Agriculture Science Center at Artesia

2019 Annual Progress Report

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College of Agricultural, Consumer and Environmental Sciences
Agricultural Experiment Station

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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.

Contents

Several individuals and companies donated products and service to the Artesia Agricultural Science Center during 2019. Appreciation is expressed to the following persons and organizations for their contribution.

Southeastern New Mexico Agricultural Research Association

Chaves County	Eddy County	Lea County
Troy Thompson	David Torres	Wade Cavitt
Travis Gray	James Walterscheid,Vice Chair	John Norris
Doug Whitney	Alisa Ogden	Todd Roberson, Chairman
	Extension Agents	
Sandra Barraza/Troy Thompson	Woods Houghton	Wayne Cox

2019 HOWARD STROUP SCHOLARSHIP RECIPIENT
Gracelyn Kiel Casey
Artesia High School
Major in Agriculture Education

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

The advisory board held an annual meeting `January 16, 2019. Officers were elected.

Flynn, R., J. Pierce and P. Monk "Ag Day" Park Junior High Feb.2019. Invited presentations

Pierce, J. and P. Monk "STEM Summer Program" June 2019

P. Monk and J. Pierce. Eddy County 4H Entomology judging workshops May and June 2019

NMSU ACES Open house. Poster Presentations by Robert Flynn.

Annual Weather Summary

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

Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
January	0.00	0.63	0.00	1.32	0.00	0.89	.10	0.13
February	0.17	0.00	0.21	0.23	0.31	0.41	.31	0.00
March	0.06	0.00	0.42	0.12	0.00	0.02	.03	0.31
April	0.02	0.00	0.80	0.92	0.53	1.09	0.00	0.44
May	3.19	0.73	0.85	2.47	0.98	0.30	1.89	0.33
June	0.18	0.10	1.12	0.83	1.02	1.83	1.67	2.00
July	2.33	3.20	2.21	1.19	0.43	1.49	1.72	1.12
August	0.97	0.06	1.09	0.38	4.17	3.15	1.38	0.65
September	1.38	3.65	7.37	0.93	5.93	1.92	1.92	1.69
October	0.26	0.06	0.50	4.49	1.42	0.43	3.01	3.86
November	0.11	0.80	1.63	0.35	0.73	0.31	0.23	0.81
December	0.01	0.46	0.22	0.50	0.76	0.07	.77	0.00
Total	8.68	9.69	16.42	13.73	16.28	11.91	13.03	11.34

Table 2. Average monthly temperatures (^{o}F) for the Agricultural Science Center at Artesia.

Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
January	43.9	40.0	38.8	36.5	37.7	43.9	38	41
February	44.5	43.6	45.1	44.4	46.9	50.4	46.1	46.9
March	55.4	52.6	51.4	50.8	55.0	57.7	54.0	51.3
April	64.6	59.4	59.7	59.8	60.6	62.8	60.5	61.4
May	70.9	70.0	68.7	65.6	67.3	68.0	73.0	68.4
June	81.0	81.4	80.7	78.1	79.1	68.0	80.1	77.2
July	80.2	78.1	80.7	81.7	85.2	79.6	80.7	82.7
August	80.4	79.9	77.8	80.6	78.0	77.9	79.5	84.8
September	71.7	72.2	69.9	76.0	71.8	73.4	71.7	77.4
October	61.0	58.8	62.2	62.7	64.6	61.6	58.9	58.3
November	52.3	46.7	45.5	49.1	52.1	53.2	46.0	47.6
December	41.0	38.9	42.6	41.6	41.9	43.2	41.2	44.0
Average	64.2	62.1	61.9	62.3	63.5	62.4	60.8	61.8

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

Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
January	62.9	56.9	59.0	50.0	53.3	59.4	57	57
February	61.7	61.9	61.6	60.6	66.8	69.4	64.0	64.8
March	77.0	72.8	71.7	68.0	74.4	78.3	72.0	67.0
April	85.2	77.9	78.5	77.4	79.7	80.1	79.8	78.7
May	87.7	88.2	86.8	81.7	83.9	86.1	91.9	84.3
June	98.4	98.3	97.7	93.2	102.0	96.2	96.1	92.9
July	94.4	90.9	95.0	96.7	85.2	95.4	94.8	97.9
August	96.4	95.2	90.9	96.7	91.4	90.9	93.2	100.0
September	88.4	86.1	79.8	91.5	84.8	88.9	84.9	91.9
October	78.5	77.5	79.1	75.7	83.0	78.3	70.2	74.7
November	72.0	62.2	61.1	65.4	67.3	69.5	62.0	63.3
December	61.6	53.6	57.8	58.0	56.8	61.1	54.5	60.3
Average	82.1	78.9	78.3	77.9	80.2	79.5	76.7	77.7

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

Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
January	25.0	23.1	18.5	23.1	22.2	28.4	18	26
February	27.3	25.4	28.7	28.3	27.0	31.4	28.1	29.1
March	33.7	32.5	31.2	33.5	35.7	37.1	35.9	35.5
April	44.1	40.8	40.8	42.2	41.5	45.4	41.1	44.2
May	54.0	51.8	50.6	49.5	50.8	49.9	54.1	52.5
June	63.6	64.6	63.6	62.9	62.1	62.9	64.2	61.5
July	65.9	65.3	66.4	66.6	68.3	66.8	66.5	67.5
August	64.4	64.5	64.6	64.6	64.7	64.8	65.7	69.7
September	54.9	58.3	60.1	60.5	58.8	58.0	58.4	62.8
October	43.5	40.2	45.3	49.6	46.2	44.8	47.6	41.9
November	32.5	31.2	29.8	32.8	36.9	36.9	30.0	31.9
December	20.4	24.3	27.4	25.2	27.0	25.4	27.9	27.8
Average	46.3	45.2	45.4	44.9	46.7	46.0	44.8	45.8

2019 Summary	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average	2019 Total
Temp Max	73	80	89	93	95	103	106	109	97	87	83	76	90.9	
Date	1/22/2019	2/16/2019	3/30/2019	4/25/2019	5/26/2019	6/21/2019	7/21/2019	8/27/2019	9/13/2019	10/7/2019	11/30/2018	12/15/2019		
Temp, Min	16	18	16	29	43	55	62	65	59	14	14	15	33.8	
Date (min)	1/4/2019	2/24/2019	3/5/2019	4/15/2018	5/11/2019	6/6/2019	7/25/2019	8/15/2019	9/5/2019	10/31/2019	11/13/2018	12/19/2019		
Ave Max Temp	57	65	67	79	84	93	98	100	92	75	63	60	77.7	
Ave Min Temp	26	29	36	44	53	61	68	70	63	42	32	28	45.8	
Ave Temp	41	47	51	61	68	77	83	85	77	58	48	44	61.8	
Rain (inches)	0.13	0	0.31	0.44	0.33	2	1.12	0.65	1.69	3.86	0.81	0	0.9	11.34
Wind (miles)	3809	5809	5857	5061	6259	4916	4537	3597	3866	3695	3618	3947	4580.9	54971
PAN Evap (inches)	2.85	5.35	5.85	8.35	10.5	11.2	11.19	9.25	7.16	4.14	2.53	3.38	6.8	81.75
Soil Temp, Max	45	48	59	65	68	76	83	83	81	73	53	49	65.3	
Date	1/23/2019	2/17/2019	3/30/2019	4/13/2018	5/30/2019	6/21/2019	7/19/2019	8/27/2019	9/1/2019	10/1/2019	11/2/2018	12/21/2019		
Soil Temp, Min	33	38	40	52	60	64	70	76	70	47	44	39	52.8	
Date	1/5/2019	2/2/2019	3/9/2019	4/5/2018	5/12/2019	6/6/2019	7/8/2019	8/3/2019	9/23/2019	10/31/2019	11/19/2018	12/22/2019		
GDD Corn			122.5	359.5	573.5	898.5	1014	1080	821.5	310.5				5180
GDD Chile			352	613	850	1086	1293	1359	1091.5	554				7198.5
GDD Cotton			241	241	438.5	681	874.5	940.5	686.5	203				4306
GDD Alfalfa		377.5	604.5	883	1129	1356	1572	1638	1361.5	819	469.5	377.5	8758.5	10587.5
GDD Canola (U.S.)	290.3	292.5	464.4	621.1	760.5				894.5	589.1	393.5	339.9		
GDD Canola (AU)	301	368	584.5	806	994.5				1137	770.5	462	377.5		
Season Cum (US)														
Season Cum (AU)														
Days above 90			0	5	9	21	29	30	24	0				118
Days above 95			0	0	2	16	24	28	10	0				80
Days above 100			0	0	0	5	15	19	0	0				39

Financials

2019	Sales	Operations Enhancements (State, Flyn, Pierce Extension)	Land Use (CEHMM)	Tractors Vehicles	Grant	TOTAL
REVENUE						
2018 Carry Over	38183		52261	9734		100178
Appropriation		110940		2000		112940
Grants & Gifts					79929	79929
Sales & Fees	5634					5634
Irrigation Usage						0
Tractor/vehicle Usage				4155		4155
Lab Usage			18000			18000
Indirect Cost						0
TOTAL REVENUE	43817	110940	70261	15889	79929	320836
SUPPLIES						
Fuel		6827		2561		9388
Office						0
Farm supplies		1314				
Other	3889	13799			1535	19223
Other Fed Excl,						0
Lab		322				322
Computer						0
Equipment purchase		2908	8731		42500	
Cleaning						0
Photo						0
Safety		904				904
Seed/Feed/Ferrtilizer	729					729
BusinessMeals/Food		986			528	1514
Books						0
Furniture &Equipment						0
Building R&M Parts		171				171
Equipment R & M Parts				1100		1100
Vehicle R & M Parts		731		2930	79	3740
Computer R&M Parts						0
Furniture &Equip 5000		2782				2782
SUPPLIES TOTAL	4619	30743	8731	6591	44642	51171

FY ("18-"19)	Sales	Operations Enhancements	Land Use	Tractors Vehicles	Grant	TOTAL
SERVICES						
Training						0
General Services		4913			150	5063
Postage	1160	436				1595
Phone/Cell		5498				5498
Internet		508				508
Advertising		1205				1205
Insurance						0
Harware & Equip Rental		216				216
Non Building RM Services			6846			6846
Building R &M		5556	20057			25613
Auto Repairs						
Equipment repairs	5448	31266				
Electric		13032				13032
Propane		2883				2883
Utiltities Water		1454				1454
Dues, Fees & Tax		225				225
Prof. contracted Serv.						0
Pest Control						0
Lab Analysis	5680	875				6555
Late Fees						0
Freight						0
Grant overrun						0
SERVICE TOTALS	12288	68067	26903	0	150	70693
Travel Totals		4742			6226	10968
Inter Dept Transfers						
Subcontract						0
Indirect Gerneral					3190	3190
Non Mand transfer						0
Furniture & Equip.	540					540
Inter Dept. Transfer Total	540	0	0	0	3190	3730
						0
TOTAL REVENUE	43817	110940	70261	15889	79929	320836
TOTAL EXPENSES	17446	103552	35634	6591	54208	217431

The 2019 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 West1

Introduction

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.

Table 1. Temperature and precipitation data for 2019 and the long-term averages for the New Mexico Alfalfa Variety Test locations.

Location Elevation Latitude	**Artesia 3366 ft. 32° 45' N Temp. (°F)**		**Precip. (in.)**	
Month	**2019**	**Avg.**	**2019**	**Avg.**
NOV-18	46	49	0.23	0.83
DEC-18	27	40	0.77	0.67
JAN-19	41	40	0.13	0.43
FEB-19	47	45	0.00	0.43
MAR-19	51	52	0.31	0.39
APR-19	61	60	0.44	0.59
MAY-19	69	70	0.33	1.30
JUN-19	77	78	2.00	1.61
JUL-19	83	80	1.12	1.65
AUG-19	85	79	0.65	1.97
SEP-19	77	71	1.69	1.85
OCT-19	58	60	3.86	1.22
Annual	60	60	11.53	12.94

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			2019 Harvests			2019	3-Yr
Variety Name	**Total**	**Total**	**8-May**	**17-Jun**	**26-Jul**	**12-Sep**	**23-Oct**	**Total**	**Average**
SW 7408	9.41**	8.28*	.94*	0.95*	1.76**	2.23**	1.42*	8.28*	8.38**
NuMex Bill Melton	9.16*	8.22*	1.15**	0.93*	1.58*	2.15*	1.01*	8.22*	8.06*
African Common	8.05*	8.45**	1.07*	1.16*	1.70*	1.96*	1.45*	8.45**	7.98*
Hybriforce-3600	8.67*	8.42*	0.78*	0.93*	1.58*	2.05*	1.12*	8.42*	7.91*
SW 8412	8.09*	8.20*	0.97*	1.38**	1.52*	1.96*	1.17*	8.20*	7.79*
SW 8476	8.29*	7.96*	0.90*	0.96*	1.34*	1.92*	1.28*	7.96*	7.57*
Zia	7.64*	7.77*	0.65*	0.94*	1.56*	2.21*	1.48*	7.77*	7.48*
SW 7473	7.78*	7.64*	0.78*	1.17*	1.38*	1.70*	1.73**	7.64*	7.36*
MS sunstra 155204	7.99*	8.06*	0.77*	0.98*	1.34*	1.56*	1.60*	8.06*	7.35*
SW 8409	8.08*	7.75*	0.64*	0.78*	1.47*	2.18*	1.26*	7.75*	7.33*
New Mexico 11-1	7.63*	7.98*	0.73*	0.71	1.75*	2.21*	1.09*	7.98*	7.29*
NM Common	7.36*	7.71*	0.68*	0.82*	1.56*	1.84*	1.39*	7.71*	7.18*
55VR08	7.78*	7.70*	0.80*	0.93	1.21*	1.43*	1.13*	7.70*	6.99*
Dona Ana	7.82*	6.67*	0.47*	1.07*	1.24*	1.78*	1.08*	6.67*	6.67*
Mean	8.13	7.92	0.81	0.98	1.5	1.94	1.3	7.92	7.52
LSD (0.05)		NS	NS	NS	NS	NS	NS	NS	NS
CV%	10.5	9.93	44.8	30.38	26.89	19.31	28.42	9.93	10.27

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

2018 Harvest dates:8-May, 7-Jun, 3-Jul, 6-Aug, and 17-Sep.

**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†.

Variety Name	16-May	26-Jun	30-Jul	13-Sep	24-Oct	2019 Total
	2019 Harvests					
SW 7473	1.81*	1.24*	1.12*	0.99*	0.41*	5.68**
Zia	1.62*	1.18*	1.22**	1.04**	0.47*	5.59*
SW 7408	1.84**	1.24*	1.10*	0.96*	0.45*	5.47*
SW 8476	1.69*	1.29**	1.08*	0.9*	0.49*	5.32*
SW 8412	1.54*	1.19*	1.14*	0.93*	0.56*	5.30*
SW 8409	1.72*	1.13*	1.01*	0.98*	0.38*	5.27*
Dona Ana	1.43*	1.15*	1.04*	0.89*	0.47*	5.16*
NM Common	1.17*	1.16*	1.19*	0.95*	0.65**	5.14*
African Common	1.07*	1.11*	1.05*	0.96*	0.55*	4.77*
Hybriforce-3600	1.32*	1.20*	0.99*	0.75*	0.45*	4.70*
SW 8421S	1.36*	1.07*	0.92*	0.71*	0.45*	4.57*
Hi-Gest 660	1.11*	1.22*	0.88*	0.86*	0.40*	4.35*
Mean	1.47	1.18	1.06	0.92	0.48	5.11
LSD (0.05)	NS	NS	NS	NS	NS	NS
CV%	13.69	14.49	16.26	20.6	22.81	9.66

†Data were analyzed using analysis of covariance where check plots of Pioneer 55V55 were used as the covariate.

2018 Harvest dates:

Sep 12

**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.

‘

Corn and Sorghum Performance Tests

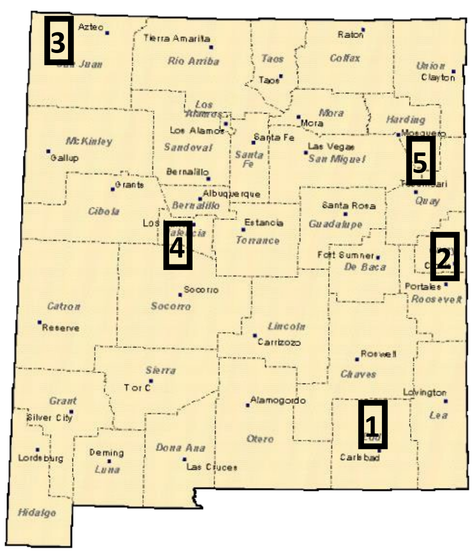
M.A. Marsalis[1], R.P. Flynn[2], L.M. Lauriault [3], A. Mesbah[4], and K. Djaman[5]

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 2019 (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.

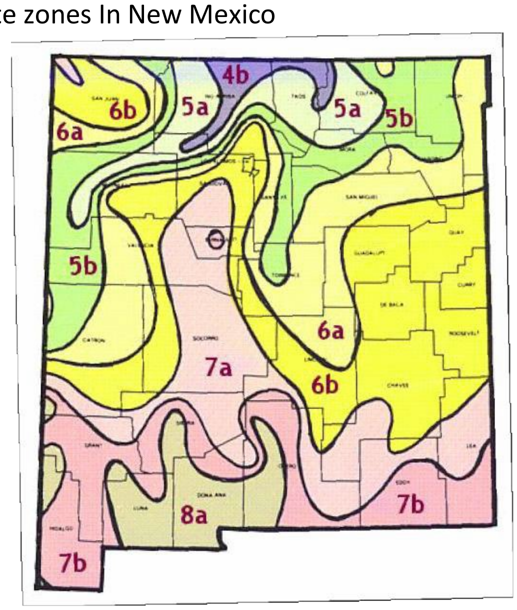
The New Mexico corn and sorghum performance testing program is part of an ongoing program to provide farmers, Extension workers and seed industry personnel with reliable, unbiased, information that will allow a valid comparison of corn and sorghum varieties/hybrids at various locations throughout the 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



ZONE KEY	a	b	Average Annual Minimum Temperature
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

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

New Mexico 2019 Forage Corn Performance Test - Agricultural Science Center at Artesia.

Investigators: Robert Flynn, Ruben Pacheco, Martin Lopez.

Test Description

Location:

County/Area:	Eddy
Longitude:	-104.23
Latitude:	32.45
Elevation:	3360 ft.
Soil Name:	Reagan
Soil Texture:	loam
Soil Depth:	0-24 in.

Test Design:

Replications:	3
Plot Length:	20 ft.
Rows per Plot:	2
Row Spacing:	30 in.
Seeding Rate:	27000 seed/a

Management Practices:

Previous Crop:	Sorghum
Planting Date:	11-Jun
Harvest Date:	10-Oct

Production Inputs

	Rate	Date
Fertilizer:		
Nitrogen	66 lb/a	carryover
Nitrogen	21 lb/a	15-Jul
Phosphorus	100 lb/a	15-Jul
Nitrogen	273 lb/a	16-Jul

Growing Conditions:

	Average Temp.	Precip.	Irrigation
	°F	in.	in.
January	41.1	0.1	
February	46.9	0.0	
March	51.3	0.3	
April	61.4	0.44	
May	68.4	0.33	1.40
June	77.2	2.00	3.20
July	82.7	1.12	5.30
August	84.8	0.56	4.40
September	77.4	1.69	
October	58.3	3.72	
November	47.7	0.4	
December	44.0	0.0	

Seasonal Precipitation:	14.3 in.
Total Irrigation:	13.7 in.
	28.0 in.
Date of Last Spring Frost:	29-Apr
Date of First Fall Frost:	31-Oct
Frost Free Period:	299 days

Forage Corn Performance Test - Agricultural Science Center at Artesia

Hybrid/Variety	Dry Forage	Green Forage	Moisture at Harvest	CP	NDF	NDFD 48hr	Starch	Ash	NE_l	Milk/ Ton	Milk/ Acre
Name	t/a	t/a	%	%	%	%	%	%	Mcal/lb	lb/t	lb/a
70N16	6.4	17.5	63.3	7.6	36.7	63.3	31.1	3.5	0.8	3110	19889
74B75	5.9	15.7	62.5	7.2	36.4	65.3	33.3	3.5	0.8	3180	18619
D55VC80	6.8	17.5	61.3	7.8	37.4	63.0	31.8	3.1	0.8	3116	21012
D57VC17_VT2P	5.9	16.7	64.4	7.8	41.3	59.7	26.3	3.6	0.8	2937	17269
D57VC51VT2P	6.7	17.6	61.4	7.6	37.4	60.3	33.5	2.9	0.8	3168	21321
D58QC72_3110	6.5	18.7	65.3	8	43.9	64.0	23.0	4.1	0.7	2989	19314
D58RR70_RR	7.0	19.6	64.3	7.9	41.8	62.0	23.4	4.5	0.8	2815	19842
D58VC65_VT2P	4.9	15.1	67.5	7.7	44.4	63.0	22.6	3.8	0.7	2929	14250
ES7698_3110	5.7	16.7	66.4	8.1	40.3	62.3	25.9	4.4	0.8	3042	17542
LG571VT2PRO	4.8	13.2	63.7	7.8	41.4	63.0	26.9	3.4	0.8	3058	14669
LG66C28-3110	5.3	15.1	65.1	8.3	39.8	60.3	27.5	4.0	0.8	3107	16647
LG67C01VT2PRO	5.7	15.6	63.1	7.9	39.0	63.0	30.7	3.3	0.8	3208	18374
Trial Mean	6.0	16.6	64.0	7.8	40.0	62.4	28.0	3.7	0.8	3055	18229
LSD $P < 0.05$	NS	NS	NS	NS	NS	3.1	NS	NS	NS	NS	NS
CV	15.9	15.4	4.7	8.0	12.7	2.9	22.4	23.4	5.8	8.6	18.4
F Test	0.1065	0.2359	0.3719	0.8215	0.5999	0.0307	0.3424	0.4519	0.6475	0.7994	0.2553

New Mexico 2019 Forage Sorghum Performance Test - Agricultural Science Center at Artesia.

Investigators: Robert Flynn, Ruben Pacheco, Martin Lopez.

Test Description

Location:

County/Area: Eddy
Longitude: -104.23
Latitude: 32.45
Elevation: 3360 ft.
Soil Name: Pima
Soil Texture: silt loam
Soil Depth: 0-24 in.

Test Design:

Replications: 3
Plot Length: 20 ft.
Rows per Plot: 2
Row Spacing: 30 in.
Seeding Rate: 27000 seed/a

Management Practices:

Previous Crop: Sorghum
Planting Date: 5-Jul
Harvest Date: 14-Oct

Production Inputs

	Rate	Date
Fertilizer:		
Nitrogen	109 lb/a	carryover
Nitrogen	276 lb/a	12-Aug
Nitrogen	110 lb/a	5-Sep

Growing Conditions:

	Average Temp. °F	Precip. in.	Irrigation in.
January	41.1	0.1	
February	46.9	0.0	
March	51.3	0.3	
April	61.4	0.44	
May	68.4	0.33	1.40
June	77.2	2.00	3.20
July	82.7	1.12	5.30
August	84.8	0.56	4.40
September	77.4	1.69	
October	58.3	3.72	
November	47.7	0.4	
December	44.0	0.0	

Seasonal Precipitation: 14.3 in.
Total Irrigation: 13.7 in.
28.0 in.

Date of Last Spring Frost: 29-Apr
Date of First Fall Frost: 31-Oct
Frost Free Period: 299 days

New Mexico 2019 Forage Sorghum Performance Test - Agricultural Science Center at Artesia.

	COMPANY	DMYIELD	WETYIELD	H2O	CP	NDF	NDFD	ASH	RFQ	TDN	NEL	MILKTON	MILKAC
ADVF7232	Advanta	5.5	15.6	80	10.4	64.4	62.7	7.8	125	60.3	0.643	2320	12628
ADVXF025	Advanta	3.6	10.4	73.2	11.9	57.1	55.7	6	137	59.7	0.71	2381	8659
ADVXF033	Advanta	4.4	12.5	77.7	12.1	63.5	58	7.4	123	60.5	0.667	2348	10332
AF7201	Advanta	8.3	23.7	72.8	10.8	58.7	61.7	6.5	140	58.8	0.687	2286	18727
AF7401	Advanta	4.6	13.3	81.1	12.4	60.9	66.3	8.5	137	58.8	0.671	2259	10565
AF8301	Advanta	6.7	19.2	77.8	11.8	63.1	57.3	8	120	59.6	0.665	2280	15325
BundleKing	Browning	5.5	15.6	74	9.9	54.7	51	5.6	131	56.5	0.71	2153	11733
BundleKing	BrowningSeed	5.8	16.6	76.1	11.2	62.5	56.5	5.3	131	60.1	0.684	2332	13862
FX19172/F74FS72BMR	DynaGro	5	14.2	81.5	12.1	62.7	62.3	9.1	124	58.3	0.647	2183	10966
SORDAN70	SWSeed	4.9	14	76.9	10.5	64.7	51.7	7	109	61.2	0.628	2376	11619
SORDAN79(Safened)	SWSeed	4.6	13.1	79.3	10.9	67.2	51.7	7.3	104	62.2	0.611	2413	11063
SORDANHEADLESS	SWSeed	4.4	12.5	81.6	12.1	65.4	56.3	8.8	109	60.7	0.613	2328	10108
SP4105	SWSeed	3.3	9.5	83.4	12.3	65.3	60.3	10.4	108	60	0.604	2268	7560
SP4555	SWSeed	8.1	23.1	74.7	11.4	59.4	55	7.8	122	59.5	0.666	2331	18856
SP7106BMR	SWSeed	3.6	10.3	81.6	12.7	61.9	61.3	10.1	118	58.7	0.633	2231	8090
SP7106BMR(Safened)	SWSeed	5.1	14.7	82.3	13.8	60.6	63.7	10.6	122	58.2	0.645	2213	11506
SUPERSILE20	DynaGro	7.7	22.1	79.6	10.6	70.1	51	6.9	99	64.1	0.606	2505	19457
SUPERSILE30	DynaGro	4.7	13.3	78.5	11.9	65.1	54.7	7.5	115	61.5	0.652	2399	11092
W7051	WarnerSeed	4.6	13.1	76.7	12.4	62.7	54.7	7.2	120	61.1	0.677	2399	11037
W7706W	WarnerSeed	6.5	18.6	75.6	11.7	58.7	58.7	7	135	58.5	0.703	2269	14581
WXF1714	WarnerSeed	5.4	15.3	76.5	12.4	62.6	57.3	7.6	123	60	0.673	2327	12425
WXF1737	WarnerSeed	5.4	15.3	80.7	11	61.4	60.7	7.4	129	56	0.668	2020	10632
X033	MojoSeed	5.5	15.6	77.8	12.8	62.4	59	7.8	126	60.2	0.676	2343	12867
	Mean	5.3	15.3	78.4	11.7	62.6	57.9	7.8	121	59.9	0.656	2307	12329
	LSD	NS	NS	3.8	1.8	5.4	4.6	1.6	19	2.9	0.05	173	NS
	CV	50.5	50.5	2.9	9.4	5.3	4.8	12.7	9.6	2.9	4.6	4.5	50.1
	P-value	0.7296	0.7302	0.0001	0.0332	0.0048	0.0001	0.0001	0.0029	0.0033	0.0008	0.0039	0.6753

New Mexico 2019 SorghumxSudan Performance Test - Agricultural Science Center at Artesia.

Investigators: Robert Flynn, Ruben Pacheco, Martin Lopez.

Test Description

Location:

County/Area:	Eddy
Longitude:	-104.23
Latitude:	32.45
Elevation:	3360 ft.
Soil Name:	Pima
Soil Texture:	silt loam
Soil Depth:	0-24 in.

Test Design:

Replications:	3
Plot Length:	20 ft.
Rows per Plot:	2
Row Spacing:	40 in.
Seeding Rate:	27000 seed/a

Management Practices:

Previous Crop:	Cotton
Planting Date:	5-Jul
Harvest Date 1:	29-Aug
Harvest Date 2:	24-Oct

Production Inputs

	Rate	Date
Fertilizer:		
Nitrogen	106 lb/a	carryover
Nitrogen	276 lb/a	12-Aug
Nitrogen	110 lb/a	5-Sep

Growing Conditions:

	Average Temp.	Precip.	Irrigation
	°F	in.	in.
January	41.1	0.1	
February	46.9	0.0	
March	51.3	0.3	
April	61.4	0.44	
May	68.4	0.33	1.40
June	77.2	2.00	3.20
July	82.7	1.12	5.30
August	84.8	0.56	4.40
September	77.4	1.69	
October	58.3	3.72	
November	47.7	0.4	
December	44.0	0.0	

Seasonal Precipitation:	14.3 in.
Total Irrigation:	13.7 in.
	28.0 in.
Date of Last Spring Frost:	29-Apr
Date of First Fall Frost:	31-Oct
Frost Free Period:	299 days

New Mexico 2019 Irrigated Forage Sorghum & Sorghum Sudangrass (Multi-Cut) Performance Test - Agricultural Science Center at Artesia

ENTRY	COMPANY	Type	DMYIELD1	WETYIELD1	H2O1	CP1	NDF1	NDFD1	ASH1	TDN1	NEL1	MILKTON1	MILKAC1	RFQ1
BrowningSeed	Cadan99BWMR	SxS	0.7	4.1	82.9	15.6	60.7	62.3	10.6	65.1	0.670	2203	1602	118
BrowningSeed	CadanPPS	SxS	1.3	7.7	82.5	16.3	60.1	64.7	11.1	64.6	0.665	2284	3059	119
Dyna-Gro	DANNYBOYIIBMR	SxS	1.0	6.8	85.3	15.1	62.0	63.0	10.5	63.9	0.657	2192	2168	118
Dyna-Gro	F75FS13	SxS	1.1	6.9	82.6	14.4	62.9	63.0	11.3	62.1	0.637	2094	2263	113
Dyna-Gro	FIRSTGRAZE	SxS	1.6	8.8	82.5	15.1	62.3	60.3	10.5	63.4	0.652	2089	3359	113
Dyna-Gro	FULLGRAZEII	SxS	0.9	5.5	84.0	14.9	62.4	59.3	10.6	62.9	0.646	2042	1867	111
Dyna-Gro	FULLGRAZEIIBMR	SxS	1.1	7.4	84.3	15.1	62.4	61.7	10.7	63.0	0.647	2128	2336	114
Dyna-Gro	SUPERSWEET10	SxS	1.6	10.0	83.6	14.2	63.6	60.3	10.2	62.2	0.638	2081	3545	112
BrowningSeed	SweetSiouxBMRVI	SxS	0.9	6.0	84.2	16.1	58.3	64.3	10.6	66.3	0.684	2347	2213	126
BrowningSEed	SweetSiouxWMR	SxS	0.8	5.0	84.1	13.1	63.5	61.0	15.4	59.2	0.605	1707	1350	94
BrowningSeed	SweetSiouxWMR	SxS	0.9	5.2	81.6	15.5	60.4	60.5	9.8	65.7	0.677	2208	2007	121
Dyna-Gro	TOPTON	SxS	1.0	6.2	83.8	10.8	66.0	57.7	8.7	60.8	0.622	2001	2003	107
BrowningSeed	TridanII	SxS	2.9	15.4	81.3	14.1	63.1	59.7	9.1	63.1	0.649	2127	6314	117
BrowningSeed	WondergreenSX66	SxS	1.1	6.2	82.4	15.3	61.3	60.3	10.0	64.4	0.663	2161	2380	117
	Mean		1.2	7.4	83.2	14.7	62.0	61.3	10.4	63.5	0.652	2138	2684	115
	LSD		1.2	NS	NS	2.8	NS	NS	NS	NS	NS	NS	2601	NS
	CV		55.4	54.0	2.4	11.4	5.1	6.1	15.9	4.0	4.3	9.6	57.5	9.0
	P-value		0.0644	0.1796	0.6131	0.0839	0.4796	0.5355	0.7353	0.5153	0.5206	0.7312	0.0805	0.5136

COMPANY	COMPANY	Type	CP1	NDF1	NDFD1	RFQ1	TDN1	NEL1	CP2	NDF2	NDFD2	RFQ2	TDN2	NEL2
BrowningSeed	Cadan99BWMR	SxS	15.6	60.7	62.3	118	65.1	0.67	12.5	65.6	61.7	102	57.5	0.585
BrowningSeed	CadanPPS	SxS	16.3	60.1	64.7	119	64.6	0.665	13.3	63.9	62	107	59.3	0.606
Dyna-Gro	DANNYBOYIIBMR	SxS	15.1	62	63	118	63.9	0.657	14.8	62.9	66.7	111	60.5	0.619
Dyna-Gro	F75FS13	SxS	14.4	62.9	63	113	62.1	0.637	13	66.1	60	102	57.5	0.586
Dyna-Gro	FIRSTGRAZE	SxS	15.1	62.3	60.3	113	63.4	0.652	13.1	64.3	61.3	108	59.5	0.608
Dyna-Gro	FULLGRAZEII	SxS	14.9	62.4	59.3	111	62.9	0.646	14.4	62.8	65.7	112	60.3	0.618
Dyna-Gro	FULLGRAZEIIBMR	SxS	15.1	62.4	61.7	114	63	0.647	13	64.9	62	108	59.4	0.607
Dyna-Gro	SUPERSWEET10	SxS	14.2	63.6	60.3	112	62.2	0.638	13.3	65.6	62.3	102	57.9	0.59
BrowningSeed	SweetSiouxBMRVI	SxS	16.1	58.3	64.3	126	66.3	0.684	13.2	66.5	60	97	57.1	0.582
BrowningSEed	SweetSiouxWMR	SxS	13.1	63.5	61	94	59.2	0.605	13.9	63.5	64	103	58.7	0.6
BrowningSeed	SweetSiouxWMR	SxS	15.5	60.4	60.5	121	65.7	0.677	12.8	65.7	59	105	58.7	0.598
Dyna-Gro	TOPTON	SxS	10.8	66	57.7	107	60.8	0.622	13.8	64.1	66	109	58.9	0.602
BrowningSeed	TridanII	SxS	14.1	63.1	59.7	117	63.1	0.649	13.3	64.9	60.3	104	58.6	0.598
BrowningSeed	WondergreenSX66	SxS	15.3	61.3	60.3	117	64.4	0.663	13.7	66.2	61.3	96	57.2	0.583
Mean	Mean		14.7	62	61.3	115	63.5	0.652	13.4	64.8	62.3	10.5	58.6	0.599
LSD	LSD		2.8	NS	NS	NS	NS	NS	1.3	NS	NS NS		NS	NS
CV	CV		11.4	5.1	6.1	9	4	4.3	5.8	3.6	6.3	10.9	3.9	4.3
P-value	P-value		0.0839	0.4796	0.5355	0.5136	0.5153	0.5206	0.0892	0.6605	0.4428	0.8564	0.7028	0.7024

		Harvest 1					Harvest 2					Total	Total
Brand Name	Hybrid/Variety Type	Dry	Green	Moisture	Milk/Ton	Milk/acre	Dry	Green	Moisture	Milk/Ton	Milk/acre	Dry Forage	Milk/acre
Results		t/a	t/a	%	lb/ton	lb.a	t/a	t/a	%	lb/ton	lb.a	t/a	lb/a
BrowningSeed	Cadan99BWMR	0.7	4.1	82.9	2203	1602	3.2	16	87.3	2280	6952	3.9	8554
BrowningSeed	CadanPPS	1.3	7.7	82.5	2284	3059	2.3	10.9	86	2336	5358	3.7	8416
Dyna-Gro	DANNYBOYIIBMR	1	6.8	85.3	2192	2168	3.8	18.9	87.2	2412	9039	4.8	11207
Dyna-Gro	F75FS13	1.1	6.9	82.6	2094	2263	4.9	23.1	86.4	2191	10306	5.9	12568
Dyna-Gro	FIRSTGRAZE	1.6	8.8	82.5	2089	3359	4.2	19.1	85.8	2256	9430	5.8	12789
Dyna-Gro	FULLGRAZEII	0.9	5.5	84	2042	1867	3.9	18.8	86.5	2405	9096	4.8	10963
Dyna-Gro	FULLGRAZEIIBMR	1.1	7.4	84.3	2128	2336	3	14.6	86.6	2316	7122	4.1	9458
Dyna-Gro	SUPERSWEET10	1.6	10	83.6	2081	3545	2.9	14.5	86.7	2268	6708	4.5	10253
BrowningSeed	SweetSiouxBMRVI	0.9	6	84.2	2347	2213	3.1	12.4	86.9	2183	6846	4.1	9059
BrowningSEed	SweetSiouxWMR	0.8	5	84.1	1707	1350	3	16.3	87.9	2061	8345	3.8	9696
BrowningSeed	SweetSiouxWMR	0.9	5.2	81.6	2208	2007	2.4	10.2	84.9	2401	5745	3.3	7751
Dyna-Gro	TOPTON	1	6.2	83.8	2001	2003	3.3	18.2	87.9	2360	7663	4.3	9666
BrowningSeed	TridanII	2.9	15.4	81.3	2127	6314	4.3	19.3	85.6	2306	9962	7.2	16276
BrowningSeed	WondergreenSX66	1.1	6.2	82.4	2161	2380	3.1	16.7	87.4	2267	7883	4.2	10263
	Mean	1.2	7.4	83.2	2138	2684	3.4	16.5	86.6	2297	7921	4.7	10606
	LSD	1.2	NS	NS	NS	2601	NS	NS	NS	NS	NS	NS	NS
	CV	55.4	54	2.4	9.6	57.5	39.2	41	1.4	6.5	38.3	34.6	35
	P-value	0.0644	0.1796	0.6131	0.7312	0.0805	0.5808	0.6511	0.5136	0.7756	0.6992	0.2915	0.4106

ASC Artesia Annual Report: Entomology

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New Mexico Cotton: Acreage was up in 2019 with an increase particularly noted in the counties that border the High Plains of Texas. Cotton was grown further north than we have seen in 23 years of observations in NM.

Background and Significance

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. Compensation trials sponsored by Cotton Incorporated indicated a lower than expected impact on yield from square and even boll losses. Increasing reports of resistance to Bt cotton make the input cost of Bt cotton in this environment more questionable.

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

Prior testing in Artesia, NM indicated that yields of non Bt cultivars were frequently equal to transgenic cultivars in SE New Mexico without insecticide applications (Pierce, Flynn, Kirk and French 2001). Bollworm is a key pest but frequently higher pressure is late in the season when there is much less impact on yield. In typical years most cotton acreage needs no insecticides for bollworm. Some acres would need one application. Some aggressive growers make two applications, but it likely does not increase yields.

Growers seem to be satisfied with profits despite the technology fee, but will be less satisfied with paying for both the tech fee and over the top applications for bollworm.

In 2019, we conducted a field trial in conjunction with Texas A&M University. Results in Texas and New Mexico indicated that there was resistance in both 2 and 3 gene Bt cotton varieties (Pierce et al. 2019, Biles et al 2019). Resistance seemed to be associated with the Bt product more than the number of genes, with the Widestrike varieties having the highest amount of damage.

Seven varieties of cotton with 0-3 Bt genes were planted in 4 row, 50 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.

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

Bollworm Square Damage in Field Trials of Selected Bt cotton cultivars

There was extraordinarily little square damage this year. Last year was the highest square and boll damage since 1998. However, this year was the lowest square damage in 23 years of observations on our research farm. Most bollworm damage was 0%. The highest level of damage was in the non Bt cotton which had 0.5% damaged squares on 7/16/19 and 0.8% damaged squares on 8/7/19. There was only one other instance of any damage which was .05% in ST5471 GLPT.

Our graduate student, Ivan Tellez, travelled to east Texas and worked with one of the project collaborators there in an attempt to get damaged squares under a higher population, but that field didn't have much higher damage than our own trial.

Field square damage to selected Bt and non Bt cotton varieties Artesia, NM 2019

Variety	# Bt genes	7/9	7/16	7/27	7/30	8/7	8/12
FM2322 GL	0	0	0.5	0	0	0.8	0
ST5122 GLT	2	0	0	0	0	0	0
DP1522 B2XF	2	0	0	0	0	0	0
PHY333 WFE	2	0	0	0	0	0	0
PHY330 W3FE	3	0	0	0	0	0	0
ST5471 GLPT	3	0	0	0.5	0	0	0
DP1845 B3XF	3	0	0	0	0	0	0

Survival of Bollworm Larvae from Field to Lab Bioassy of Bt Cultivars 2018- 2019

A field to lab bioassay was conducted to evaluate resistance to cotton bollworm. In 2018, first instar larvae were tested vs neonate larvae in 2019. Ten bollworm larvae were placed in petri dishes with 2 squares of each cultivar. The larvae were maintained for 96 hours with squares changed after 48 hours.

Results:

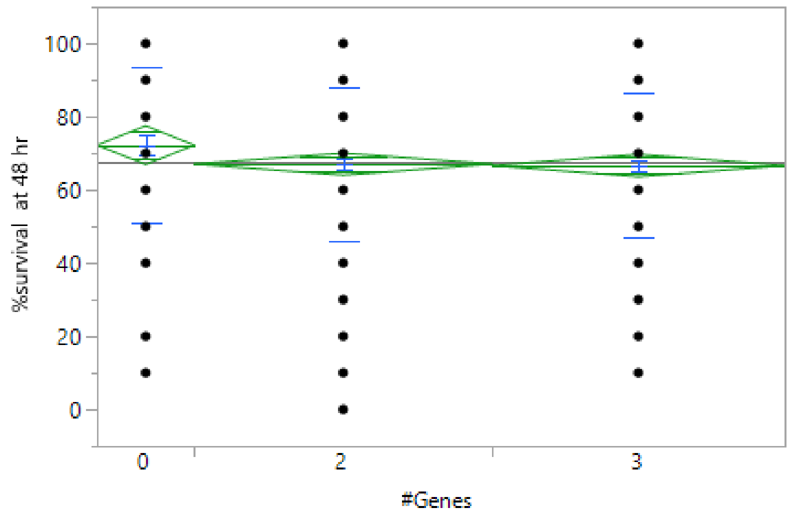
In 2018, there were significant differences in survival at 96 hours with 32 and 56% survival in 3 and 2 Bt gene cotton vs 5% survival in the non Bt cotton. Survival in the non Bt cotton was much lower when we used neonate larvae in 2019, with only 20% survival in the non Bt cotton compared to 56% in 2018.

In 2019, there was significantly higher survival at 96 hours in cotton with 0 genes compared to Bt cotton. Larval survival ranged from 67-72% at 48 hours in cotton with 0-3 genes with no significant difference in survival.

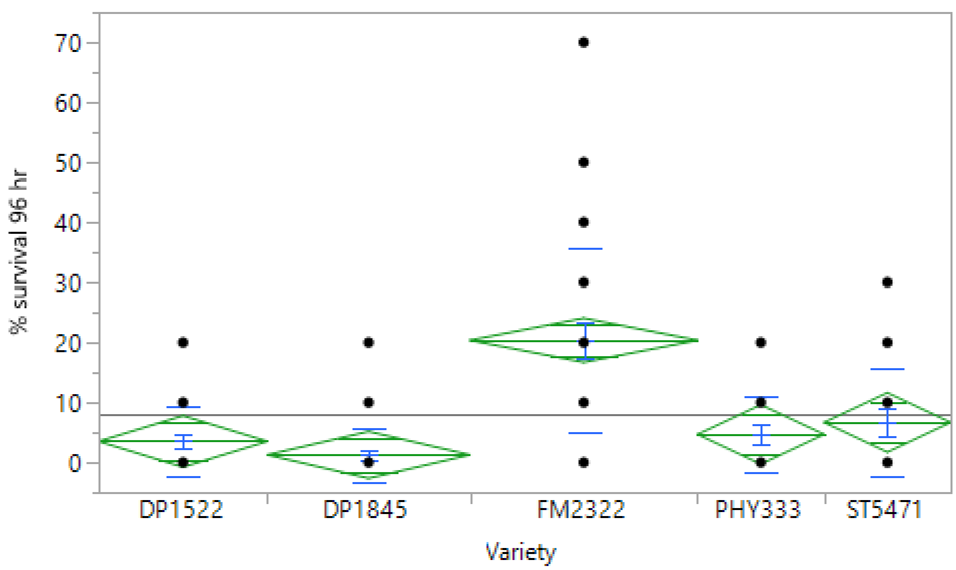
At 96 hours there was 20% survival on conventional cotton squares vs. 3-4% survival on cotton with 2-3 genes, with no significant difference between the 2 and 3 gene cotton varieties.

Often first or second instars are used to avoid high mortality in the control treatments. Historically, we have had about 70-80% survival of first instars on glanded non-Bt cottons. We made this attempt with neonate larvae in an effort to see if we could mimic field conditions most closely. There was very low survival in all Bt cotton varieties at 96 hours but there was some survival in 2 and 3 gene cotton varieties despite using the more susceptible neonate larvae. This is consistent with field observations where we are seeing field infestations in all bollworm infested commercial corn. Bollworm populations were high with approximately 40-70% infested ears in all cultivars except VIP corn. Bollworm infested corn in VIP corn ranged from 1-2%.

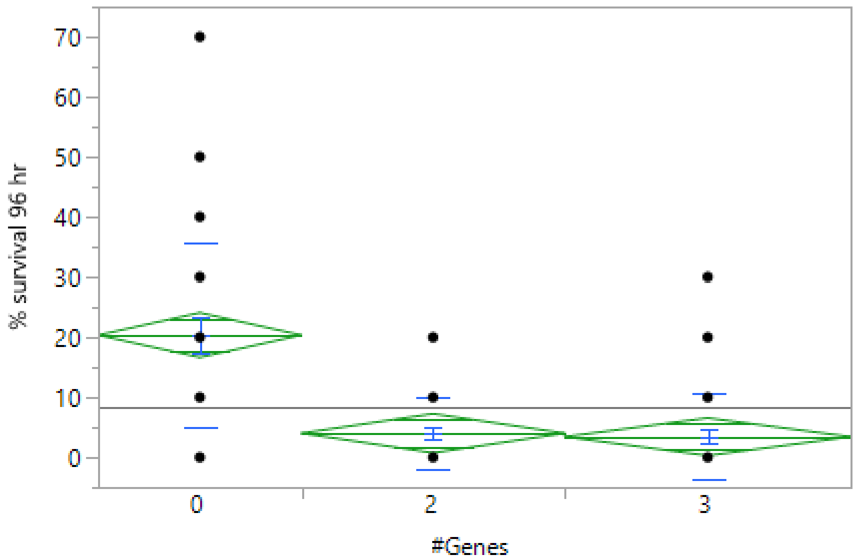
Bollworms were collected from both susceptible and resistant corn for testing by industry collaborators and Texas A & M collaborators (Kern lab). Collections were from all areas in New Mexico, from close to the Arizona border in Farmington, to near the eastern border with Texas, Clovis, and more central areas of New Mexico.



H. zea larval survival 48 hours after feeding on squares of cotton with 0-3 Bt genes



H. zea larval survival at 96 hours in selected Bt+/- cotton varieties



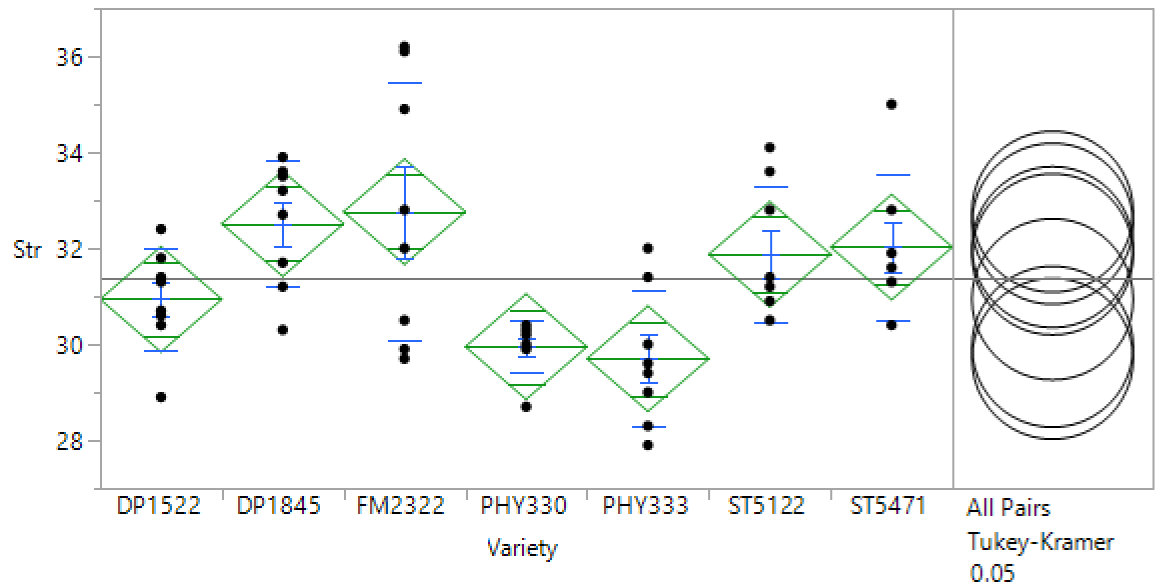
H. zea larval survival after 96 hours on 0-3 gene Bt cottons

Fiber Quality of Selected Bt Cotton Varieties 2019

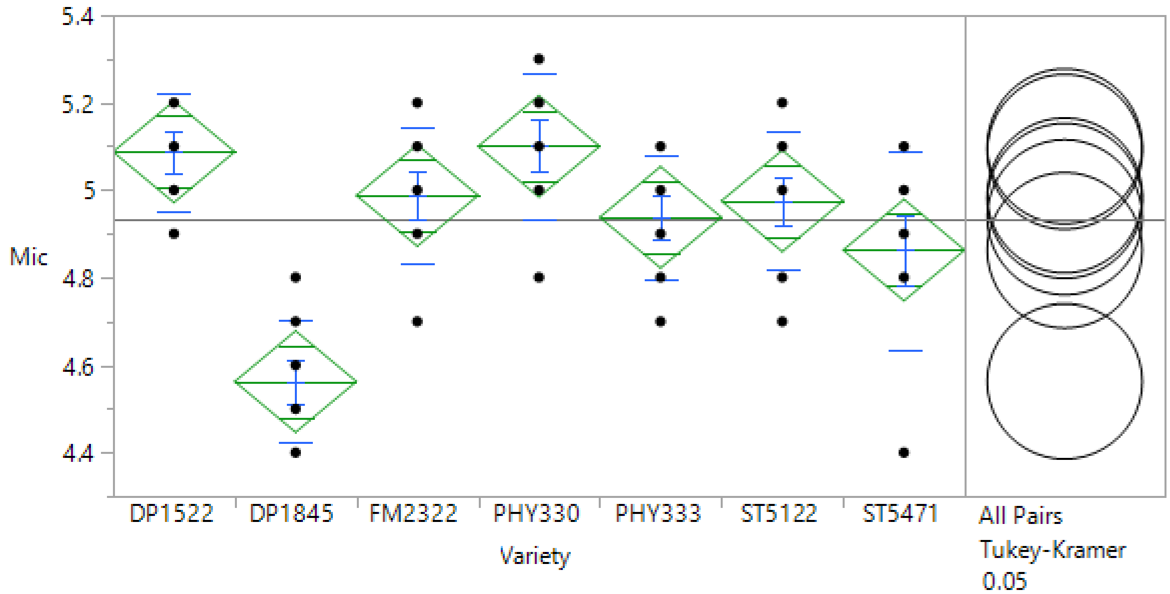
Fiber quality was significantly different among varieties in length, strength and mic. Three varieties FM2322 GL, DP1845 B3XF and ST5471 GLPT had fiber strength of at least 32 g/tex. Length was similar across varieties at 1.2" with the exception of DP1845 B3XF which had a mean 1.3" length.

Fiber Quality of Selected Bt and non Bt Cotton Varieties Artesia, NM 2019

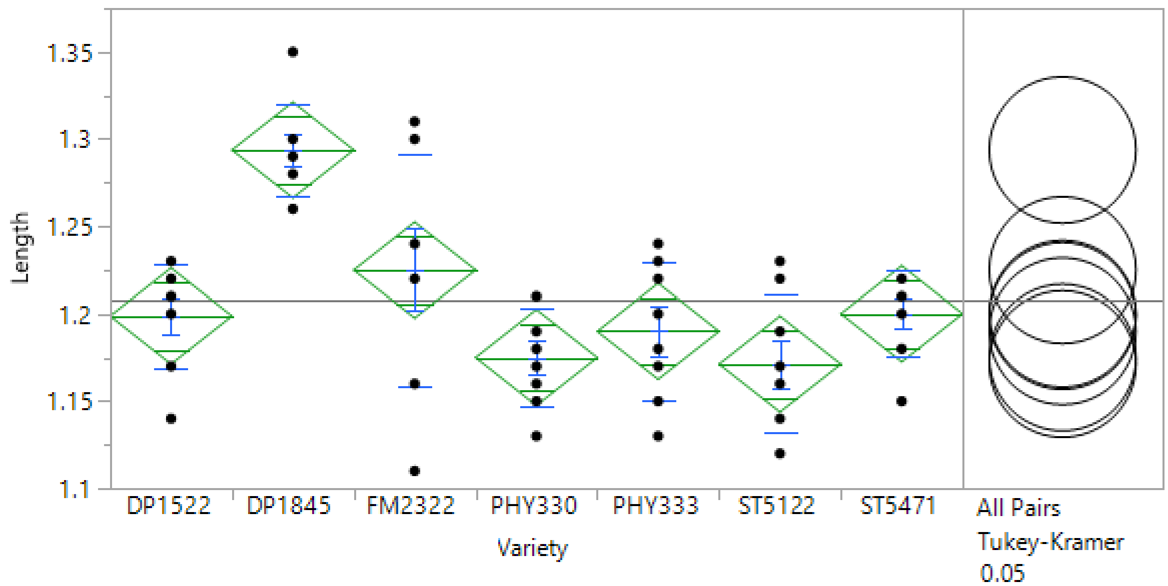
Variety	# Bt genes	Length (Inches)	Strength	Mic
FM2322 GL	0	1.2a	32.8a	5.0a
ST5122 GLT	2	1.2a	31.9ab	5.0a
DP1522 B2XF	2	1.2a	30.9ab	5.1a
PHY333 WFE	2	1.2a	29.7b	4.9a
PHY330 W3FE	3	1.2a	30.0b	5.1a
ST5471 GLPT	3	1.2a	32.0ab	4.9a
DP1845 B3XF	3	1.3b	32.5a	4.6b



Fiber Strength of Selected Bt and non Bt Cotton Varieties Artesia, NM 2019



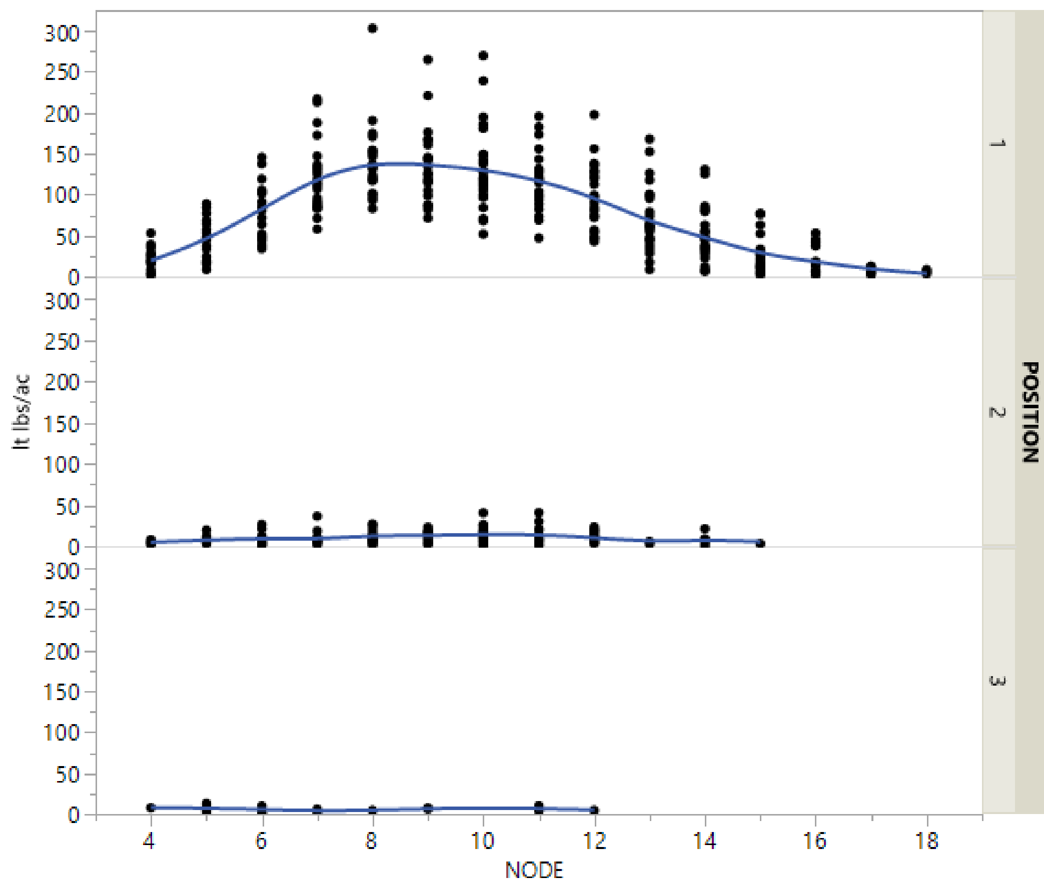
Micronaire of Selected Bt and non Bt Cotton Varieties Artesia, NM 2019



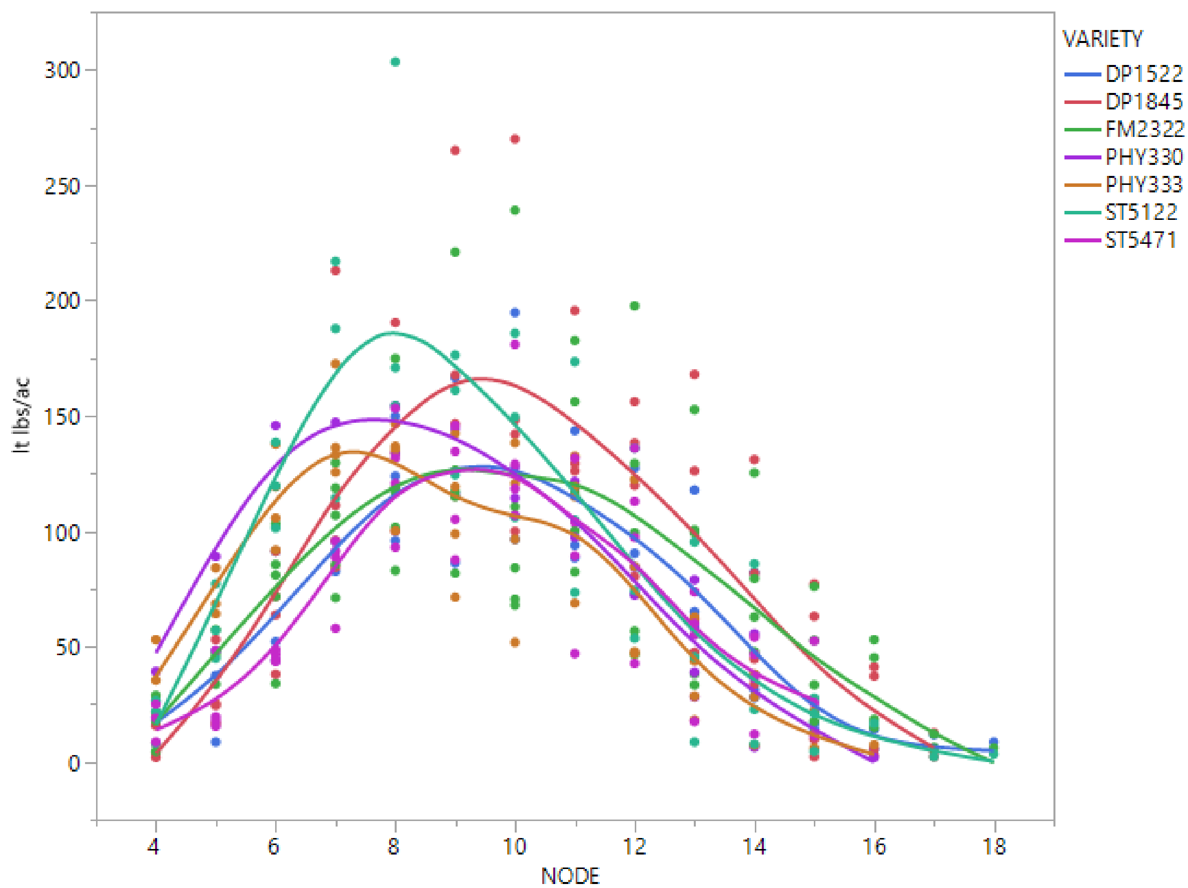
Fiber Length of Selected Bt and non Bt Cotton Varieties Artesia, NM 2019

Yield Partitioning of Selected Bt Cultivars under *H. zea* pressure.

Yields were recorded as bulk weights from a picker in two center rows. Yields were also partitioned out by collecting whole plants in ten foot of row from a border row in each plot. Bolls were collected by hand, weighed individually, with locks counted then ginned by treatment/rep to compare yields of each variety per node and position and yield by lock which is more stable statistically than yield /boll.

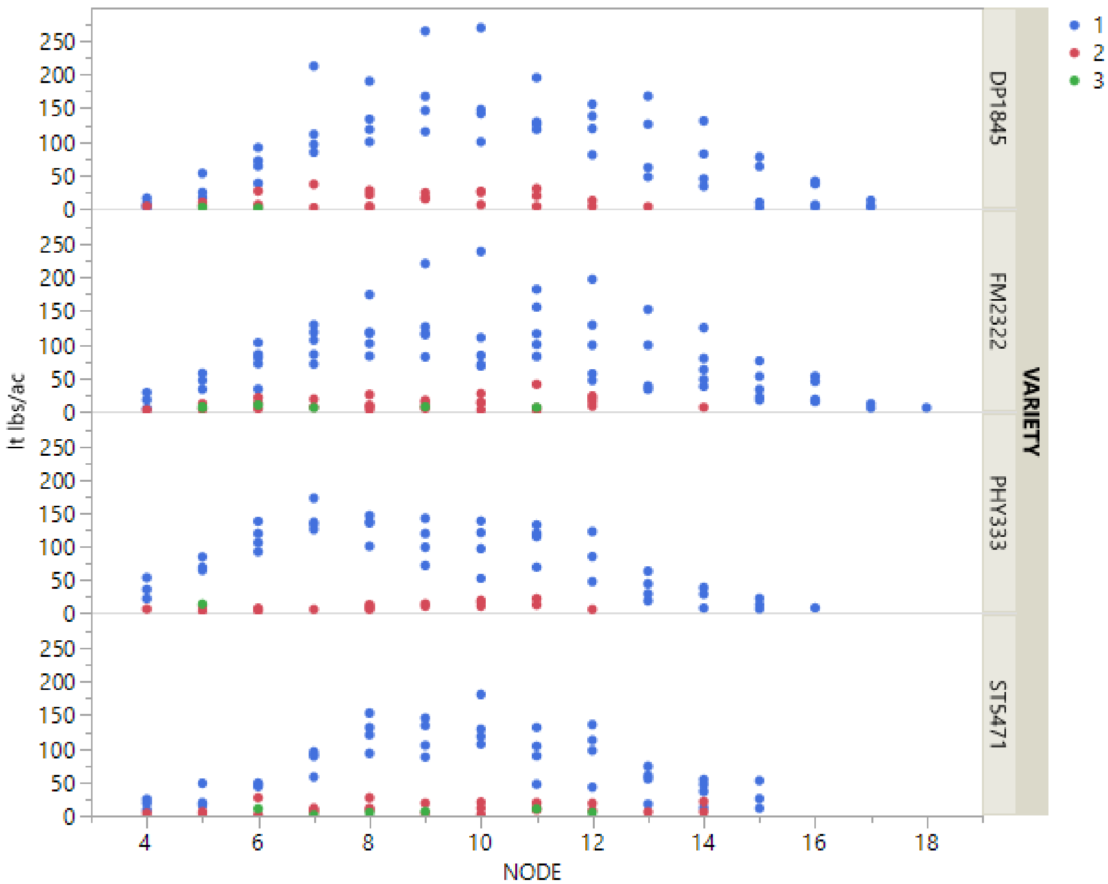


Peak production of 7 selected varieties of Bt and non Bt cotton



Four of seven varieties had peak production on nodes 9-10. Three early-mid season varieties had peak production on earlier nodes. PHY333 WFE and PHY330 W3FE had peak production on nodes 7-8 while ST5122 B2XF had peak production on node 8.

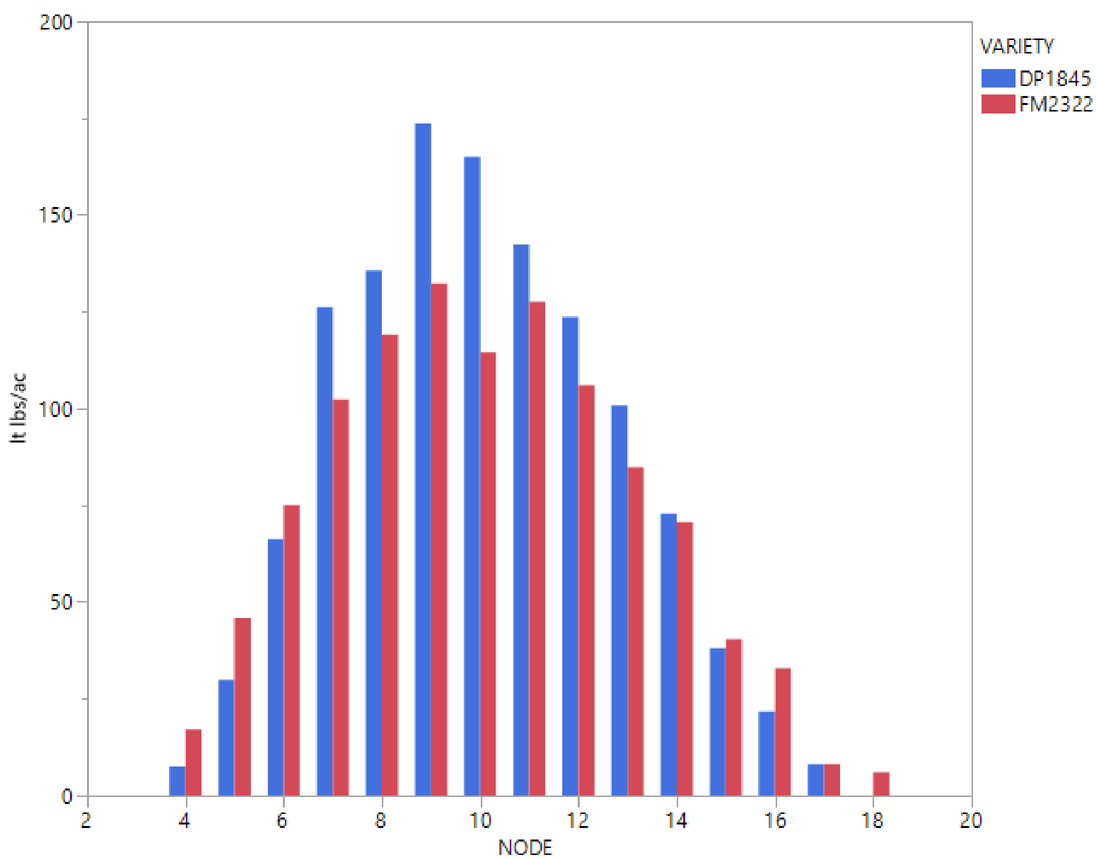
Highest yields were produced by 1st position bolls (Figure 1). Highest yields were produced by nodes 7-14 in position 1 with little difference in yield among nodes in positions 2 and 3. Thus, in evaluating damage from insects our analysis was restricted to first position bolls.



This graph illustrates the bollworm square damage and resulting yield loss in non Bt cotton plots of FM2322 GL, which was extremely high in all but one plot on nodes 9 and 10.

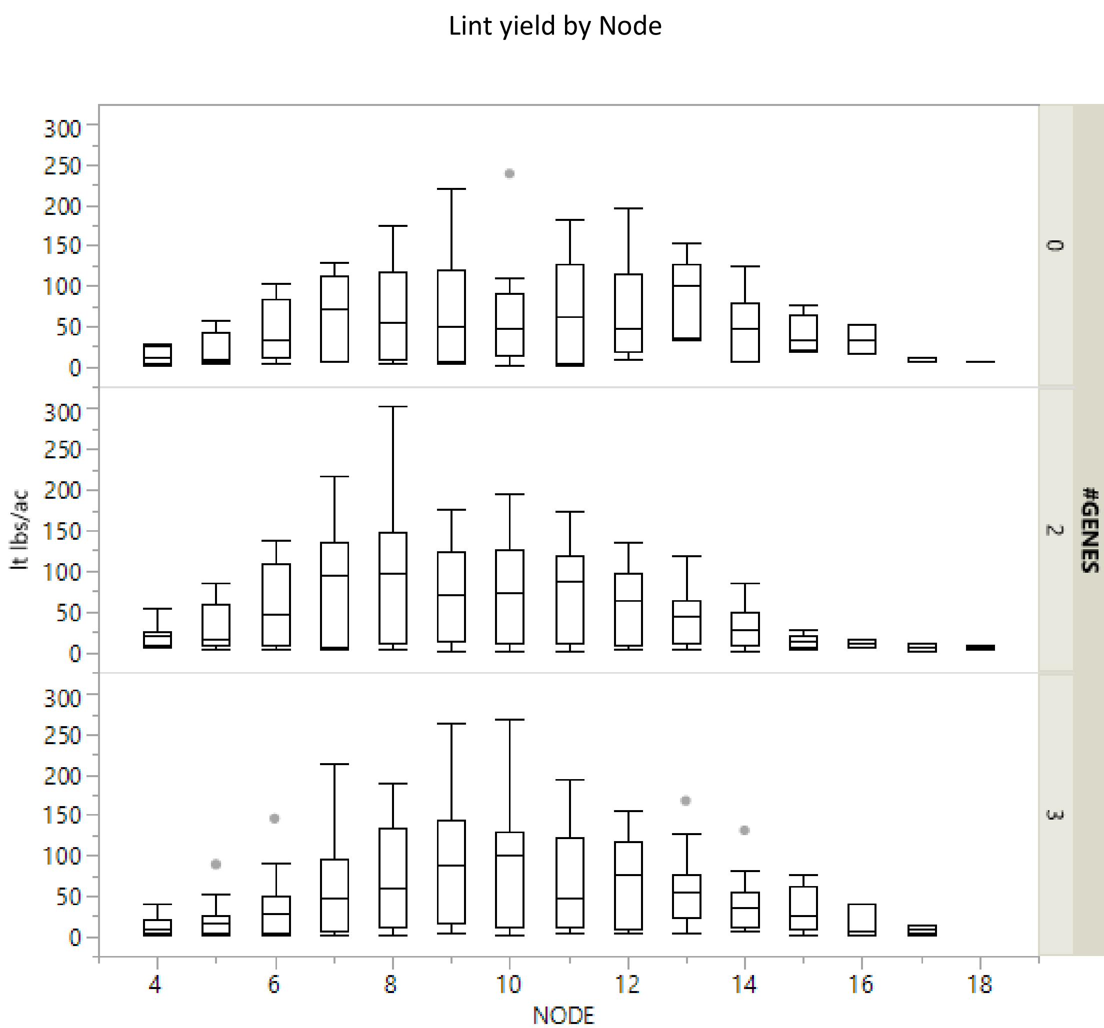
Losses from bollworm damage in non Bt cotton were most severe in nodes 9-10. For example, DP1845 B3XF produced 174 and 165 lb/A compared to 132 and 114 lb/A in FM2322 GL on nodes 9 and 10 first position bolls respectively (Figure 2). The non Bt cotton had 93 lb/A or 27% less lint on just those 2 nodes compared to DP1845 B3XF. Losses from heliothine pests were the highest in 20 years at this location. Damage reported in 2019 noted that there was 3 times as much square damage on the non Bt cotton compared to the DP1845 B3XF Bollgard 3 cotton with 9.2% vs 2.8% damaged squares in July when squares on those nodes were susceptible to feeding damage. (Pierce et al. 2013).

A Comparison of Lint Yield by Node for DP1845 B3XF and FM2322 GL



Mean lint yield of nodes 7-10 in the non Bt cotton was lower than the Bt cottons as illustrated by this comparison with DP1845 B3XF. It appears may have been some attempt to compensate for injury late season and compensation can be sufficient after late season short term damage. However, the lack of yield potential on nodes 15-16 prevent sufficient compensation for damage at node 7-10 the highest yielding nodes.

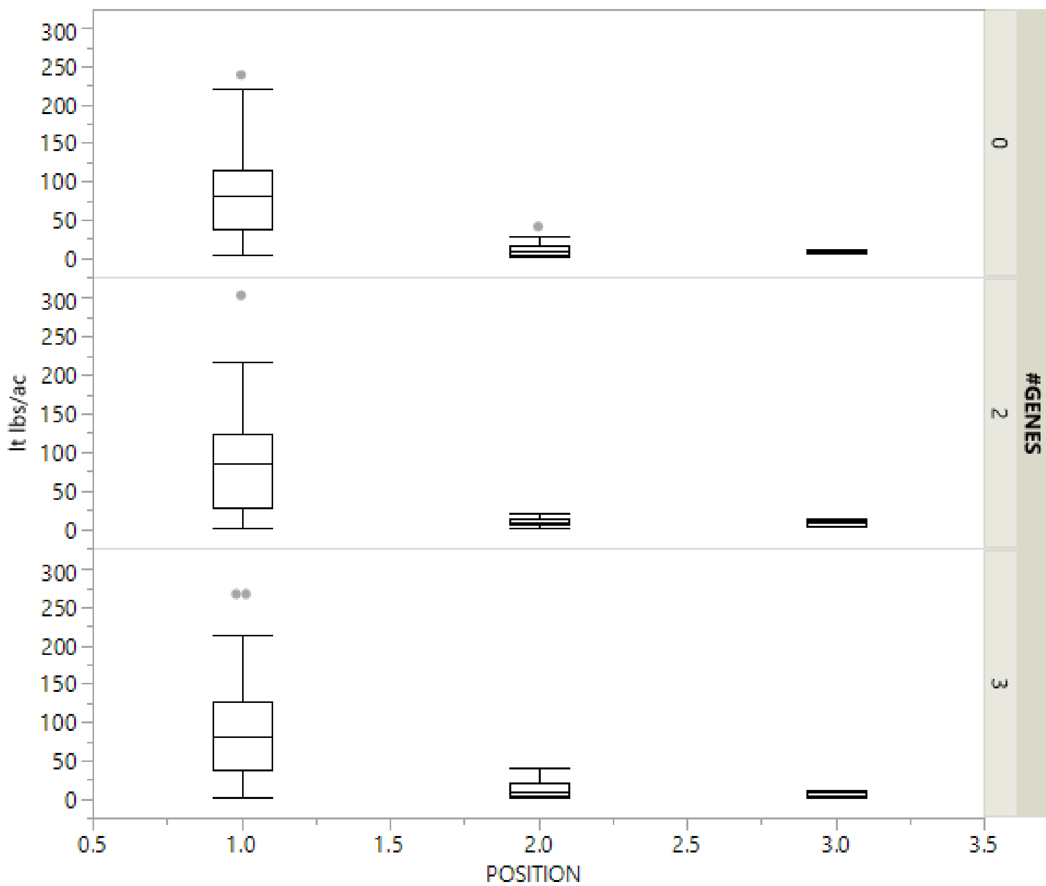
Insect populations are often not uniformly distributed. One plot produced yields on nodes 9 and 10 similar to DP1845 B3XF, while all other plots had mean yield losses of 50-51% compared to the highest yielding control plot and 55-59% less than the highest yielding DP1845 B3XF plot.



Relative lint yield by node on 0-3 gene cotton in Artesia, NM 2019

This graph illustrates the dramatic impact of bollworm injury to node 10 which should have been the node with the highest yield in position one. Only one plot produced expected yields on node 10.

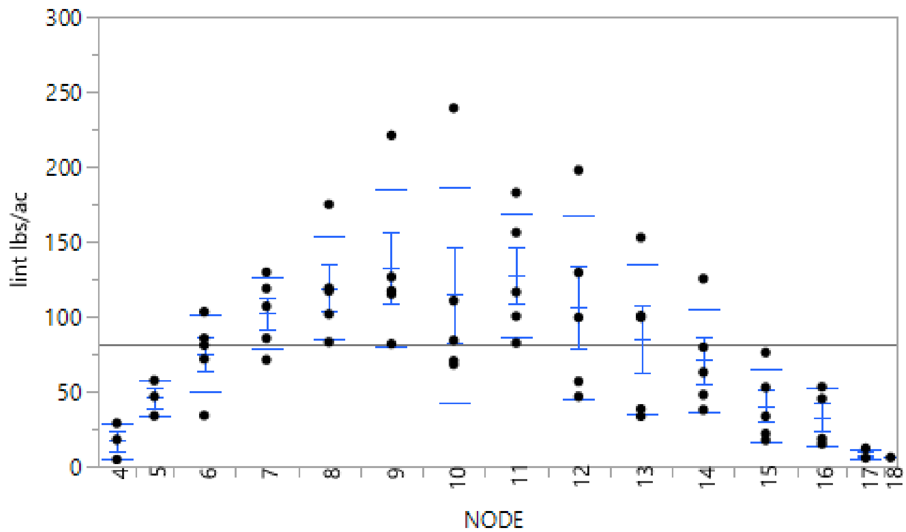
Lint Yield by Boll Position and Bt Genes



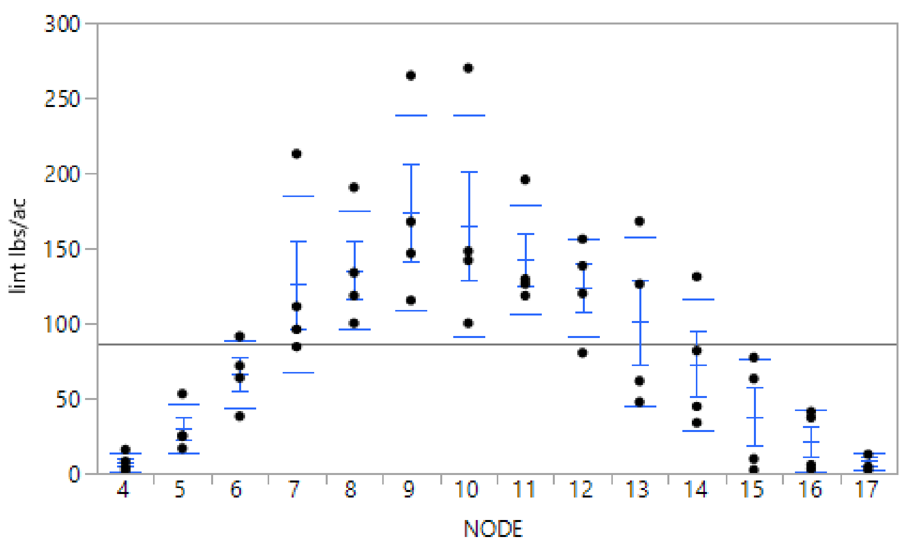
Lint lb/A by position on 0-3 gene cotton.

The vast majority of lint was produced on the first position square in all 7 varieties.

Mean yield (lb/A) of first position bolls by node for FM2322 GL, a non Bt cotton

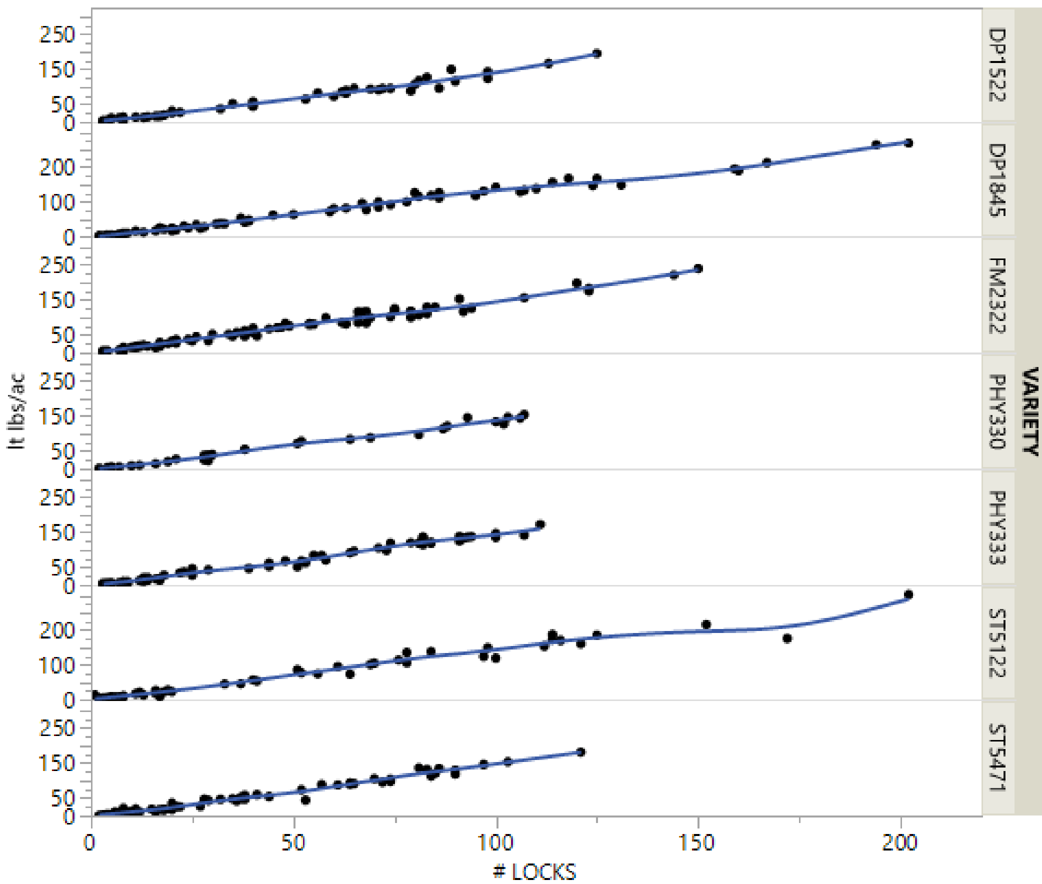


Mean yield (lb/A) of first position bolls by node for DP1845 B3XF, a Bollgard 3 cotton

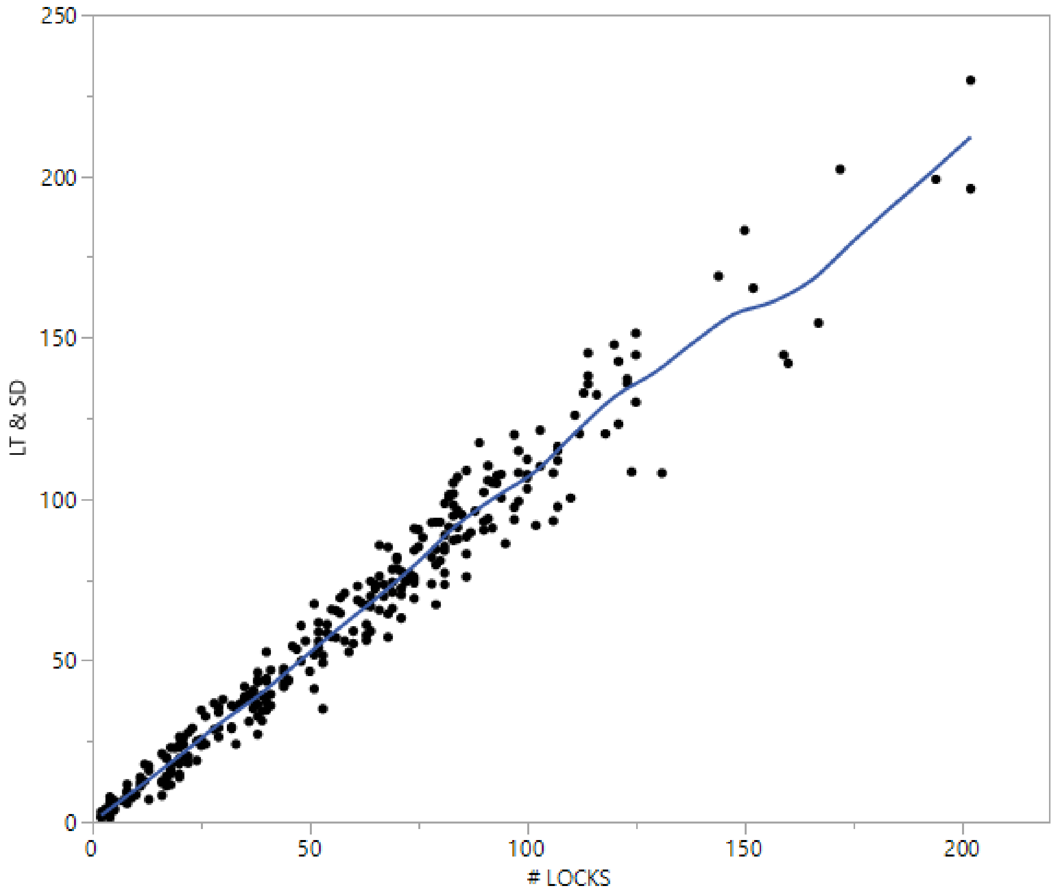


Total mean yields recorded from machine picking (Pierce et al. 2019) were 1412 lb/A in the non Bt FM2322 GL and 1630 lb/A in DP1845 B3XF plots. These yields were not significantly different. The severe losses in two of the highest producing nodes illustrate the risk of heliothine damage. Nodes 9-10 produced 339 lb/A in the first position bolls, 21% of total yield for that cultivar in only two nodes. However, it is important to note that compensation can lessen the impact of yield loss of selected nodes both by retaining squares that would otherwise be shed and reallocation of resources resulting in larger yield per lock in subsequent bolls (Pierce et al. 2008)

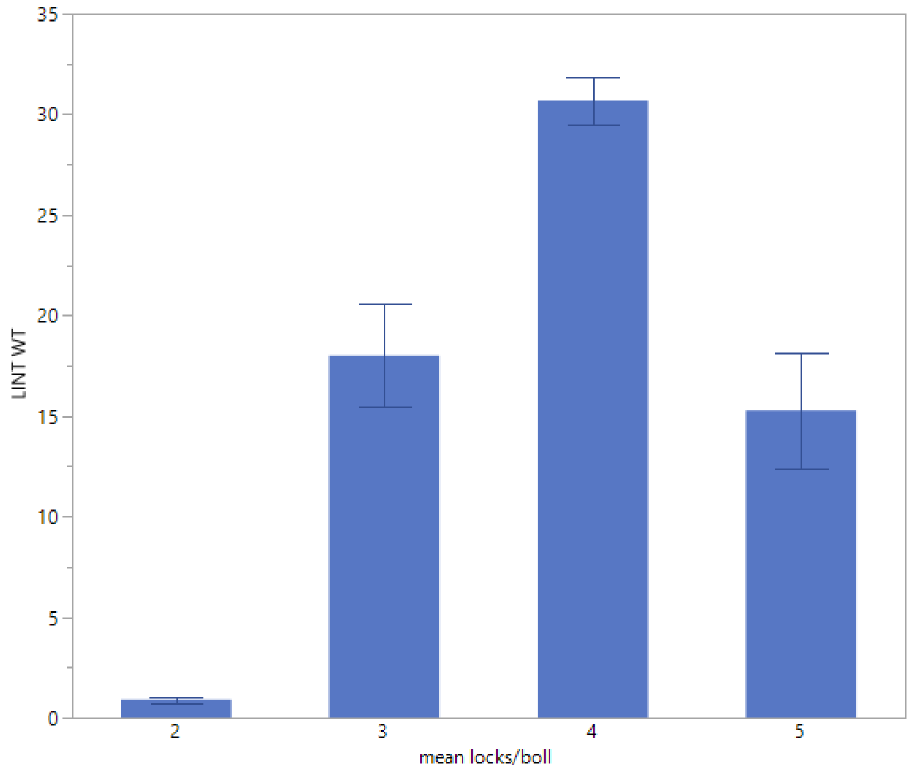
Correlation of Lock number and Lint Yield



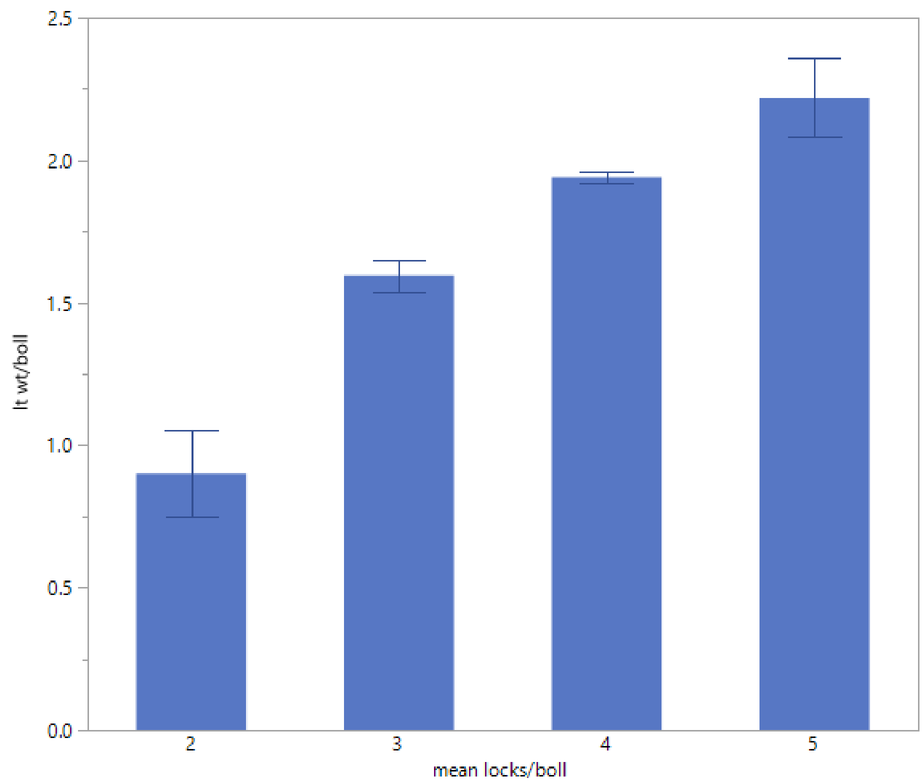
Lint lb/A by number of locks in selected Bt and non Bt cotton varieties



Not surprisingly lint and seed weight were very closely correlated with the number of locks per node. F=8407 df 1,306 *P*<0.0001



There is value in evaluating the relative impact of lock number vs lock size which may help breeders in targeting routes to increase yields or early yields. The impact of locks/.boll on lint weight is more difficult to interpret than the simple correlation of lock number to yield per 10 ft block/node/position. Five locks produced the highest lint weight per boll but significantly lower lint weight overall.



***H. zea* and *H. virescens* populations in New Mexico**

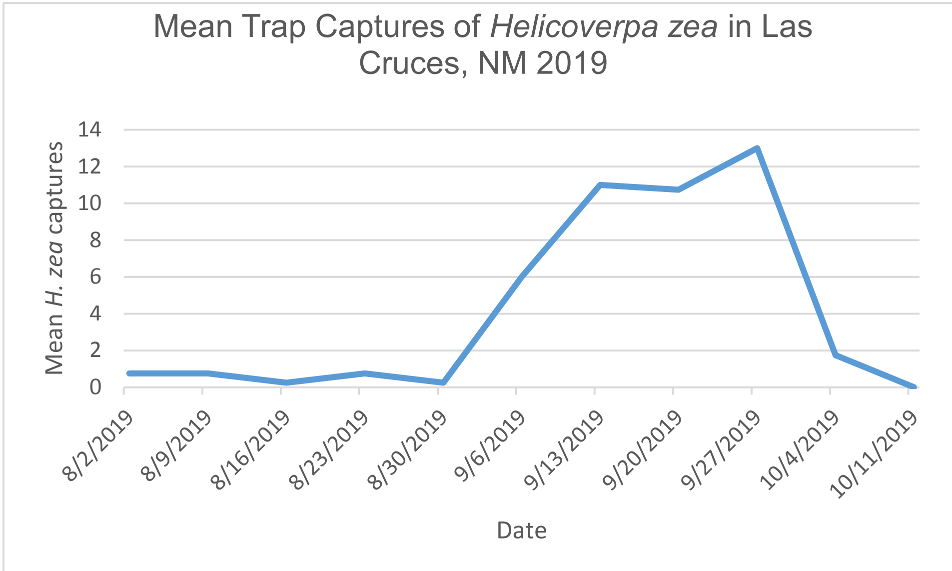
Populations of a number of lepidopterous pests were monitored with pheromone traps**.** Trapping data of *H. zea* and *H. virescens* is important to compare changes in the prevalence of *H. virescens* over time and to provide a heads up for growers in years where traps captures are particularly high. While trap captures do not correlate extremely well with field damage, there is some correlation particularly in years with extremely high damage. (Greene et al 2018)

Also, *Helicoverpa armigera* is a concern despite the fact that it has not yet been found in nearby Texas. We collected data from traps to determine baseline levels of *H. zea* and *H. virescens,* in part, to have a comparison if *H. armigera* makes an incursion into NM.

Four traps for *H. zea* and *H. virescens* were maintained in Artesia and in Las Cruces to evaluate populations in comparison to other areas and over time in New Mexico.

While we did have some captures of *H. virescens* in 2018 and in earlier trapping there were no captures in 2019 in either location. More surprising, there were zero captures of *H. zea* in traps in Artesia which is unprecedented but consistent with close to zero damage in nearby cotton fields.

Despite extremely low *H. zea* in our field plots and traps in Artesia it was not absent. Nearby commercial and research corn fields that were not VIP fields were all heavily infested. Also we did record captures of *H. zea* in traps in Las Cruces. Highest captures were somewhat late with the highest captures in September. The maximum captures were 13 in one week ending 9/27/19.



Okra Leaf Trial: Impact of Leaf Shape/Plant Architecture on crop microclimate and desiccation of lepidopterous eggs

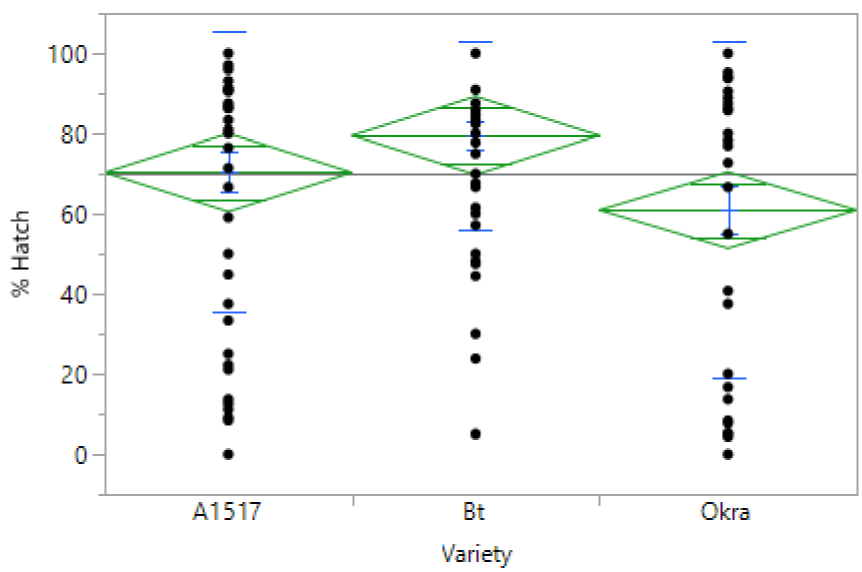
Previously low relative humidity was shown to affect bollworm egg hatch in laboratory and field trials in New Mexico. The effect of desiccation which increased with east west oriented rows and wider row spacing was not high enough to impress growers. However, with the recent release of okra leaf cottons this issue is worth revisiting.

Okra leaf cotton was found to have some impact on pink bollworm and boll weevil survival due to lower relative humidity in canopy. (Pieters and Bird 1977, Wilson 1986)**.** This lower relative humidity would likely reduce bollworm survival. (Pierce and Monk 2010) A number of okra leaf cotton varieties were recently registered which can be evaluated for impact on bollworm survival (Zhang, Cantrell, Hughes and Jones 2019). Okra leaf cotton could be a particularly good fit in West Texas and New Mexico due to our low ambient relative humidity. Relative humidity is often in the range of 15-20% which combined with moderately high temperatures, 95^{o} F, can cause extremely high mortality in bollworm eggs and larvae, with less than 1% survival under laboratory conditions. (Pierce and Yates 2001). Relative humidity in canopy for conventional varieties late season is much higher and is part of the reason we have issues with bollworm late season. Lower bollworm damage combined with high yields and good quality lint from Acala1517 genes would give growers additional varietal options and provide higher profits. When there is no need to use insecticides, growers will retain the dollars now used for the Bt technology fee. If there is sufficient demand perhaps we could revisit the grower-University cooperative that produced A1517 seed for growers in New Mexico and West Texas.

Bollworm eggs produced in the laboratory were used to evaluate potential desiccation in okra leaf cotton compared to two control cottons with standard shaped leaves. Bollworms were reared in the laboratory. Eggs laid on fabric were removed at 12 hours old with fabric cut to produce groups of approximately 30 eggs each. These were attached to leaves mid-canopy with 15 eggs masses per plot. After 48 hours, eggs were removed and monitored for hatching in the laboratory.

There was significantly less egg hatch in okra leaf cotton df 2,148 $F=3.6$ $P<0.02$ with 76% egg hatch in okra leaf cotton vs. 80-90% hatch in A1517 and the Bt cotton, DP1845 B3XF respectively which have conventional leaves. There was significantly higher egg hatch in Okra leaf at 72 hours and one conventional leaf Bt cotton cultivar with 48-56% hatch compared to 34% in our NM standard Acala 1517. Hatch rates were significantly higher in the A1517 at 96 hours reflecting the delay in hatching. While the effect was significant weather conditions were such that we anticipate another trial could show a greater impact.

There was no significant difference in temperature or relative humidity as recorded by dataloggers in the crop canopy so a light meter was used to look at possible differences in sunlight exposure in canopy. Total area of leaves was also compared and that data is being analyzed. Insects in each plot were sampled weekly and are being identified by graduate student Ivan Tellez.



Percent hatch of *H. zea* in 3 varieties of cotton

Comparison of *H. zea* egg Hatch in Okra vs Conventional Cotton Cultivars Over Time

Cultivar	% Hatch at:			
	72	96	120hr	Total hatch
A1517	34a	46a	0.5a	80ab
DP1845 B3XF	56b	33b	0.4a	90a
Okra Leaf	48b	28b	04a	76b

Numerous reports of insect resistance to Bt cotton are a growing concern. (Taillon et al 2018, Kerns et al 2018) The high cost of Bt cotton and variable pressure in New Mexico from year to year makes justification of this expense questionable if resistance levels are high, particularly when there are other options for control and most importantly since pink bollworm is now no longer a concern (Pierce et al 2013, Anon 2018). Insecticide rescue treatments are still an option. Predation is a typically a source of control of approximately 40-60% of bollworm eggs. Some cultural methods of control have been investigated by our program such as row orientation and row spacing had an impact on bollworm survival (Pierce and Monk 2010). However, these cultural control management options can be a hard sell to growers particularly when there is a demonstrable, but not dramatic impact.

Efficacy of Neonicotinoid Seed Treatments for Thrips in Seedling Cotton in NM

Optimal cotton production is often dependent on managing pre-flowering insect pests including thrips. Cotton damaged by these pests 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 trials in multiple locations.

Early-season pest management in cotton was previously primarily achieved with an in-furrow treatment of aldicarb (Temik®). In 2010, the Environmental Protection agency and Bayer CropScience reached an agreement to terminate production and use of aldicarb in the United States (EPA Newsroom, 2010). Growers had to adopt alternative practices for early-season pest management. Neonicotinoid insecticide seed treatments have become the primary solution managing early-season pests of cotton. Thiamethoxam and imidacloprid are two common systemic insecticide seed treatments applied to commercial cotton seed. Resistance to neonicotinoid seed treatments has been reported, particularly in the Southeastern US, thus it is important to evaluate efficacy in other regions. This project will continue to evaluate five seed treatments in conjunction with Texas A&M University (Vyavhare et al 2019).

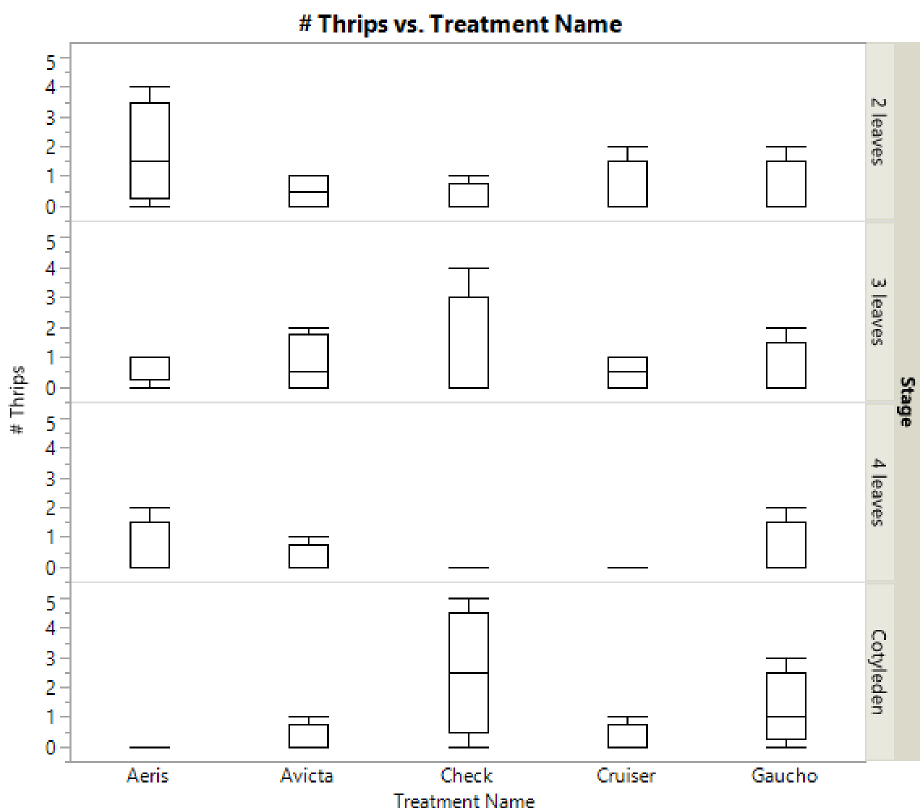
In cooperation with Texas A&M University a field trial wasl be conducted with multiple seed treatments in one variety DP161B2XF. Thrips will be sampled at cotyledon, 2, 3 and 4 true leaves with adults and immatures noted.

Results: There was a significant difference in thrip number only at the cotyledon stage. At the cotyledon stage there were ten time more thrips on the check seedings compared to the Avica and Guacho treatments and twice as many thrips as the Gaucho treatment.

Thrip numbers were low overall with a mean range of only 0-5 thrips /5 plants across all stages, cotyledon, 2, 3 and 4 leaf stages and all treatments.

Effect of seed treatment on thrip number at cotyledon stage.

Treatment	Mean # thrips	(s.e.)
check	2.5 a	1.0
Gaucho	1.25 ab	0.6
Avicta	0.25 ab	0.25
Cruiser	0.25 ab	0.25
Aeris	0 b	0

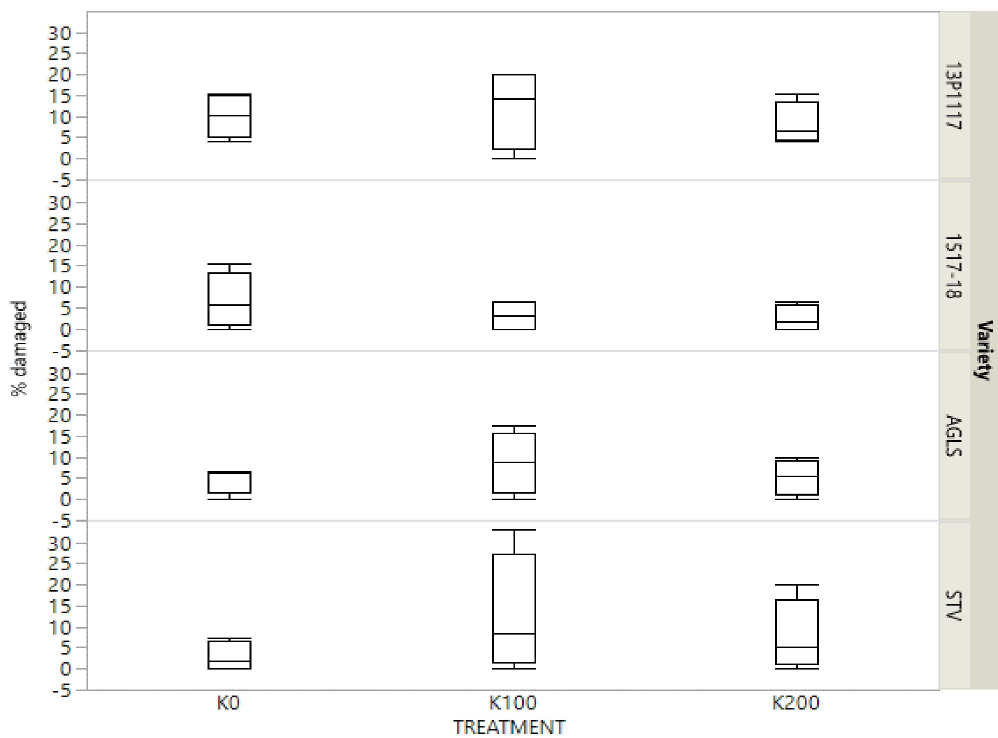


Thrips at different stages of seedling cotton in selected seed treatments

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 in 2018. In 2019 populations of bollworm were extremely low. There was no significant difference but the only damage was in two plots with no potassium treatment. There was no foliar damage noted.



Impact of potassium on square damage by *H. zea*

Effect of Potassium on Cotton Bollworm damage to squares in 2019

K_2O (Kg/ha)	Mean # squares damaged/50	Mean % squares damaged
0	0.5	1
50	0	0
100	0	0
200	0	0

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