications, proceedings and research journals.

Objectives: 1. At least 70% of participants in insect pest management and pesticide trainings will increase their awareness of insect pest management and/or insecticide issues and increase their knowledge of insect pest management, or insecticides

2. At least 50% of participants in insect pest management or pesticide training classes will learn about new and effective strategies to manage insect pests and beneficials and reduce crop losses caused by arthropod pests or more effective/safer ways to work with insecticides.

3. At least one parasitoid will become established in at least two more counties for control of alfalfa weevil as a result of multiyear releases by the specialist and county agents.

4. At least two field surveys will be conducted on emerging pests. Traps will be maintained for variegated cutworm which has periodically caused severe losses in hay. Traps will also be maintained for bollworm and budwom which are pests of cotton and in the case of H. zea also corn. Support will be provided to eradication programs with field data collection if necessary. At least one detailed survey will be completed on crop losses from arthropod pests and reported to a national Conference yearly.

5. The potential for insect damage to glandless cotton will be evaluated and reported to growers in New Mexico and to national commodity support groups.

6. At least two pests of concern to cotton, alfalfa or pecan will be monitored, in detail, in collaboration with county agents and consultants.

Evaluation Plan: A brief quiz on the primary points of the training session may be given prior to and after educational programs. These pre and post training tests help assess knowledge of insect pest management topics before and after training and assess attitudes regarding insect pest management strategies and options.

Establishment of parasitoids, incidence and range of arthropod pests, and monitoring of existing pests will be determined from field collections.

Actual or Anticipated Impacts: In 2018 identified over 200 insects for county agents, growers, homeowners or crop consultants.

In 2018 made 13 extension presentations with 204 attendees at presentations that allowed pesticide applicators in New Mexico to earn CEUs to maintain their licenses.

Insect losses in cotton in New Mexico were evaluated and communicated to growers nationally and in New Mexico.

We are monitoring crops for invasive pests as well as established pests that can produce outbreaks. Traps have been maintained for cotton bollworm, tobacco budworm, pecan nut casebearer, and variegated cutworm in 2018

Alfalfa Weevil parasitoids were released in 2 counties in NM. We have recovered *O. incertus* from two counties, Eddy and Chaves Counties where it is fairly well established but with highly variable populations. Last year an insectovac was acquired which will be used to increase sample sizes and to develop protocols for mass rearing to increase success rates.

Alfalfa weevil continues to be a very serious pest in most of New Mexico. In 2015-2016 it caused up to 100% loss of first cuttings in some areas with the highest losses in the upper Rio Grande Valley. In 2016 growers were more aware of the issue and were able to maintain control but many growers made multiple application to control alfalfa weevil which was rare ten years ago. There are also reports of insecticide resistance to alfalfa weevil insecticides. Presentations to growers are focused on awareness of potential insect pests but also control strategies that are more sustainable, such as conservation of beneficials and use of insecticides that are soft on beneficials. There has been some success in convincing growers and agronomists to consider ‘softer” insecticides but the greater expense is a valid concern.

Program Products: 1.CES publications will be written / revised each year.

2. The specialist will participate in national /regional surveys as professional evaluations or field surveys for specific arthropod pests as requested by grower commodity organizations, or collaborative agencies /cooperative extension cooperators.

3. Research results and recommendations for managing arthropod pests and beneficials will be communicated to growers/consultants/industry through newsletters, radio interviews/reports, press releases/interviews, commodity reports and presentations and posters at grower meetings.

4. Research results will be presented at regional and national professional meetings

5. Research results will be reported in experiment station reports, proceedings and relevant journals.

Agent/Specialist Interaction: Agent /Specialist interactions include specialist participation in agent planned trainings as requested. Identification of arthropod pests or beneficials, development of appropriate management plans for insect pest and beneficials, and assistance with arthropod pest /beneficial questions. Collaboration will also include surveys for invasives, monitoring of existing insect pests, releases of beneficial parasitioids and coauthoring extension publications.

Partnering Agencies and Organizations: The Animal Plant Health Inspection Service of the United States Department of Agriculture, Agricultural Research Service of the United States Department of Agriculture, Texas A & M University, University of New Mexico, University of Arkansas, Cotton Incorporated, Pecos Valley Farmers Association, New Mexico Cotton Growers Association. New Mexico boll weevil and pink bollworm control districts, NM Hay Association.

VI. ADMINISTRATIVE ACTIVITIES

VIII. HONORS/AWARDS/RECOGNITIONS

Best Professional Poster (2nd place) JMP Discovery Summit. Cary, NC. October 2018.

IX. OTHER ACTIVITIES NOT LISTED ABOVE

Education

PHD, Rutgers State University - New, Piscataway NJ, Entomology. (1990).

MS, Texas A & M University Colege Station, College Station TX, Entomology. (1985).

BS, University of Massachusetts-Am, Amherst MA, Entomology. (1979).

Research Currently in Progress

Pierce, J. B., Monk, P. and Biles, S. Performance of Bt Cottons in NM. Status: On-Going.

Pierce. J. B., Monk, P. and Vyavhare, S. Potential resistance to thrip seed treatments in New Mexico. Status: On-Going.

Pierce, Jane B, Sutherland, Carol A, Houghton, Woods E, Barraza, Sandra K, Dean, Tom L, Kircher, Patrick D, "Biological Control of Alfalfa Weevil in New Mexico", Status: On-Going,

Pierce, **Jane B**, Bendixsen, Devin, Richman, David B, Monk, Patricia and Bendixsen, Derik, "Biological Control of Insect Pests in NM Pecan", Status: On-going,

Idowu, Omololu J, Flynn, Robert P, **Pierce, Jane B**, Zhang, Jinfa, "Evaluation of Glandless Cotton Cultivars in New Mexico", Status: On-Going,

Pierce, Jane B, Garnett, Drew and Monk, Patricia, "Glandless Cotton: Impact on survival and preference by insect pests and compatibility with biological control". Status: On-Going.

Pierce, Jane B, "Landscape effects on predation of insect pests in NM", Status: On-Going,

Idowu, Omololu J, Zhang, Jinfa, Flynn, Robert P, **Pierce, Jane B**, "Planting Date and Fertilizer Rate Effects on Selected Cotton Cultivars in New Mexico.

Hanson, Stephen F, **Pierce, Jane B**, "Survey of Triatome species present in NM", Status: On-Going,