2014 Extension Cotton Project Annual Report

Southwest Research and Extension Center, Altus

In cooperation with the Oklahoma State University Integrated Pest Management Program

2014 Extension Cotton Report

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An effective cotton integrated pest management (IPM) program includes all aspects of production. This report contains summarized data from various applied research trials and demonstrations that address many different cotton production components. The drought that began basically at the end of 2010 continues for the heart of cotton country in southwestern Oklahoma (Figure 1).

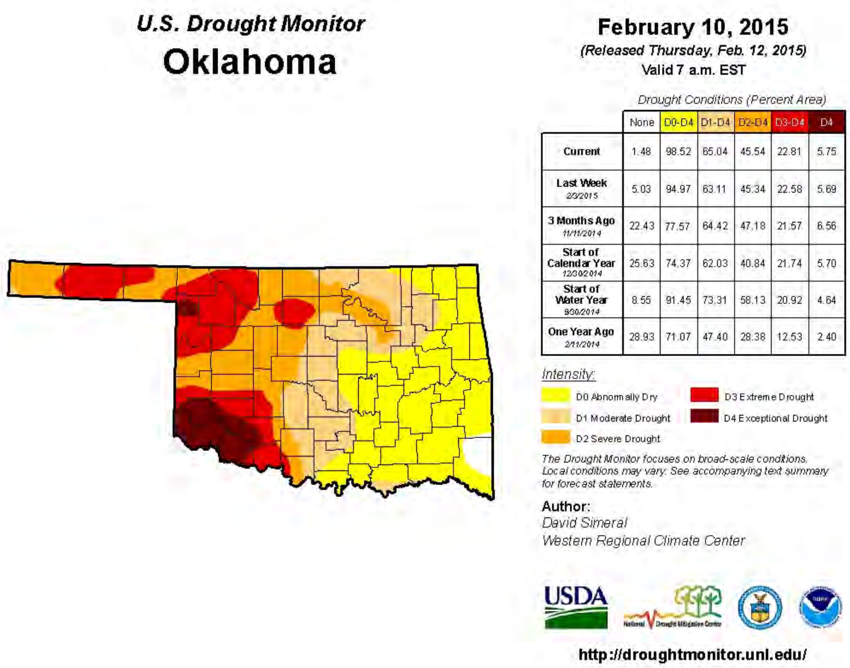

Figure 1. Oklahoma drought situation, February 10, 2015.

According to USDA-NASS, in 2014, 230,000 acres were planted with 210,000 acres expected to be harvested. This was a significant improvement over the 2013 crop year. Abandonment was due to extreme drought conditions in some areas. The continuing drought and lack of irrigation water in the Lugert-Altus Irrigation District contributed to abandoned acres. Other groundwater-based irrigated acreage was plagued by significantly reduced pumping capacity. Due to some timely summer rainfall, some growers in the Lugert-Altus Irrigation District were able to harvest many low yielding fields to contribute to the overall state production estimated by USDA-NASS at 235,000 bales – the highest production since 2010. As of February 13, 2015, a total of 226,432 bales had been classed by USDA-AMS at Abilene, TX. Average fiber quality has been good to excellent. The continuing Exceptional (D4) category drought in far southwestern Oklahoma (Harmon, Greer, Jackson, Tillman, Comanche, and Kiowa counties) is very serious. Significant, above average rainfall is needed to alleviate the exceptional drought situation.

The crop was planted later than usual but exceptional fall weather helped maturity. This was due to lack of early May rainfall, but by June, enough precipitation had been received for growers to initiate planting in most areas. Early thrips pressure developed in Tillman County and other small pockets throughout the state. Control sprays were very effective. Cotton fleahopper pressure was persistent and multiple control sprays were used in many fields. Stink bugs appeared late, but infestations were confined to only areas with adequate irrigation. Population trends, insect updates, and control tips were published in the Cotton Comments Newsletter and distributed to the state's cotton producers and consultants to help formulate management strategies to enhance profitability. Field surveys were conducted in 7 counties with a total of 19 fields. Insect pressure as well as plant development were recorded and reported in the newsletter.

The other good news is that the USDA-AMS Classing Office at Abilene is reporting that color and leaf grades, staple, micronaire, strength, uniformity, and bark contamination have all been good to excellent for many producers. This is based on classing results for about 221,000 bales of Oklahoma cotton classed through February 10, 79% have been color grades 11, 21 or 31, with 52% with color grade 11 or 21 – the best possible. Leaf grades have averaged 2.9 with 38% exhibiting leaf grade 1 or 2 – the best quality possible. Bark contamination is present in about 20% of the bales classed thus far. Staple (fiber length) has averaged 35.3 32nds. This is good considering the significant moisture stress encountered in August, and we have nearly one-fourth of the crop with a 37 or longer staple, with an additional 27% classed as a 36. Micronaire (a measure of maturity) averaged 4.4 units, with 81% in the 3.5-4.9 range. Currently our strength average is 31 g/tex, with nearly 83% classed as 30 g/tex or higher. It is of utmost importance that growers make good decisions with respect to varieties planted. The Extension cotton crop management program is critical to this success. Incidentally, the Oklahoma-ginned bales classed at Abilene thus far from the 2014 crop have the highest average staple and strength averages, and this again is a result of wise variety selection. The Abilene classing office serves east Texas, a portion of west Texas, Oklahoma, and Kansas.

We are very appreciative of the contributions made by the OSU IPM Program. Without their support and participation, much of this work would not be possible. We also appreciate the support from producers and ginners, County Extension Educators, the Oklahoma Cooperative Extension Service, and the Oklahoma Agricultural Experiment Station. Cotton Incorporated, through the Oklahoma State Support Committee, has also provided assistance through partial funding of several projects. We also appreciate the assistance of the Oklahoma Cotton Council, because their continued support of our educational programs is critical to our success. A thank you is extended to the following entities, whose specific contributions make it possible to maintain and expand our research and demonstration programs and distribute results.

Cotton Incorporated	Worrell Farms	Syngenta Crop Protection
Americot/NexGen	BASF Corporation	Bayer CropScience
Monsanto Company	Crop Production Services	Cheminova, Inc.
Dow AgroSciences	DuPont	Helena Chemical
Nichino America	Winfield Solutions	FMC

We appreciate the interest, cooperation and support of all those involved in the cotton industry in Oklahoma and encourage your comments and suggestions for the improvement of our programs. This report can be accessed via the Internet at the following websites: www.cotton.okstate.edu and www.ntokcotton.org.

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Roger Fischer - Frederick
Tony Cox – Wellington, TX
Kelly Horton – Hollis
Clint Abernathy - Altus
Gary Winsett – Altus
Humphreys Co-operative, Altus-Tipton
Cotton Growers Co-op, Altus
John McCullough - Tipton
Merlin Schantz - Hydro
Drew Darby - Duke
Harvey Schroeder - Oklahoma Cotton Council
Jack and Jake Damron – Delhi

Table of Contents

Variety Performance

2014 Extension On-Farm Variety Testing

Extension large-plot on-farm replicated cotton variety trials are an important component in modern germplasm evaluation. Producer-cooperator and industry support for these trials is substantial. These trials enable growers to observe the newest genetics and transgenic traits on their operations, under their management conditions and are planted and harvested with their equipment. Multiple sites have provided excellent information on which growers can base important variety selection decisions. The objective of this project was to evaluate multiple cotton varieties in producer-cooperator fields under irrigated and dryland management systems.

Eight large-plot trials were planted and harvested using grower equipment. The testing locations were Custer, Harmon, Tillman, Jackson, Beckham and Washita Counties. Most trials were established under no-till or strip-till conditions. For the Replicated Agronomic Cotton Evaluation (RACE) trials, typically 6-8 entries (one entry per brand name, plus a grower choice option) were planted at each site, with 3 replicates used. The Cotton Incorporated Core program provided direct support for two trials, the Enhanced Variety Trials, which contained up to 10 entries and 3 replicates (Custer and Harmon Counties). A West Texas Lee weigh wagon (for boll buggies) or Western Forage Systems platform scale (for round modules) was utilized to capture plot weights. At harvest, grab samples were taken from each plot and ginned at the Texas A&M AgriLife Research and Extension Center at Lubbock. Fiber samples were submitted to the Texas Tech University Fiber and Biopolymer Research Institute for high volume instrument (HVI) analysis. Color and leaf grades were set to 21 and 2, respectively, for each sample. HVI data were used to compute the Commodity Credit Corporation (CCC) Loan value for each sample. Final plant heights and visual estimates of storm resistance were taken prior to harvest.

Replicated trials are used in order to obtain multiple independent observations of each variety's performance in comparison with other entries. Statistical analyses of each characteristic reported are represented by “protected” LSD (least significant difference) values given at the bottom of each column in the table. If the difference between the characteristic of concern (i.e. yield, lint turnout, staple, etc) of any two varieties exceeds the LSD (0.05) value provided, then the chances are approximately 95 out of 100 that the difference is real and not a result of other factors such as random error.

The data indicated that in spite of the continuing severe drought situation in far southwestern counties, irrigated cotton performed very well in most locations in 2014. This can be attributed to some timely precipitation and cooler temperatures in July, and September and October cotton heat unit accumulation that was about 30% above normal.

Cultural practices and other information for each site are provided in Table 1. Data summaries for each location are provided in Tables 2-17. Summaries across irrigated locations for several important characteristics are provided in Tables 18-26. Summaries across dryland locations are provided in Tables 27-35.

Mean lint yields at all irrigated sites exceeded 2 bales/acre, and some sites had entries producing above 4 bales/acre. Lint yields from on-farm irrigated trials were generally a function of available water and delivery efficiency in these fields, but timely rainfall in June and July assisted in producing exceptional yields at some sites. Test average yields ranged from a low of 1249 lb/acre in a center-pivot irrigated trial to just under 1900 lb/acre in a sub-surface drip irrigated trial.

Net value/acre in this report is defined as lint loan value on a per acre basis plus seed value, which equals total potential income/acre. Total potential income/acre minus ginning cost/acre and seed and technology fees/acre then defines net value/acre. Net value/acre averaged $847/acre across all irrigated sites and ranged from a low of $623 to a high of $1083. Within-site differences were most expressed at the Harmon County location. When comparing the top and bottom entries, a difference of about $294/acre could be attributed to variety selection in this field in 2014. When the four common entries across locations in Beckham, Jackson, and Tillman Counties were compared, it is evident that the PhytoGen 333WRF entry was very competitive with NexGen 1511B2RF and Deltapine 1291B2RF. Across the 3 sites, the Croplan Genetics was about $95/acre less competitive than the PhytoGen 333WRF.

The three dryland no-till locations averaged about 541 lb/acre, and ranged from a low of 467 lb/acre to a high of 619 lb/acre. Moisture stress in August affected both yield and fiber quality at all dryland sites. Net value/acre averaged $242/acre across the three dryland sites and ranged from a low of $201 to a high of $276. Within-site differences were most expressed at the Jackson County location. When comparing the top and bottom entries, a difference of about $124/acre could be attributed to variety selection in this field in 2014. When the three common entries across locations in Washita, Jackson, and Tillman Counties were compared, the Deltapine 1044B2RF, NexGen 1511B2RF and Stoneville 4946GLB2 performed similarly.

Another important attribute producers should consider includes storm resistance. Storm resistance ratings were visually scored just prior to harvest. These ratings range from 1 (bolls loose, with considerable seedcotton loss) to 9 (bolls very tight, with no seedcotton loss). The degree of storm tolerance that a grower can accept can vary from one operation to another. The most important consideration is to be aware of the storm tolerance of varieties planted. This is a major component of risk management.

Plant height is another varietal characteristic that producers should investigate. The plant heights provided were measured near the end of the growing season, prior to harvest aid applications. Excessive rainfall and/or irrigation coupled with high nitrogen fertility can result in varieties producing large plants in spite of high doses of mepiquat based plant growth regulators.

Fiber quality among entries was generally good to excellent unless maturity or late season stress (on dryland) was encountered. The HVI data include several important fiber property measurements. Fiber length (staple when expressed as 32nds), micronaire, strength, and uniformity are the fiber properties reported which partially determine the price per pound for lint. Fiber length was measured as the upper half mean (in inches). Those measurements were also converted into 32nds to determine staple. Uniformity was obtained by dividing mean length (also measured in inches) by the upper half mean length and expressing the result as a percentage. Micronaire is actually a confounded measurement of both fiber fineness and maturity. Micronaire was measured in standard micronaire units. Fiber strength was measured in grams-force per tex on a “beard of fibers” during HVI analysis.

Higher values for lint yield, lint turnout, staple, strength, and uniformity are generally more desirable than lower ones. Micronaire is acceptable anywhere within the micronaire “base” range of 3.5 to 4.9 inclusive. The “premium” range is between 3.7 and 4.2 inclusive. If micronaire falls in the “discount” range (below 3.5 or above 4.9), the price per pound of lint is reduced. Penalties tend to be more severe for micronaire values below 3.5 (especially below 3.0) than for those above 4.9. Therefore, producers should probably select varieties with micronaire values toward the upper half of the range, rather than the lower.

The results from these trials indicate that variety selection in 2014 was very important at some sites. Differences in yields (lb/acre) between highest and lowest lint producers were 468, 285, 225, 354, and 425 among irrigated sites. This difference was 151, 232 and 144 lb/acre for the dryland sites.

ACKNOWLEDGEMENTS

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Table 1. 2014 Cultural information for Extension large plot trial sites.								
	Irrigated Cotton Inc Enhanced Variety		Irrigated RACE			Dryland RACE		
County-location	Custer - Hydro	Harmon - Hollis	Tillman - Tipton	Jackson - Duke	Beckham - Delhi	Washita - Elk City	Tillman - Hollister	Jackson - Altus
Cooperator	Merlin Schantz	Tony Cox	John McCullough	Drew Darby	Jack Damron	Danny Davis	Roger Fischer	Clint Abernathy
Tillage system	strip till	conventional till	conventional till	conventional till	strip till	no-till	no-till	no-till
Planting date	20-May	21-May	15-May	21-May	20-May	4-Jun	5-Jun	13-Jun
Seeding rate (seeds/acre)	48,000	58,000	45,000	52,000	35,000	28,000	26,000	28,000
Row spacing (inches)	36	40	40	40	40	40	40	38
Replicates	3	3	3	3	3	3	3	3
Harvested plot width (rows)	8	6	4	4	6	6	4	6
Harvested plot length (ft)	670	1,300	1,050	725	600	1,100	2490	1320
Harvest date	10-Nov	9-Dec	19-Nov	1-Nov	13-Nov	14-Nov	21-Nov	11-Nov
Comments	pivot irrigation	drip irrigation	furrow irrigation	furrow irrigation	pivot irrigation	good early	good early	good early
						season, late stress	season, late stress	season, late stress
Harvester type	stripper	moduling picker	picker	stripper	stripper	stripper	stripper	stripper
Entries	NG 1511 B2RF	NG 1511 B2RF	NG 1511 B2RF	NG 1511 B2RF	NG 1511 B2RF	NG 1511 B2RF	NG 1511 B2RF	NG 1511 B2RF
	FM 1830 GLT	FM 2334 GLT	FM 2334 GLT	FM 2334 GLT	FM 1830 GLT	FM 1830 GLT	FM 2334 GLT	FM 2334 GLT
	ST 4747 GLB2	ST 4946 GLB2	ST 4946 GLB2	ST 4946 GLB2	ST 4747 GLB2	ST 4946 GLB2	ST 4946 GLB2	ST 4946 GLB2
	PHY 339 WRF	PHY 333 WRF	PHY 333 WRF	PHY 333 WRF	PHY 333 WRF	PHY 339 WRF	PHY 499 WRF	PHY 499 WRF
	CG 3787 B2RF	DP 1321 B2RF	DP 1219 B2RF	DP 1219 B2RF	DP 1219 B2RF	DP 1044 B2RF	DP 1044 B2RF	DP 1044 B2RF
	DP 1044 B2RF	CG 3787 B2RF	CG 3787 B2RF	CG 3787 B2RF	CG 3787 B2RF			
	DP 0912 B2RF	DP 1044 B2RF						
	PHY 499 WRF	DP 1219 B2RF						
	FM 1740 B2F	PHY 499 WRF						
		FM 1740 B2F						
Grower's choice	DP 1321 B2RF	none	PHY 499 WRF	DP 1359 B2RF	PHY 499 WRF	DP 1410 B2RF	DP 1321 B2RF	DP 104 B2RF

Table 2. Harvest results from the Custer County irrigated Cotton Incorporated Enhanced Variety trial, Merlin Schantz Farm, Hydro, OK, 2014.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre ------------------------------						
FM1830GLT	34.2	47.0	4200	1436	1974	0.5615	807	168	974	126	76	772	a
NG1511B2RF	38.1	50.7	3663	1396	1857	0.4933	691	158	849	110	69	670	ab
PHY339WRF	34.6	48.4	3679	1273	1781	0.5440	694	151	845	110	71	664	ab
GCDP1321B2RF	35.6	49.2	3642	1297	1796	0.5320	689	153	842	109	74	659	ab
FM1740B2F	35.1	50.1	3708	1305	1858	0.5027	656	158	814	111	66	637	abc
DP0912B2RF	33.2	49.7	3636	1207	1803	0.5275	637	153	790	109	74	607	bc
ST4747GLB2	32.4	48.9	3739	1211	1828	0.5220	633	155	789	112	76	601	bc
CG3787B2RF	34.3	48.0	3344	1147	1605	0.5218	599	136	735	100	70	565	bc
DP1044B2RF	31.8	51.0	3558	1135	1815	0.4993	567	154	722	107	68	547	bc
PHY499WRF	34.0	46.0	3181	1082	1463	0.5067	549	124	674	96	71	507	c
Test average	34.3	48.9	3635	1249	1778	0.5211	652	151	803	109	72	623	
CV, %	4.2	3.0	10.2	10.6	10.4	3.9	12.4	10.4	11.9	10.1	--	13.6	
OSL	0.0035	0.0116	0.2087	0.0712	0.1357	0.0133	0.0432	0.1375	0.0638	0.2050	--	0.0585	
LSD	2.5	2.6	NS	187†	NS	0.0345	138	NS	136 †	NS	--	120†	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$170/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 3. Harvest results from the Custer County irrigated Cotton Incorporated Enhanced Variety trial, Merlin Schantz Farm, Hydro, OK, 2014.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG 3787B2RF	31,460	36.5	6.0	4.6	33.1	28.6	80.3
DP 0912B2RF	42,108	35.6	4.7	4.7	33.6	28.6	80.7
DP 1044B2RF	37,752	34.6	5.7	4.4	32.2	28.3	80.1
FM 1740B2F	45,012	34.0	4.7	4.2	32.5	28.3	79.4
FM 1830GLT	43,560	30.7	4.7	4.2	35.3	29.9	80.7
GC DP 1321B2RF	45,012	35.9	5.7	4.7	33.6	30.1	80.8
NG 1511B2RF	34,364	31.8	5.7	4.6	32.0	29.4	79.0
PHY 339WRF	41,624	38.5	3.7	3.6	34.8	30.4	80.2
PHY 499WRF	40,656	39.9	4.7	4.2	32.7	30.5	79.0
ST 4747GLB2	45,012	36.8	4.3	3.8	34.3	25.7	78.2
Test average	40,656	35.4	5.0	4.3	33.4	29.0	79.8
CV, %	13.0	7.9	11.6	5.4	2.3	3.4	1.0
OSL	0.0537	0.0220	0.0017	0.0002	0.0005	0.0005	0.014
LSD	7,466 †	4.8	1.0	0.4	1.3	1.7	1.4

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 4. Harvest results from the Harmon County irrigated Cotton Incorporated Enhanced Variety trial, Tony Cox Farm, Hollis, OK, 2014.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre -----------------------------						
PHY 333WRF	39.4	56.1	5311	2093	2979	0.5785	1210	253	1463	159	86	1218	a
ST 4946GLB2	36.4	58.9	5523	2010	3259	0.5753	1157	277	1434	165	92	1176	a
NG 1511B2RF	35.6	48.8	5495	1956	2682	0.5798	1134	228	1362	165	83	1114	b
DP 1321B2RF	34.7	53.0	5518	1915	2924	0.5798	1110	249	1359	165	89	1105	b
FM 2334GLT	36.3	51.4	5294	1922	2721	0.5810	1117	231	1348	159	92	1097	b
PHY 499WRF	38.6	53.6	4937	1901	2646	0.5803	1103	225	1328	148	86	1094	b
CG 3787B2RF	35.0	50.3	5467	1914	2750	0.5763	1103	234	1337	164	84	1088	b
FM1740B2F	32.8	46.1	5579	1830	2572	0.5747	1052	219	1270	167	80	1023	c
DP 1044B2RF	33.7	59.2	5087	1715	3012	0.5618	963	256	1219	153	81	986	c
DP 1219B2RF	32.5	54.7	5134	1668	2808	0.5518	921	238	1160	154	81	924	d
Test average	35.5	53.2	5335	1892	2835	0.5739	1087	241	1328	160	85	1083	
CV, %	6.7	6.3	2.7	2.9	2.7	1.7	3.1	2.7	3.0	2.7	--	3.3	
OSL	0.0313	0.0024	0.0002	<0.0001	<0.0001	0.0289	<0.0001	<0.0001	<0.0001	0.0003	--	<0.0001	
LSD	4.1	5.8	246	94	133	0.1690	57	11	67	7	--	61	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$170/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 5. Harvest results from the Harmon County irrigated Cotton Incorporated Enhanced Variety trial, Tony Cox Farm, Hollis, OK, 2014.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG 3787B2RF	26,136	42.6	3.3	3.8	36.6	28.3	82.2
DP 1044B2RF	19,602	39.8	5.3	3.4	36.0	28.9	80.9
DP 1219B2RF	35,719	48.2	2.7	3.2	37.4	30.3	80.0
DP 1321B2RF	27,879	40.1	2.3	3.9	36.8	30.1	82.1
FM 1740B2F	29,621	36.0	4.3	3.8	35.7	28.9	81.4
FM 2334GLT	25,700	33.3	4.0	3.8	38.1	30.7	82.1
NG 1511B2RF	24,829	40.2	3.0	4.0	36.6	30.7	82.6
PHY 333WRF	35,284	41.6	5.3	3.8	37.8	29.6	82.0
PHY 499WRF	34,848	45.4	3.3	3.6	36.8	31.0	82.5
ST 4946GLB2	27,443	42.6	5.7	3.8	36.2	29.3	81.4
Test average	28,706	41.0	3.9	3.7	36.8	29.8	81.7
CV, %	14.6	5.9	13.7	4.5	1.2	2.4	0.9
OSL	0.0026	<0.0001	<0.0001	0.0013	<0.0001	0.0023	0.0066
LSD	7,192	4.2	0.9	0.3	0.8	1.3	1.2

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 6. Harvest results from the Tillman County irrigated RACE trial, John McCullough Farm, Tipton, OK, 2014.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	-------------------------- $/acre ----------------------------						
FM 2334GLT	37.2	55.4	4259	1589	2359	0.5815	924	201	1124	128	71	925	a
DP 1219B2RF	35.8	57.6	4310	1547	2483	0.5758	892	211	1103	129	63	911	a
ST 4946GLB2	36.2	56.7	4080	1477	2309	0.5785	854	196	1051	122	71	857	a
GC PHY 499WRF	37.3	55.0	3888	1450	2139	0.5747	834	182	1015	117	67	832	a
CG 3787B2RF	36.7	54.7	3807	1397	2086	0.5777	807	177	984	114	67	804	a
PHY 333WRF	37.4	54.3	3646	1364	1980	0.5752	784	168	953	109	67	777	a
NG 1511B2RF	38.1	54.6	3584	1366	1957	0.5623	770	167	936	108	64	764	a
Test average	37.0	55.5	3939	1456	2188	0.5751	838	186	1024	118	67	839	
CV, %	1.8	2.3	8.6	8.5	8.8	1.5	9.0	8.8	9.0	8.6	--	9.7	
OSL	0.0151	0.0764	0.1260	0.2510	0.0403	0.2431	0.2105	0.0393	0.1683	0.1243	--	0.1866	
LSD	1.2	1.9†	NS	NS	344	NS	NS	29	NS	NS	--	NS	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$170/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 7. Harvest results from the Tillman County irrigated RACE trial, John McCullough Farm, Tipton, OK, 2014.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG 3787B2RF	37,026	33.9	5.3	4.5	36.2	30.7	82.2
DP 1219B2RF	41,382	33.2	4.3	4.3	36.2	33.2	81.2
FM 2334GLT	37,897	29.7	5.7	4.5	38.5	32.4	82.7
GC PHY 499WRF	37,462	34.0	5.0	4.5	35.5	31.9	82.3
NG 1511B2RF	37,897	31.5	4.7	4.5	35.0	31.3	81.9
PHY 333WRF	38,333	34.7	5.3	4.3	36.5	31.2	81.8
ST 4946GLB2	38,333	30.4	7.7	4.5	36.1	32.8	82.5
Test average	38,333	32.5	5.4	4.4	36.3	31.9	82.1
CV, %	7.9	4.1	9.4	5.0	2.3	3.2	0.9
OSL	0.6771	0.0029	0.0001	0.6250	0.0066	0.0875	0.2986
LSD	NS	2.4	0.9	NS	1.5	1.5†	NS

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 8. Harvest results from the Jackson County irrigated RACE trial, Drew Darby Farm, Duke, OK, 2014.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre -----------------------------						
ST 4946GLB2	36.6	49.1	3939	1442	1934	0.5453	786	164	951	118	83	750	a
PHY 333WRF	36.0	46.3	3841	1383	1779	0.5600	774	151	925	115	77	733	a
FM 2334GLT	38.7	47.6	3478	1346	1656	0.5758	775	141	916	104	83	729	a
GC DP 1359B2RF	36.6	47.5	3713	1359	1764	0.5582	759	150	909	111	80	717	a
DP 1219B2RF	34.9	49.4	3752	1309	1854	0.5495	719	157	877	113	73	691	ab
NG 1511B2RF	36.3	44.6	3563	1297	1589	0.5048	655	135	790	107	75	609	bc
CG 3787B2RF	35.5	45.9	3261	1157	1497	0.5443	632	127	759	98	76	585	c
Test average	36.4	47.2	3650	1328	1725	0.5483	729	147	875	109	78	688	
CV, %	3.7	3.5	5.0	5.0	5.0	3.3	7.2	4.9	6.8	5.1	--	7.9	
OSL	0.0971	0.0402	0.0100	0.0065	0.0005	0.0149	0.0161	0.0006	0.0133	0.0107	--	0.0152	
LSD	2.0†	3.0	326	118	152	0.0326	94	13	106	10	--	96	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$170/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 9. Harvest results from the Jackson County irrigated RACE trial, Drew Darby Farm, Duke, OK, 2014.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
ST 4946GLB2	36,155	29.1	5.3	4.7	34.4	27.0	80.9
PHY 333WRF	46,609	31.3	4.7	4.5	34.8	30.4	80.2
FM 2334GLT	37,897	30.6	5.3	4.8	36.5	29.6	82.0
GC DP 1359B2RF	41,818	30.9	6.0	4.7	35.1	31.1	80.8
DP 1219B2RF	45,738	30.1	4.7	4.9	33.0	29.4	81.0
NG 1511B2RF	43,125	30.2	5.0	4.5	34.9	28.2	80.5
CG 3787B2RF	46,609	28.4	6.3	4.8	34.3	30.2	80.5
Test average	42,564	30.1	5.3	4.7	34.7	29.4	80.8
CV, %	8.8	8.5	9.3	2.7	2.1	3.6	1.2
OSL	0.0242	0.8162	0.0089	0.0141	0.0037	0.0065	0.4019
LSD	6,692	NS	0.9	0.2	1.3	1.9	NS

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 10. Harvest results from the Beckham County irrigated RACE trial, Jack Damron Farm, Delhi, OK, 2014.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	---------------------------- $/acre ------------------------------						
PHY 333WRF	33.3	47.8	5677	1891	2720	0.5798	1096	231	1327	170	52	1105	a
NG 1511B2RF	35.1	46.6	5597	1965	2608	0.5578	1096	222	1317	168	50	1099	a
GC PHY 499WRF	34.4	47.6	5467	1881	2602	0.5630	1060	221	1281	164	52	1065	ab
FM 1830GLT	34.9	45.8	4983	1739	2282	0.5792	1007	194	1201	149	56	996	bc
CG 3787B2RF	32.8	47.3	5169	1696	2440	0.5720	970	207	1178	155	51	972	c
DP 1219B2RF	31.6	46.5	5321	1682	2474	0.5720	962	211	1172	160	49	963	c
ST 4747GLB2	28.8	43.9	5198	1497	2282	0.5660	847	194	1042	156	56	830	d
Test average	33.0	46.5	5345	1764	2487	0.5700	1005	212	1217	160	52	1004	
CV, %	5.8	5.1	3.8	3.9	3.9	1.8	4.5	4.0	4.3	3.9	--	4.7	
OSL	0.019	0.4762	0.0139	<0.0001	0.0007	0.1720	0.0002	0.0008	0.0003	0.0145	--	0.0001	
LSD	3.4	NS	366	121	173	NS	80	15	94	11	--	83	

For net value/acre, means within a column with the same letter are not significantly different.

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Note: some columns may not add up due to rounding error.

Assumes:

$3.00/cwt ginning cost.

$170/ton for seed.

Value for lint based on CCC loan value from grab samples and FBRI HVI results.

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 11. Harvest results from the Beckham County irrigated RACE trial, Jack Damron Farm, Delhi, OK, 2014.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG 3787B2RF	28,750	35.1	4.7	4.1	35.8	29.4	81.4
DP 1219B2RF	30,492	36.7	4.0	4.0	35.4	31.5	80.1
FM 1830GLT	34,412	30.6	4.3	4.1	36.5	32.0	81.0
GC PHY 499WRF	31,799	38.6	4.7	4.1	35.0	31.3	81.5
NG 1511B2RF	31,799	34.2	4.3	4.5	34.5	31.0	81.4
PHY 333WRF	33,105	34.3	3.3	4.0	36.5	30.7	81.6
ST 4747GLB2	34,412	29.8	5.3	3.8	35.8	27.9	79.9
Test average	32,110	34.2	4.4	4.1	35.6	30.5	81.0
CV, %	14.0	9.8	13.0	4.6	1.5	3.1	0.8
OSL	0.6994	0.0718	0.0291	0.0388	0.0038	0.0028	0.0274
LSD	NS	4.9†	1.0	0.3	0.9	1.7	1.1

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 12. Harvest results from the Washita County dryland RACE trial, Danny Davis Farm, Elk City, OK, 2014.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	---------------------------- $/acre ------------------------------						
ST 4946GLB2	38.0	50.0	1460	555	730	0.4875	271	62	333	44	44	244	a
GC DP 1410B2RF	35.0	47.4	1321	461	627	0.4960	229	53	282	40	42	201	b
PHY 339WRF	35.1	45.8	1298	455	594	0.5045	230	51	280	39	42	200	b
NG 1511B2RF	37.8	47.1	1237	467	582	0.4842	226	50	276	37	40	198	bc
DP 1044B2RF	36.3	50.6	1266	459	641	0.4640	213	54	267	38	39	190	bc
FM 1830GLT	36.8	47.7	1098	404	524	0.5080	205	45	250	33	44	172	c
Test average	36.5	48.1	1280	467	616	0.4907	229	52	281	38	42	201	
CV, %	3.3	2.1	5.5	5.4	5.6	2.8	6.2	5.3	5.8	5.8	--	7.4	
OSL	0.0434	0.0012	0.0022	0.0008	0.0004	0.0286	0.0033	0.0004	0.0022	0.0026	--	0.0033	
LSD	2.2	1.8	127	46	60	0.0251	26	5	30	4	--	27	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$170/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 13. Harvest results from the Washita County dryland RACE trial, Danny Davis Farm, Elk City, OK, 2014.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
DP 1044B2RF	16,988	29.9	5.0	5.0	31.0	29.3	78.7
FM 1830GLT	20,909	28.6	4.3	4.2	33.0	28.8	78.8
GC DP 1410B2RF	20,909	29.5	5.0	4.2	32.5	28.2	77.6
NG 1511B2RF	20,473	32.1	5.3	4.5	31.6	29.6	78.7
PHY 339WRF	21,780	34.3	4.7	3.7	32.5	30.6	78.6
ST 4946GLB2	20,473	29.7	6.0	4.2	30.8	29.3	79.2
Test average	20,255	30.7	5.1	4.3	31.9	29.3	78.6
CV, %	7.0	4.5	9.3	5.3	1.9	2.8	1.4
OSL	0.0256	0.0044	0.0215	0.0009	0.0061	0.0819	0.6133
LSD	2,568	2.5	0.9	0.4	1.1	1.2 †	NS

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 14. Harvest results from the Tillman County dryland RACE trial, Roger Fischer Farm, Hollister, OK, 2014.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre ------------------------------						
NG 1511B2RF	37.0	49.3	1809	669	892	0.4678	313	76	389	54	37	297	a
GC DP 1321B2RF	37.0	48.8	1686	624	823	0.4983	311	70	381	50	40	290	a
DP 1044B2RF	34.0	48.3	1907	648	921	0.4662	302	78	380	57	37	286	a
PHY 499WRF	37.2	48.3	1688	628	816	0.4840	303	69	373	51	39	284	a
ST 4946GLB2	34.4	50.0	1807	622	904	0.4613	287	77	364	54	41	269	a
FM 2334GLT	34.8	45.9	1508	525	691	0.4843	255	59	313	45	41	227	b
Test average	35.7	48.4	1734	619	841	0.4770	295	71	367	52	39	276	
CV, %	3.2	3.0	4.4	4.4	4.4	5.1	6.3	4.2	5.7	4.1	--	7.0	
OSL	0.0143	0.0724	0.0012	0.0012	0.0002	0.4518	0.0266	0.0001	0.0128	0.0008	--	0.0118	
LSD	2.1	2.2†	139	50	68	NS	34	5	38	4	--	35	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$170/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 15. Harvest results from the Tillman County dryland RACE trial, Roger Fischer Farm, Hollister, OK, 2014.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
DP 1044B2RF	17,859	28.1	5.3	5.4	32.5	29.2	80.4
FM 2334GLT	16,988	26.3	4.3	5.3	34.3	28.5	80.8
GC DP 1321B2RF	16,988	30.6	5.0	5.3	32.1	29.3	79.5
NG 1511B2RF	17,424	29.4	5.0	5.3	32.4	29.2	79.3
PHY 499WRF	16,553	31.7	4.7	5.3	32.9	31.4	81.1
ST 4946GLB2	16,553	29.9	5.7	5.4	33.5	31.1	81.2
Test average	17,061	29.3	5.0	5.3	32.9	29.8	80.4
CV, %	5.9	6.3	9.7	1.4	2.9	4.4	1.4
OSL	0.5899	0.0560	0.0741	0.2269	0.1287	0.1215	0.2848
LSD	NS	2.7†	0.7†	NS	NS	NS	NS

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 16. Harvest results from the Jackson County dryland RACE trial, Clint Abernathy Farm, Altus, OK, 2014.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre -----------------------------						
DP 1044B2RF	34.3	52.5	1861	638	977	0.5117	327	83	410	56	40	314	a
NG 1511B2RF	37.5	49.7	1519	570	755	0.4812	273	64	338	45	40	252	b
PHY 499WRF	36.0	48.6	1540	554	748	0.4945	275	64	338	46	42	250	b
FM 2334GLT	38.6	51.1	1347	520	688	0.5323	277	59	335	40	45	250	b
ST 4946GLB2	36.2	52.4	1497	542	784	0.4972	269	67	336	45	45	247	b
GC DP 104B2RF	31.1	54.0	1305	406	703	0.5133	208	60	268	39	40	190	c
Test average	35.6	51.4	1511	538	776	0.5050	272	66	338	45	42	250	
CV, %	4.2	4.9	4.1	4.2	4.1	2.8	4.6	4.1	4.4	4.3	--	5.3	
OSL	0.0012	0.1857	<0.0001	<0.0001	<0.0001	0.0172	<0.0001	<0.0001	<0.0001	<0.0001	--	<0.0001	
LSD	2.7	NS	113	41	58	0.0258	23	5	27	4	--	24	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$170/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 17. Harvest results from the Jackson County dryland RACE trial, Clint Abernathy Farm, Altus, OK, 2014.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
DP 1044B2RF	22,468	27.7	8.0	5.0	33.9	30.7	81.4
FM 2334GLT	23,844	23.1	6.7	5.2	34.8	30.5	81.4
GC DP 104B2RF	24,761	24.2	7.0	4.7	32.6	31.5	81.7
NG 1511B2RF	23,385	29.8	6.0	5.1	32.7	31.2	80.1
PHY 499WRF	26,481	27.9	7.0	5.2	33.3	31.8	81.2
ST 4946GLB2	23,385	26.4	7.3	5.2	33.8	31.4	81.6
Test average	24,054	26.5	7.0	5.1	33.5	31.2	81.2
CV, %	6.2	6.8	10.1	2.7	1.2	2.5	0.5
OSL	0.0908	0.0090	0.0877	0.0066	0.0006	0.3783	0.0093
LSD	2219†	3.3	1.0†	0.3	0.7	NS	0.8

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 18. Lint yield results from the Extension irrigated RACE trials, 2014.

County ==>	Beckham	Jackson	Tillman	Custer	Harmon	3-Site
Irrigation Type ==>	Pivot	Furrow	Furrow	Pivot	Drip	Mean
Location ==>	Delhi	Duke	Tipton	Hydro	Hollis	for Common
Cooperator ==>	Damron	Darby	McCullough	Schantz	Cox	Entries
Entry	-----------------------------------	Lint yield (lb/acre)	-----------------------------------			
CG 3787 B2RF	1696	1157	1397	1147	1914	1417
DP 0912 B2RF	--	--	--	1207	--	
DP 1044 B2RF	--	--	--	1135	1715	
DP 1219 B2RF	1682	1309	1547	--	1668	1513
DP 1321 B2RF	--	--	--	1297	1915	
DP 1359 B2RF	--	1359	--	--	--	
FM 1740 B2F	--	--	--	1305	1830	
FM 1830 GLT	1739	--	--	1436	--	
FM 2334 GLT	--	1346	1589	--	1922	
NG 1511 B2RF	1965	1297	1366	1396	1956	1543
PHY 333 WRF	1891	1383	1364	--	2093	1546
PHY 339 WRF	--	--	--	1273	--	
PHY 499 WRF	1881	--	1450	1082	1901	
ST 4747 GLB2	1497	--	--	1211	--	
ST 4946 GLB2	--	1442	1477	--	2010	
Test average	1764	1328	1456	1249	1892	1505
CV, %	3.9	5.0	8.5	10.6	2.9	
OSL	<0.0001	0.0065	0.2510	0.0712	<0.0001	
LSD	121	118	NS	187†	94	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Table 19. Storm resistance results from the Extension irrigated RACE trials, 2014.

County ==>	Beckham	Jackson	Tillman	Custer	Harmon	3-Site
Irrigation Type ==>	Pivot	Furrow	Furrow	Pivot	Drip	Mean
Location ==>	Delhi	Duke	Tipton	Hydro	Hollis	for Common
Cooperator ==>	Damron	Darby	McCullough	Schantz	Cox	Entries
Entry	Storm resistance (visual rating: 1 loose, 9 tight)					
CG 3787 B2RF	4.7	5.3	5.3	6.0	3.3	5.1
DP 0912 B2RF	--	--	--	4.7	--	
DP 1044 B2RF	--	--	--	5.7	5.3	
DP 1219 B2RF	4.0	4.7	4.3	--	2.7	4.3
DP 1321 B2RF	--	--	--	5.7	2.3	
DP 1359 B2RF	--	6.0	--	--	--	
FM 1740 B2F	--	--	--	4.7	4.3	
FM 1830 GLT	4.3	--	--	4.7	--	
FM 2334 GLT	--	5.3	5.7	--	4.0	
NG 1511 B2RF	4.3	4.7	4.7	5.7	3.0	4.6
PHY 333 WRF	3.3	5.0	5.3	--	5.3	4.5
PHY 339 WRF	--	--	--	3.7	--	
PHY 499 WRF	4.7	--	5.0	4.7	3.3	
ST 4747 GLB2	5.3	--	--	4.3	--	
ST 4946 GLB2	--	6.3	7.7	--	5.7	
Test average	4.4	5.3	5.4	5.0	3.9	4.6
CV, %	13.0	9.3	9.4	11.6	13.7	
OSL	0.0291	0.0089	0.0001	0.0017	<0.0001	
LSD	1.0	0.9	0.9	1.0	0.9	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level.

Table 20. Plant height results from the Extension irrigated RACE trials, 2014.

County ==>	Beckham	Jackson	Tillman	Custer	Harmon	3-Site
Irrigation Type ==>	Pivot	Furrow	Furrow	Pivot	Drip	Mean
Location ==>	Delhi	Duke	Tipton	Hydro	Hollis	for Common
Cooperator ==>	Damron	Darby	McCullough	Schantz	Cox	Entries
Entry	--- Plant height (inches) --					
CG 3787 B2RF	35.1	29.1	33.9	36.5	42.6	32.7
DP 0912 B2RF	--	--	--	35.6	--	
DP 1044 B2RF	--	--	--	34.6	39.8	
DP 1219 B2RF	36.7	31.3	33.2	--	48.2	33.7
DP 1321 B2RF	--	--	--	35.9	40.1	
DP 1359 B2RF	--	30.9	--	--	--	
FM 1740 B2F	--	--	--	34.0	36.0	
FM 1830 GLT	30.6	--	--	30.7	--	
FM 2334 GLT	--	30.6	29.7	--	33.3	
NG 1511 B2RF	34.2	30.1	31.5	31.8	40.2	31.9
PHY 333 WRF	34.3	30.2	34.7	--	41.6	33.1
PHY 339 WRF	--	--	--	38.5	--	
PHY 499 WRF	38.6	--	34.0	39.9	45.4	
ST 4747 GLB2	29.8	--	--	36.8	--	
ST 4946 GLB2	--	28.4	30.4	--	42.6	
Test average	34.2	30.1	32.5	35.4	41.0	32.9
CV, %	9.8	8.5	4.1	7.9	5.9	
OSL	0.0718	0.8162	0.0029	0.0220	<0.0001	
LSD	4.9†	NS	2.4	4.8	4.2	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Table 21. Loan value results from the Extension irrigated RACE trials, 2014.

County ==>	Beckham	Jackson	Tillman	Custer	Harmon	3-Site
Irrigation Type ==>	Pivot	Furrow	Furrow	Pivot	Drip	Mean
Location ==>	Delhi	Duke	Tipton	Hydro	Hollis	for Common
Cooperator ==>	Damron	Darby	McCullough	Schantz	Cox	Entries
Entry	---------- Loan value ($/lb) ----------					
CG 3787 B2RF	0.5720	0.5443	0.5777	0.5218	0.5763	0.5647
DP 0912 B2RF	--	--	--	0.5275	--	
DP 1044 B2RF	--	--	--	0.4993	0.5618	
DP 1219 B2RF	0.5720	0.5495	0.5758	--	0.5518	0.5658
DP 1321 B2RF	--	--	--	0.5320	0.5798	
DP 1359 B2RF	--	0.5582	--	--	--	
FM 1740 B2F	--	--	--	0.5027	0.5747	
FM 1830 GLT	0.5792	--	--	0.5615	--	
FM 2334 GLT	--	0.5758	0.5815	--	0.5810	
NG 1511 B2RF	0.5578	0.5048	0.5623	0.4933	0.5798	0.5416
PHY 333 WRF	0.5798	0.5600	0.5752	--	0.5785	0.5717
PHY 339 WRF	--	--	--	0.5440	--	
PHY 499 WRF	0.5630	--	0.5747	0.5067	0.5803	
ST 4747 GLB2	0.5660	--	--	0.5220	--	
ST 4946 GLB2	--	0.5453	0.5785	--	0.5753	
Test average	0.5700	0.5483	0.5751	0.5211	0.5739	0.5609
CV, %	1.8	3.3	1.5	3.9	1.7	
OSL	0.1720	0.0149	0.2431	0.0133	0.0289	
LSD	NS	0.0326	NS	0.0345	0.1690	

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, NS - not significant.
Note: Color grades set to 21, leaf grades set to 2 for entire trial.

Table 22. Net value results from the Extension irrigated RACE trials, 2014.

County ==>	Beckham	Jackson	Tillman	Custer	Harmon	3-Site
Irrigation Type ==>	Pivot	Furrow	Furrow	Pivot	Drip	Mean
Location ==>	Delhi	Duke	Tipton	Hydro	Hollis	for Common
Cooperator ==>	Damron	Darby	McCullough	Schantz	Cox	Entries
Entry	--- Net value ($/acre) --					
CG 3787 B2RF	972	585	804	565	1088	787
DP 0912 B2RF	--	--	--	607	--	
DP 1044 B2RF	--	--	--	547	986	
DP 1219 B2RF	963	691	911	--	924	855
DP 1321 B2RF	--	--	--	659	1105	
DP 1359 B2RF	--	717	--	--	--	
FM 1740 B2F	--	--	--	637	1023	
FM 1830 GLT	996	--	--	772	--	
FM 2334 GLT	--	729	925	--	1097	
NG 1511 B2RF	1099	609	764	670	1114	824
PHY 333 WRF	1105	733	777	--	1218	872
PHY 339 WRF	--	--	--	664	--	
PHY 499 WRF	1065	--	832	507	1094	
ST 4747 GLB2	830	--	--	601	--	
ST 4946 GLB2	--	750	857	--	1176	
Test average	1004	688	839	623	1083	834
CV, %	4.7	7.9	9.7	13.6	3.3	
OSL	0.0001	0.0152	0.1866	0.0585	<0.0001	
LSD	83	96	NS	120 †	61	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Table 23. MIcronaire results from the Extension irrigated RACE trials, 2014.

County ==>	Beckham	Jackson	Tillman	Custer	Harmon	3-Site
Irrigation Type ==>	Pivot	Furrow	Furrow	Pivot	Drip	Mean
Location ==>	Delhi	Duke	Tipton	Hydro	Hollis	for Common
Cooperator ==>	Damron	Darby	McCullough	Schantz	Cox	Entries
Entry	-- Micronaire (units)					--
CG 3787 B2RF	4.1	4.7	4.5	4.6	3.8	4.4
DP 0912 B2RF	--	--	--	4.7	--	
DP 1044 B2RF	--	--	--	4.4	3.4	
DP 1219 B2RF	4.0	4.5	4.3	--	3.2	4.3
DP 1321 B2RF	--	--	--	4.7	3.9	
DP 1359 B2RF	--	4.7	--	--	--	
FM 1740 B2F	--	--	--	4.2	3.8	
FM 1830 GLT	4.1	--	--	4.2	--	
FM 2334 GLT	--	4.8	4.5	--	3.8	
NG 1511 B2RF	4.5	4.9	4.5	4.6	4.0	4.6
PHY 333 WRF	4.0	4.5	4.3	--	3.8	4.3
PHY 339 WRF	--	--	--	3.6	--	
PHY 499 WRF	4.1	--	4.5	4.2	3.6	
ST 4747 GLB2	3.8	--	--	3.8	--	
ST 4946 GLB2	--	4.8	4.5	--	3.8	
Test average	4.1	4.7	4.4	4.3	3.7	4.4
CV, %	4.6	2.7	5.0	5.4	4.5	
OSL	0.0388	0.0141	0.6250	0.0002	0.0013	
LSD	0.3	0.2	NS	0.4	0.3	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, NS - not significant.

Table 24. Staple results from the Extension irrigated RACE trials, 2014.

County ==>	Beckham	Jackson	Tillman	Custer	Harmon	3-Site
Irrigation Type ==>	Pivot	Furrow	Furrow	Pivot	Drip	Mean
Location ==>	Delhi	Duke	Tipton	Hydro	Hollis	for Common
Cooperator ==>	Damron	Darby	McCullough	Schantz	Cox	Entries
Entry	----------	----------	Staple (32nds inch)	----------	----------	
CG 3787 B2RF	35.8	34.4	36.2	33.1	36.6	35.5
DP 0912 B2RF	--	--	--	33.6	--	
DP 1044 B2RF	--	--	--	32.2	36.0	
DP 1219 B2RF	35.4	34.8	36.2	--	37.4	35.5
DP 1321 B2RF	--	--	--	33.6	36.8	
DP 1359 B2RF	--	35.1	--	--	--	
FM 1740 B2F	--	--	--	32.5	35.7	
FM 1830 GLT	36.5	--	--	35.3	--	
FM 2334 GLT	--	36.5	38.5	--	38.1	
NG 1511 B2RF	34.5	33.0	35.0	32.0	36.6	34.2
PHY 333 WRF	36.5	34.9	36.5	--	37.8	36.0
PHY 339 WRF	--	--	--	34.8	--	
PHY 499 WRF	35.0	--	35.5	32.7	36.8	
ST 4747 GLB2	35.8	--	--	34.3	--	
ST 4946 GLB2	--	34.3	36.1	--	36.2	
Test average	35.6	34.7	36.3	33.4	36.8	35.3
CV, %	1.5	2.1	2.3	2.3	1.2	
OSL	0.0038	0.0037	0.0066	0.0005	<0.0001	
LSD	0.9	1.3	1.5	1.3	0.8	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level.

Table 25. Strength results from the Extension irrigated RACE trials, 2014.

County ==>	Beckham	Jackson	Tillman	Custer	Harmon	3-Site
Irrigation Type ==>	Pivot	Furrow	Furrow	Pivot	Drip	Mean
Location ==>	Delhi	Duke	Tipton	Hydro	Hollis	for Common
Cooperator ==>	Damron	Darby	McCullough	Schantz	Cox	Entries
Entry	---------- Strength (g/tex) ----------					
CG 3787 B2RF	29.4	27.0	30.7	28.6	28.3	29.0
DP 0912 B2RF	--	--	--	28.6	--	
DP 1044 B2RF	--	--	--	28.3	28.9	
DP 1219 B2RF	31.5	30.4	33.2	--	30.3	31.7
DP 1321 B2RF	--	--	--	30.1	30.1	
DP 1359 B2RF	--	31.1	--	--	--	
FM 1740 B2F	--	--	--	28.3	28.9	
FM 1830 GLT	32.0	--	--	29.9	--	
FM 2334 GLT	--	29.6	32.4	--	30.7	
NG 1511 B2RF	31.0	29.4	31.3	29.4	30.7	30.6
PHY 333 WRF	30.7	28.2	31.2	--	29.6	30.0
PHY 339 WRF	--	--	--	30.4	--	
PHY 499 WRF	31.3	--	31.9	30.5	31.0	
ST 4747 GLB2	27.9	--	--	25.7	--	
ST 4946 GLB2	--	30.2	32.8	--	29.3	
Test average	30.5	29.4	31.9	29.0	29.8	30.3
CV, %	3.1	3.6	3.2	3.4	2.4	
OSL	0.0028	0.0065	0.0875	0.0005	0.0023	
LSD	1.7	1.9	1.5†	1.7	1.3	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, NS - not significant.

Table 26. Uniformity results from the Extension irrigated RACE trials, 201.

County ==>	Beckham	Jackson	Tillman	Custer	Harmon	3-Site
Irrigation Type ==>	Pivot	Furrow	Furrow	Pivot	Drip	Mean
Location ==>	Delhi	Duke	Tipton	Hydro	Hollis	for Common
Cooperator ==>	Damron	Darby	McCullough	Schantz	Cox	Entries
Entry			Uniformity (%)			
CG 3787 B2RF	81.4	80.9	82.2	80.3	82.2	81.5
DP 0912 B2RF	--	--	--	80.7	--	
DP 1044 B2RF	--	--	--	80.1	80.9	
DP 1219 B2RF	80.1	80.2	81.2	--	80.0	80.5
DP 1321 B2RF	--	--	--	80.8	82.1	
DP 1359 B2RF	--	80.8	--	--	--	
FM 1740 B2F	--	--	--	79.4	81.4	
FM 1830 GLT	81.0	--	--	80.7	--	
FM 2334 GLT	--	82.0	82.7	--	82.1	
NG 1511 B2RF	81.4	81.0	81.9	79.0	82.6	81.4
PHY 333 WRF	81.6	80.5	81.8	--	82.0	81.3
PHY 339 WRF	--	--	--	80.2	--	
PHY 499 WRF	81.5	--	82.3	79.0	82.5	
ST 4747 GLB2	79.9	--	--	78.2	--	
ST 4946 GLB2	--	80.5	82.5	--	81.4	
Test average	81.0	80.8	82.1	79.8	81.7	81.2
CV, %	0.8	1.2	0.9	1.0	0.9	
OSL	0.0274	0.4019	0.2986	0.014	0.0066	
LSD	1.1	NS	NS	1.4	1.2	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, NS - not significant.

Table 27. Lint yield results from the Extension dryland RACE trials, 2014.

County ==>	Washita	Jackson	Tillman	3-Site Mean
Location ==>	Elk City	Altus	Hollister	for Common
Cooperator ==>	Davis	Abernathy	Fischer	Entries
Entry	------------------------------	Lint yield (lb/acre)	------------------------------	
DP 104 B2RF	--	406	--	
DP 1044 B2RF	459	638	648	582
DP 1321 B2RF	--	--	624	
DP 1410 B2RF	461	--	--	
FM 1830 GLT	404	--	--	
FM 2334 GLT	--	520	525	
NG 1511 B2RF	467	570	669	569
PHY 339 WRF	455	--	--	
PHY 499 WRF	--	554	628	
ST 4946 GLB2	555	542	622	573
Test average	467	538	619	574
CV, %	5.4	4.2	4.4	
OSL	0.0008	<0.0001	0.0012	
LSD	46	41	50	

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.

Table 28. Storm resistance results from the Extension dryland RACE trials, 2014.

County ==>	Washita	Jackson	Tillman	3-Site Mean
Location ==>	Elk City	Altus	Hollister	for Common
Cooperator ==>	Davis	Abernathy	Fischer	Entries
Entry	------- Storm resistance (visual rating: 1 loose, 9 tight) -------			
DP 104 B2RF	--	7.0	--	
DP 1044 B2RF	5.0	8.0	5.3	6.1
DP 1321 B2RF	--	--	5.0	
DP 1410 B2RF	5.0	--	--	
FM 1830 GLT	4.3	--	--	
FM 2334 GLT	--	6.7	4.3	
NG 1511 B2RF	5.3	6.0	5.0	5.4
PHY 339 WRF	4.7	--	--	
PHY 499 WRF	--	7.0	4.7	
ST 4946 GLB2	6.0	7.3	5.7	6.3
Test average	5.1	7.0	5.0	6.0
CV, %	9.3	10.1	9.7	
OSL	0.0215	0.0877	0.0741	
LSD	0.9	1.0†	0.7†	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level.

Table 29. Plant height results from the Extension dryland RACE trials, 2014.

County ==> Location ==> Cooperator ==>	Washita Davis Elk City	Jackson Altus Abernathy	Tillman Hollister Fischer	3-Site Mean for Common Entries
Entry	------------------------- Plant height (inches)		-------------------------	
DP 104 B2RF	--	24.2	--	
DP 1044 B2RF	29.9	27.7	28.1	28.6
DP 1321 B2RF	--	--	30.6	
DP 1410 B2RF	29.5	--	--	
FM 1830 GLT	28.6	--	--	
FM 2334 GLT	--	23.1	26.3	
NG 1511 B2RF	32.1	29.8	29.4	30.4
PHY 339 WRF	34.3	--	--	
PHY 499 WRF	--	27.9	31.7	
ST 4946 GLB2	29.7	26.4	29.9	28.7
Test average	30.7	26.5	29.3	29.2
CV, %	4.5	6.8	6.3	
OSL	0.0044	0.0090	0.0560	
LSD	2.5	3.3	2.7†	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level.

Table 30. Loan value results from the Extension dryland RACE trials, 2014.

County ==> Location ==> Cooperator ==>	Washita Elk City Davis	Jackson Altus Abernathy	Tillman Hollister Fischer	3-Site Mean for Common Entries
Entry	------------------------ Loan value ($/lb) ------------------------			
DP 104 B2RF	--	0.5133	--	
DP 1044 B2RF	0.4640	0.5117	0.4662	0.4806
DP 1321 B2RF	--	--	0.4983	
DP 1410 B2RF	0.4960	--	--	
FM 1830 GLT	0.5080	--	--	
FM 2334 GLT	--	0.5323	0.4843	
NG 1511 B2RF	0.4842	0.4812	0.4678	0.4777
PHY 339 WRF	0.5045	--	--	
PHY 499 WRF	--	0.4945	0.4840	
ST 4946 GLB2	0.4875	0.4972	0.4613	0.4820
Test average	0.4907	0.5050	0.4770	0.4801
CV, %	2.8	2.8	5.1	
OSL	0.0286	0.0172	0.4518	
LSD	0.0251	0.0258	NS	

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, NS - not significant.
Note: Color grades set to 21, leaf grades set to 2 for entire trial.

Table 31. Net value results from the Extension dryland RACE trials, 2014.

County ==>	Washita	Jackson	Tillman	3-Site Mean
Location ==>	Elk City	Altus	Hollister	for Common
Cooperator ==>	Davis	Abernathy	Fischer	Entries
Entry	------------------------ Net value ($/acre) ------------------------			
DP 104 B2RF	--	190	--	
DP 1044 B2RF	190	314	286	263
DP 1321 B2RF	--	--	290	
DP 1410 B2RF	201	--	--	
FM 1830 GLT	172	--	--	
FM 2334 GLT	--	250	227	
NG 1511 B2RF	198	252	297	249
PHY 339 WRF	200	--	--	
PHY 499 WRF	--	250	284	
ST 4946 GLB2	244	247	269	253
Test average	201	251	276	255
CV, %	7.4	5.3	7.0	
OSL	0.0033	<0.0001	0.0118	
LSD	27	24	35	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level.

Table 32. MIcronaire results from the Extension dryland RACE trials, 2014.

County ==>	Washita	Jackson	Tillman	3-Site Mean
Location ==>	Elk City	Altus	Hollister	for Common
Cooperator ==>	Davis	Abernathy	Fischer	Entries
Entry	---------------------------- Micronaire (units) ----------------------------			
DP 104 B2RF	--	4.7	--	
DP 1044 B2RF	5.0	5.0	5.4	5.1
DP 1321 B2RF	--	--	5.3	
DP 1410 B2RF	4.2	--	--	
FM 1830 GLT	4.2	--	--	
FM 2334 GLT	--	5.2	5.3	
NG 1511 B2RF	4.5	5.1	5.3	5.0
PHY 339 WRF	3.7	--	--	
PHY 499 WRF	--	5.2	5.3	
ST 4946 GLB2	4.2	5.2	5.4	4.9
Test average	4.3	5.1	5.3	5.0
CV, %	5.3	2.7	1.4	
OSL	0.0009	0.0066	0.2269	
LSD	0.4	0.3	NS	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, NS - not significant.

Table 33. Staple results from the Extension dryland RACE trials, 2014.

County ==> Location ==> Cooperator ==>	Washita Elk City Davis	Jackson Altus Abernathy	Tillman Hollister Fischer	3-Site Mean for Common Entries
Entry	------------------------------ Staple (32nds inch) ------------------------------			
DP 104 B2RF	--	32.6	--	
DP 1044 B2RF	31.0	33.9	32.5	32.5
DP 1321 B2RF	--	--	32.1	
DP 1410 B2RF	32.5	--	--	
FM 1830 GLT	33.0	--	--	
FM 2334 GLT	--	34.8	34.3	
NG 1511 B2RF	31.6	32.7	32.4	32.2
PHY 339 WRF	32.5	--	--	
PHY 499 WRF	--	33.3	32.9	
ST 4946 GLB2	30.8	33.8	33.5	32.7
Test average	31.9	33.5	33.0	32.5
CV, %	1.9	1.2	2.9	
OSL	0.0061	0.0006	0.1287	
LSD	1.1	0.7	NS	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, NS - not significant.

Table 34. Strength results from the Extension dryland RACE trials, 2014.

County ==>	Washita	Jackson	Tillman	3-Site Mean
Location ==>	Elk City	Altus	Hollister	for Common
Cooperator ==>	Davis	Abernathy	Fischer	Entries
Entry	---------------------------- Strength (g/tex)		----------------------------	
DP 104 B2RF	--	31.5	--	
DP 1044 B2RF	29.3	30.7	29.2	29.7
DP 1321 B2RF	--	--	29.3	
DP 1410 B2RF	28.2	--	--	
FM 1830 GLT	28.8	--	--	
FM 2334 GLT	--	30.5	28.5	
NG 1511 B2RF	29.6	31.2	29.2	30.0
PHY 339 WRF	30.6	--	--	
PHY 499 WRF	--	31.8	31.4	
ST 4946 GLB2	29.3	31.4	31.1	30.6
Test average	29.3	31.2	29.8	30.1
CV, %	2.8	2.5	4.4	
OSL	0.0819	0.3783	0.1215	
LSD	1.2 †	NS	NS	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Table 35. Uniformity results from the Extension dryland RACE trials, 201.

County ==>	Washita	Jackson	Tillman	3-Site Mean
Location ==>	Elk City	Altus	Hollister	for Common
Cooperator ==>	Davis	Abernathy	Fischer	Entries
Entry	------------------------------ Uniformity (%) ------------------------------			
DP 104 B2RF	--	81.7	--	
DP 1044 B2RF	78.7	81.4	80.4	80.2
DP 1321 B2RF	--	--	79.5	
DP 1410 B2RF	77.6	--	--	
FM 1830 GLT	78.8	--	--	
FM 2334 GLT	--	81.4	80.8	
NG 1511 B2RF	78.7	80.1	79.3	79.4
PHY 339 WRF	78.6	--	--	
PHY 499 WRF	--	81.2	81.1	
ST 4946 GLB2	79.2	81.6	81.2	80.7
Test average	78.6	81.2	80.4	80.1
CV, %	1.4	0.5	1.4	
OSL	0.6133	0.0093	0.2848	
LSD	NS	0.8	NS	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, NS - not significant.

OSU Cotton Official Variety Tests - 2014

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Caddo Research Station, Fort Cobb

The Experiment Station cotton official variety tests (OVTs) were planted at the Southwest Research and Extension Center at Altus Center (SWREC) (furrow irrigated), Southwest Agronomy Research Station at Tipton (dryland), and Caddo Research Station at Fort Cobb (low elevation spray center pivot irrigated) in 2014. Continuing Exceptional Drought (D4 category) has affected production at Altus and Tipton once again. Since the SWREC is located within Lugert-Altus Irrigation District, no irrigation was available in 2014 and the trials there failed. The Tipton dryland location also failed due to drought in 2014.

The Caddo Research Station site is classified as a Binger fine sandy loam, 1 to 3 percent slopes. The taxonomic classification is: Fine-loamy, mixed, active, thermic Udic Rhodustalfs. The trial consisted of 4 replicates of entries in both 2012 and 2013. Plot size was four 40-inch rows wide by 30 ft in length in 2012. In 2013, row spacing was changed to 36 inches, and plots were four rows wide by 30 ft in length. Harvested area was the center two rows by the length of the plot.

Fort Cobb 2014 OVT results can be found in Tables 1 and 2.

2012 Methodology Change

It should be noted that the methodology for the OVT program was changed in 2012 as compared to previous years. **This methodology is similar to other experiment station stripper harvested OVT locations such as Dr. Jane Dever's Texas A&M AgriLife Research program at Lubbock. At harvest, grab samples were taken from each plot in 3 of the 4 replicates. These grab samples were used to determine the lint and seed turnout for each individual entry and were used to convert plot bur cotton weights to lint per acre. Lint from these grab samples was submitted to the Texas Tech University Fiber and Biopolymer Research Institute to obtain high volume instrument (HVI) data.** Additionally, 50-boll samples were taken from each plot in 3 of the 4 replicates and other data (including boll sample lint fractions, boll size, seed index, lint index, and seed per boll) were derived from those. Additional collected data included a plant height from the soil surface to terminal and a visual estimate of storm resistance (1-9 with 9 tightest).

Caddo Research Station Site Information and Cultural Practices

20-May	Applied 500 lb/acre of 32-10-10 = 160-50-50 lb nutrients/acre

3-Jun	Planted no-till into standing terminated wheat cover @ 4 seed/row-ft in 36 inch rows = 58,080 seed/acre using JD MaxEmerge planter with Kincaid cone units

4-Jun	Prowl H2O @ 1qt/acre + Roundup PowerMax @ 1 qt/acre

19-Jun	Roundup PowerMax @ 1 qt/acre

8-Jul	Mepiquat chloride @ 8 oz/acre + Vydate @ 6oz/acre + Roundup PowerMax @ 1 qt/acre

21-Jul	Mepiquat chloride @ 8 oz/acre + Vydate @ 6oz/acre + Roundup PowerMax @ 1qt/acre

7-Aug	Mepiquat chloride @ 8 oz/acre + Roundup PowerMax @ 1qt/acre

24-Oct	Ginstar @ 12 oz/acre + Bollbuster @ 42 oz/acre

24-Nov	Harvested using JD 482 plot stripper

Rainfall and irrigation by month (Fort Cobb actual).

Month	Precipitation	Irrigation	Total
	---------------------------------- Inches -------------------------------------		
May	5.38	--	5.38
June	5.43	0.75	6.18
July	2.22	3.00	5.22
August	1.61	4.00	5.61
September	1.30	3.00	4.30
Total	15.94	10.75	26.69

Preplant soil test results.

Depth	pH	Nitrate-N lb/acre	Mehlich III P ppm	Mehlich III K ppm
0-6 inches	7.6	3	23	121
6-12 inches	7.3	4	4	91
12-18 inches	7.1	4	2	112
Total profile nitrate-N lb/acre	--	11	--	--

Table 1. Yield and agronomic results from the OSU cotton official variety test, Caddo Research Station, Fort Cobb, OK 2014.

Entry	Lint yield	Grab sample turnout		Boll sample lint fraction		Boll size	Seed index	Lint index	Seed per boll	Storm resistance	Final plant height
		Lint	Seed	Picked	Pulled						
	lb/acre	------------------------%	------------------------			g seed cotton/boll	g wt 100 fuzzy seed	g wt lint from 100 fuzzy seed	count/boll	visual scale (1=loose, 9=tight)	inches
NexGen NG 1511B2RF	1924	28.7	43.6	46.1	37.2	8.1	10.3	9.2	32.5	4	33
Stoneville ST 4946GLB2	1904	25.1	46.3	42.3	34.5	8.6	11.9	9.0	33.2	6	34
PhytoGen PHY 333WRF	1896	24.6	41.5	43.9	34.1	8.6	10.1	8.2	35.8	5	35
CPS-All-Tex CT14515B2R	1883	24.6	43.2	44.9	35.0	8.4	10.2	8.6	34.3	7	37
FiberMax FM 1830GLT	1861	27.5	46.5	44.6	35.9	8.2	10.7	8.8	33.4	6	31
All-Tex Nitro-44B2RF	1827	24.1	47.2	41.9	33.9	7.8	12.0	8.9	29.5	6	32
CPS-All-Tex CT13464B2R	1820	25.6	46.1	42.7	35.2	8.1	11.6	9.0	31.8	7	34
Bayer BCSBX1538GLT	1800	27.0	43.3	45.6	36.6	8.8	11.6	10.3	31.4	7	33
PhytoGen PHY 499WRF	1785	24.0	44.1	45.5	34.3	7.5	10.1	8.8	29.6	4	38
PhytoGen PHY 222WRF	1753	26.4	44.1	44.0	34.1	7.8	11.2	8.9	29.9	6	32
Deltapine DP 0912B2RF	1750	24.5	47.7	41.1	32.1	7.5	10.7	7.6	31.4	3	33
Stoneville ST 4747GLB2	1743	24.4	44.6	42.8	33.9	8.1	10.6	8.2	33.6	6	31
Croplan Genetics CG 3787B2RF	1737	24.8	42.7	44.1	34.4	7.4	10.1	8.2	31.1	4	34
Deltapine DP 1410B2RF	1731	25.5	48.4	41.1	32.7	7.9	10.7	7.7	33.7	7	32
FiberMax FM 1944GLB2	1714	22.9	47.7	41.8	33.0	8.5	11.4	8.3	33.9	6	32
FiberMax FM 2011GT	1710	25.9	45.1	43.8	34.7	9.2	12.2	9.8	32.9	8	33
PhytoGen PHY 367WRF	1691	25.5	45.6	43.3	34.6	7.1	9.8	7.7	31.8	5	29
NexGen NG 3306B2RF	1688	24.4	48.1	40.9	32.4	7.6	10.6	7.5	33.2	6	35
Deltapine DP 1044B2RF	1674	24.4	49.0	40.1	31.4	6.8	10.1	7.0	30.9	5	33
PhytoGen PHY 339WRF	1645	23.8	47.0	40.8	32.3	7.5	9.9	7.0	34.8	4	35
FiberMax FM 2322GL	1642	27.3	42.0	47.9	37.9	8.1	10.9	10.5	29.2	7	34
Deltapine DP 1219B2RF	1639	24.0	46.4	42.6	32.9	6.9	9.1	6.9	33.0	4	36
FiberMax FM 2334GLT	1619	27.1	42.7	45.0	34.9	7.3	9.5	8.2	31.8	6	30
FiberMax FM 1320GL	1614	24.1	44.0	43.9	33.9	8.4	10.1	8.2	34.9	8	33
Deltapine DP 1321B2RF	1604	25.8	43.4	44.8	37.1	7.4	11.0	9.3	29.4	5	32
MON 12R224B2R2	1600	23.5	46.5	42.1	33.8	7.4	10.8	8.2	31.3	5	34
FiberMax FM 2484B2RF	1543	25.6	46.3	43.7	34.6	7.0	10.5	8.4	29.0	7	30
PhytoGen PHY 725RF	1383	22.1	50.3	39.6	31.3	8.5	11.0	7.3	35.9	4	36
Test average	1721	25.1	45.5	43.2	34.2	7.9	10.7	8.4	32.3	6	33
CV, %	9.3	5.4	3.8	2.7	5.1	6.7	6.6	8.3	8.2	15.2	6.4
OSL	0.0017	<0.0001	<0.0001	<0.0001	0.0007	<0.0001	<0.0001	<0.0001	0.0428	<0.0001	<0.0001
LSD	224	2.2	2.8	1.9	2.8	0.9	1.2	1.1	4.3	1	3

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.

Table 2. Fiber property results from the OSU cotton official variety test, Caddo Research Station, Fort Cobb, OK 2014.

Entry	Micronaire	Length	Staple	Strength	Uniformity	Elongation	Reflectance	Yellowness
	units	inches	32nds inch	g/tex	%	%	rd %	+b %
All-Tex Nitro-44B2RF	4.3	1.27	40.5	34.5	86.0	5.8	69.9	6.5
Bayer BCSBX1538GLT	4.9	1.22	39.0	33.7	85.0	4.1	70.0	6.5
CPS-All-Tex CT13464B2R	4.6	1.27	40.8	35.0	85.5	6.2	69.0	6.7
CPS-All-Tex CT14515B2R	4.5	1.20	38.3	32.6	84.5	6.1	71.0	7.9
Croplan Genetics CG 3787B2RF	4.6	1.22	39.1	30.2	85.4	7.2	72.7	7.1
Deltapine DP 0912B2RF	5.0	1.16	37.1	32.8	84.0	6.2	72.2	6.5
Deltapine DP 1044B2RF	4.4	1.18	37.8	33.0	85.2	7.1	72.3	6.5
Deltapine DP 1219B2RF	4.4	1.24	39.8	33.6	84.6	5.1	72.6	6.8
Deltapine DP 1321B2RF	5.1	1.19	38.2	32.9	85.1	6.8	71.8	7.2
Deltapine DP 1410B2RF	4.4	1.27	40.5	32.0	83.9	4.8	70.4	6.0
FiberMax FM 1320GL	4.7	1.19	38.1	33.7	83.9	6.0	73.0	6.6
FiberMax FM 1830GLT	4.6	1.27	40.5	32.7	85.0	4.8	74.2	6.2
FiberMax FM 1944GLB2	4.6	1.21	38.8	33.2	83.7	4.5	74.5	6.1
FiberMax FM 2011GT	4.8	1.18	37.8	32.1	83.4	5.0	71.7	7.0
FiberMax FM 2322GL	4.5	1.26	40.2	33.8	84.9	4.5	70.4	6.9
FiberMax FM 2334GLT	4.7	1.24	39.8	33.0	84.6	4.8	73.9	6.1
FiberMax FM 2484B2RF	4.1	1.25	39.9	33.2	84.5	4.5	75.1	5.9
MON 12R224B2R2	4.6	1.20	38.5	31.6	84.1	5.5	71.8	6.5
NexGen NG 1511B2RF	5.2	1.16	37.1	34.1	84.3	7.0	71.2	7.3
NexGen NG 3306B2RF	4.5	1.25	40.1	35.0	85.6	6.1	71.3	6.8
PhytoGen PHY 222WRF	5.4	1.18	37.8	32.9	84.3	6.4	70.9	6.6
PhytoGen PHY 333WRF	4.5	1.21	38.6	31.6	85.4	5.4	69.7	7.2
PhytoGen PHY 339WRF	4.2	1.22	38.9	32.4	84.6	6.3	72.9	6.3
PhytoGen PHY 367WRF	4.8	1.18	37.8	32.4	84.2	6.2	70.3	7.1
PhytoGen PHY 499WRF	4.4	1.21	38.6	33.7	84.9	6.4	69.9	7.0
PhytoGen PHY 725RF	4.3	1.26	40.3	35.9	85.0	5.9	70.6	6.9
Stoneville ST 4747GLB2	4.7	1.23	39.5	30.5	83.5	3.9	70.8	6.1
Stoneville ST 4946GLB2	4.6	1.20	38.4	33.4	84.9	6.2	71.2	6.9
Test average	4.6	1.22	39.0	33.1	84.6	5.7	71.6	6.7
CV, %	5.0	1.9	1.9	3.1	0.9	5.3	1.5	4.1
OSL	<0.0001	<0.0001	<0.0001	<0.0001	0.0034	<0.0001	<0.0001	<0.0001
LSD	0.4	0.04	1.2	1.7	1.2	0.5	1.8	0.4

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.

2014 Regulated XtendFlex™ Germplasm Trials

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Two regulated XtendFlex™ germplasm evaluation trials were conducted in 2014. These included XtendFlex technology (which includes Monsanto's dicamba tolerance trait) germplasm lines from Monsanto/Deltapine and Americot/NexGen. Monsanto's XtendFlex™ cotton trait imparts tolerance to dicamba, glyphosate and glufosinate herbicides. The DGT trait was only just recently deregulated. It is assumed that several varieties will be available for sale to producers in 2015. The objective of this study was to evaluate the performance of several germplasm lines containing the XtendFlex™ trait compared to current standard entries. **In 2014, two separate regulated trials (Monsanto/Deltapine and Americot/NexGen) were established under center pivot irrigation at the Caddo Research Station near Fort Cobb.** The site is classified as a Binger fine sandy loam, 1 to 3 percent slopes. Four replicates of entries were used in both trials. Plot size was two 36-inch rows by 30 ft in length. **Both trials were managed in a Roundup Ready Flex® herbicide system, thus no dicamba was applied.** Harvested area was two rows by plot length and harvesting was accomplished using a modified John Deere 482 plot stripper. At harvest, samples were taken from each plot. These samples were used to determine lint turnout for each plot and were used to convert plot bur cotton weights to lint per acre. Lint from these samples was submitted to the Texas Tech University Fiber and Biopolymer Research Institute to obtain HVI data. Loan value was determined using the Cotton Incorporated 2014 Upland Cotton Loan Valuation Model.

Site information and cultural practices for XtendFlex Trials at the Caddo Research Station, Fort Cobb, OK, 2014.

Month	Precipitation	Irrigation	Total
	------------------- Inches -------------------		
May	5.38	--	5.38
June	5.43	0.75	6.18
July	2.22	3.00	5.22
August	1.61	4.00	5.61
September	1.30	3.00	4.30
Total	15.94	10.75	26.69

20-May	Applied 500 lb/acre of 32-10-10 = 160-50-50 lb nutrients/acre
2-Jun	Planted no-till into standing terminated wheat cover @ 4 seed/row-ft
	in 36 inch rows = 58,080 seed/acre using JD MaxEmerge planter with Kincaid cone units
4-Jun	Prowl H2O @ 1qt/acre + Roundup PowerMax @ 1 qt/acre
19-Jun	Roundup PowerMax @ 1 qt/acre
8-Jul	Mepiquat chloride @ 8 oz/acre + Vydate @ 6oz/acre + Roundup PowerMax @ 1 qt/acre
21-Jul	Mepiquat chloride @ 8 oz/acre + Vydate @ 6oz/acre + Roundup PowerMax @ 1qt/acre
7-Aug	Mepiquat chloride @ 8 oz/acre + Roundup PowerMax @ 1qt/acre
15-Oct	Plant observation data collected
24-Oct	Ginstar @ 12 oz/acre + Bollbuster @ 42 oz/acre
24-Nov	Harvested using JD 482 plot stripper

Monsanto/Deltapine trial results (Table 1) indicate that when comparing lint yield and fiber properties, the B2XF entries were very competitive with standard entries. For lint yield, 4 of the 6 entries in the upper statistical tier of significance were B2XF types. One Monsanto B2XF entry

(DP 1518B2XF) produced higher yields than standard types such as DP 1044B2RF and FM 1944GLB2.

Americot/NexGen results (Table 2) show that 3 of 4 entries in the first statistical tier of significance were B2XF germplasm. The NG 1511B2RF entry has exhibited excellent yield stability for several years in our area and 3 entries statistically produced the same yield at this site. Fiber quality results for indicate that the XtendFlex germplasm lines are very competitive or superior to current Bollgard II Roundup Read Flex varieties.

Results from these trials conducted simultaneously at one site indicate that at first glance, the B2XF and XF entries evaluated are highly competitive with currently planted standard entries. In 2015, as XtendFlex™ technology gets planted widely better information will become available. Additional multi-site and multi-year research is needed to evaluate the new varieties across a series of environments.

NOTICE: DO NOT APPLY DICAMBA HERBICIDE IN-CROP TO BOLLGARD II® XTENDFLEX™ COTTON IN 2015. IT IS A VIOLATION OF FEDERAL AND STATE LAW TO MAKE AN IN-CROP APPLICATION OF ANY DICAMBA HERBICIDE ON BOLLGARD II® XTENDFLEX™ COTTON UNLESS THE PRODUCT LABEL SPECIFICALLY AUTHORIZES THAT USE. YOU SHOULD NOT MAKE AND MONSANTO DOES NOT AUTHORIZE MAKING AN IN-CROP APPLICATION OF ANY DICAMBA HERBICIDE TO BOLLGARD II® XTENDFLEX™ COTTON IN 2015. REFER TO THE MONSANTO TECHNOLOGY USE GUIDE FOR DETAILS AND RECOMMENDATIONS ON USING APPROVED ROUNDUP® AND LIBERTY® BRANDED AGRICULTURAL HERBICIDES ON BOLLGARD II® XTENDFLEX™ COTTON.

100099M2-129/53

Table 1. Harvest results from the irrigated Monsanto/Deltapine XtendFlex Germplasm Trial, Fort Cobb, OK, 2014.

Entry designation	Stand	Lint yield	Lint loan value	Final plant height	Node of first fruiting branch	Total mainstem nodes	Nodes above cracked boll	Micronaire	Length	Staple	Strength	Uniformity
	1,000 plants/acre	lb/acre	$/lb	inches	--------------- number ---------------			units	inches	32nds inch	g/tex	%
DP 1518B2XF*	44.3	2041	0.5440	35.0	6.6	20.2	5.1	3.9	1.18	37.9	31.8	82.9
DP 1522B2XF*	47.0	1980	0.5453	33.4	6.5	19.4	5.2	4.1	1.19	38.0	34.2	83.3
DP 0912B2RF	44.3	1960	0.5434	30.9	6.8	18.2	4.4	4.5	1.14	36.3	33.1	83.5
ST 4946GLB2	45.3	1935	0.5458	33.7	7.0	18.7	4.3	4.1	1.18	37.5	33.9	84.0
14R935B2XF	42.0	1914	0.5406	32.8	6.3	17.2	4.3	4.5	1.12	35.9	33.9	82.6
DP 1549B2XF*	43.8	1907	0.5444	35.1	6.7	19.8	4.9	3.9	1.18	37.8	34.2	82.9
DP 1553B2XF*	37.5	1884	0.5444	34.4	6.0	17.9	3.7	4.1	1.20	38.4	33.8	83.4
DP 1044B2RF	42.8	1840	0.5435	30.8	6.5	18.2	4.4	3.9	1.16	37.0	34.3	83.3
14R960B2XF	37.5	1738	0.5403	36.0	6.3	18.9	6.3	3.7	1.21	38.5	35.4	83.4
14R934B2XF	44.8	1666	0.5451	33.4	6.4	17.7	5.3	4.2	1.18	37.7	34.6	83.6
FM 1944GLB2	43.5	1649	0.5443	31.2	7.2	18.1	3.6	4.2	1.19	38.0	33.6	83.2
Test average	43.0	1865	0.5437	33.3	6.5	18.5	4.7	4.1	1.17	37.5	33.9	83.3
CV, %	8.9	5.6	0.6	4.3	6.7	5.6	23.6	5.3	1.6	1.6	4.4	0.8
OSL	0.0289	<0.0001	0.3703	<0.0001	0.0410	0.0064	0.0677	<0.0001	<0.0001	<0.0001	0.1759	0.3214
LSD	5.5	151	NS	2.0	0.6	1.5	1.3†	0.3	0.03	0.9	NS	NS

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Color grades set to 41, leaf grades set to 4 for entire trial.

* - indicates potential 2015 release.

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Table 2. Harvest results from the irrigated Americot/NexGen XtendFlex Germplasm Trial, Fort Cobb, OK, 2014.

Entry designation	Stand	Lint yield	Lint loan value	Final plant height	Node of first fruiting branch	Total mainstem nodes	Nodes above cracked boll	Micronaire	Length	Staple	Strength	Uniformity
	1,000 plants/acre	lb/acre	$/lb	inches	-------------- number --------------			units	inches	32nds inch	g/tex	%
NG 1511B2RF	39.4	2090	0.5094	34.2	6.5	18.9	3.4	5.3	1.18	37.9	34.5	84.1
NG 3405B2XF*	48.9	2062	0.5328	32.1	6.3	17.5	4.9	4.7	1.14	36.4	29.5	83.2
NG 3406B2XF*	46.0	1972	0.5198	29.5	6.3	17.5	3.9	5.1	1.17	37.4	32.4	83.9
NG 5007B2XF*	48.2	1971	0.5341	33.6	6.3	17.1	4.0	4.9	1.17	37.5	29.9	83.3
AMDG 3 XF	46.9	1913	0.5221	36.3	6.6	21.3	4.5	5.1	1.13	36.2	34.4	83.8
AMDG 2 B2XF	53.1	1908	0.5189	35.6	7.1	20.2	3.6	5.0	1.13	36.0	34.1	83.9
NG 5315B2RF	37.9	1882	0.5375	33.7	5.9	17.8	3.7	4.8	1.19	37.9	32.1	84.4
AMX 4350B2RF	41.3	1828	0.5231	32.2	6.6	18.7	3.5	5.0	1.15	36.7	30.3	83.0
AMDG 1 B2XF	56.3	1727	0.5254	34.9	6.8	19.8	3.0	5.0	1.17	37.4	33.0	82.6
AMDG 4 B2XF	45.7	1716	0.5358	33.5	6.7	18.7	3.2	4.7	1.16	37.2	31.2	83.4
NG 4111RF	38.3	1669	0.5356	33.8	6.6	20.2	2.1	4.8	1.13	36.2	34.0	83.2
NG 4010B2RF	36.4	1640	0.5151	34.0	6.7	20.1	3.1	5.1	1.17	37.3	35.0	83.9
NG 4012B2RF	37.7	1593	0.5270	34.5	7.0	20.2	4.3	4.8	1.17	37.5	34.1	83.8
NG 3348B2RF	39.4	1474	0.5360	30.4	6.5	18.5	2.6	4.8	1.14	36.6	32.9	83.4
Test average	44.0	1817	0.5266	33.4	6.5	19.0	3.5	4.9	1.16	37.0	32.6	83.5
CV, %	8.2	6.7	2.7	5.2	6.4	5.3	30.0	5.2	1.7	1.7	3.6	1.2
OSL	<0.0001	<0.0001	0.1501	<0.0001	0.0283	<0.0001	0.0472	0.0945	0.0002	0.0002	<0.0001	0.5087
LSD	5.2	174	NS	2.5	0.1	1.5	1.5	0.3†	0.03	0.9	1.7	NS

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Color grades set to 41, leaf grades set to 4 for entire trial.

* - indicates potential 2015 release.

Weed Control

Results from a recent survey show that Oklahoma cotton producers continue to struggle with tough weeds in their cotton. Despite the fact that weed resistance is growing in most cotton producing regions surrounding Oklahoma, our growers seem committed to limited or no-till production. These production systems depend heavily on effective herbicide programs to remove competitive weeds from their growing environment. When weeds are allowed to exist with the cotton crop, their competitive nature results in lost plant stands, harvest complications and reduced yields. Maintaining a weed free environment with an effective herbicide program eliminates all of these problems. Recent feedback from Oklahoma growers indicates that horseweed and pigweed are the top two "most difficult to control" weeds in their cotton. Our efforts over the last few years have centered around the control of these two weeds. Unfortunately, according to both OSU testing and grower testimonials, these are the two weeds most reported to be resistant to glyphosate herbicide (Roundup). Managing these challenges with the current technology requires several key elements. Currently there are no in-season herbicides available to growers that effectively control horseweed in a growing cotton crop. Although glufosinate (Liberty) does have activity on horseweed and may be used over-the-top of Liberty Link and Glytol-Liberty Link "stacked" cotton varieties, its inconsistency on pigweed (2nd most difficult to control weed for Oklahoma growers) reduces its appeal as a basis for herbicide programs in Oklahoma. Therefore, in order to effectively control horseweed we must target the window prior to the establishment of a cotton crop. Preplant burndown herbicides can effectively control horseweed when used properly and according to OSU recommendations. Weed size at application time is critical. Horseweed is a winter annual that germinates in the fall or winter and remains in the rosette (flat, prostrate) stage until late spring. During late spring it shifts to vertical growth and begins bolting. Once this weed initiates vertical growth it becomes very difficult to control with available herbicides. Effective control can be achieved when targeting the appropriate weed stage. Dicamba and 2,4-D are the basis for effective preplant control of horseweed ahead of cotton production. Our studies have shown that the inclusion of 1.0 lb ai/A of 2,4-D or 0.25 lb ai/A of dicamba results in effective horseweed control when applied at the appropriate time. Pigweed continues to present problems for many growers in Oklahoma. The rapid spread of glyphosate resistant pigweed around the Cotton Belt and increasing frequency of complaints within Oklahoma require that we adopt an effective pigweed control strategy now rather than ponder the question as to whether or not we have glyphosate resistance. Fortunately there are several options available to growers. Residual herbicides and the inclusion of herbicides with different modes of action are key components of an effective strategy. Specific recommendations for season-long programs can be found within this report. In addition several studies were established in 2014 to evaluate new technologies that may be effective considerations for growers in the future. Most of these projects are focused on the two most difficult to control weeds in Oklahoma cotton, horseweed and pigweed. As stated in the opening letter, some of these projects include treatments that are not currently labeled. Always consult local extension resources for current recommendations and always read and follow all current product labeling.

Huskie Herbicide Carryover to Cotton

Huskie herbicide consists of two active ingredients representing two distinct modes of action (Pyrasulfotole – group 27, pigment inhibitor and bromoxynil-group 6, photosynthetic inhibitor). It is currently labeled for broadleaf weed control in wheat, barley, triticale and grain sorghum. As glyphosate resistant weeds continue to spread, more emphasis is being placed on crop rotation. Controlling problem weeds in these rotational crops is mandatory to prevent the continued spread of resistance. Pyrasulfotole is the HPPD (hydroxyphenylpyruvate dioxygenase) inhibiting component within Huskie herbicide. This chemistry has been proven very effective in the fight against resistant pigweed and comes highly recommended in wheat and grain sorghum. While the ability control resistant weeds in alternative crops is critical, rotational considerations must be taken into account. The objective of this study was to evaluate the level of carryover from applications of Huskie herbicide to a subsequent cotton crop. Two application timings were targeted, 6 and 9 months before planting. These applications occurred on September 30th and December 17th, 2013. At each timing Huskie was applied to bare soil at the rates of 16 and 32 oz/A. The nearest (< 2 miles) Mesonet weather station recorded 9.7 inches of rainfall between the first application (9 months before planting) and the June 4th planting date in 2014. Seven inches of rainfall was recorded between the second application (6 months before planting) and planting in 2014. Stand counts and injury ratings were taken 14 days after emergence of the cotton seedlings. Additional injury observations were made at 30 and 60 days after planting. Results of these observations are presented below. No differences were observed when comparing stand counts between treatments and the untreated check. Injury from the 32 oz/A rate of Huskie applied 9 months before planting was $\leq$ to 12% across all observation dates. This was significantly greater than injury observed from the 16 oz/A rate applied 9 months before planting. The lower rate of Huskie (16 oz/A) applied 6 months before planting increased injury significantly (to 20-21%). In addition, 32 oz/A of Huskie applied at the 6 month timing resulted in substantially more injury at all observations (38-65%). This was significantly greater than any injury observed from all other rates and timings.

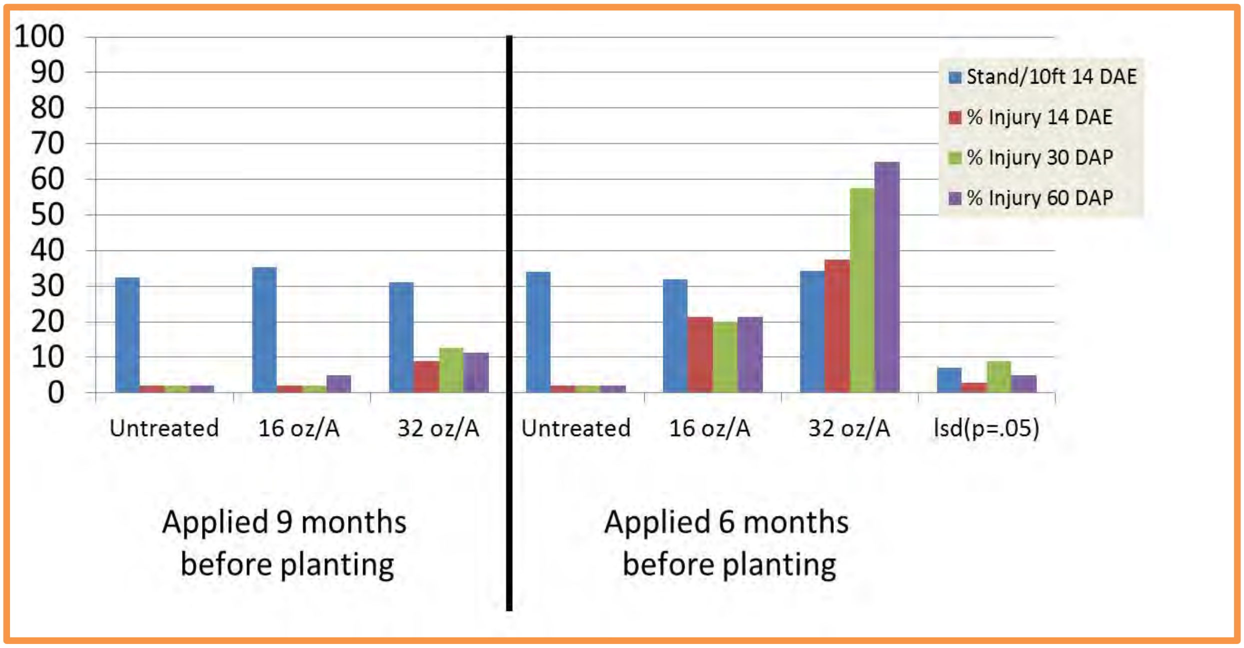

Figure 1. Stand and Injury evaluations from Huskie carryover.

Figure 2. Injury observed from Huskie herbicide carryover.

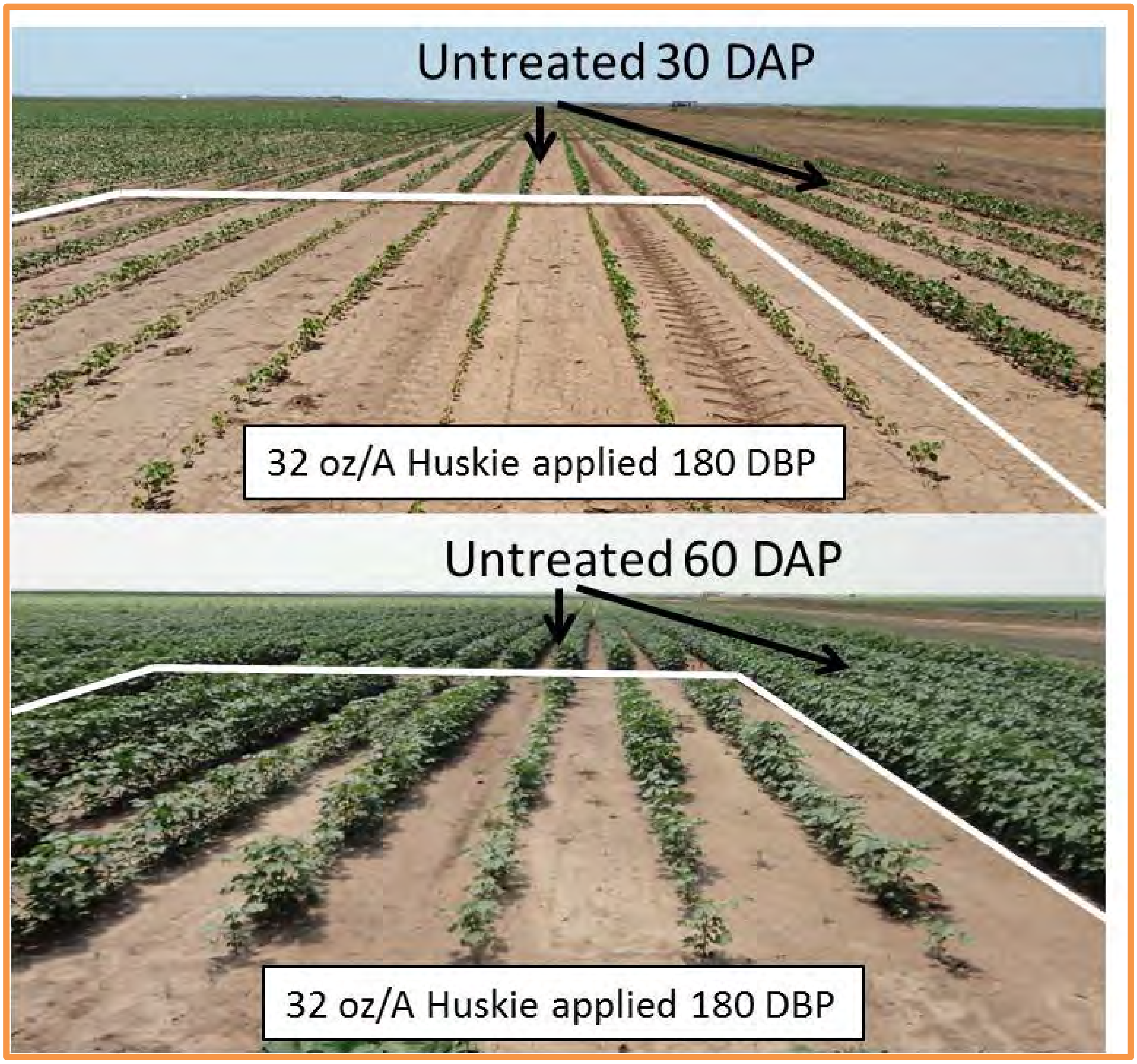

Figure 3. Carryover injury from Huskie herbicide applications.

Enlist Duo for Postemergence Pigweed Control

The Enlist Weed control system will offer (pending regulatory approval) cotton growers the ability to effectively control glyphosate resistant weeds, including pigweed. Pigweed has gradually emerged as growers leading in-season problem. Its rapid growth, prolific seed production and in many cases tolerance to glyphosate, are three reasons growers continue to see the spread of this weed across cotton growing regions from coast to coast. Stopping the spread of glyphosate resistant pigweed requires two key elements. The use of effective soil applied residual herbicides and the ability to effectively control these weeds with postemergence applications. Enlist Duo is a premix combination of a new ultra-low volatility formulation of 2,4-D and glyphosate offering postemergence control of many broadleaf weeds. A research trial was established to evaluate Enlist Duo for the postemergence control of pigweed in a non-crop situation.

Enlist Duo was applied at two different rates (56 and 75 oz/A) and compared to Roundup Weathermax applied alone (28 oz/A) or with Clarity (16 oz/A) for the control of 6-8 inch pigweed. All applications were made with TurboTeejet Induction nozzles at 40 PSI in 10 gallons of water. Plots were 6.67 x 30 feet in length and replicated four times. Weed control from each treatment was evaluated at 7, 14 and 30 days after treatment. Results are presented in the figures below.

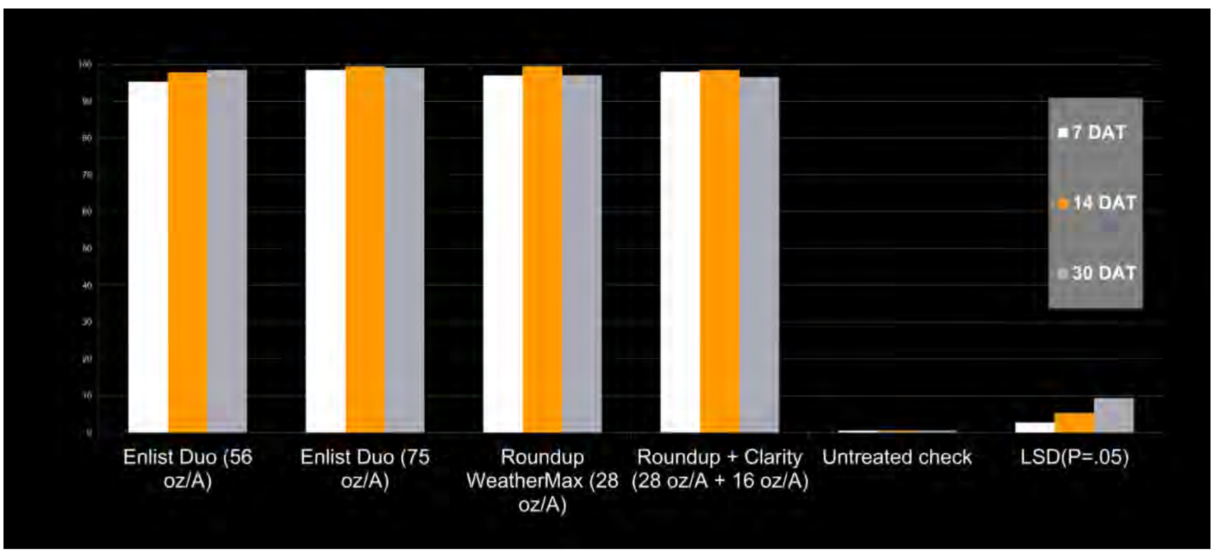

Figure 1. Enlist Duo treatment performance.

It should be noted that growing conditions at application timing were excellent. Soil moisture was extremely good with mild temperatures at application. Enlist Duo applied at either rate (56 or 75 oz/A) controlled pigweed 95-98% 7 days after treatment (DAT). This was similar to control observed from applications of Roundup weathermax alone (97%) or Roundup weathermax + Clarity (98%). Effective pigweed control (97-100%) was also observed from all treatments at the 14 and 30 day evaluations. No difference in control was observed between treatments at any observation timing.

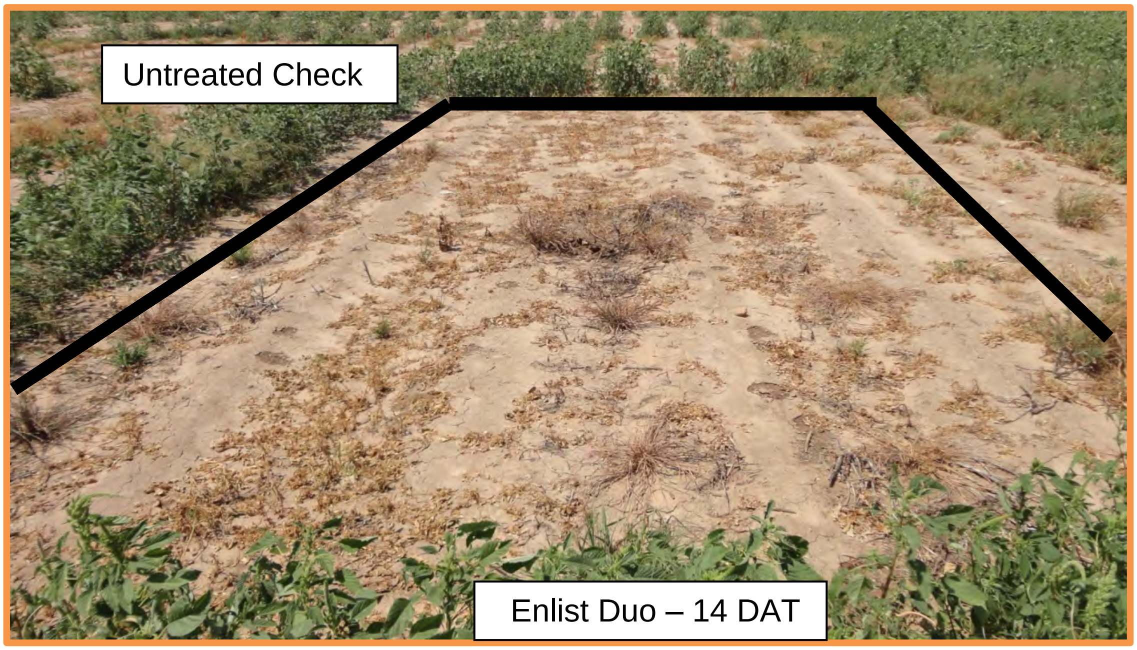

Figure 2. Enlist Duo 14 DAT.

In addition, off-target herbicide movement was also monitored.   Off-target movement (drift) associated with pesticide application is categorized in two ways. The first is physical drift which occurs during an actual application and the second is volatility drift primarily occurring post-application. While all herbicides are subject to physical drift during application, herbicides containing 2,4-D and dicamba have historically been proven to volatilize and move off-target, injuring sensitive crops. In fact, due to the nature of these herbicides, their use in certain (prominent cotton producing) counties of Oklahoma is currently restricted during cotton's growing season. The new formulation of 2,4-D within Enlist Duo exhibits ultra-low volatility characteristics. At each observation timing, adjacent areas in all directions were evaluated in order to monitor any off-target movement as a result of volatility following application. No 2,4-D or dicamba symptomology was observed beyond 1-2 feet (in any direction) past any plot receiving Enlist Duo. In addition, cotton planted 30 feet to the north and 30 feet to the south of the test area showed no symptomology at any observation timing. Wind speed at application time was extremely low (2 mph) and TurboTeejet Induction nozzles were used at 40 PSI which produce an ultra-coarse droplet. This combination of low wind and appropriate nozzle selection significantly reduced the opportunity for physical drift as evidenced by the figures below. Very different results should be expected when these two variables are modified. It should also be noted that no glyphosate resistant pigweed was present at this location (as evidenced by the control provided by Roundup Weathermax alone) and these results will not be representative of the level of control expected when treating glyphosate resistant pigweed.

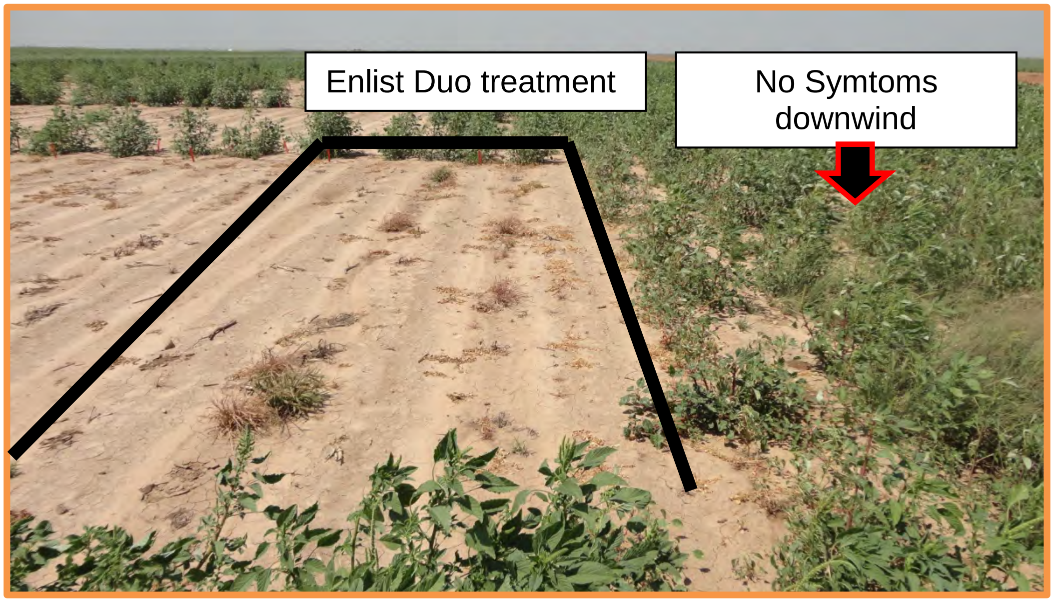

Figure 3. Enlist Duo safety

Anthem Flex Programs for Pigweed Control

Anthem Flex (shown below as F9312-3) is a combination of Pyroxasulfone (active ingredient in Zidua- root and shoot inhibitor) and Fluthiacet-methyl (active ingredient in Blizzard-ppo inhibitor). Fluthiacet-methyl offers burndown activity on broadleaf weed species, while Pyroxasulfone provides residual control of both broadleaf and grass weeds. Combining these two products has the potential to control pigweed from both preemergence and postemergence applications. In addition, each product offers a different mode of action to help producers follow basic resistance management recommendations. A trial was initiated to evaluate weed control and cotton injury as a result of Anthem Flex applications.

Cotton was planted on June 4th, 2014 into conventional tilled beds. Preemergence applications were made the next day on June 5th. Stand counts and injury ratings were taken approximately 14 days after emergence. Pigweed control was also observed at this timing. Three additional pigweed observations were made throughout the season. The data gathered from all observations is presented in the tables below.

Three and a half inches of rain was received over the course of the week following preemergence application. While this promoted activation of the preemergence herbicide applications, significant cotton injury was observed following cotton emergence. These ratings are presented in the table and figure below. As indicated in the table, excellent pigweed control (97-100%) was observed from preemergence application of Anthem Flex. This was significantly better than control (86%) observed from 32 oz/A Caparol. Two postemergence over the top applications were made in season, one early and one late. Also, two post-directed applications were made, one early and one late. By the end of the season (August 18th observation), all plots that received preemergence applications followed by postemergence applications controlled pigweed effectively (93-100%). Plots receiving only postemergence applications did not control pigweed as effectively (77-87%). Although all programs that included Anthem Flex (F9312-3) applied preemergence did effectively control pigweed season-long, severe injury and stand loss did occur. For this reason further evaluation of this product will most likely focus on late-season post-directed application.

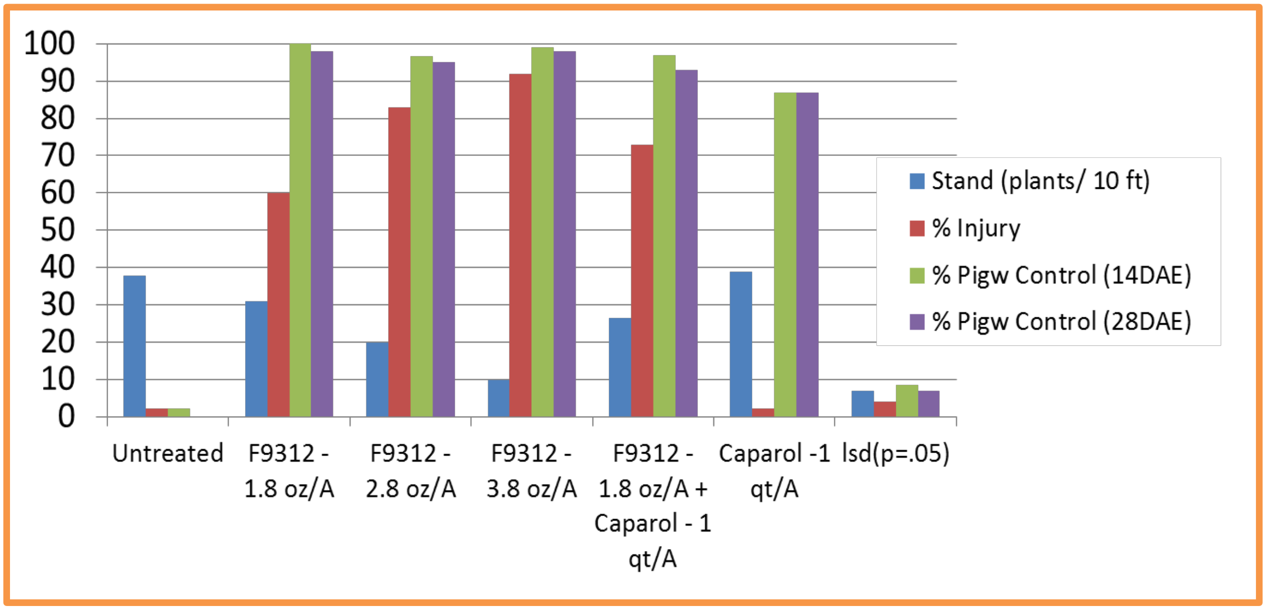

Figure 1. Plant stand and Injury observed from Anthem Flex PRE applications.

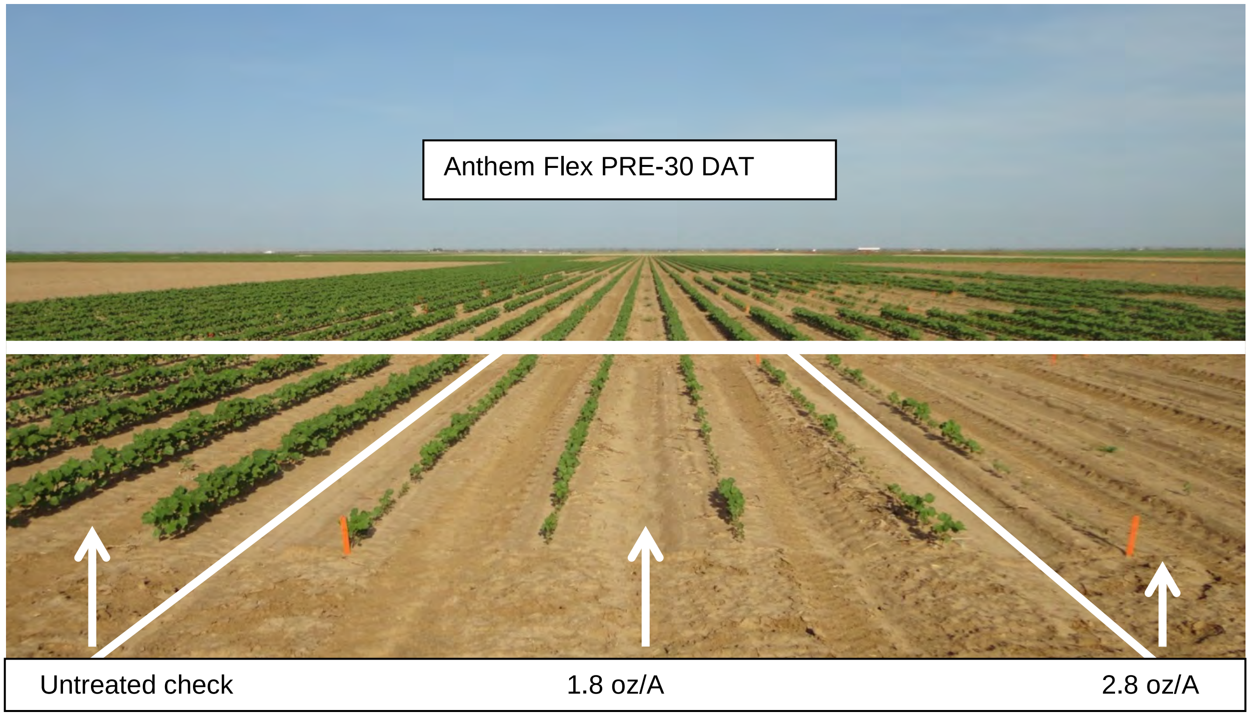

Figure 2. Injury from Anthem Flex Pre applications 30 DAT

Table 1. Treatment performance in Anthem Flex trial.

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	6/25/2014 Stand #/10 ft	6/25/2014 Injury %	6/25/2014 Pigw control %	7/8/2014 Pigw control %	8/3/2014 Pigw control %	8/18/2014 Pigw control %
1	UNTREATED							37.7 ab	0 e	0 c	0 d	0 d	0 f
2	F9312-3	4	SE	1.8	FL OZ/A	ATPLAN	A	31 bc	60 d	100 a	98 a	89 a	100 a
2	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	ATPLAN	A						
2	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	EAPOWE	C						
3	F9312-3	4	SE	2.8	FL OZ/A	ATPLAN	A	19.7 d	83.3 b	96.7 a	95 ab	77 ab	97 ab
3	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	ATPLAN	A						
3	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	EAPOWE	C						
4	F9312-3	4	SE	3.8	FL OZ/A	ATPLAN	A	9.7 e	91.7 a	99.3 a	98 a	88 a	98 a
4	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	ATPLAN	A						
4	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	EAPOWE	C						
5	F9312-3	4	SE	1.8	FL OZ/A	ATPLAN	A	26.3 cd	73.3 c	96.7 a	93 abc	77 ab	100 a
5	CAPAROL	4	SC	32	FL OZ/A	ATPLAN	A						
5	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	ATPLAN	A						
5	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	EAPOWE	C						
6	CAPAROL	4	SC	32	FL OZ/A	ATPLAN	A	38.7 a	0 e	86.7 b	87 c	78 ab	93 abc
6	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	ATPLAN	A						
6	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	EAPOWE	C						
7	F9312-3	4	SE	2.8	FL OZ/A	POSDIR	B	34.7 ab	0 e	0 c	0 d	82 ab	82 d
7	AIM	2	EC	1.2	FL OZ/A	POSDIR	B						
7	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	POSDIR	B						
8	F9312-3	4	SE	3.8	FL OZ/A	POSDIR	B	36 ab	0 e	0 c	0 d	80 ab	85 cd
8	AIM	2	EC	1.1	FL OZ/A	POSDIR	B						
8	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	POSDIR	B						
9	WARRANT	3	CS	48	FL OZ/A	POSDIR	B	38 a	0 e	0 c	0 d	37 c	23 e
9	DIREX 4L	4	SC	32	FL OZ/A	POSDIR	B						
9	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	POSDIR	B						
10	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	POEMCR	D	34.3 ab	0 e	0 c	90 bc	87 a	87 bcd
10	F9312-3	4	SE	2.8	FL OZ/A	POSDIR	E						
10	AIM	2	EC	1.2	FL OZ/A	POSDIR	E						
10	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	POSDIR	E						
11	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	POEMCR	D	36.7 ab	0 e	0 c	88 bc	68 b	83 cd
11	F9312-3	4	SE	2.8	FL OZ/A	POSDIR	E						
11	AIM	2	EC	1.1	FL OZ/A	POSDIR	E						
11	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	POSDIR	E						
12	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	POEMCR	D	33.3 ab	0 e	0 c	95 ab	83 a	77 d
12	DIREX 4L	4	SC	32	FL OZ/A	POSDIR	E						
12	ROUNDUP POWERMAX	5.5	SL	22	FL OZ/A	POSDIR	E						
LSD (P=.05)								6.88	3.88	8.46	6.98	13.4	11.58

Table 2. Application information for Anthem Flex trial.

Application Description					
	A	B	C	D	E
Application Date:	6/5/2014	7/8/2014	8/6/2014	6/25/2014	8/18/2014
Time of Day:	8:45 am	9:30 am	11:15 am	10:30 am	9:30 am
Application Method:	SPRAY	SPRAY	SPRAY	SPRAY	SPRAY
Application Timing:	ATPLAN	PD6-8"	PT OTT	PT OTT	PD15-18"
Application Placement:	BROADC	PT direct	Broadcast	Broadcast	PT direct
Applied By:	OSU	OSU	OSU	OSU	OSU
Air Temperature, Unit:	80 f	79 f	86 F	81 F	81 F
% Relative Humidity:	48	54	61	56	83
Wind Velocity, Unit:	8 mph	7 mph	9 mph	8 mph	8 mph
Wind Direction:	SSE	SSW	SSE	SE	SSW
Soil Temperature, Unit:	81 F	88 F	87 F	74 F	88 F
Soil Moisture:	Good	adequate	Dry	Good	Dry
% Cloud Cover:	10	0	20	20	25
Next Rain Occurred On:	6/7/2014	7/16/2014	8/28/2014	7/2/2014	8/28/2014
Application Equipment					
	A	B	C	D	E
Appl. Equipment:	Lee Spider	Redball 420	Lee Spider	Lee Spider	Redball 420
Equipment Type:	HICLEA	HOODED	HICLEA	HICLEA	HOODED
Operation Pressure, Unit:	40 psi	25 psi	40 psi	40 psi	25 psi
Nozzle Type:	TT Induct	TJ XR	TT Induct	TT Induct	TJ XR
Nozzle Size:	11002	8003/001	11002	11002	8003/001
Nozzle Spacing, Unit:	20 in		20 in	20 in	
Nozzles/Row:	2	3	2	2	3
Ground Speed, Unit:	3 mph	3.6 mph	3 mph	3 mph	3.6 mph
Incorporation Equip.:	NA		NA	NA	
Carrier:	WATER	WATER	WATER	WATER	WATER
Spray Volume, Unit:	15 gal/ac	15 gal/ac	15 gal/ac	15 gal/ac	15 gal/ac
Mix Size, Unit:	1 gallons	2 gallons	1 gallons	1 gallons	2 gallons
Propellant:	comp.air	comp.air	comp.air	comp.air	comp.air

Residual Control of Pigweed with Isoxaflutole (Balance Bean)

Balance Bean (Isoxaflutole) is a pigment inhibitor (inhibiting the HPPD – hydroxyphenylpyruvate dioxygenase enzyme) soon to be registered in soybeans and currently registered as Balance Flexx in corn. This active ingredient offers both postemergence and residual control of many grass and broadleaf weeds including glyphosate and ALS resistant pigweed. The ability to utilize this class of chemistry (group 27) in cotton could be extremely valuable. Bayer CropScience hopes to commercialize the HPPD tolerance trait for cotton in the future. A research trial was established in 2014 in a non-crop setting to evaluate pigweed control from Isoxaflutole (Balance Bean). Applications were made on July 2nd to bare ground plots measuring 6.7 x 30 feet. TurboTeejet nozzles were used at 32 PSI to deliver 15 gallons of water per acre through a backpack spraying system at 3 mph. Preplant incorporated (PPI) treatments were tilled to a depth of 1.5 inches with a roto-tiller covering the center 60 inches of each plot.

Three tenths of an inch of rain was received a few hours after application followed by another 3.8 inches two weeks after application. These rains helped to incorporate the preemergence treatments and to germinate an additional flush of pigweeds a few weeks after treatment. Balance Bean was applied at either 2 or 3 oz/A alone or with Treflan as a PPI treatment. It was also applied at 2 or 3 oz/A as a preemergence. Balance Bean was also applied at 2 oz/A in combination with either Treflan, Caparol, Cotoran, Dual II Magnum or Valor. Caparol, Cotoran Dual II Magnum and Valor were also applied alone. As indicated by the table below, all treatments provided excellent pigweed control (100%) 14 days after application. Results from the thirty day observation indicate that some treatment separation began to occur. Preplant incorporated applications of Balance Bean alone controlled pigweed 94-95% 30 days after treatment (DAT). This was similar to preemergence applications of Balance bean applied preemergence alone at 3 oz/A and to single preemergence applications of Caparol, Cotoran, Dual II Magnum and Valor (95-100%). Preemergence applications of Balance Bean alone at 2 oz/A provided significantly less pigweed control (85%) 30 DAT. Combinations including Balance Bean did not improve pigweed control compared to stand alone treatments except when the Balance Bean preemergence rate was decreased to 2 oz/A.

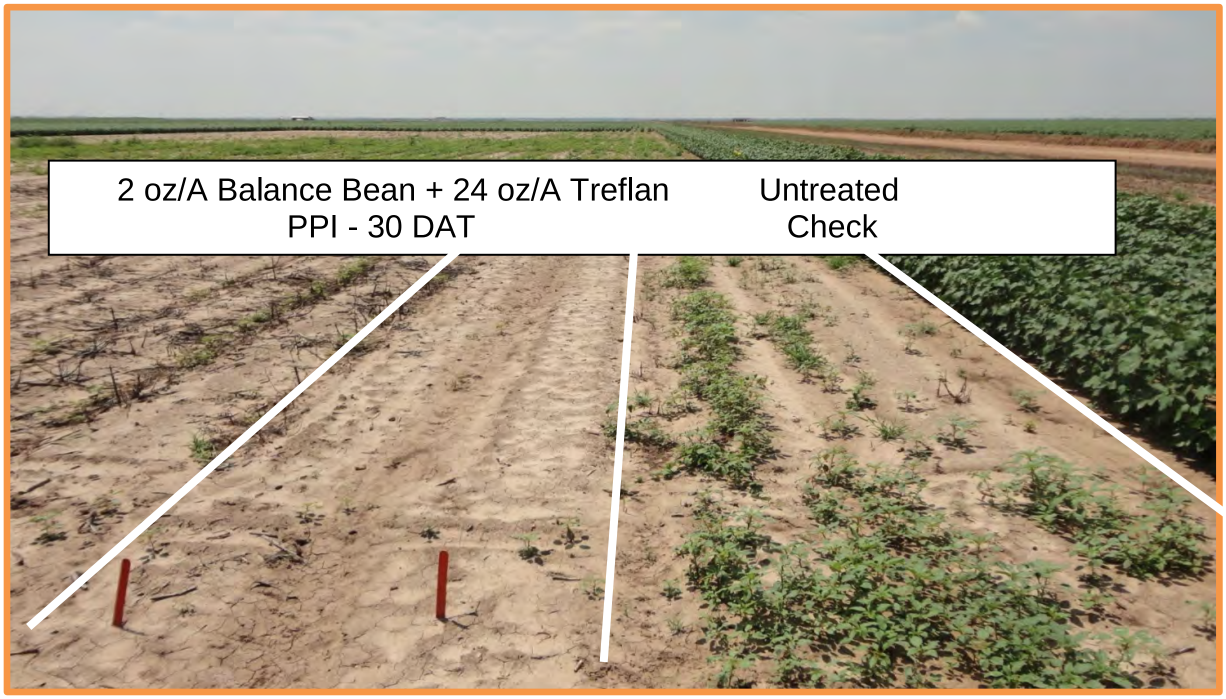

Figure 1. Pigweed control from Balance Bean + Treflan PPI.

Table 1. Treatments evaluated in Balance Bean trial.

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	Pigweed 7/16/2014 Control %		Pigweed 8/4/2014 Control %	
1	Untreated							0	b	0	g
2	Balance Bean	4	SC	3	OZ/A	PPI	A	100	a	94.5	cde
3	Balance Bean	4	SC	2	OZ/A	PPI	A	100	a	93.5	de
4	Balance Bean	4	SC	3	OZ/A	PRE	B	100	a	90.8	e
5	Balance Bean	4	SC	2	OZ/A	PRE	B	100	a	85	f
6	Balance Bean	4	SC	2	OZ/A	PPI	A	100	a	100	a
6	Treflan	4	L	1.5	PT/A	PPI	A				
7	Balance Bean	4	SC	2	OZ/A	PRE	B	100	a	96.5	a-d
7	Cotoran	4	L	32	OZ/A	PRE	B				
8	Balance Bean	4	SC	2	OZ/A	PRE	B	100	a	98.5	abc
8	Caparol	4	L	32	OZ/A	PRE	B				
9	Balance Bean	4	SC	2	OZ/A	PRE	B	100	a	100	a
9	Dual II Magnum	7.62	EC	20	OZ/A	PRE	B				
10	Balance Bean	4	SC	2	OZ/A	PRE	B	100	a	99.5	ab
10	Valor	50	WDG	2	OZ/A	PRE	B				
11	Cotoran	4	L	32	OZ/A	PRE	B	100	a	94.8	b-e
12	Caparol	4	L	32	OZ/A	PRE	B	100	a	97.3	a-d
13	Dual II Magnum	7.62	EC	20	OZ/A	PRE	B	100	a	99.5	ab
14	Valor	50	WDG	2	OZ/A	PRE	B	100	a	96.5	a-d
LSD (P=.05)								0		4.8	
CV								0		3.78	

Table 2. Application information for Balance Bean trial.

Application Description	
	A
Application Date:	7/2/2014
Time of Day:	8:00 AM
Application Method:	SPRAY
Application Timing:	PRE/PPI
Application Placement:	Broadcast
Applied By:	OSU
Air Temperature, Unit:	73 F
% Relative Humidity:	84
Wind Velocity, Unit:	4.5 mph
Wind Direction:	East
Dew Presence (Y/N):	Y yes
Soil Temperature, Unit:	72 F
Soil Moisture:	Dry
% Cloud Cover:	70
Next Rain Occurred On:	7/16/2014
Application Equipment	
	A
Appl. Equipment:	Backpack
Equipment Type:	SPRBAC
Operation Pressure, Unit:	32 PSI
Nozzle Type:	TurboTeej
Nozzle Size:	8002 VS
Nozzle Spacing, Unit:	20 in
Nozzles/Row:	2
Ground Speed, Unit:	3 mph
Incorporation Equip.:	Rototille
Hours to Incorp.:	0.1
Incorp. Depth, Unit	2.5 in
Carrier:	WATER
Spray Volume, Unit:	15 gal/ac
Mix Size, Unit:	0.5 gallons
Propellant:	CO2

FirstShot SG for Preplant Burndown of Winter Weeds

Figure 1. Redstem filaree trial area.

FirstShot SG is a sulfonylurea herbicide offering postemergence burndown control of broadleaf weeds. However, unlike other common sulfonylurea herbicides (such as Ally, Glean, Finesse, etc.), FirstShot SG has a very short plant back interval (for cotton) after application. In fact, depending on rate, soil type and soil pH, cotton may be planted 14-21 days after application. This may allow producers an additional option to control late emerging winter weeds just prior to planting. Ten treatments were applied on the 9th of April in order to evaluate their effectiveness on a population of Redstem filaree in Jackson County Oklahoma. FirstShot SG was applied with either glyphosate, 2,4-D, Engenia, or Gramoxone 2.0 SL. These treatments were compared to standard winter weed programs (glyphosate+ 2,4-D or dicamba, or Gramoxone applied alone). Unfortunately conditions were extremely dry at application time and worsened in the following 7-14 days. The picture above presents the condition of the untreated check 7 days after treatment. Due to severe drought no observation data was recorded.

Cotton Tolerance of Zidua Applied with a Hooded Sprayer

Zidua was applied through the Redball 420 layby hood at varying heights ranging from standard operating height to 50% coverage of cotton foliage in an effort to evaluate potential injury. Injury evaluations were made at 7, 14, & 28 days after treatment. Cotton was severely stressed and showed no signs of injury. Severe drought failed the cotton and therefore no yield results are reported.

Figure 1. Hooded sprayer settings for Zidua Postdirect trial.

COTTON HERBICIDE SUGGESTIONS

Read and follow all label directions before product use.

Products with Residual Control Highlighted in Yellow

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated, PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
2,4-D LV6 5.6 lb ai per gallon **All applications:** 2/3 – 2 2/3 pt /A For broadleaf weeds only	Active Ingredients: 2,4-Dichlorophenoxyacetic Acid MOA: 4	EARLY PRE-PLANT. **Apply at least 30 days prior to planting cotton for control of existing broadleaf weeds or potential for crop injury exists.** Tank-mix with glyphosate for additional control of grass species.	Coverage is essential for good control. Do not apply this product through any type of irrigation system. In order to maximize control of horseweed, apply before horseweed passes the rosette stage (prior to upright growth). A minimum of 1.0 lb ai/acre is recommended for optimum horseweed control.
Aim 2 EC 2.0 lb ai per gallon **EPP to PRE:** Up to 2.0 oz/A **Hooded and Post (directed)** Up to 1.6 oz/A For broadleaf weeds only	**Active Ingredients:** **Carfentrazone** **Similar Products:** None MOA: 14	**EARLY PRE-PLANT to PRE.** May be applied no later than one day after cotton planting. **Hooded and Post (directed).** Cotton less than 12 inches in height requires closed hood applications in order to avoid any contact with cotton stem or foliage or potential for crop injury exists. For layby applications cotton must be at least 12 inches in height and have sufficient bark on stem to avoid contact with green stem tissue.	Aim provides absolutely no grass control therefore tankmixing with glyphosate is recommended when grasses are present. **Hooded and Post (directed).** Do not apply when winds are above 10 mph or at application speeds above 5 mph. 10 GPA minimum spray volume. Include crop oil concentrate at 1% v/v. **Coverage is essential for good control.** When attempting to control volunteer cotton apply before volunteer reaches 5 leaf stage.
Assure II 0.88 lb ai per gallon **POST applications:** 5-12 fl oz. /A For grass weeds only	**Active Ingredients:** Quizalofop **Similar Products:** None **MOA:** 1	**POST.** Apply to young, actively growing grasses according to the rate chart listed on the label. If field is to be irrigated, apply product after irrigation. **Do not** apply more than 18 fl oz /A per season.	**Do not** apply this product through any type of irrigation system. **Do not** apply within 80 days of harvest. **Do not** feed forage or hay from treated areas.
Caparol 4 lb ai per gallon **PRE applications:** 2.4 pt /A For broadleaf and some grass weeds	**Active Ingredients:** Prometryn **Similar Products:** None **MOA:** 5	**PRE.** Apply at planting or shortly after planting (prior to cotton emergence) at the rate of 2.4 to 4.8 pt/A depending on soil type. See label for soil type and rate restrictions. **POST (layby).** Prevent spray from contacting green foliage or injury may occur. Use precision application equipment so the spray is accurately directed to the base of the cotton plants and still thoroughly covers soil and weeds beneath the cotton plants.	**Do not** feed treated forage to livestock, or graze treated areas, or illegal residues may result. **Do not** use on glandless cotton varieties, or crop injury will occur. **Do not** make more than one application per year. **POST-layby**. Cotton must be at least 12 inches tall. Rates vary from 1.6-3.2 pt/A depending on soil classification. See label for rate information according to soil type. Apply before weeds are two inches tall. May be tank-mixed with 2 lb ai/A MSMA at layby for morningglory control. When applying to emerged weeds, add 2 qt of surfactant per 100 gal of spray mixture.
Clarity 4 lb. ai per gallon **EPP applications:** 8 fl oz /A For broadleaf weeds only	**Active Ingredients:** Dicamba **Similar Products:** Banvel Rates may vary due to formulation. **MOA:** 4	**EARLY PREPLANT.** For best performance, apply when weeds are in the 2-4 leaf stage and rosettes are less than 2" in diameter. Following application and a minimum 1" of rainfall or overhead irrigation, a waiting interval of 21 days is required per 8 fluid ounces per acre or less. These intervals must be observed prior to planting cotton or potential for crop injury exists.	**Do not** apply through any type of irrigation equipment. **Do not** cultivate within 7 days after application. **For optimum control of horseweed apply a minimum of 8 oz/A to 2-4 leaf weeds or rosettes less than 2 inches across.** Consult label for cotton plant-back interval following application. Tank-mix with glyphosate for additional control of grass species.

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Dual II Magnum 7.64 lb ai per gallon **All applications:** 1 to 1.33 pt /A For small-seeded broadleaf and annual grass weeds	**Active Ingredients:** Metolachlor **Similar Products:** Dual Magnum Cinch **MOA:** 15	**PPI.** Apply and incorporate into top 1 inch immediately before planting, at planting, or after planting, but before crop or weeds emerge. **PRE.** Apply to soil surface at planting or after planting, but before weeds or crop emerges. **POST.** Apply after cotton emergence but prior to weed emergence. Will not control weeds that have already emerged prior to application. **All applications.** Apply at a rate of 1.0 pt/A on sandy loams, 1.0-1.33 pt/A on medium soil, or 1.33 pt/A on fine soils.	**Do not** use on sands and loamy sand. **Do not** feed forage from treated areas to livestock. **PPI.** PPI application is recommended if furrow irrigation is used or when a period of dry weather after application is expected. Crop should be planted below the level of incorporation; i.e., at least 1 inch on fine soils and 1.5 inches on coarse and medium soils. **PRE. Do not** apply to areas where water is likely to pond over the bed. **Do not** make broadcast applications to crops planted in furrows more than 2 inches deep.
Fusilade DX 2 lb ai per gallon **POST applications:** 48 fl oz /A For grass weeds only	**Active Ingredients:** Fluazifop **Similar Products:** None **MOA:** 1	**POST.** Refer to label for weed specific application rates and timing. Thorough coverage of all grass foliage is important for good activity. Optimum control is achieved when young actively growing grasses are treated that are not under stress from moisture, temperature, low soil fertility, mechanical, or chemical stress. **Always** add either crop oil concentrate, nonionic surfactant, or other adjuvant.	**Do not** apply to crop after boll set. **Do not** harvest within 90 days of application. **Do not** graze fields or harvest for forage or hay. **If applied through irrigation system,** apply only through sprinkler systems including center pivot, lateral move, end tow, side (wheel) roller, big gun, solid set, or hand move. **Do not** apply through any other type of irrigation system.
Fusion 2.56 lb ai per gallon **POST applications:** 6-12 fl oz /A For grass weeds only	**Active Ingredients:** Fluazifop Fenoxaprop **Similar Products:** None **MOA:** 1 & 1	**POST.** Best control of susceptible grasses is obtained when applied to actively growing grasses before they exceed the recommended growth stages listed, refer to label for list of grasses and application rates for specific weeds and areas.	**Do not** apply this product through any type of irrigation system. **Do not** apply if rainfall is expected within 1 hour. **Do not** apply more than 24 fluid ounces per acre per season. **Do not** apply after boll set. **Do not** harvest within 90 days of application. **Do not** graze fields or feed treated forage or hay to livestock.
Roundup Power Max 5.5 lb ai per gallon **All applications:** 22 to 32 oz /A Non-selective control of broadleaf and grass weeds	**Active Ingredients:** Glyphosate **Similar Products:** Many Rates may vary due to formulation. **MOA:** 9	**EARLY PREPLANT to PRE.** May be applied before, during or after planting crop. **POST (conventional cotton).** May be applied through hooded sprayers, recirculating sprayers, shielded applicators or wiper applicators. Allow at least 7 days between application and harvest. **POST over-the-top (Roundup Ready Flex or GlyTol cotton varieties).** Apply anytime from preemergence to 7 days prior to harvest. Late season applications may require directed applications to ensure proper weed coverage.	**Do not** apply through any type of irrigation system. **Do not** apply more than 5.3 qt per acre per year. **Refer** to label for application rates for specific weed types. **Do not** apply postemergence to any crops other than those listed as Roundup Ready Flex or GlyTol. **Do not** apply to Roundup Ready Flex or GlyTol crops within 7 days of harvest. For horseweed control apply a tank-mix of 22 oz/A Roundup PowerMax + a minimum of 1.0 lb ai /A 2,4-D or 0.25 lb ai/A of Dicamba. **In order to maximize control, apply before horseweed passes the rosette stage .**

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Gramoxone Inteon[r] 2 lb ai per gallon **EPP to PRE applications:** 2.5 to 4 pt /A Non-selective control of broadleaf and grass weeds	**Active Ingredients:** Paraquat **Similar Products:** Firestorm (3 lb) **MOA:** 22	**EARLY PREPLANT to PRE.** Apply prior to, during, or after planting, but before crop emergence. For fallow bed treatment, beds should be preformed to permit maximum broadleaf weed and grass emergence prior to treatment. Seeding should be done with minimum soil disturbance.	**Do not** apply this product through any type of irrigation system. **Always** add nonionic surfactant. Complete coverage is essential for good control.
Liberty 280 (formerly Ignite) 2.34 lb ai per gallon **POST applications:** 22 to 29 fl oz /A Non-selective control of broadleaf and grass weeds	**Active Ingredients:** Glufosinate-ammonium **Similar Products:** None **MOA:** 10	**EARLY PREPLANT to PRE.** Apply to actively growing weeds up to 120 prior to planting cotton. **POST over-the-top. Apply POST, over LibertyLink Cotton varieties only,** to actively growing weeds when the cotton has emerged and up to the cotton early bloom stage.	**Do not** apply more than 43 fl oz/A in a single application. **Do not** apply more than 87 fl oz/A in a growing season if 22-29 oz/A rates are used. **Do not** apply more than 72 oz/A in a growing season if first application of up to 30-43 oz/A is used. **Do not** apply within 70 days prior to harvest. Herbicide should be applied broadcast in a minimum of 15 gallons of water per acre. Use a spray volume of 20 to 40 gallons per acre for dense weed/crop canopies so that thorough spray coverage will be obtained.
Karmex DF 80% DF **EPP applications:** See table **PRE applications:** See table **POST applications:** 1 to 1.5 lb /A For small seeded broadleaf and annual grass weeds	**Active Ingredients:** Diuron **Similar Products:** Direx 4L Direx 80 DF Diuron 4L Diuron 80 DF **MOA:** 7	**EARLY PREPLANT.** Apply from 15 to 45 days prior to planting. If weeds are present the addition of a non-ionic surfactant is recommended. Weeds should be 2 inches or smaller. **PRE. Do not** apply to sand or loamy sand soils. Use only where crop is planted on flat or raised seedbeds (not planted in a furrow). Apply 1-2 lb/A according to labeled guidelines regarding soil texture. **POST-directed applications.** Apply 1 to 1.5 lb/A when crop is at least 12" high. In irrigated crops, best control is obtained if the field is irrigated within 3-4 days after application. Apply to soil beneath crop and between rows immediately after last cultivation.	**Do not** spray over the top of crop plants. **Do not** apply to sand or loamy sand soils. **Do not** use on soils with less than 1% organic matter as crop injury may result. **Do not** use in preplant or preemergence applications where soil-applied organophosphate insecticides are used due to potential for severe crop injury and possible stand loss. **Do not** allow livestock to graze treated cotton. **EPP & PRE.** If less than the maximum rate is used, a second PRE application can be made, but total can not exceed maximum use rates listed on label. **Do not** apply PRE if maximum application rate was used in preplant application.

Karmex DF Application Rates		
Soil Texture	**Rate/Acre**	**Rate/Acre/Season**
Sandy loam, Loam, Silt loam, Silt	1 lb /A	1 lb /A
Sandy clay loam, Clay loam, Silty clay loam, Sandy clay	1.25 lb /A	1.25 lb /A
Silty clay, Clay	2 lb /A	2.75 lb /A

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
MSMA 6.6 6.6 lb ai per gallon **All applications:** 0.5 to 2.5 pt /A For broadleaf and grass weeds	**Active Ingredients:** MSMA **Similar Products:** MSMA 6 Plus 120 Herbicide 912 Herbicide **MOA:** 17	**EARLY PREPLANT.** Apply preplant or postplant up to cracking of soil before cotton emergence using ground or aircraft equipment. Apply at a rate of 2.5 pt/A of product with a suitable surfactant. **POST (over-the-top).** Apply over the top when crop is 3 to 6 inches tall or up to early first square stage, apply at a rate of 1 to 1.25 pt/A with a suitable surfactant. **Will cause significant leaf burn of the crop.** **POST (Directed Spray).** Applicable as a directed spray with ground equipment when crop is 3 inches tall to first bloom, apply at a rate of 2.5 pt/A with a suitable surfactant.	**Apply** over the top of crop only as a salvage operation; apply only to healthy, rapidly growing crops, 3 inches high but no later than 6 inches high. **POST (Directed Spray). Do not** apply as a directed spray after the first bloom. A second or repeat application, if needed, should be timed about 1 to 3 weeks after first application.
Poast Plus 1 lb ai per gallon **POST applications:** 1.5 to 3.75 pt /A For grass weeds only	**Active Ingredients:** Sethoxydim **Similar Products:** Poast **Rates may vary due to formulation.** **MOA:** 1	**POST.** Applications can be made to actively growing weeds as aerial, broadcast, band, or spot spray applications. Most effective control is achieved if applied when weeds are small and actively growing.	**Do not** apply this product through any type of irrigation system. **Do not** apply within 40 days of harvest. To achieve consistent weed control, always use either seed oil or crop oil concentrate. **Do not** cultivate within 5 days before or 7 days after application. **Processed** meal may be fed to animals.

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Prowl 3.3 EC 3.3 lb ai per gallon **All applications:** See table. For small seeded broadleaf and grass weeds	**Active Ingredients:** Pendimethalin **Similar Products:** Pendimax 3.3 Prowl H2O **MOA:** 3	**EARLY PREPLANT.** Apply up to 15 days prior to planting. **PPI.** Apply up to 60 days prior to planting and incorporate within 7 days of application; however, immediate incorporation is best. **PRE.** Apply overlay application at planting or up to 2 days after planting. Total amount applied per acre cannot exceed the highest labeled rate for a given soil type. **POST/LAYBY.** Apply directly to the soil between rows as a directed spray following the last normal cultivation (layby). **Fall Application.** May be applied for weed control in cotton in the fall, after Oct. 15 (up to 140 days prior to planting). Apply at a broadcast rate of 1.8 pt /A on coarse soils, 2.4 pt /A on medium soils and 3.6 pt /A on fine soils.	**If applied through irrigation system,** use only center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move irrigation systems. **Do not** apply this product through any other type of irrigation system for layby applications. **Do not** apply as a broadcast spray over-the-top of crop. **Do not** feed forage or graze livestock in treated fields. **Product** is most effective when adequate rainfall or overhead irrigation is received within 7 days after application. **Use** higher rates listed for no-tillage applications for control of rhizome johnsongrass in specified soil textures. This use is not recommended for soils with more than 3% organic matter. **There** must be an interval of at least 60 days between the last application and harvest.
Prowl H2O 3.8 lb ai per gallon **All applications:** See table. For small-seeded broadleaf and grass weeds	**Active Ingredients:** Pendimethalin **Similar Products:** Pendimax 3.3 Prowl 3.3 EC MOA: **3**	**EARLY PREPLANT.** Apply up to 15 days prior to planting. **PPI.** Apply up to 60 days prior to planting and incorporate within 7 days of application; however, immediate incorporation is best. **PRE.** Apply overlay application at planting or up to 2 days after planting. Total amount applied per acre cannot exceed the highest labeled rate for a given soil type. **POST/LAYBY.** Apply directly to the soil between rows as a directed spray following the last normal cultivation (layby). **Fall Application.** May be applied for weed control in cotton in the fall, after Oct. 15 (up to 140 days prior to planting). Apply at a broadcast rate of 1.8 pt /A on coarse soils, 2.4 pt /A on medium soils and 3.6 pt /A on fine soils.	**If applied through irrigation system,** use only center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move irrigation systems. **Do not** apply this product through any other type of irrigation system for layby applications. **Do not** apply as a broadcast spray over the top of crop. **Do not** feed forage or graze livestock in treated fields. **Product** is most effective when adequate rainfall or overhead irrigation is received within 7 days after application. **Use** higher rates listed for no-tillage applications for control of rhizome johnsongrass in specified soil textures. This use is not recommended for soils with more than 3% organic matter. **There** must be an interval of at least 60 days between the last application and harvest. **Postemergence** over-the-top broadcast tank-mix applications with Roundup PowerMax may be made **to Roundup Ready Flex** or **GlyTol** cotton varieties between the 4 leaf and 8 leaf growth stages. Over-the-top applications past the 8 leaf stage may result in crop injury and or yield loss. Do not apply over-the-top of cotton with fluid fertilizer or to cotton under stress. Dry ammonium sulfate (at 17 lb/100 gal) or the liquid equivalent must be used when tank-mixing with Roundup PowerMax.

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

EPP, PPI &/or PRE	Prowl 3.3 EC Broadcast Rates pt/A		
	Soil Texture	**Conventional or Minimum Tillage**	**No-Tillage**
	Coarse	1.2 to 2.4 pt /A	1.8 to 2.4 pt /A
	Medium	1.8 to 2.4 pt /A	2.4 to 3.6 pt /A
	Fine	2.4 to 3.6 pt /A	3.6 to 4.8 pt /A
	For heavy clay soils, apply at a broadcast rate of 3.6 pt /A.		
	Total amount applied per acre cannot exceed the highest labeled rate for a given soil type.		

POST/LAYBY	Prowl 3.3 EC Layby Application Use Rates	
	Soil Texture	**Use Rate pt /A**
	Coarse	1.2 to 1.8 pt /A
	Medium	1.8 to 2.4 pt /A
	Fine	2.4 to 3.6 pt /A

EPP, PPI &/or PRE & Layby	Prowl H2O 3.8 Broadcast Use Rates		
	Soil Texture	**Conventional or Minimum Tillage**	**No-Tillage**
	Coarse	1 to 2 pt /A	2 pt /A
	Medium	2 pt /A	3 pt /A
	Fine	3 pt /A	4 pt /A
	For heavy clay soils, apply at a broadcast rate of 3 pt /A.		
	Total amount applied per acre cannot exceed the highest labeled rate for a given soil type.		

POST alone or tank-mixed with Roundup PowerMax	Prowl H2O 3.8 Broadcast Use Rates Conventional, Minimum or No-till	
	Soil Texture	**Use Rate pt /A**
	Coarse	1 to 2 pt /A
	Medium	1.5 to 2 pt /A
	Fine	2 pt /A

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Select 2 EC 2 lb ai per gallon **POST applications:** 6 to 16 fl oz /A For grass weeds only	**Active Ingredients:** Clethodim **Similar Products:** Prism **MOA:** 1	**POST.** Apply to actively growing grasses, refer to label for specific rates for weed type. In arid regions, application should be made as soon as possible after irrigation (within 7 days). A second application will generally provide more effective perennial grass control in arid conditions than a single application. Make second application to actively growing grass 2 to 3 weeks after emergence of new growth.	**Do not** apply within 60 days of harvest. **Do not** graze treated fields or feed treated forage or hay to livestock. **Do not** apply through any type of irrigation system. **Do not** apply if rainfall is expected within one hour of application. **Always** use a crop oil concentrate at 1.0 qt /A by ground or 1% v/v in the finished spray volume by air. **Refer** to label for application rates for specific grass species controlled.
Sequence 5.25 lb ai per gallon **All applications:** 2.5 to 4 pt/A Non-selective control of broadleaf and grass weeds	**Active Ingredients:** Metolachlor & Glyphosate **Similar Products:** None **MOA:** 15 & 9	**EARLY PREPLANT.** Apply prior to planting for control of emerged actively growing weeds and soil residual activity. **Do not** incorporate if applied EPP or crop injury will result. **PRE.** Apply after planting in no-till production system for control of emerged actively growing weeds and soil residual activity. **POST on Roundup Ready Flex and GlyTol cotton varieties.** Apply after crop and weeds have emerged for control of emerged actively growing weeds and soil residual activity.	**Do not** apply POST to non-Roundup Ready Flex or non-GlyTol cotton varieties. **Do not** graze or feed forage or fodder from Sequence treated cotton to livestock. **Do not** apply EPP or PRE on sand or loamy sand soils. **POST applications on Roundup Ready Flex or GlyTol cotton varieties:** Make postemergence applications from cotyledon stage to the 10-leaf stage (not to exceed 12 inches tall) of cotton development. **Do not** apply later as severe injury, including yield loss, could occur**. Do not** exceed 2.5 pt of Sequence per acre in a single application on cotton with less than 5 leaves. Apply up to 2.75 pt of Sequence per acre in a single application from the 5-leaf through the 10-leaf stage of cotton. **Do not** use if cotton plants are under stress.
Sharpen 2.85 lb ai per gallon **Early Preplant applications:** 1.0 oz/A For broadleaf weeds only	**Active Ingredients:** Saflufenacil **Similar Products:** None MOA: **14**	**EARLY PREPLANT.** Apply at least 42 days prior to planting cotton for control of emerged actively growing weeds and soil residual activity or crop injury may occur.	**Do not** plant cotton until 42 days and an accumulation of 1 inch of rainfall has occurred after application in order to avoid crop injury. **Do not** apply to coarse soils classified as sand with less than 1.5% organic matter or cotton injury may occur. **Do not** apply Sharpen with other Group 14/GroupE herbicides (such as flumioxazin) as a tank-mix or sequential application within 30 days or crop injury may result. **Do not** apply sharpen where an at-planting application of an organophosphate or carbamate insecticide(s) is planned because severe injury may result. May be tank-mixed with 0.25 lb ai/A Dicamba or 1.0 lb ai/A 2,4-D for horseweed control. **In order to maximize control, apply before horseweed passes the rosette stage (prior to upright growth).** For control of grass species tank-mix with glyphosate. Include either a crop oil concentrate or methylated seed oil at 1% v/v plus ammonium sulfate at 8.5 to 17 lb/100 gal.
Staple LX 3.2 lb ai per gallon **PRE applications:** 1.3 to 2.1 oz /A **POST applications:** 2.6 to 3.8 oz /A For broadleaf weeds only	**Active Ingredients:** Pyrithiobac **Similar Products:** None **MOA:** 2	**PRE.** May be applied preemergence to aid in the control of many problematic weeds. Applications require rainfall or sprinkler irrigation to activate the herbicide. Use the higher application rate for difficult to control weeds or in fields where high infestation of weeds occur. **POST.** Application should be made over-the-top or as a post-directed spray to cotton (begin at cotyledon stage) and actively growing weeds.	**PRE. Do not** apply through any type of irrigation system. **Do not** use on coarse soils such as sands or loamy sands. **Do not** use on soils with less than 0.5% organic matter. **Do not** use on crops planted in furrows. **POST.** Use a minimum of 10 gallons of water per acre by ground or 3 gallons of water per acre by air. All rates are broadcast. Use proportionately less for banded applications. **All applications. Do not** apply more than 5.1 oz/A per year. Add a non-ionic surfactant at the rate of 0.25-0.5% v/v or a crop oil concentrate at the rate of 1-2% v/v with all postemergence applications. Under arid conditions, a crop oil concentrate is recommended. Weed size at application is critical for optimal control, consult label for appropriate weed sizes.

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Treflan HFP 4.0 lb ai per gallon **PPI applications:** See table. For small seeded broadleaf and grass weeds	**Active Ingredients:** Trifluralin **Similar Products:** Treflan TR-10 Trifluralin HF Trust 10G Trust 4EC Trust Herbicide **MOA:** 3	**Fall applications.** Apply to flat ground and incorporate once within 24 hours. **Spring applications.** Application and incorporation may occur before planting or after planting prior to crop emergence. Use the lower application rates when sequential applications are anticipated. **Layby applications.** Application may be made in established crops from the 4 true leaf stage of growth up to layby, but no less than 90 days before harvest.	**If applying through irrigation system:** Apply only through continuously moving center pivot, lateral move, end tow, solid set, or hand move irrigation systems. **Refer** to label for additional chemigation instructions. **Do not** apply to soils that are wet or are subject to prolonged periods of flooding as poor weed control may result.

Treflan HFP Application Rates

Soil Texture	Spring Application	Fall Application	Chemigation Application	Conservation Tillage	Layby Application
Coarse	1 pt /A	2 pt /A	1-3 pt /A	1-2 pt /A	1 pt /A
Medium	1.25-1.5 pt /A	2 pt /A	1.5-4 pt /A	1.5-2 pt /A	1.5 pt /A
Fine	1.5-2 pt /A	2.5 pt /A	2-4 pt/A	2-4 pt /A	2 pt /A

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Valor SX 51% WP **Preplant Burndown applications:** 1 to 2 oz/A **POST-Directed/Hooded applications:** 2.0 oz/A For broadleaf and some grass weeds	**Active Ingredient:** Flumioxazin **Similar Products:** Valor **Rates may vary due to formulation** **MOA:** 14	**EARLY PREPLANT.** A minimum of 14 to 30 days must pass prior to planting cotton after application depending on tillage system and rate applied, consult label. **POST-Directed/Hooded Applications.** Precautions should be taken to avoid contacting the green foliage of cotton plants or severe crop injury may result. Cotton should be at least 6 inches in height at the time of application. Direct the spray onto the bottom 2 inches of the cotton stem-bark layer. **Do not** allow spray to contact green cotton stems. **Layby Application** Layby application of VALOR SX tank-mixes may be made once cotton has developed a minimum of 4 inches of bark and has reached a minimum of 18 inches in height. **Cotton that is smaller than 18 inches in height and/or has less than 4 inches of bark may be injured by VALOR SX applications.** VALOR SX application must be directed to the lower 2 inches of bark to avoid crop injury. Severe crop injury may result if application is made to green or unbarked stem.	**Do not** graze treated fields or feed treated forage or hay to livestock. **Do not** incorporate into the soil after application. **Do not** apply more than 2 oz/A in a single application or 4 oz/A during a single growing season. **Do not** make a sequential Valor WP application within 30 days of the previous Valor application. Do not apply within 60 days of harvest. **Do not** use on crops grown for seed. Only apply with nonionic surfactant, d**o not** apply with crop oil concentrate, methylated seed oil or other types of adjuvants as crop injury may result. Valor should be tank-mixed with glyphosate or MSMA to provide grass control. Consult label for rotation intervals to other crops. Spray equipment used to apply VALOR SX should not be used to apply other materials to any crop foliage
Warrant 3.0 lb ai/gallon **POST applications** 1.25 to 2 qt/A For small-seeded broadleaf and grass weeds	**Active Ingredient:** Acetochlor **Similar Products:** None **MOA:** 15	**POST.** Apply this product postemergence to cotton and preemergence to weeds at 1.25 to 2 qt/A according to soil classification rate chart listed on label. Application should be made after cotton is completely emerged but before bloom.	**Postemergence to Roundup Ready Flex or GlyTol cotton varieties.** This product may be tank-mixed with Roundup agricultural herbicides on Roundup Ready Flex or GlyTol cotton varieties when cotton is completely emerged until cotton reaches first bloom. The optimum timing of application is when cotton is in 2-3 leaf stage. Product may be applied again when cotton is in the 5 to 6 leaf stage if directed to the soil. **Do not make postemergence surface applications using sprayable fluid fertilizer as the carrier because severe crop injury may occur.**

Warrant Application Rates (Broadcast per acre)		
Soil Texture	**Less than 1.5% Organic Matter (quarts)**	**1.5% or More Organic Matter (quarts)**
Coarse	1.25 to 1.6	1.25 to 1.7
Medium	1.25 to 1.7	1.25 to 1.9
Fine	1.25 to 1.9	1.25 to 2.0

Herbicide Program Suggestions
For Fighting/Preventing Glyphosate Resistant Pigweed
In Oklahoma Cotton

Weed Control Programs in Glyphosate Tolerant Cotton Varieties (Roundup Ready Flex, GlyTol)

	Production System	Preplant Burndown or Incorporated	At-plant Burndown or Preemerge	Early to Mid-season Postemergence	Late-season Layby-Hoods
1	Minimum or No-till	Dicamba or 2,4-D + Glyphosate	Glyphosate + Prowl H20	Glyphosate + Staple LX	Aim + Direx
2	Minimum or No-till	Dicamba or 2,4-D + Valor + Glyphosate	Gramoxone SL + Direx	Glyphosate + Warrant	Glyphosate + Direx
3	Minimum or No-till	Dicamba or 2,4-D + Sharpen + Glyphosate	Glyphosate + Dual II Magnum	Glyphosate + Prowl H20	Caparol + MSMA
1	Conventional tillage	Treflan or Prowl H20	Caparol	Glyphosate + Staple LX	Valor + MSMA
2	Conventional tillage	Treflan or Prowl H20	Direx	Glyphosate + Warrant	Aim + Caparol
3	Conventional tillage	Treflan or Prowl H20	Staple LX	Glyphosate + Prowl H20	Direx + MSMA

Without the use of residuals Palmer amaranth can emerge all season long…plan ahead!

Preventing/Fighting Glyphosate Resistance in Oklahoma Cotton

✓ ***Plan ahead…devise an effective strategy early.***

-Consider season long approach…PPI thru layby
-Develop a spray schedule and consider alternatives
-Purchase chemical ahead of time if possible

✓ ***Return to the residuals…still several options which have different MOA.****

-Treflan/Prowl, Aim/Valor, Gramoxone Max, Caparol/Direx, Dual Magnum/Warrant, StapleLX/Pyrimax
-Consider potential crop rotational issues when using residuals

✓ ***Tank-mixing with glyphosate should be a standard consideration***

-Several in-season options, Prowl, Dual, Warrant, Staple, etc.

✓ ***Scout thoroughly …before and after applications.***

-Weed size at application time is key, check labels
-Identifying failures as early as possible can be critical

✓ ***Make every application count!***

-Choose appropriate rate for weed size at app….read labels
-Properly condition water…8-17 lbs/100 gal AMSO4 prior to the addition of glyphosate to the tank
-Use a spray volume that will provide good coverage…dense canopies require more water to effectively reach all weeds
-Speed is your enemy…what good is finishing in an hour if it has to be re-sprayed
-Avoid speeds that generate excess dust
-Avoid spraying in extreme temperatures

✓ ***Diversify your practices.***

-Don't rule out tillage
-Rotation may be necessary

Without the use of a residual product Palmer Amaranth can emerge all season…don't save yourself into a disaster!

*It is recommended that at least two different modes of action (MOA) be used in-season in addition to glyphosate.

Herbicide How-to:

Understanding Herbicide Mode of Action

Joe Armstrong
Extension Weeds Specialist

The large number of herbicide options—new products, old products with new names, new formulations of old products, premixes, and generics—can make weed control a difficult and confusing task. In addition to knowing the crops in which a herbicide can be used, the weeds it will control, the appropriate rate, and any necessary adjuvants to include, it is also important to know and understand the herbicide's mode of action to design a successful weed management program.

What is "Mode of Action?"

The mode of action is the way in which the herbicide controls susceptible plants. It usually describes the biological process or enzyme in the plant that the herbicide interrupts, affecting normal plant growth and development. In other cases, the mode of action may be a general description of the injury symptoms seen on susceptible plants. In Oklahoma crop production, 11 different herbicide modes of action are commonly used, and each is unique in the way it controls susceptible plants. Some herbicide modes of action comprise several chemical families that vary slightly in their chemical composition, but control susceptible plants in the same way and cause similar injury symptoms.

Herbicides can also be classified by their "site of action," or the specific biochemical site that is affected by the herbicide. The site of action is a more precise description of the herbicide's activity; however, the terms "site of action" and "mode of action" are often used interchangeably to describe different groups of herbicides.

Why is it Important to Know the Mode of Action?

Knowing and understanding each herbicide's mode of action is an important step in selecting the proper herbicide for each crop, diagnosing herbicide injury, and designing a successful weed management program for your production system. Over-reliance on a single herbicide active ingredient or mode of action places heavy selection pressure on a weed population and may eventually select for resistant individuals. Over time, the resistant individuals will multiply and become the dominant weeds in the field, resulting in herbicides that are no longer effective for weed control. Simply rotating herbicide active ingredients is not enough to prevent the development of herbicide-resistant weeds. Rotating herbicide modes of action, along with other weed control methods, is necessary to prevent or delay herbicide-resistant weeds. Always read each product's label to determine the mode of action and best management practices for herbicide-resistant weeds.

Many weeds have developed "cross resistance" and are resistant to multiple herbicides within a single mode of action. Most waterhemp populations in Oklahoma, for example, are cross-resistant to both Scepter (chemical family: imidazolinone) and Classic (chemical family: sulfonylurea). Both of these herbicides are ALS inhibitors, but belong to different chemical families within the same mode of action. Therefore, it is important to not only rotate herbicide active ingredients but also to rotate modes of action to prevent herbicide-resistance weed populations from developing. One of the most effective ways to rotate herbicide modes of action is through crop rotation.

Weeds that have developed "multiple resistance" are resistant to herbicides from two or more modes of action. At this time, there are no weeds in Oklahoma that have been confirmed as resistant to multiple herbicide modes of action; however, instances of weeds with multiple resistance can be found in neighboring states. ALS-resistant, PPO-resistant, and glyphosate-resistant populations of waterhemp have been confirmed in Kansas. As well, Italian ryegrass populations in Arkansas have been confirmed to be resistant to both ALS- and ACCase inhibitor herbicides.

How can I Determine the Herbicide's Mode of Action?

Information regarding each product's mode of action can sometimes be found on the front of the herbicide label. Often, the herbicide is described as being a member of a particular numbered group. These numbers refer to a specific mode of action and were developed to consistently organize herbicides based on their mode of action. For example, "Group 1" herbicides are ACCase inhibitors and "Group 2" herbicides are ALS inhibitors. Some herbicides will list the mode of action somewhere in the general instructions or product description in the label. In other situations, products may not mention the mode of action anywhere in the label. If you are unsure of the herbicide's mode of action, contact your local county extension educator for clarification.

What are the Different Modes of Action? What are their Characteristics?

The following is a short description of the 11 most commonly used herbicide modes of action in Oklahoma crop

(Continued on page 4)

ACCase Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
1	Arloxyphenoxypropionate "FOPs"	Assure II	quizalofop
		Hoelon[r]	diclofop
		Fusilade	fluazifop
		Puma	fenoxaprop
1	Cyclohexanedione "DIMs"	Select, Select Max, others	clethodim
		Poast, Poast Plus	sethoxydim
1	Phenylpyrazoline "DENs"	Axial XL	pinoxaden

ALS Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
2	Imidazolinone "IMIs"	Beyond, Raptor	imazamox
		Cadre	imazapic
		Pursuit	imazethapyr
		Scepter	imazaquin
2	Sulfonylurea "SUs"	Accent	nicosulfuron
		Ally	metsulfuron
		Amber	triasulfuron
		Autumn	iodosulfuron
		Beacon	primisulfuron
		Classic	chloriumuron
		Express	tribenuron
		Glean	chlorsulfuron
		Harmony	thifensulfuron
		Maverick	sulfosulfuron
		Option	foramsulfuron
		Osprey	mesosulfuron
		Peak	prosulfuron
		Permit	halosulfuron
		Resolve	rimsulfuron
2	Triazolopyrimidine	FirstRate	cloransulam-methyl
		PowerFlex	pyroxsulam
		Python	flumetsulam
		Strongarm	diclosulam
2	Pyrimidinyl(thio)benzoate	Staple	pyrithiobac
2	Sulfonylaminocarbonyltriazolinones	Everest	flucarbazone
		Olympus	propoxycarbazone

Root Growth Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
3	Dinitroaniline	Treflan, others	trifluralin
		Prowl, others	pendimethalin
		Sonalan	ethafluralin

Growth Regulators

Group	*Chemical family*	*Trade names*	*Active ingredient*
4	Phenoxy-carboxylic acid	many	2,4-D
		Butyrac, others	2,4-DB
			MCPA
4	Benzoic acid	Banvel, Clarity, Status, others	dicamba
4	Pyridine carboxylic acid	Stinger	clopyralid
		Starane	fluroxypyr
		Tordon[r], Grazon[r]	picloram
4	Quinoline carboxylic acid	Paramount	quinclorac

Photosynthesis Inhibitors (Photosystem II)

Group	*Chemical family*	*Trade names*	*Active ingredient*
5	Triazine	Aatrex[r], atrazine[r], others	atrazine
		Princep	simazine
		Caparol	prometryn
5	Triazinone	Sencor	metribuzin
		Velpar	hexazinone
5	Uracil	Sinbar	terbacil
6	Nitrile	Buctril, others	bromoxynil
6	Benzothiadiazinone	Basagran	bentazon
7	Urea	Linex, Lorox	linuron
		Karmex	diuron

Shoot Growth Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
8	Lipid synthesis inhibitor, thiocarbamate	Eptam	EPTC
15	Chloroacetamide	Dual, Cinch, others	metolachlor
		Intrro[r], Micro-Tech[r]	alachlor
		Harness[r], Degree[r], Surpass[r], others	acetochlor
		Outlook	dimethenamid-P
15	Oxyacetamide	Define	flufenacet

Aromatic Amino Acid Synthesis Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
9	Glycine	Roundup, Touchdown, others	glyphosate

Glutamine Synthesis Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
10	Phosphonic acid	Ignite, Liberty	glufosinate

Pigment Synthesis Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
12	Pyridazinone	Zorial Rapid 80	norflurazon
13	Isoxazolidinone	Command	clomazone
27	Triketone	Callisto	mesotrione
		Laudis	tembotrione
		Impact	topramezone
27	Isoxazole	Balance[r]	isoxaflutole

PPO Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
14	Diphenylether	Blazer	acifluorfen
		Reflex, Flexstar	fomesafen
		Cobra	lactofen
		Goal	oxyfluorfen
14	N-phenylphthalimide	Valor	flumioxazin
		Resource	flumiclorac
14	Thiadiazole	Cadet	fluthiacet
14	Triazolinone	Aim	carfentrazone
		Spartan, Authority	sulfentrazone

Photosynthesis Inhibitors (Photosystem I)

Group	*Chemical family*	*Trade names*	*Active ingredient*
22	Bipyridilium	Gramoxone Inteon[r], others	paraquat
		Reglone, others	diquat

[r] Restricted use pesticide.

production. The list of herbicides in the accompanying table (found on the inside pages) is not exhaustive and does not account for herbicide premixes that contain two or more active ingredients. If you have questions regarding mode of action, consult the individual product label and support literature from the manufacturer or contact your county agricultural Extension educator for more information.

ACCase Inhibitors (Group 1)

Inhibitors of the ACCase enzyme in plants are used strictly for grass control. As a result, they are used primarily in broadleaf crops or fallow situations, but there are also some products labeled for use in grass crops to control specific grass weeds. These herbicides are commonly referred to by the nicknames of their chemical families, "FOPs," "DIMs," and "DENs."

ALS Inhibitors (Branched-Chain Amino Acid Inhibitors) (Group 2)

ALS inhibitors, or branched-chain amino acid inhibitors, comprise the largest mode of action and include at least one herbicide used in nearly every crop produced in Oklahoma. Many herbicides in this mode of action fall into two chemical families: imidazolinones (or "IMIs") or sulfonylureas (or "SUs"), but there are three other chemical families within the ALS inhibitors. Cross resistance, or herbicide-resistance to multiple chemical families within a single mode of action, is common with ALS inhibitors.

Root Growth Inhibitors (Group 3)

Herbicides in this mode of action inhibit cell division, which stops roots from extending and are distinctive because of the yellow color of their formulations. They are applied preplant incorporated or preemergence in a wide range of agronomic crops, vegetables, turf, and ornamentals for control of grasses and small-seeded broadleaf weeds.

Growth Regulators (Group 4)

This mode of action, also known as synthetic auxins, includes many commonly used plant hormone-type herbicides in wheat, corn, sorghum, and pasture settings. These herbicides are generally selective for broadleaf control in grass crops; however, there are some uses for preplant and in-season weed control in broadleaf crops.

Photosynthesis Inhibitors—Photosystem II (Groups 5, 6, and 7)

These herbicides inhibit Photosystem II, part of the photosynthesis pathway, and are used in a variety of crops for control of grass and broadleaf weeds. Because of their extensive use for several decades, some weeds have developed resistance to these herbicides, particularly atrazine and metribuzin.

Shoot Growth Inhibitors (Groups 8 and 15)

Herbicides in this mode of action are soil-applied herbicides and control weeds that have not emerged from the soil surface. These herbicides generally control grass weeds and small-seeded broadleaf weeds.

Aromatic Amino Acid Inhibitors (Group 9)

The only herbicide included in this mode of action is glyphosate. There are many generic glyphosate and glyphosate-containing products available. Depending on the product, glyphosate can be formulated as ammonium, diammonium, dimethylammonium, isopropylamine, and/or potassium salts. Despite the different salt formulations available, it is important to know that the type of salt formulation does not affect weed control, but rather it indicates the way a particular glyphosate product is formulated. Glyphosate is a generally a non-selective herbicide and will severely injure or kill any living plant tissue that it comes in contact with. However, it can be used selectively in glyphosate-resistant crops, including corn, soybean, cotton, and canola. Like the ALS inhibitors, glyphosate controls susceptible plants by inhibiting amino acid synthesis; however, glyphosate and ALS inhibitors control susceptible plants in completely different ways and should not be considered to be the same mode of action.

Glutamine Synthesis Inhibitors (Group 10)

The only herbicide included in this mode of action is glufosinate. Glufosinate can be used as a non-selective burndown treatment or as an over-the-top postemergence application in Liberty Link® crops (glufosinate resistant).

Pigment Synthesis Inhibitors (Groups 12, 13, 27)

These herbicides are also called "bleachers" because of the characteristic white plant tissue that develops in susceptible plants after application. Several of the pigment synthesis inhibitors (mesotrione, isoxaflutole) are also referred to as HPPD-inhibitors, based on their site of action.

PPO Inhibitors (Groups 14)

PPO inhibitors may also be referred to as cell membrane disruptors and are usually "burner"-type herbicides. Some PPO-inhibitors can be applied preemergence, but most are used for postemergence weed control.

Photosynthesis Inhibitors—Photosystem I (Group 22)

Photosystem I inhibitors include paraquat and diquat and are used for non-selective weed control and crop desiccation prior to harvest. These herbicides are also referred to as "cell membrane disruptors" because of their contact activity.

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OKLAHOMA STATE UNIVERSITY
AGRICULTURE
Horseweed Control
Suggestions In No-till Cotton
✓ Use an effective control strategy ...tank-mix with Glyphosate
Include 1.0 lb ai/acre - 2,4-D or 0.25 lb ai/acre - Dicamba
✓ Spray when weeds are small
-Rosettes are easiest to control
✓ Remember labeled plant back intervals
-30 days after 2,4-D
-21 days after 1" rainfall following Dicamba*
*Do not apply Dicamba in regions receiving less than 25" of average annual rainfall.
Don't Let Horseweed Get the Jump on Your Cotton . . .
Start Clean and Stay Clean!

How to Use Agweather's Drift Risk Advisor

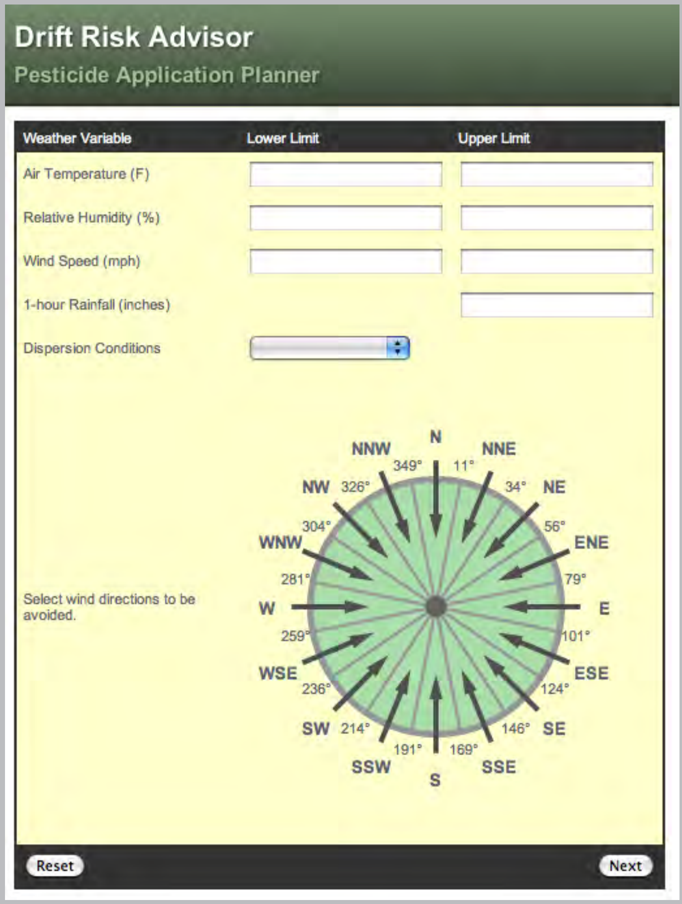
article revised November 2009

Introduction:

Spray applicators are faced with the challenge of avoiding spray drift. Spray drift is defined as "the output from an agricultural crop sprayer that is deflected out of the target area," typically caused by wind. Spray drift can be hazardous to sensitive plants and animals.

To aid applicators in identifying times of higher drift risk due to weather variables, the Oklahoma Mesonet has created a Drift Risk Advisor. This planning tool compares weather variable parameters with an 84-hour forecast matched to each Mesonet site. The Drift Risk Advisor uses the National Weather Service 84-hour North American Model forecast. In addition to weather variables the Drift Risk Advisor has forecasted dispersion conditions.

The Drift Risk Advisor is a weather-based planning tool that provides drift risk guidance, it does not supersede conditions at the field at the time of application that may be different from the forecast. The final judgement of whether conditions are appropriate for a spray application are the responsibility of the applicator.



Drift Risk Advisor Weather Variables:

Select "Upper" and "Lower Limits" that are appropriate for the application material. Upper and/or Lower Limits can be entered for one, all or any combination of the Drift Risk weather variables.

- Air temperature (Fahrenheit)
- Relative humidity (percent)
- Average wind speed (miles per hour)
- One hour rainfall (inches per hour)
- Wind direction
- Dispersion conditions

Dispersion conditions are based on the Oklahoma Mesonet Dispersion Advisor. Dispersion conditions are reported as one of six levels of vapor dispersion. These six categories are given text and number designations: Very Poor (1), Poor (2), Moderately Poor (3), Moderately Good (4), Good (5) and Excellent (6).

Finding the Drift Risk Advisor:

The Oklahoma Mesonet Drift Risk Advisor is located on the Agweather Web site (**http://agweather.mesonet.org**).

- From the main Agweather page, select "**Forecast**"
  - Choose "**Drift Risk Advisor**"

or

- From the main Agweather page, select "**Crop**"
  - Choose any crop
    - Under Pest Control, select "**Drift Risk Advisor**"

or

- From the main Agweather page, select "**Horticulture**"
  - Choose any horticulture crop
    - Under Pest Control, select "**Drift Risk Advisor**"

AGWEATHER

Drift Risk Advisor

Pesticide Application Planner

Date and Time	Criteria Met?	Wind Direction	Wind Direction in degrees	Wind Speed	Air Temperature	Rainfall per Hour	Dispersion Conditions	Relative Humidity
Nov 13, 2009 3:00 pm CST	Yes	SSW	194.7	4 mph	77°F	0.00 in.	5 (G)	36%
Nov 13, 2009 4:00 pm CST	Yes	S	176.7	3 mph	74°F	0.00 in.	4 (MG)	46%
Nov 13, 2009 5:00 pm CST	Yes	SE	143.5	2 mph	70°F	0.00 in.	3 (MP)	56%
Nov 13, 2009 6:00 pm CST	No	ESE	107.2	2 mph	66°F	0.00 in.	1 (VP)	65%
Nov 13, 2009 7:00 pm CST	No	SE	125.3	2 mph	65°F	0.00 in.	1 (VP)	68%
Nov 13, 2009 8:00 pm CST	No	SE	141.4	3 mph	64°F	0.00 in.	2 (P)	71%
Nov 13, 2009 9:00 pm CST	No	SSE	153.7	3 mph	63°F	0.00 in.	2 (P)	74%
Nov 13, 2009 10:00 pm CST	No	SSE	160.6	2 mph	61°F	0.00 in.	1 (VP)	78%
Nov 13, 2009 11:00 pm CST	No	SSW	194.5	1 mph	59°F	0.00 in.	1 (VP)	82%

Drift Risk Advisor Output Table:

The times when Weather Variables are within the user entered "**Upper and Lower Limits**" will appear as green colored boxes in the output table. When the Weather Variable is outside the Upper and Lower Limits, the box will have a red color. Weather Variables not compared will be shown in the table as column(s) of alternating gray and white boxes.

When all selected "**Weather Variables**" for a single hour fall within the entered Upper and Lower Limits, the "**Criteria Met?**" box will be colored green and have "**Yes**" text. When any one Weather Variable for a single hour falls outside the entered Upper and Lower Limits, the box in the "**Criteria Met?**" column will have a red color and "**No**" text.

Examples of Drift Caution Statements on Pesticide Labels

Trade name	Common name	Pesticide group	Drift caution statements
Banvel + 2,4-D	Banvel and 2,4-D	Hormone herbicide	Do not spray near sensitive plants if wind is gusty or in excess of 5 mph and moving in the direction of adjacent sensitive crops
Command 3ME	Clomazone	Preemergecy herbicide	Do not apply in winds about 10 mph. Avoid gusty or windless conditions
Dimethoate 4E	Dimethoate	Organophosphate insecticde	Apply only when the wind is less than or equal to 10 mph
Tordon 22K	Picloram	Hormone herbicide	Drift potential is lowest between wind speeds of 2-10 mph. Application should not occur during an inversion because drift potential is high.
Trigard	Cyromazine	Insect growth regulator	To avoid spray drift, do not apply under windy conditions
Warrior	Lambda-cyhalothrin	Synthetic pyrethroid insectcide	Do not apply when wind velocity exceeds 15 mph.

Your feedback is important to us. Call us at 405-325-3126.

Our story

In 1982, Oklahoma scientists recognized the need for a statewide weather network.

At OSU, agricultural scientists wanted to upgrade weather instruments at their research sites. Their goal was to expand the use of weather data in agricultural applications.

Meanwhile, scientists from OU and the Oklahoma Climatological Survey were helping to plan and implement a flood-warning system for Tulsa.

OSU and OU joined forces in 1987 when they realized that one statewide weather network would help both universities achieve their missions.

No other state or nation is known to have a network that boasts the capabilities of the Oklahoma Mesonet.

Agweather is one Web site that features data from the Oklahoma Mesonet. Agweather provides weather-related products for agriculture and natural resources.

Agweather can be found at http://agweather.mesonet.org/.

Agweather
LOCAL. RELIABLE. FREE.

Oklahoma Mesonet

Lugert-Altus Irrigation District

Deep Soil Sampling Program

Nitrogen (N) is typically one of the most expensive fertilizer nutrients used in cotton production. It can also be difficult to properly manage because of biological activity and mobility in the soil environment. Inadequate N reduces the number of fruiting sites and potential yield, whereas excessive N can create rank growth, and can actually lower yield and quality by delaying maturity. Excess N can also potentially increase problems with Verticillium wilt disease, insects, higher plant growth regulator requirements, and defoliation. Recommended N rates are based on the N required to produce a crop at a realistic yield goal, and should be reduced by credits for residual nitrate nitrogen (NO_3-N) in the soil, as well as by any NO_3-N applied in irrigation water. Crediting soil and water NO_3-N requires collection and submission of samples to a laboratory for proper analysis. In 2012, OSU N recommendations for cotton were changed from 60 lb N/bale of yield goal to 50 lb N/bale. A factsheet was generated to support this and it can be found below.

Deep soil sampling for residual N can be accomplished using a hydraulic probe. In Oklahoma, deep sampling to a depth of 18 inches is suggested and supported with recommendations by the Soil, Water & Forage Quality Analytical Laboratory. In order to accomplish this, a probe must be inserted 18" into the soil, and the resultant core should be sectioned into 0-6 inch (submit for routine analysis) and 6-18 inch (submit for NO_3-N only) increments. We have a few producers who have adopted deep sampling as a management practice. These producers have constructed the frame and purchased the hydraulic pump system and soil probes and other accessories. Probes have been mounted on utility vehicles such as a John Deere Gator or Ranger Polaris. Pickup trucks or small tractors can also be utilized. We recently acquired a Gator and Mr. Danny Davis of Elk City provided considerable assistance to get a hydraulic probe constructed and mounted. He pioneered this design a couple of years ago. We want to extend our thanks to Danny for his engineering skills and assistance. This equipment will expand our field sampling capabilities and will be used for numerous projects in the future.

There has been no release of irrigation water to the LAID since 2011 due to ongoing drought and the lack of runoff in the North Fork watershed, and many cotton fields failed over multiple years. Working with Mr. Gary Strickland, Jackson County Extension Educator, in March and April project personnel identified several LAID producer-cooperators who agreed to participate in a deep sampling project. A total of 24 fields were deep sampled to 18" inches using this probe, and cooperators completed a survey for each field. This represented a total of 2,654 acres out of the approximately 40,000 acres located in the Irrigation District.

The objectives were to evaluate nitrate-N accumulation by depth (0-6" and 6-18"), as well as obtain a general snapshot of residual P and K fertility. In addition, we included salinity testing in the 0-6" increment. Some sampled fields were sub-surface drip irrigated but many were furrow watered. All samples were submitted to the OSU Soil, Water, and Forage Analysis Laboratory on campus.

Results indicate that substantial nitrate-N has accumulated in the soil profile in several fields due to the ongoing drought, continuing mineralization, and multiple crop failures (Table 1). The range in lb/acre of residual nitrate-N found in fields was 57 to 266. Most fields with extremely high residual N had experienced no biomass removal since 2010. Other fields have had some level of biomass removal (low yielding forage production and harvest and baling, and thus removal) and have somewhat lower values.

Average field size was 111 acres, with an average of 151 lb N/acre noted across all fields. Overall, in the 24 fields surveyed, a total of 417,445 lb N was directly measured (Table 2). When using 32-0-0 priced at $350/ton ($0.57/lb actual N), this survey indicated that the total value of residual N found in these fields was $237,944. This averages about $89/acre across sampled fields. The average per field total value of residual N was $9,914. Since the Lugert-Altus Irrigation District consists of approximately 40,000 acres, and if these surveyed values from 24 fields (totaling 2654 acres) are accurate, then there is a total value of residual N of about $3.56 million.

The high soil residual nitrate-N will be a challenge for cotton producers in the future. The excessive accumulated N can exacerbate Verticillium wilt, increase cotton aphid populations, increase plant growth regulator need, delay maturity, challenge harvest aid performance, and ultimately negatively impact fiber quality (e.g. micronaire). This could result in cotton production losses, or extremely high expenses or both. It will also be a detriment to forage sorghum production, and possibly result in high nitrates in the harvested forage if extreme drought continues. Overall, salinity doesn't appear to be a major concern, with the exception of a few fields with high electrical conductivity.

24-Field Producer Survey Summary Results

Approximate acres represented in field? 2,654 total acres, 111 acres average per field

What is the lint yield goal for this field? 3 bales/acre average

Row spacing: 12 fields 38 inches (50%), 12 fields 40 inches (50%)

Irrigation type:
Subsurface drip: 7 fields (29.2%) Configuration: 3-76 inches, 4-80 inches
Furrow irrigation: 17 fields (70.8%)

Have you ever experienced any stand establishment issues or stand loss due to perceived salinity problems in this field? Yes 9 (37.5%) No 15 (62.5%)

Do you soil sample/test your fields? Yes (100%)

If yes, how often? 6 Not regular (25%) 18 annual (75%)

If yes, how deep? 6 (25%) Surface and subsoil
18 (75%) Surface only

Irrigation water tested? (Yes): 1 (4%)

If yes, what was ppm NO_3-N concentration (ppm): 0.1

Tillage System:	No-Till	Minimum-Till	Conventional Till
2010	8	5	11
2011	12	1	11
2012	12	12	0
2013	11	12	1

OKLAHOMA STATE UNIVERSITY EXTENSION

Table 1. 2014 Lugert-Altus Irrigation District Soil Sampling Project Results

	Soil Sample for Routine Analysis						Soil Sample for Salinity Testing									
Field	0-6" pH	0-6" NO3-N lb/acre	6-18" NO3-N lb/acre	total 0-18" NO3-N lb/acre	P index	K index	pH	EC umohs/cm	Na ppm	K ppm	Ca ppm	Mg ppm	B ppm	TSS ppm	PAR ratio	SAR ratio
1	7.8	23	58	81	19	682	8.0	2,997	315	23	127	34	0.2	1,978	0.28	6.4
2	7.7	27	50	77	12	745	7.7	2,694	311	17	95	31	0.2	1,778	0.23	7.1
3	7.7	24	52	76	2	518	7.8	8,850	909	19	521	147	0.2	5,841	0.11	9.1
4	7.7	25	78	103	24	682	7.6	2,034	218	30	77	25	0.2	1,342	0.45	5.5
5	7.5	24	78	102	14	550	7.6	3,141	337	23	116	39	0.2	2,073	0.28	6.9
6	7.6	19	48	67	6	560	7.6	1,398	177	16	38	13	0.2	923	0.34	6.3
7	7.8	28	190	218	59	564	7.7	1,494	139	22	64	21	0.2	986	0.36	3.9
8	7.6	23	34	57	61	763	7.7	3,912	357	42	168	50	0.2	2,582	0.43	6.2
9	7.9	34	170	204	26	744	7.6	2,391	256	25	88	27	0.2	1,578	0.35	6.1
10	7.5	32	72	104	42	812	7.6	2,163	208	30	88	28	0.2	1,428	0.42	4.9
11	7.5	28	176	204	65	801	7.3	1,722	175	27	65	22	0.2	1,137	0.43	4.8
12	7.7	83	178	261	50	809	7.7	4,710	461	37	196	61	0.2	3,109	0.35	7.4
13	7.3	61	130	191	76	527	7.3	3,408	298	45	144	52	0.2	2,249	0.48	5.4
14	7.7	26	72	98	31	778	7.7	1,608	104	26	94	17	0.2	1,061	0.38	2.6
15	7.7	31	160	191	103	545	7.8	1,932	220	20	64	21	0.2	1,275	0.33	6.1
16	7.6	67	170	237	53	586	7.6	8,250	814	31	389	107	0.2	5,445	0.21	9.4
17	7.7	26	70	96	54	826	7.7	4,101	426	31	178	53	0.4	2,707	0.31	7.2
18	7.6	38	142	180	49	802	7.7	4,524	429	46	202	58	0.2	2,986	0.43	6.8
19	7.6	21	62	83	46	529	7.7	1,332	122	31	53	18	0.2	879	0.55	3.7
20	6.6	24	152	176	56	553	6.8	2,766	227	56	114	42	0.2	1,826	0.67	4.6
21	7.5	42	150	192	37	627	7.7	3,303	329	30	127	39	0.2	2,180	0.35	6.5
22	7.8	38	116	154	69	851	7.7	2,640	303	29	85	29	0.2	1,742	0.41	7.2
23	7.7	70	196	266	18	675	7.7	4,224	492	27	148	47	0.2	2,788	0.29	9.0
24	7.9	77	128	205	19	672	7.9	5,001	526	19	211	57	0.2	3,301	0.18	8.3
Average	7.6	37	114	151	41	675	7.6	3,358	340	29	144	43	0.2	2,216	0	6

Table 2. 2014 Lugert-Altus Irrigation District Soil Sampling Project Results
Value of Residual Soil Nitrate-N Observed

Field	Acres	Total 0-18" NO3-N lb/acre	Total N lb/field	N value $/field
1	80	81	6,480	3,694
2	73	77	5,621	3,204
3	145	76	11,020	6,281
4	123	103	12,669	7,221
5	72	102	7,344	4,186
6	90	67	6,030	3,437
7	137	218	29,866	17,024
8	110	57	6,270	3,574
9	73	204	14,892	8,488
10	145	104	15,080	8,596
11	125	204	25,500	14,535
12	153	261	39,933	22,762
13	75	191	14,325	8,165
14	130	98	12,740	7,262
15	77	191	14,707	8,383
16	150	237	35,550	20,264
17	27	96	2,592	1,477
18	73	180	13,140	7,490
19	195	83	16,185	9,225
20	23	176	4,013	2,287
21	152	192	29,184	16,635
22	97	154	14,938	8,515
23	195	266	51,897	29,581
24	134	205	27,470	15,658
Total	2654	--	417,445	237,944
Average	111	151	17,394	9,914

N value at $350/ton of 32-0-0
is $0.57/lb actual N

Cotton Yield Goal - Nitrogen Rate Recommendation

Brian Arnall
Precision Nutrient Management

Randy Boman
Cotton Extension Program Leader

Nitrogen in the Crop

Nitrogen (N) is the most limiting mineral nutrient in cotton production. It plays an integral role as a building block for proteins and chlorophyll synthesis. Cotton lint is actually an extension of the cell wall of the seed. Therefore, if seed is not produced, then neither will lint. Unlike cereal grains, cotton can be impacted by both under- and over-fertilization. Under-fertilization can result in reduced fruiting site development, lead to boll abortion, reduce lint yield, and potentially reduce fiber length and strength. Over-fertilization can result in excessive vegetative growth (rank growth), higher plant growth regulator requirements to check the unwanted growth, decreased lint turnout, possibly increased *Verticillium* wilt disease incidence, maturity delay resulting in immature fiber (low micronaire), negative effects on harvest aid chemical treatment efficacy, and ultimately reduced lint yield and fiber quality (Main et al. 2010; Main et al. 2011).

Historic Trends and New Data

The past fifty years have brought great changes in Oklahoma cotton production. During that time, the average lint yield in Oklahoma has nearly tripled (Figure 1), while the amount of cotton seed required to produce a 480-lb bale of lint has decreased by about 100 lbs (Figure 2). This decrease was from about 800 lbs seed per bale of lint in the early to mid-1990s to about 700 lbs seed per bale of lint in more recent years. This indicates that the amount of lint produced per lb of seed has increased. Overall, this leads to a reduction in N removal per bale of lint. If we assume that seed N concentrations were relatively constant during these years, the amount of N removed by 100 lbs fewer seed per bale would represent about 12.5 percent less N per bale with modern transgenic cultivars when compared to 20 years ago.

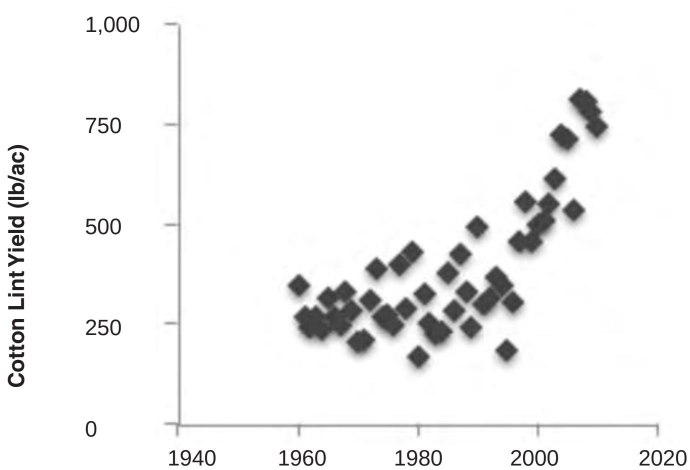


Figure 1. Average Oklahoma cotton lint yield (for irrigated and non-irrigated combined) from 1960 to 2010. Data retrieved from NASS.

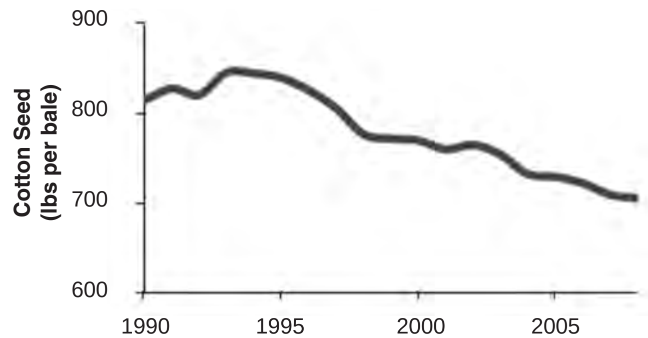


Figure 2. Average pounds of cotton seed required to produce one bale of lint from 1990 to 2010. Data shows a 5-yr smoothed average. Data retrieved from NASS.

A review of data from a long-term cotton fertility experiment conducted at the OSU Southwest Research and Extension Center near Altus indicated that since the early 1990s, maximum yield has essentially doubled and the total amount of N to meet the needs of the higher yielding crop has increased. However, N required per bale of lint has decreased. Several factors are involved in these tremendous productivity gains, including boll weevil eradication, Bt transgenic cultivars resistant to many caterpillar pests, transgenic weed control traits and herbicide systems that provide excellent control of weeds, and overall breeding improvements in cotton cultivars in terms of yield and quality. On average, the newer cultivars reached three bales per acre yields with just 120 lbs of N when all other nutrients were sufficient (Girma et al. 2007). The conclusion of the paper was that when P and K were adequate and held constant across N rates, all cultivars attained maximum lint yield with application of 120 lbs/ac N (Figure 3).

Nitrogen Requirement

With the changes in cultivars, lint yield potential, and other factors, Oklahoma State University has noted a need

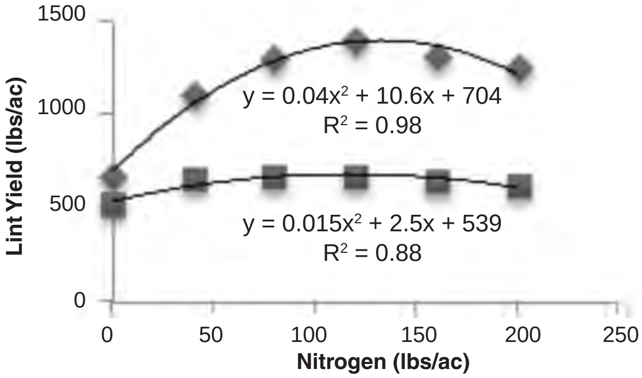


Figure 3. Nitrogen response curves when P and K were adequate from the long-term cotton fertility trial located at the OSU Southwest Research and Extension Center near Altus. Yield data for bottom regression line are Paymaster 145 cultivar from 1989-1994; whereas top regression line data are Paymaster 2326BG/RR cultivar from 2001 to 2004. Figure derived from Desta et al. 2007.

to adjust the N rate recommendation for cotton production in Oklahoma, which has been 60 lbs N/bale for many years. The amount of N needed for all crops is directly related to the yield goal of the field. Oklahoma State University now recommends that cotton requires 50 lbs of N per expected bale of lint (Table 1). This amount of N per bale of yield goal should be appropriate for most soils. It should be noted that the amount of N mineralized during the growing season is unknown for most soils, but it is obvious that contributions from atmospheric N deposition, and organic residue mineralization can be adequate in some irrigated soils to produce more than a bale of lint per acre (see Figure 3, 0-N rate yields).

Yield goals can be determined by one of two methods: a) the average of the three highest yields from the past five years, or b) the five-year average plus 20 percent. The total amount of N applied should be the yield goal rate (Table 1) minus soil test N, and any contributions of NO_3-N from irrigation water (if applied). Since cotton is a tap rooted crop it is recommended that both top soil (0 to 6 inches) and sub-soil (6 to 18 inches) samples should be collected and analyzed for

Table 1. Nitrogen requirement for cotton production in Oklahoma (actual N needed is the amount listed in the table less soil and irrigation water test N).

Yield Goal (bales /ac)	N requirement (lbs /ac)
1	50
1.5	75
2	100
2.5	125
3	150
3.5 and greater	175

residual nitrate (NO_3-N). The amount of NO_3-N found in subsoil can be significant and therefore can result in substantial fertilizer savings in terms of reduced N application.

In some areas of Oklahoma, irrigation water contains sufficient NO_3-N that should be credited toward the cotton N requirement. To determine if irrigation water contains significant NO_3-N, a water sample must be collected and submitted to a testing laboratory. For every one ppm of NO_3-N in irrigation water, 0.23 lb per acre of N will be added to the soil with each acre-inch of water applied. Thus, one acre-foot (12 acre-inches) of 10 ppm NO_3-N irrigation water would supply about 27 pounds of N per acre. This can be calculated using the following:

ppm of NO_3-N in water x 0.23 x inches of water applied = lbs of N per acre added.

As an example, suppose 15 inches of irrigation water is applied and the water test indicates 10 ppm for NO_3-N. Based on the above formula, an additional 34.5 lbs of N per acre will be applied during the growing season (10 ppm x 0.23 x 15 inches = 34.5 lbs N/acre).

Total N (soil test plus irrigation and fertilizer N) of 175 lbs per acre should be adequate for lint yields of 3.5 bales per acre and greater. This maximum rate may need to be reassessed in the future due to differences in N use efficiency among irrigation delivery systems, newer transgenic traits, or if yield otherwise increases to new record high levels. The total N requirement for cotton can be calculated using the following equation if soil and irrigation water (if available) are tested:

N (lbs/ac) = Yield goal N – {top soil NO_3-N + sub-soil NO_3-N + irrigation water NO_3-N}

In no-till fields with a large amount of crop residue the N rate should be increased by 20 to 30 lbs of N per acre when fertilizer is surface applied. This will compensate for the N tied up in the residue due to immobilization.

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Entomology & Plant Pathology

Outreach-NTOKcotton.org, cotton.okstate.edu, eXtension Cotton Community of Practice, Cotton Comments Newsletter, and Texas Cotton Resource DVD

The NTOK (North Texas, Oklahoma, and Kansas) program and website (www.ntokcotton.org), was maintained for the Oklahoma Cotton Council. This project was supported by generation of timely information on important issues during the growing season. For the ntokcotton.org website, and based on results from ipower.com website traffic analysis software, from January 1 through December 31, 2014, the number of unique visitors was 8,380. The total number of visits was 43,585, number of page downloads was 51,007, and total hits was 59,097. Documents downloaded totaled 44,696.

The OSU Extension Cotton Team published seven newsletters which were directly sent to 354 email recipients. A yearly survey was sent to all recipients, and a total of 31 responded. It was evident based on this survey and respondents, that an additional 76 people were forwarded the newsletter. Therefore, the best estimate we have for direct distribution of the newsletters would total about 430. The best estimate we have for direct distribution of the newsletter is a total of 3,010 (7 editions x 430 recipients). The recipients were asked to rate the newsletter on a scale of 1 to 5 (1 being not very useful) and 5 (being extremely useful). The result for the newsletter's usefulness was 4.53. With respect to the question of "topics being timely and discussed" the result was 4.59. When asked whether the newsletter was to be continued the result was 100% of respondents.

We placed considerable content on the www.cotton.okstate.edu website hosted by a campus server since it was initiated in 2012. We supported this website with our publications and newsletters. This website has a great appearance and we have provided various information tabs containing content or links for the following areas: Cotton Team, Cotton Comments Newsletters, Cotton Extension Annual Reports, Extensive Production Information Links, Variety Tests, Budgets, Irrigation, Sprayer Calibration, Weed Control, Weed Resistance Management, Plant Growth Regulators, Plant Growth and Development, Fertility, Insect Management, Diseases, Yield Estimation, Harvest Aids, Harvesting and Ginning, Fiber Quality, Crop Insurance, No-till Production, Producer Organization Links, Seed and Trait Company Links, Oklahoma Mesonet Tools, and Journal of Cotton Science.

Several years ago cotton specialists from across the Belt participated in conference calls and a meeting in Kansas City to establish the eXtension cotton website. We provided numerous numbered publications to upload to the Website. It was launched at the Beltwide Cotton Conference in Nashville in January, 2008. In 2012, this was still actively supported by our Beltwide Extension Cotton Specialist Working Group, a true multi-state research and extension effort. Dr. Boman is the subject matter editor for the Ginning and Classing section for the

Cotton Community of Practice. All subject matter sections were updated in the fall of 2012 by the various editors. Dr. Guy Collins of North Carolina State University is handling coordination of content updating. We have a direct link on both websites we manage. This website can be found at www.extension.org.

Included in Oklahoma State Support-Cotton Incorporated funding for 2012 was the acquisition of 500 copies of the 2011 Texas Cotton Resource DVD. We worked with Dr. Gaylon Morgan, State Extension Cotton Specialist with Texas A&M AgriLife Extension Service, and were successful in acquiring these DVDs. In addition to copies initially distributed in 2012, more copies were distributed at various meetings during 2014. We will continue to distribute this DVD during subsequent meetings in the state until the supply is exhausted.

Surveys of Crop and Pest Conditions

Population trends, insect updates, and control tips were published in the Cotton Comments Newsletter and distributed to the state's cotton producers and consultants to help formulate management strategies to enhance profitability. Field surveys were conducted in 7 counties with a total of 19 fields. Insect pressure as well as plant development were recorded and reported in the newsletters. Field inspections were performed weekly.

Plant development was also recorded and reported in the newsletter. As part of the COTMAN program, nodes above white flower (NAWF) criterion was tracked at each location (Figures 1 and 2) to assist producers in the identification of the last cohort of bolls that should likely make harvestable lint at each site. This assists with the termination of insecticides for late season pests, and helps determine irrigation termination and harvest aid application dates.

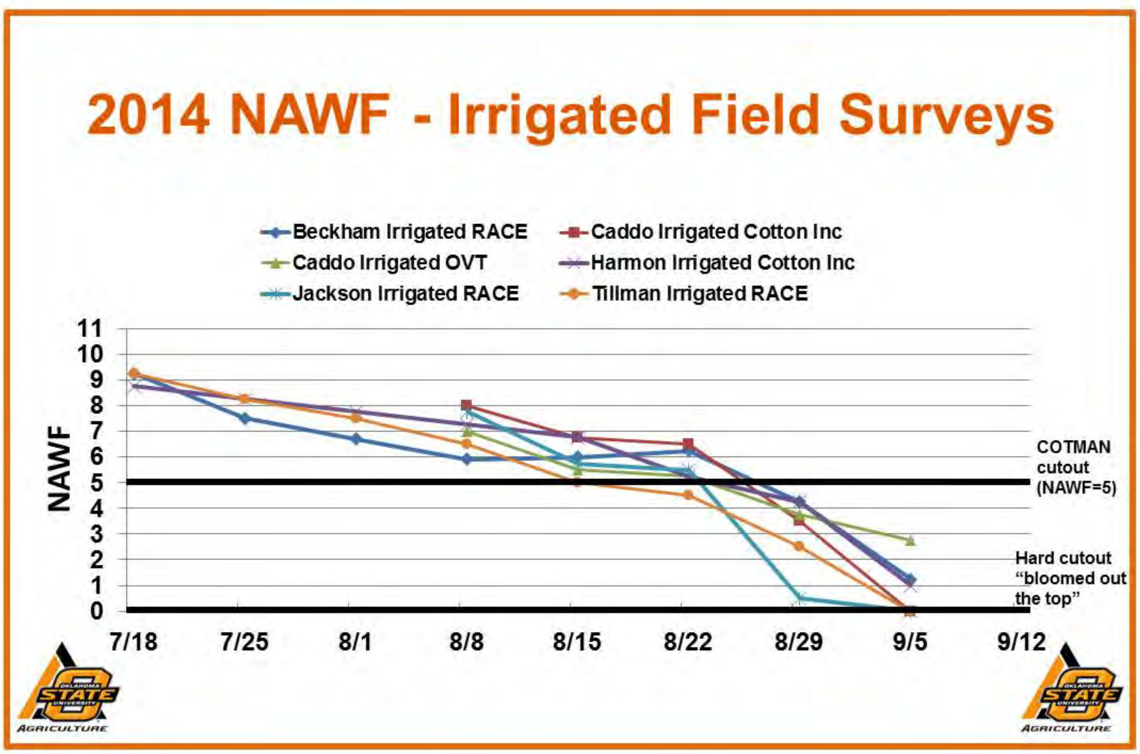

Figure 1. Weekly nodes above white flower (NAWF) in surveyed irrigated fields in 2014.

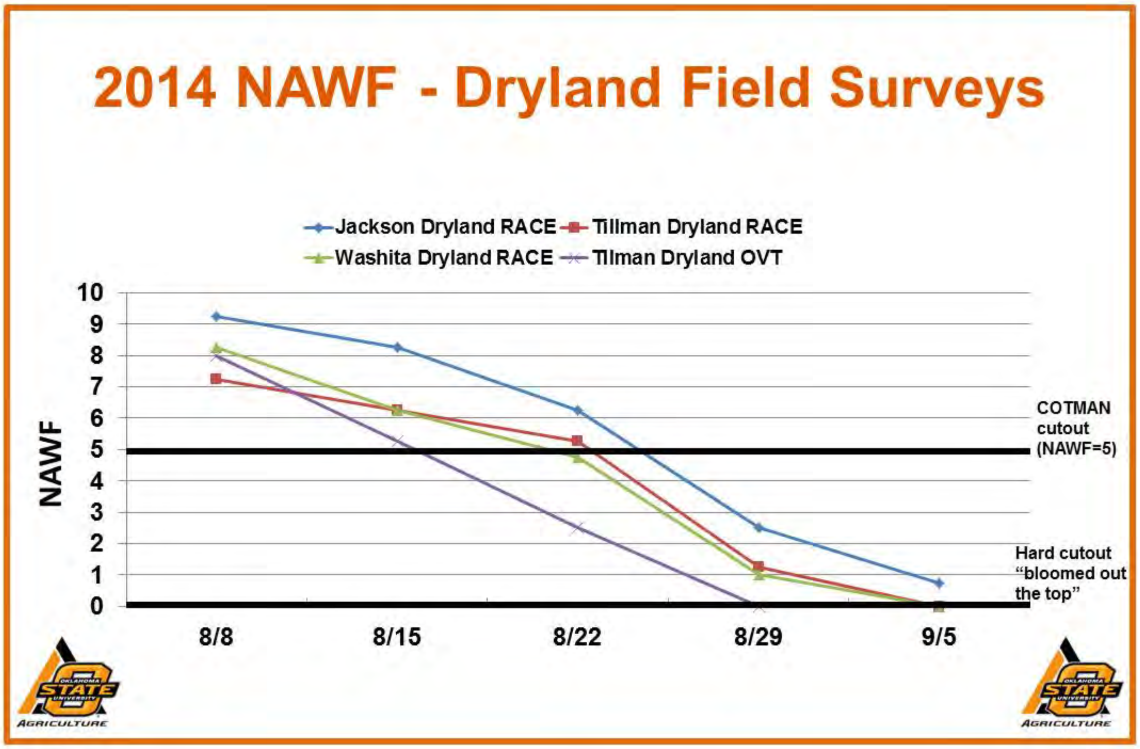

Figure 2. Weekly nodes above white flower (NAWF) in surveyed dryland fields in 2014.

<u>Research Accomplishments</u>

Cotton Bollworm / Tobacco Budworm and Beet Armyworm Monitoring

The bollworm/tobacco budworm complex has been the target of insecticide applications applied annually to a few acres of non-Bt cotton. Monitoring moth activities helps determine species ratio and peak ovipositional activity for these insects.

Traps were located near the communities of Altus, Delhi, Ft Cobb, Hollis, and Tipton. In addition to Heliothine activity, beet armyworm catches were also monitored at each location. Traps were maintained between June 1 and October 1, 2014. Although both species do coexist and are considered the same by growers, this species ratio is important since tobacco budworms exhibit a higher level of resistance to insecticides than bollworms. Also, it would be important to know this ratio in the event of Bt cotton failures. It is extremely important to detect fluctuations in species ratio of each ovipositional period and adjust insecticide recommendations accordingly if necessary.

A total of 808 moths were captured between the weeks of June 1 and October 1. This is approximately 20% lower compared to 2013. Bollworms comprised 81.43% of the total catch in 2014. Beet armyworm moth catches were extremely low.

Table 1. Moth Pheromone Trap Catch Totals for Selected Regions of Oklahoma, Summer 2014.

Altus	Tipton	Hollis	Ft. Cobb	Delhi
Bollworm				
226	191	131	39	71
Tobacco Budworm				
33	43	30	21	23
Beet Armyworm				
2	5	2	4	5

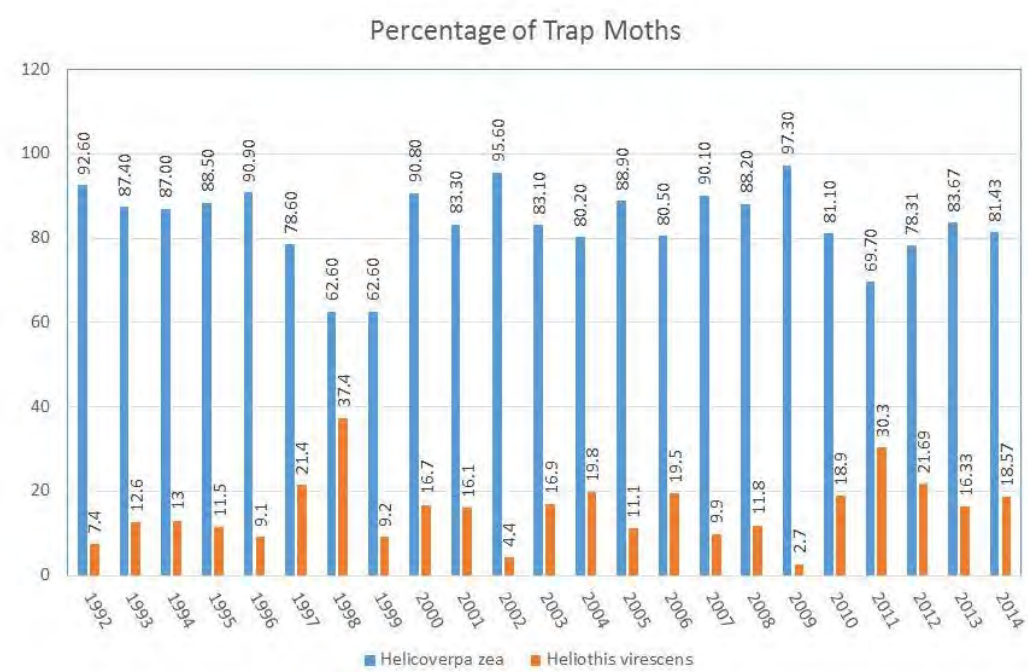

Figure 3. Species composition of moths trapped across Oklahoma, Summer 2014.

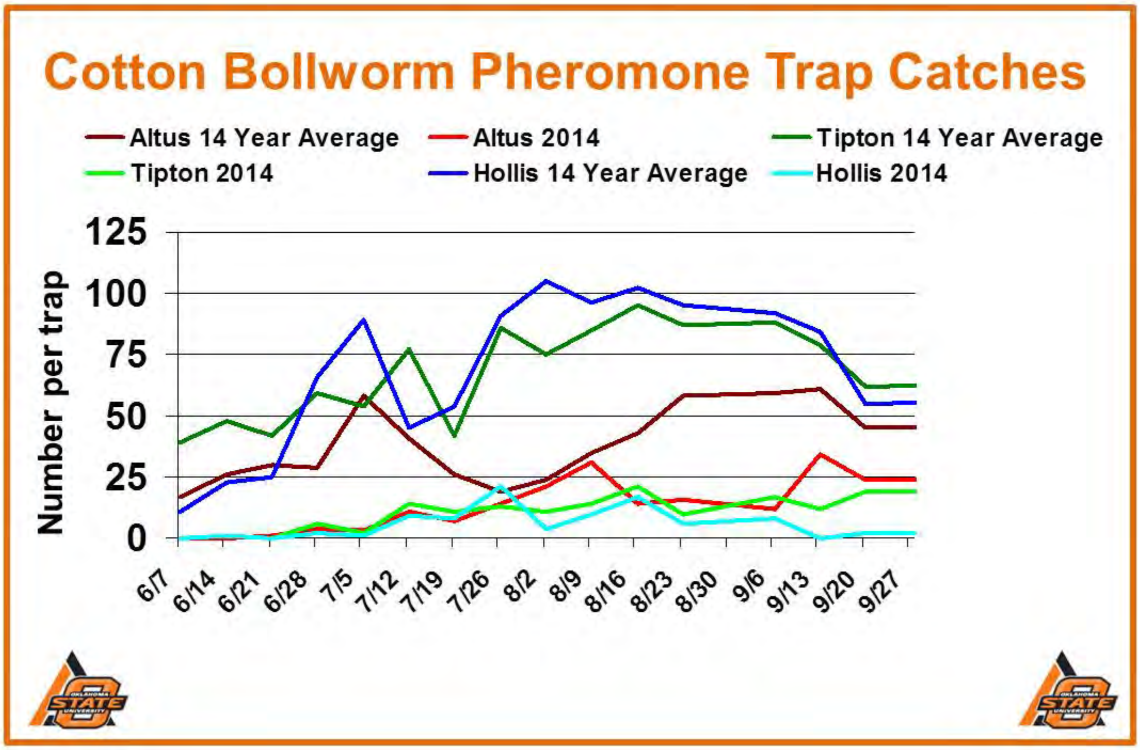

Figure 4. Cotton bollworm moths trapped by week across Oklahoma, Summer 2014.

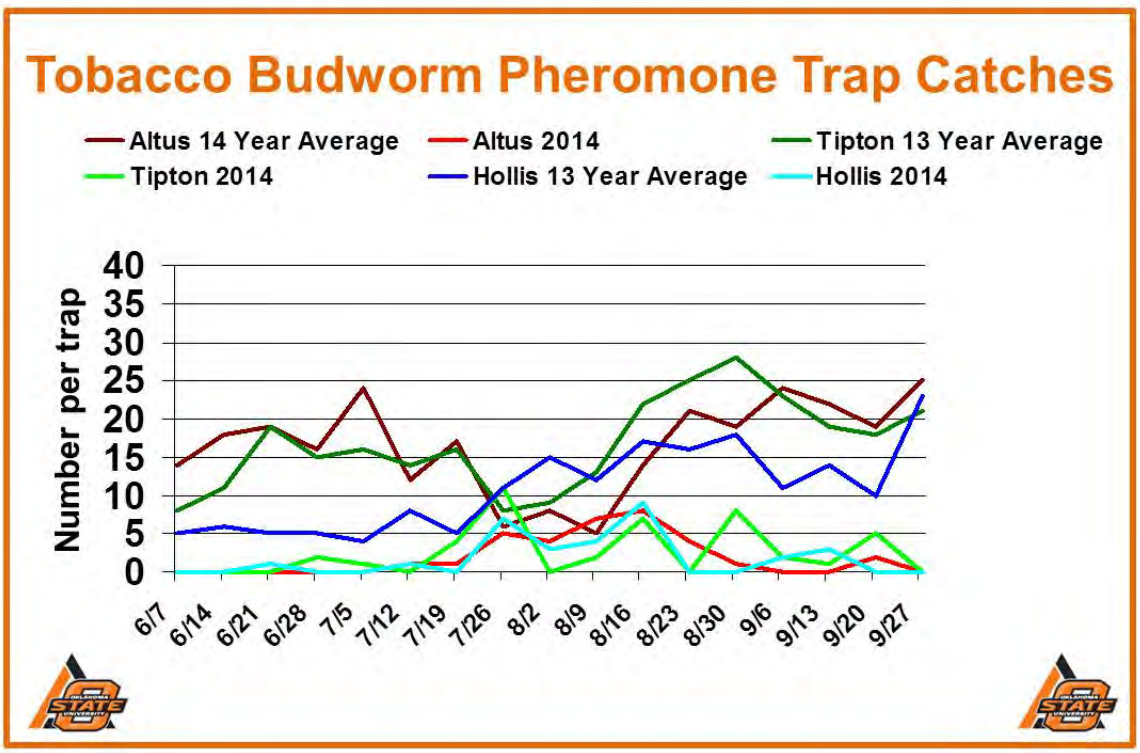

Figure 5. Tobacco budworm moths trapped by week across Oklahoma, Summer 2014.

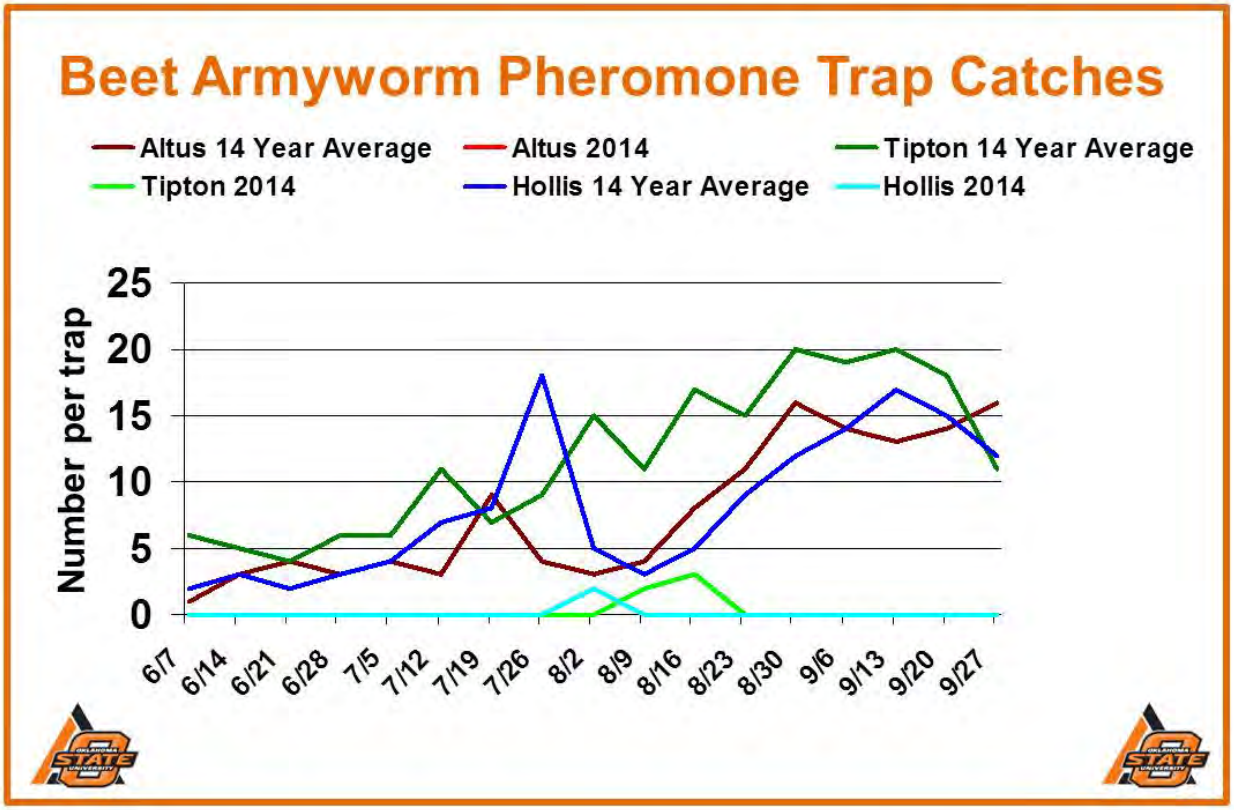

Figure 6. Beet armyworm moths trapped by week across Oklahoma, Summer 2014.

Insecticide Evaluation Trials

Three replicated Bayer CropScience seed treatment and in-furrow treatment trials were established in a producer-cooperator irrigated field in Tillman County. These trials included various experimental seed treatments and in-furrow treatments using the new Velum Total product. One trial consisted of 7 treatments, another had 6 treatments and the last one had 5 treatments. All trials were replicated 4 times, with observational data collected and yields determined. Pending outcome of projects conducted across the Cotton Belt, at this time Bayer CropScience has requested that this information not be published.

Dow Widestrike III Bt Observation Trial – Important Tool in Cotton Insect Resistance Management

Working with industry, we initiated a Dow PhytoGen Seed Innovation Plot that included one entry (PhytoGen 495 W3RF) containing Widestrike III triple-stacked Bt technology (Cry1A + Cry1F + VIP 3A) targeted to control various lepidopterous pests. Other entries included Dow's Widestrike and Monsanto's Bollgard II technologies. Although still sourced from Bt, Widestrike III is a different system than what is currently marketed by Monsanto (Bollgard II, Cry1A + Cry2AB), Dow AgroSciences' Widestrike (Cry1A + Cry1F), and Bayer CropSciences' TwinLink. TwinLink (consists of two genes to express Cry1Ab and Cry2Ae proteins) and was approved by EPA and USDA in 2013, and was commercialized in 2014. The objectives of this trial were to evaluate germplasm and to observe Widestrike III performance compared to Widestrike and

Bollgard II technologies. Widestrike III Bt was effective in controlling low populations of lepidopterous pests encountered at the site in 2014. Additional traits will be important to reduce the potential for insect resistance to currently planted Bt traits. In the near future, Bollgard II and TwinLink will also be stacked with the VIP 3A trait. These will be called Bollgard III and TwinLink Plus.

Evaluation of Flutriafol for Cotton Root Rot Control, Section 18 Request and EPA Approval

Phymatotrichopsis (or cotton) root rot (PRR) is caused by the fungus *Phymatotrichopsis omnivora*. Once infected, cotton is rapidly killed by this disease. As a result, yield is severely reduced, and harvesting efficiency declines due to dead stalks becoming entangled in harvester row units, particularly with stripper-type machines. Two Phymatotrichopsis (or cotton) root rot (PRR) control trials evaluating Topguard (flutriafol) were established in Kiowa (irrigated) and Tillman (dryland) counties in 2013. The dryland test failed due to extreme drought. When compared to the untreated check, yields in the 2013 irrigated trial were increased by 340 and 489 lb/acre for the 0.13 and the 0.26 lb a.i./acre rates, respectively. This represents 28 and 40 percent yield increases for flutriafol rates of 0.13 and 0.26 lb a.i./acre, respectively, when compared to the untreated check. The project results were presented at the 2014 Beltwide Cotton Conferences in New Orleans, LA.

Based on 2013 results and significant support from Texas research, a Section 18 request was made to the Oklahoma Department of Agriculture, Food and Forestry in early February, 2014. Counties in this request included Comanche, Cotton, Kiowa, and Tillman. Based on cotton plantings in these counties, this would potentially affect a maximum of about 50,000 acres (see http://obweo.org/County%20Statistics.htm).

A Section 18 was granted by EPA and was effective April 14, 2014 and expired on June 30, 2014. **In January 2015, EPA granted a full federal label for Topguard Terra (a 4 lb/gallon flutriafol product) for cotton root rot control. We were notified by Cheminova on February 13 that Oklahoma was the first state to approve the use of Topguard Terra under the new federal Section 3 label.**

COTTON INSECT LOSSES 2014

This report is sponsored by a grant from the Cotton Foundation.

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Highlights

Cotton losses to arthropod pests reduced overall yields by 2.38%. Lygus were the top ranked pest in 2014 reducing yields by 0.829%. Thrips were ranked second at 0.417%. Stink bugs were ranked third at 0.411%. Bollworm/budworm complex were fourth at 0319%. Cotton fleahopper caused 0.134% loss and spider mites reduced yields by 0.118%. No other pest exceeded 0.1% loss. Total costs and losses for insects in 2014 were $646.9 million. Direct management costs for arthropods were $34.07 per acre.

Table 1 Oklahoma Summary Cotton Insect Losses 2014

Pest	acres infested	acres treated	#apps/ acre trtd	#apps/ tot acres	cost/ acre	%red	Bales lost
Bollworm/Budworm	0	0	0	0.00	$0.00	0.000%	0
Beet Armyworm	0	0	0	0.00	$0.00	0.000%	0
Fall Armyworm	0	0	0	0.00	$0.00	0.000%	0
Loopers	0	0	0	0.00	$0.00	0.000%	0
Cutworms	0	0	0	0.00	$0.00	0.000%	0
Saltmarsh Caterpillar	0	0	0	0.00	$0.00	0.000%	0
Verde Plant bug	0	0	0	0.00	$0.00	0.000%	0
Cotton Fleahopper	178,500	136,500	2	1.14	$10.24	0.850%	2,897
Lygus	0	0	0	0.00	$0.00	0.000%	0
Stink Bugs	10,500	2,100	0	0.00	$0.00	0.050%	170
Clouded Plant bugs	0	0	0	0.00	$0.00	0.000%	0
Other Bugs	0	0	1	0.00	$0.00	0.000%	0
Bagrada Bug	0	0	0	0.00	$0.00	0.000%	0
Leaf-footed Bugs	0	0	0	0.00	$0.00	0.000%	0
Spider Mites	0	0	0	0.00	$0.00	0.000%	0
	63,000	84,000	1	0.40	$0.80	0.600%	2,045
Aphids	0	0	0	0.00	$0.00	0.000%	0
Grasshoppers	84,000	42,000	1	0.20	$2.00	0.400%	1,363
Banded Winged Whitefly	0	0	0	0.00	$0.00	0.000%	0
Silverleaf Whitefly (Bemisia)	0	0	0	0.00	$0.00	0.000%	0
Darkling Beetle	0	0	0	0.00	$0.00	0.000%	0
Pale-striped Flea Beetle	0	0	0	0.00	$0.00	0.000%	0
Boll Weevil	0	0	0	0.00	$0.00	0.000%	0
				1.74	$13.04	1.900%	6,475

Yield & Management Results	
Total Acres	210,000
Total bales Harvested	255,938
yield (lbs/acre)	585
Total bales Lost to Insects	6,475
Percent Yield Loss	1.90%
Yield w/o Insects (lbs/ac)	596
Ave. # Spray Applications	1.74
Bales lost all factors	84,858
% yield loss all factors	24.90%

Economic Results	Total	Per Acre
Foliar Insecticides Costs	$2,737,875	$13.04
At Planting Costs	$913,500	$4.35
In-furrow costs	$0	$0.00
Scouting costs	$204,750	$0.98
Eradication costs	$945,000	$4.50
Transgenic cotton	$1,197,000	$5.70
Total Costs	$5,998,125	$28.56
Yield Lost to insects	$2,020,236	$9.62
Total Losses + Costs	$8,018,361	$38.18

COTTON DISEASE LOSS ESTIMATE COMMITTEE REPORT, 2014

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Abstract

The National Cotton Council Disease Loss committee submitted estimates of the losses due to each disease during the 2014 growing season. Estimates are calculated by cotton specialists in each state discussing disease incidence observed across each state during the year. Yield losses are determined by using the USDA "Crop Production" published at www.usda.gov/nass/PUBS/TODAYRPT/crop1114.pdf which documents cotton acreage planted, harvested, and average yields for each state. Total average percent loss was estimated at 11.7% which is down 0.84 % from 2013. Plant parasitic nematodes were the group of pathogens responsible for the largest average percent loss estimated at 5.5% up from the previous two years. Georgia, Alabama, Louisiana, and Mississippi, suffered the greatest disease losses of over 15 %; although these states were followed closely by Tennessee, South Carolina, and Florida which estimated losses over 10%. Oklahoma, New Mexico, and California appeared to have the best growing conditions with the least amount of disease losses.

Table 1. Cotton disease loss estimates for the 2014 season.

2014	loss %	loss %	loss %	loss %	loss %	loss %	loss %	loss %	loss %	loss %	loss %	loss %	loss %	loss %	loss %	loss %	Total	%
Percent disease loss estimates	**AL**	**AZ***	**AR**	**CA***	**FL**	**GA**	**LA**	**MS**	**MO**	**NM***	**NC**	**OK**	**SC**	**TN**	**TX***	**VA**	**Bales lost**	**Bales lost**
Fusarium Wilt (F.o. vasinfectum)	1.0	0.0	0.0	1.5	0.0	0.1	0.0	trace	0.1	0.0	0.0	0.0	1.0	0.5	0.0	0.0		0.2
Bales lost to Fusarium (x 1,000)	*7*	*0*	*0*	*11*	*0*	*3*	*0*	*0*	*1*	*0*	*0*	*0*	*5*	*2*	*0*	*0*	*28*	
Verticillium Wilt (V. dahliae)	1.5	1.5	1.6	0.4	0.0	0.0	0.0	trace	0.1	1.0	0.0	0.5	0.0	0.5	1.6	0.0		0.8
Bales lost to Verticillium (x 1,000)	*10*	*8*	*13*	*3*	*0*	*0*	*0*	*0*	*1*	*1*	*0*	*1*	*0*	*2*	*96*	*0*	*133*	
Bacterial Blight (X. malvacearum)	trace	0.0	0.3	0.0	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.0		0.1
Bales lost to Xanthomonas (x 1,000)	*0*	*0*	*2*	*0*	*0*	*0*	*2*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*18*	*0*	*24*	
Root Rot (P. omnivora)	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0		0.0
Bales lost to Phymatotrichopsis (x 1,000)	*0*	*8*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*8*	
Seedling Diseases (Rhizoctonia & Etc.)	4.5	0.5	2.5	1.5	0.3	2.0	3.0	2.1	3.0	0.5	2.0	0.1	0.5	6.0	2.5	2.0		2.3
Bales lost to Seedling disease (x 1,000)	*29*	*3*	*20*	*11*	*1*	*50*	*12*	*21*	*17*	*0*	*20*	*0*	*3*	*30*	*149*	*5*	*370*	
Ascochyta Blight (A. gossypii)	0.5	0.0	0.0	0.0	1.0	trace	0.3	trace	0.0	0.0	0.5	0.0	0.1	0.5	0.0	0.1		0.1
Bales lost to Ascochyta (x 1,000)	*3*	*0*	*0*	*0*	*2*	*0*	*1*	*0*	*0*	*0*	*5*	*0*	*1*	*2*	*0*	*0*	*15*	
Boll Rots (Rhizopus, etc.)	2.0	0.1	1.0	trace	3.0	2.0	1.5	3.4	3.0	0.0	3.0	0.0	0.3	1.0	1.0	1.0		1.5
Bales lost to Rhizopus (x 1,000)	*13*	*1*	*8*	*0*	*6*	*50*	*6*	*34*	*17*	*0*	*30*	*0*	*2*	*5*	*60*	*2*	*233*	
Nematodes (All)	5.0	2.5	4.0	0.1	4.0	13.0	6.0	7.9	2.0	0.5	4.0	0.1	8.0	3.0	4.0	3.0		5.5
Bales lost to Nematodes (x 1,000)	*33*	*13*	*32*	*1*	*8*	*325*	*25*	*79*	*11*	*0*	*40*	*0*	*43*	*15*	*239*	*7*	*870*	
Nematodes (Meloidogyne spp.)	1.0	2.5	2.0	0.1	3.0	10.0	3.0	1.6	0.5	0.5	2.5	0.1	4.0	0.0	2.0	2.0		3.1
Bales lost to Meloidogyne (x 1,000)	*7*	*13*	*16*	*1*	*6*	*250*	*12*	*16*	*3*	*0*	*25*	*0*	*22*	*0*	*120*	*5*	*494*	
Nematodes (Reniform reniformis)	4.0	0.0	2.0	0.0	1.0	2.5	3.0	5.8	1.0	0.0	0.5	0.0	2.0	3.0	2.0	0.0		2.1
Bales lost to Reniform (x 1,000)	*26*	*0*	*16*	*0*	*2*	*63*	*12*	*58*	*6*	*0*	*5*	*0*	*11*	*15*	*120*	*0*	*333*	
Nematodes (Other spp.)	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.5	0.0	0.2	0.0	2.0	0.0	0.0	1.0		0.2
Bales lost to other Nematodes (x 1,000)	*3*	*0*	*0*	*0*	*0*	*13*	*0*	*5*	*3*	*0*	*2*	*0*	*11*	*0*	*0*	*2*	*39*	
Leaf Spots & Others	1.0	0.0	0.3	0.0	2.0	2.5	4.0	1.4	0.1	0.0	0.5	0.5	0.2	0.8	0.3	0.2		0.9
Bales lost to Leaf spots & Others (x 1,000)	*7*	*0*	*2*	*0*	*4*	*63*	*16*	*14*	*1*	*0*	*5*	*1*	*1*	*4*	*18*	*0*	*136*	
Total Percent Lost	16.0	6.1	9.7	3.5	10.3	19.6	15.3	14.9	8.3	2.0	9.2	1.4	10.1	12.3	9.7	6.3		11.7
Total Bales Lost (x 1,000)	*104*	*31*	*78*	*25*	*22*	*490*	*63*	*149*	*46*	*1*	*91*	*3*	*54*	*61*	*580*	*14*	*1811*	
Total Yield in Bales (x 1,000)(USDA Dec'14)	650	500	800	705	210	2500	410	1000	560	71	990	235	540	495	5975	230	15871 **	

notes:

* for AZ, CA, NM and TX: yields include upland and pima cotton production

** Total estimated US yield excludes 52,000 bales produced in KS (disease losses not known)

Comments:

AL Warm wet spring with rainfall in late June and July and a very dry late summer and fall. Nematode damage was greater especially on irrigated land. Fusarium and Verticillium wilt incidence and severity were greater. Corynespora leaf spot was very light this season..

GA Our season was characterized by extremes. Planting was, in some cases, delayed by excessive rains. However, once significant plant commenced and throughout much of the rest of the season, drought was punishing. Seedling disease was a problem, but down from 2013. Stemphylium leaf spot was problematic as a result of drought; target spot was less of a problem than in 2013. Nematodes continue to be our biggest challenge and loss of aldicarb continues to be an issue. Also, in 2014 many growers who would have used Telone II did not because of delayed planting due to rains. Fusarium wilt continues to gain importance. While still only affecting a small percentage of the acreage, where it does occur can be very damaging. Lastly, boll rot was problematic, but down from 2013 because of drought.

OK Lack of water was their biggest problem.

Harvest Aids

Three harvest aid demonstrations were initiated adjacent to the Tillman County furrow irrigated RACE trial (applied September 25), the Jackson County furrow irrigated RACE trial (September 26), and the Harmon County subsurface drip irrigated RACE trial (September 26). Since these plots were not replicated, no data was collected (strictly for demonstration purposes only). These demonstrations focused on tankmixing various defoliants with ethephon, and consisted of 8 treatments of interest for producers. Signs were installed on each treatment at all sites so producers could observe and determine the most effective treatment. One site was established in the Lugert-Altus Irrigation District near Altus. This demonstration consisted of 10 treatments of less costly products for growers to evaluate. This was a timely project and was very useful for producers to observe the performance of several harvest aid products and rates on lower yielding rainfed cotton destined for harvest in the area in 2014.

Table 1. Treatments used in 2014 Irrigated harvest aid demonstrations.

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage
1	Ethephon	6	L	32	OZ/A	60%Open
	Folex	6	EC	16	OZ/A	60%Open
2	Ethephon	6	L	32	OZ/A	60%Open
	ETX	0.208	EC	1.25	OZ/A	60%Open
	Crop Oil Concentrate	100	L	1	% V/V	60%Open
3	Ethephon	6	L	32	OZ/A	60%Open
	Sharpen	2.85	SC	1	OZ/A	60%Open
	Methylated Seed Oil (MSO)	100	L	1	% V/V	60%Open
	Ammonium Sulfate (spray grade)	100	WG	17.5	LB/100 GA	60%Open
4	Ethephon	6	L	32	OZ/A	60%Open
	Display	2	L	1	OZ/A	60%Open
	Crop Oil Concentrate	100	L	1	% V/V	60%Open
5	Ethephon	6	L	32	OZ/A	60%Open
	Ginstar	1.5	EC	6.4	OZ/A	60%Open
6	Ethephon	6	L	32	OZ/A	60%Open
	Ginstar	1.5	EC	8	OZ/A	60%Open
7	Finish 6 Pro	6	L	32	OZ/A	60%Open
	Ginstar	1.5	EC	6.4	OZ/A	60%Open
8	Finish 6 Pro	6	L	21	OZ/A	60%Open
	Ginstar	1.5	EC	6.4	OZ/A	60%Open

Table 2. Treatments applied at dryland harvest aid demonstration site.

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage
1	Gramoxone 2.0 SL	2	L	8	OZ/A	80%Open
	NIS	100	L	0.5	% V/V	80%Open
2	Gramoxone 2.0 SL	2	L	16	OZ/A	80%Open
	NIS	100	L	0.5	% V/V	80%Open
3	Gramoxone 2.0 SL	2	L	32	OZ/A	80%Open
	NIS	100	L	0.5	% V/V	80%Open
4	ETX	0.28	EC	1.7	OZ/A	80%Open
	Crop Oil Concentrate	100	L	1	% V/V	80%Open
5	Sharpen	2.85	SC	1	OZ/A	80%Open
	MSO	100	L	1	% V/V	80%Open
	AMS-Dry	100	DG	17	LB/100 GAL	80%Open
6	Display	2	L	1	OZ/A	80%Open
	Crop Oil Concentrate	100	L	1	% V/V	80%Open
7	Ginstar	1.5	EC	8	OZ/A	80%Open
8	Gramoxone 2.0 SL	2	L	8	OZ/A	80%Open
	ETX	0.28	EC	1.25	OZ/A	80%Open
	Crop Oil Concentrate	100	L	1	% V/V	80%Open
9	Ethephon	6	L	32	OZ/A	80%Open
	ETX	0.28	EC	1.25	OZ/A	80%Open
	Crop Oil Concentrate	100	L	1	% V/V	80%Open

In addition to the demonstrations, a replicated harvest aid trial was established in a producer-cooperator field near Tipton in Tillman County. Plots were 4 rows wide and 150 feet long. All treatments were applied with a high-clearance compressed air, research sprayer at 15 GPA with Turbo Teejet nozzles on 20 inch spacings. This trial consisted of 6 total treatments (including an untreated control). It investigated the efficacy of a new PPO inhibitor harvest aid product (ETX) from Nichino, compared to various treatments of Display from FMC, and Sharpen from BASF. The ETX formulation performed similarly to Display and these provided slightly less defoliation than the Sharpen product. Cotton condition at the time of application may have affected these results.

Table 3. Application information for ETX trial.

Application Description	
	A
Application Date:	9/25/2014
Time of Day:	8:30 AM
Application Method:	Spray
Application Timing:	55%Open
Application Placement:	Broadcast
Applied By:	OSU
Air Temperature, Unit:	72 F
% Relative Humidity:	61
Wind Velocity, Unit:	5.4 mph
Wind Direction:	ESE
Soil Temperature, Unit:	75 F
Soil Moisture:	Adequate
% Cloud Cover:	50
Next Rain Occurred On:	10/12/2014
Application Equipment	
	A
Appl. Equipment:	Lee Spider
Equipment Type:	HICLEA
Operation Pressure, Unit:	60 psi
Nozzle Type:	Turbotee
Nozzle Size:	110015
Nozzle Spacing, Unit:	20 in
Nozzles/Row:	2
Ground Speed, Unit:	4 mph
Carrier:	WATER
Spray Volume, Unit:	12 gal/ac
Mix Size, Unit:	1 gallons
Propellant:	Comp. air

Table 4. Treatment performance in ETX trial.

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	10/2/2014 Defol %		10/2/2014 Desicc %		10/9/2014 Defol %		10/9/2014 Desicc %		10/9/2014 Open Boll %		10/21/2014 Term Reg %		10/21/2014 Bas Reg %	
1	Untreated							0	e	0	d	0	d	0	d	72.7	b	10	b	8.3	d
2	ETX 4%	0.335	EC	1.25	OZ/A	60% open	A	13.3	c	16.7	c	43.3	b	20	c	94	a	10	b	33.3	b
2	Ethephon	6	L	32	OZ/A	60% open	A														
2	Crop Oil Concentrate	100	L	0.5	% V/V	60% open	A														
3	ETX 4%	0.335	EC	1.7	OZ/A	60% open	A	8.3	d	21.7	c	33.3	c	36.7	a	95	a	10	b	13.3	cd
3	Ethephon	6	L	32	OZ/A	60% open	A														
3	Crop Oil Concentrate	100	L	0.5	% V/V	60% open	A														
4	Display	2	L	0.6	OZ/A	60% open	A	11.7	cd	13.3	c	30	c	26.7	b	91.3	a	15	ab	28.3	b
4	Ethephon	6	L	32	OZ/A	60% open	A														
4	Crop Oil Concentrate	100	L	0.5	% V/V	60% open	A														
5	Display	2	L	0.8	OZ/A	60% open	A	18.3	b	33.3	b	40	b	40	a	91.7	a	15	ab	26.7	bc
5	Ethephon	6	L	32	OZ/A	60% open	A														
5	Crop Oil Concentrate	100	L	0.5	% V/V	60% open	A														
6	Sharpen	2.85	L	1	OZ/A	60% open	A	30	a	53.3	a	50	a	38.3	a	93.3	a	18.3	a	50	a
6	Ethephon	6	L	32	OZ/A	60% open	A														
6	Ammonium Sulfate (spray grade)	100	DG	17	LB/100 (	60% open	A														
6	Methylated seed oil (MSO)	100	L	1	% V/V	60% open	A														
LSD (P=.05)								3.95		8.41		6.36		6.57		6.08		6.14		13.89	
CV								15.97		20.06		10.67		13.41		3.73		25.85		28.64	

2015 Beltwide Cotton Conference Presentations-San Antonio, Texas

Project personnel were involved in several Beltwide Cotton Conference presentations in San Antonio, Texas in January 2015.

Monsanto's newest herbicide trait package (XtendFlex) in cotton will soon be available to growers. This package will impart tolerance to dicamba, glyphosate and glufosinate herbicides in addition to the Bollgard II insect system. Two trials were established in Fort Cobb Oklahoma at OSU's Caddo Research Station to evaluate the performance of new germplasm containing these traits and to compare yield and fiber with current standards.

The Extension Specialist Working Group (ESWG) initiated a project to evaluate possible plant health benefits encountered from the application of fungicides in the absence of disease pressure. Five states (Louisiana, Texas, Oklahoma, Virginia and Mississippi) established locations to study this relationship and determine if there was any yield increase or economic benefit associated with these applications.

The new Roundup Xtend Cropping System for cotton will allow growers the opportunity to utilize three different herbicides (with different modes of action, glyphosate, glufosinate and dicamba) in-season over the top of cotton varieties containing the Bollgard II XtendFlex trait. Several projects were initiated in order to evaluate the effectiveness of two new dicamba formulations expected to be available with these new varieties. Projects focused on addressing the three most common and difficult weeds Oklahoma growers fight…horseweed, pigweed and morningglory.

Salinity continues to be an issue for many producers in Oklahoma. Dr. Saleh Taghvaeian initiated a project to monitor soil moisture and salinity levels with sensors installed in three different cotton fields under subsurface drip and sprinkler irrigation. Monitoring water availability in the rooting zone and cotton's demand for water as influenced by atmospheric conditions and salinity was the focus of the project.

PERFORMANCE OF XTENDFLEX™ COTTON GERMPLASM IN OKLAHOMA IN 2014

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Abstract

Monsanto's XtendFlex™ cotton trait imparts tolerance to dicamba, glyphosate and glufosinate herbicides. Trait deregulation is anticipated soon. After trait deregulation, it is assumed that several varieties will be available for sale to producers. The objective of this study was to evaluate the performance of several germplasm lines containing the XtendFlex™ trait compared to current standard entries. In 2014, two separate regulated trials (Monsanto/Deltapine and Americot/NexGen) were established under center pivot irrigation at the Caddo Research Station near Fort Cobb. The site is classified as a Binger fine sandy loam, 1 to 3 percent slopes. Four replicates of entries were used in both trials. Plot size was two 36-inch rows by 30 ft in length. Both trials were managed in a Roundup Ready Flex® herbicide system, thus no dicamba was applied. Harvested area was two rows by plot length and harvesting was accomplished using a modified John Deere 482 plot stripper. At harvest, samples were taken from each plot. These samples were used to determine lint turnout for each plot and were used to convert plot bur cotton weights to lint per acre. Lint from these samples was submitted to the Texas Tech University Fiber and Biopolymer Research Institute to obtain HVI data. Loan value was determined using the 2014 Upland Cotton Loan Valuation Model. Analysis of variance was performed using SAS ver. 9.4 for Windows. Monsanto/Deltapine trial results indicate that when comparing lint yield and fiber properties, the B2XF entries were very competitive with standard entries. For lint yield, 4 of the 6 entries in the upper statistical tier of significance were B2XF types. One Monsanto B2XF entry (DP 1518B2XF) produced higher yields than standard types such as DP 1044B2RF and FM 1944GLB2. Americot/NexGen results show that 3 of 4 entries in the first statistical tier of significance were B2XF germplasm. The NG 1511B2RF entry has exhibited excellent yield stability for several years in our area and 3 entries statistically produced the same yield at this site. Fiber quality results for this trial were not yet available at time of printing. Results from these trials conducted simultaneously at one site indicate that at first glance, the B2XF and XF entries evaluated are highly competitive with currently planted standard entries. When the XtendFlex™ technology gets deregulated, additional multi-site and multi-year research is needed to evaluate the new varieties across a series of environments.

Evaluation of Early Season Foliar Fungicide Applications for Improved Plant Health in Cotton

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Abstract

Early season fungicide applications were made to cotton to determine if there were any plant health benefits in the absence of disease pressure. Fungicide trials were conducted in Louisiana, Texas, Oklahoma, Virginia, and Mississippi. The objective of these studies was to determine if there was a yield increase or economic benefit of applying a fungicide to cotton in the absence of disease pressure and to determine if differences in plant health could be measured. Foliar fungicide applications were applied when cotton reached the 2-4 true leaf stage. Fungicides evaluated included in these studies included Quadris and Priaxor. At 0, 14, and 28 DAT, the following data was collected: plant vigor, plant height, number of nodes, chlorophyll measurements, and leaf area. Lint yield and fiber quality were determined at harvest.

For the Louisiana location, differences in lint yield, fiber quality, vigor, plant height, total nodes, chlorophyll amounts, and total leaf area were not found when comparing the two fungicide applications to the untreated check. Differences in lint yield at the Oklahoma and Virginia locations were not found; however, both fungicide applications increased lint yields at the Texas location.

Introduction

Fungicides are typically used in cotton to control foliar diseases when the potential for yield loss is significant. However, some suggest fungicides should be used to improve plant health regardless of the presence of disease. This preemptive application is thought to improve the physiological function of the plant and to improve stress tolerance. Modern cotton varieties with high yield potential and new fungicide active ingredients with effects on crop physiology have been given as possible motivations for the increased interest in cotton (1). In particular, based on bioassays and studies conducted under controlled conditions, quinone outside inhibitor (QoI) fungicides have been show to induce physiological and developmental changes in plants, including retardation of senescence due reduced oxidative stress (2), increased photosynthetic capacity, transient inhibition of respiration, inhibition of ethylene biosynthesis (3), and reduction of stomatal aperture and water loss through transpiration (4,5). These changes are believed to translate into greater stress tolerance and higher yields. The actual benefits of these applications in commercial cotton fields are uncertain and producers question if spending between $15.00 to $25.00 an acre + application costs for these fungicides is profitable. The objective of these studies was to: determine if there is an effect on lint yield from applying an early season fungicide application and if differences in plant health can be measured from an early season fungicide application.

Materials/Methods

The Louisiana trial was planted on May 1, 2014 into a clay soil at the Dean Lee Research and Extension Center at Alexandria, Louisiana. Seeding rate was 41,000 seed per acre. Variety was Phytogen 499WRF. Row spacing was 38 inches. Plot sizes were 2 rows by 50 feet in length. Experimental design was a randomized complete block. Number of replications was eight. Fungicide applications were applied on May 26, 2014 at the three true leaf stage. Treatments included Quadris at 6 ounces per acre, Priaxor at 6 ounces per acre, and the untreated check. Visual vigor ratings (1=poor, 9=excellent) were recorded at 0, 14, and 28 DAT. Ten plants per plot were measured to compare plant height, number of nodes, Chlorophyll (Spad), and leaf area at 0, 14, and 28 DAT. Harvest date was October 24, 2014. Harvest method was with a two row cotton picker. For lint yield, seed cotton was ginned in a Continental research gin. Fiber quality was determined by send a grab sample to the LSU fiber laboratory located at Baton Rouge.

Also, trials were conducted in Texas (Brazos Bottom), Oklahoma (Fort Cobb), Virginia (Tidewater), and Mississippi (data not shown). Fungicide applications were made at the 2-4 true leaf stage at the Texas and Virginia locations. For the Oklahoma location, fungicide application was made at the 6-7 true leaf stage.

Results

For the Louisiana location, differences in lint yield, fiber quality, vigor, plant height, total nodes, chlorophyll amounts, and total leaf area were not found when comparing the two fungicide applications to the untreated check (Tables 1, 2, and 3).

For Texas, Oklahoma, and Virginia only the results for lint yield are shown. Differences in lint yield at the Oklahoma and Virginia locations were not found; however, both fungicide applications increased lint yields at the Texas location (Table 4)..

Table 1. Lint yield and fiber quality, Louisiana, 2014.

Treatment	Lint (lbs/ac)		Turnout (%)		Micronaire		Length (inches)		Strength (g/tex)		Uniform. (%)		Loan Value (¢/lb)		Lint Value ($/acre)	
Untreated Check	1547	a	47.17	a	4.49	a	1.15	a	31.43	a	84.46	a	54.03	a	836.53	a
Quadris @ 6 oz.	1480	a	46.04	a	4.68	a	1.14	a	30.80	a	84.56	a	54.16	a	801.90	a
Priaxor @ 6 oz.	1442	a	46.92	a	4.61	a	1.15	a	31.23	a	84.25	a	54.34	a	783.52	a
Mean	1490		46.71		4.59		1.15		31.15		84.43		54.18		807.32	
P>F	0.4426		0.6751		0.1103		0.3302		0.417		0.875		.6629		.5095	
LSD (P=.05)	NS		NS		NS		NS		NS		NS		NS		NS	
STD DEV	160.89		2.6471		0.168		0.0261		0.936		1.245		.6679		90.4752	
CV%	10.8		5.67		3.65		2.28		3		1.47		1.23		11.21	

Table 2. Vigor, plant height, and total nodes, Louisiana, 2014.

Treatment	Vigor[1] 0 DAT		Vigor[1] 14 DAT		Vigor[1] 28 DAT		Plt. Ht. (CM) 0 DAT		Plt. Ht. (CM) 14 DAT		Plt. Ht. (CM) 28 DAT		Total Nodes 0 DAT		Total Nodes 14 DAT		Total Nodes 28 DAT	
UTC	9	a	9	a	9	a	11.20	a	16.94	a	39.20	a	3.00	a	7.50	a	10.48	a
Quadris @ 6 oz.	9	a	9	a	9	a	11.10	a	16.77	a	37.31	a	2.90	a	7.41	a	10.21	a
Priaxor @ 6 oz.	8.8	a	9	a	9	a	11.05	a	16.96	a	38.21	a	2.95	a	7.45	a	10.61	a
Mean	8.92		9		9		11.22		16.89		38.24		2.95		7.45		10.43	
P>F	0.1335		1		1		.9818		0.922		0.2752		0.91		0.8257		0.1627	
LSD,P=.05	NS		NS		NS		NS		NS		NS		NS		NS		NS	
S. DEV.	0.27		0		0		1.594		1.059		2.2435		0.459		0.282		0.399	
CV%	3		0		0		14.34		6.27		5.87		15.55		3.79		3.83	

Table 3. Chlorophyll and leaf area, Louisiana, 2014.

Treatment	Chlorophyll (Spad) (0 DAT)		Chlorophyll (Spad) (14 DAT)		Chlorophyll (Spad) (28 DAT)		T. Leaf Area (0 DAT)		T. Leaf Area (14 DAT)		T. Leaf Area (28 DAT)	
UTC	35.69	a	38.81	a	39.94	a	330.5	a	2773.4	a	9706.3	a
Quadris @ 6 oz.	37.06	a	37.70	a	40.35	a	294.1	a	2476.6	a	8615.8	a
Priaxor @ 6 oz.	36.03	a	37.90	a	39.09	a	306.3	a	2502.9	a	9069.1	a
Mean	36.26		38.14		39.79		310.29		2584.29		9130.38	
P>F	0.2726		.2038		.2939		.4924		0.196		0.0848	
LSD (P=.05)	NS		NS		NS		NS		NS		NS	
STD DEV	1.696		1.256		1.574		60.67		343.01		900.98	
CV%	4.68		3.29		3.95		19.55		13.27		9.87	

Table 4. Lint yield results, Texas, Oklahoma, and Virginia, 2014.

Treatment	Texas (pounds lint/acre)		Oklahoma[1] (pounds lint/acre)		Virginia (pounds lint/acre)	
UTC	2106	b	1938	a	1821	a
Quadris @ 6 oz.	2426	a	1905	a	1707	a
Priaxor @ 6 oz.	2382	a	1915	a	1844	a
Mean	2305		1919		1791	
P>F	0.00019		0.8911		0.0839	
LSD (P=.05)	138		NS		NS	
STD DEV	86.3		121.37		99.928	
CV%	3.71		6.32		5.58	

EXPERIENCES WITH THE ROUNDUP READY XTEND CROP SYSTEM IN OKLAHOMA

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Abstract

The Roundup Ready Xtend Cropping System will provide a platform for cotton producers to address current herbicide resistant weed challenges in Oklahoma (pending regulatory approval). However, without proven performance from these new transgenic varieties, adoption may be slow to occur. This could lead to the continued spread of herbicide (glyphosate) resistant weeds in Oklahoma. The ability to effectively control weeds with a system that offers yield potential comparable to current standards would be very desirable for cotton producers. The Roundup Ready Xtend cropping system will offer cotton varieties with tolerance to three herbicides representing separate modes of action. This could facilitate or increase the adoption of recommended resistance management practices necessary to stop the progression of glyphosate resistant weeds in Oklahoma. The objectives of this project were to determine the effectiveness of this system on current weed problems and to evaluate the performance of several new variety offerings expected upon deregulation. Several replicated trials were established to determine the effectiveness of this weed control system and to evaluate the performance of several new varieties. New dicamba formulations effectively controlled horseweed, pigweed and morningglory. Seven new Bollgard II Xtendflex cotton lines were compared to four current standards. Four of the seven new lines evaluated performed as well or better than the four standards.

Introduction

Glyphosate resistant (GR) weed populations (pigweed and/or horseweed) are prevalent in most of Oklahoma's cotton production areas. A recent producer survey identifies these weeds as the "most difficult to control" in Oklahoma cotton. In addition, GR weeds have caused many producers to re-assess production practices (no-till vs. conventional) and question their ability to meet important conservation goals. Despite the fact that many producers rotate their cotton ground to winter wheat, GR weed problems continue to escalate. This is most likely due to the exclusive use of glyphosate (only) weed control programs in both cropping systems. This heavy in-season dependence upon glyphosate in Roundup Ready Flex cotton and off-season use for no-till wheat can lead to a series of GR weed escapes over consecutive years, accelerating the spread of resistance. It is critical that growers adopt programs that limit the spread of GR weeds. Utilizing herbicides with multiple modes of action will help limit the spread of GR weeds while also restoring the weed control benefits normally experienced through crop rotation. The Roundup Ready Xtend Crop System should provide an effective platform to control GR weeds in cotton. Bollgard II XtendFlex cotton varieties will confer differential tolerance to three herbicides representing three different modes of action: glyphosate (Roundup Powermax-group 9), glufosinate (Liberty-group 10) and dicamba (Mon 119096 / Engenia-group 4). The current windows of application for Roundup Powermax and Liberty will be continued with an additional season-long window (same as current glyphosate window) for dicamba application. Currently the only stand-alone dicamba formulations expected to be approved for use in the Mon 76832 System are Mon 119096 (Monsanto) and/or Engenia (BASF). In addition, Monsanto will offer a prepackaged combination of glyphosate plus a new dicamba formulation currently referred to as Mon 76832. These new dicamba formulations exhibit ultra-low volatility compared to currently registered products. This increase in product safety coupled with specific application requirements will significantly lower the risk of off-target movement associated with applications.

Combining the Roundup Ready Xtend system with the known effectiveness of current residual herbicides will provide growers with preemergence and postemergence herbicide options necessary to effectively control glyphosate resistant weeds in cotton. Several projects were established in 2013 and 2014 to determine the effectiveness of these new dicamba products and to evaluate the performance of potential new Bollgard II XtendFlex (B2XF) cotton varieties.

Materials and Methods

Two new dicamba formulations were evaluated for horseweed, pigweed and morningglory control and included Mon 119096 and Engenia . Two projects were conducted in a non-crop setting. One study evaluated preplant control of horseweed and the other focused solely on postemergence (POST) control of large (12-24 inch) pigweed. The third study was conducted in Bollgard II XtendFlex cotton and targeted pitted morningglory. All applications were made with TurboTeejet Induction nozzles at 40 PSI in 10 gallons of water. All treatments were replicated four times in randomized complete block designs. Results from each project are presented in figures 1-5.

In addition, a germplasm trial was established in order to assess the performance of seven Bollgard II XtendFlex lines. The trial was planted June 2nd in two-row plots, 30 feet in length and replicated four times. The trial received approximately 11 inches of in-season rainfall combined with 11 inches of sprinkler irrigation. Weeds, insects and plant growth were managed for optimum yields. The sole purpose of this trial was to compare germplasm performance. It was managed in a Roundup Ready Flex herbicide system in order to make direct comparisons to current commercial standards. No dicamba products were used. Results are presented in figure 5.

Results and Discussion

Horseweed control presented in figure 1 indicates that 0.25 lb ai/A Engenia + 0.75 lb ai/A Roundup applied to horseweed in the rosette stage provided 81% control 14 days after treatment (DAT). This was similar to control observed from an application of 0.25 lb ai/A Clarity + 0.75 lb ai/A Roundup Powermax (79%). The same Engenia rate when combined with 1 oz/A Sharpen + 2.5 oz/A Zidua controlled horseweed 100% 14 DAT. All three treatments effectively controlled horseweed (99-100%) 45 DAT.

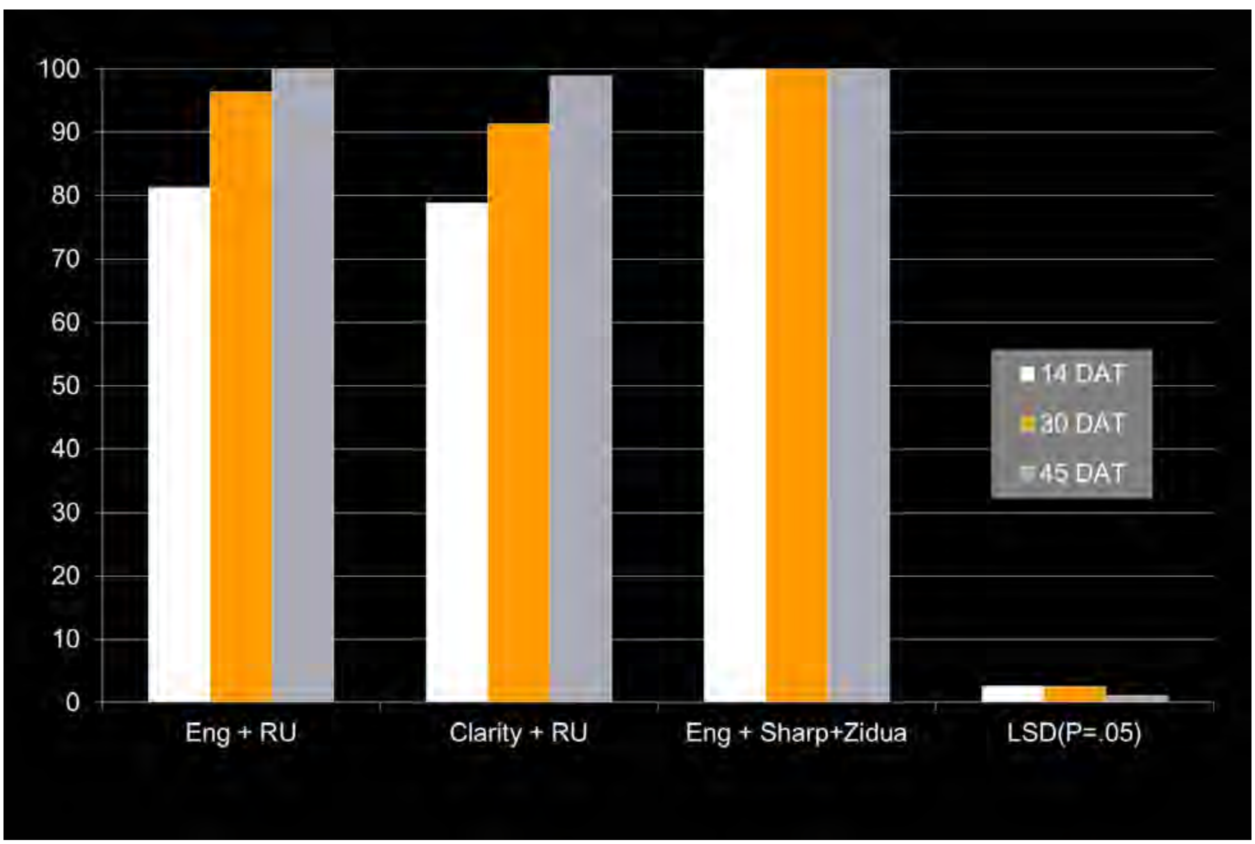

Figure 1. Preplant Control of Horseweed with Engenia.

The second study assessed POST control of over-sized (12-24 inch) pigweed. While prior work has proven the effectiveness of dicamba on small (2-6”) pigweeds (data not shown), fewer studies have emphasized salvage situations. Growers often experience weather issues delaying weed control applications beyond recommended timings. This trial focused on large pigweed control in that setting. Results are presented in figures 2 and 3. Mon 76832 applied at 1.5 lb ae/A controlled 12-24 inch pigweed 48% 7 DAT. This was significantly greater than 0.5 lb ae/A Mon 119096 alone (29%) or with 29 oz/A Liberty (39%). However, by 14 DAT control of large pigweed from Mon 76832 increased to 98%. This was significantly greater than control observed from Mon 119096 alone (48%) or with Liberty (72%). At the final observation (36DAT) control from Mon 76832 remained effective (97%) while Mon 119096 and Mon 119096 + Liberty controlled pigweed 75% and 63%, respectively.

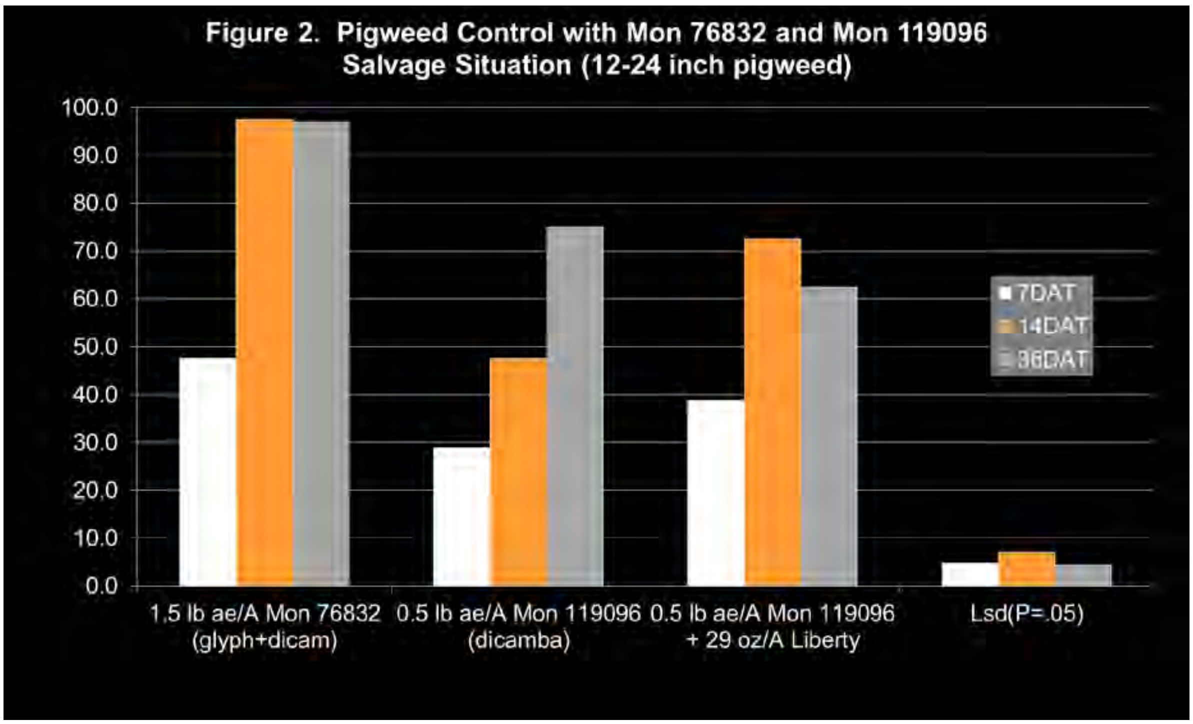

Figure 2. Pigweed control with Mon 76832 and Mon 119096 in a salvage situation.

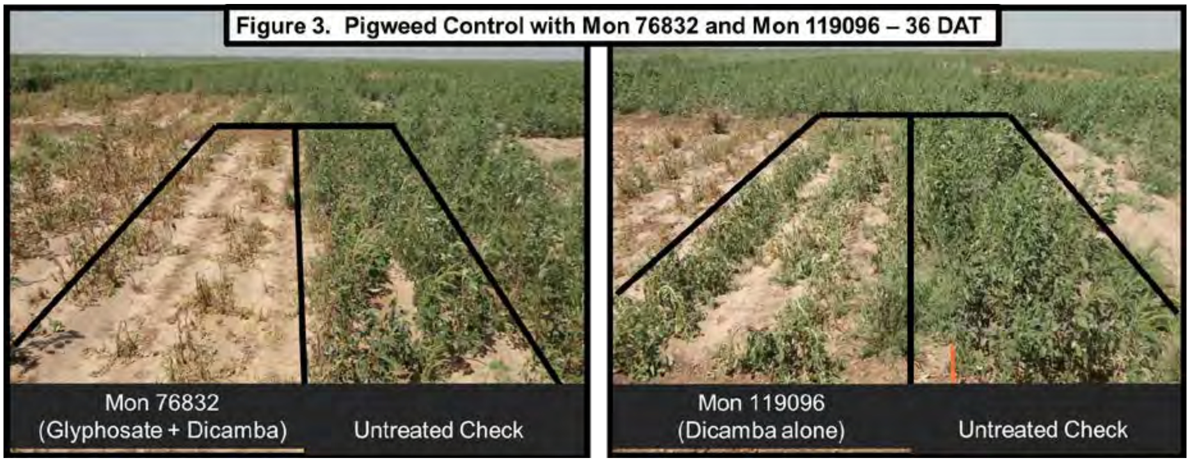

Figure 3. Pigweed control with Mon 76832 and Mon 119096 – 36 DAT.

The third weed control project targeted pitted morningglory and was conducted in-crop (B2XF cotton). While severe drought reduced late-season weed pressure potential, early-season observations were made and are presented in figures 4-5. An activating rain was received within 24 hrs of preemergence applications. Preemergence (PRE) applications of 0.5 lb ae/A Mon 119096 combined with either Prowl (1.0 lb ai/A), Warrant (48 oz/A) or Direx (0.5 lb ai/A) controlled pitted morningglory approximately 68-76% 30 DAT. Increasing the Mon 119096 rate to 1.0 lb ae/A (when combined with Warrant) improved control to 90%. All PRE treatments were followed with POST applications of either Mon 76832 or Mon 119096 + Liberty to 2-6 inch pitted morningglory. These postemergence treatments controlled pitted morningglory 90-100% 21 DAT.

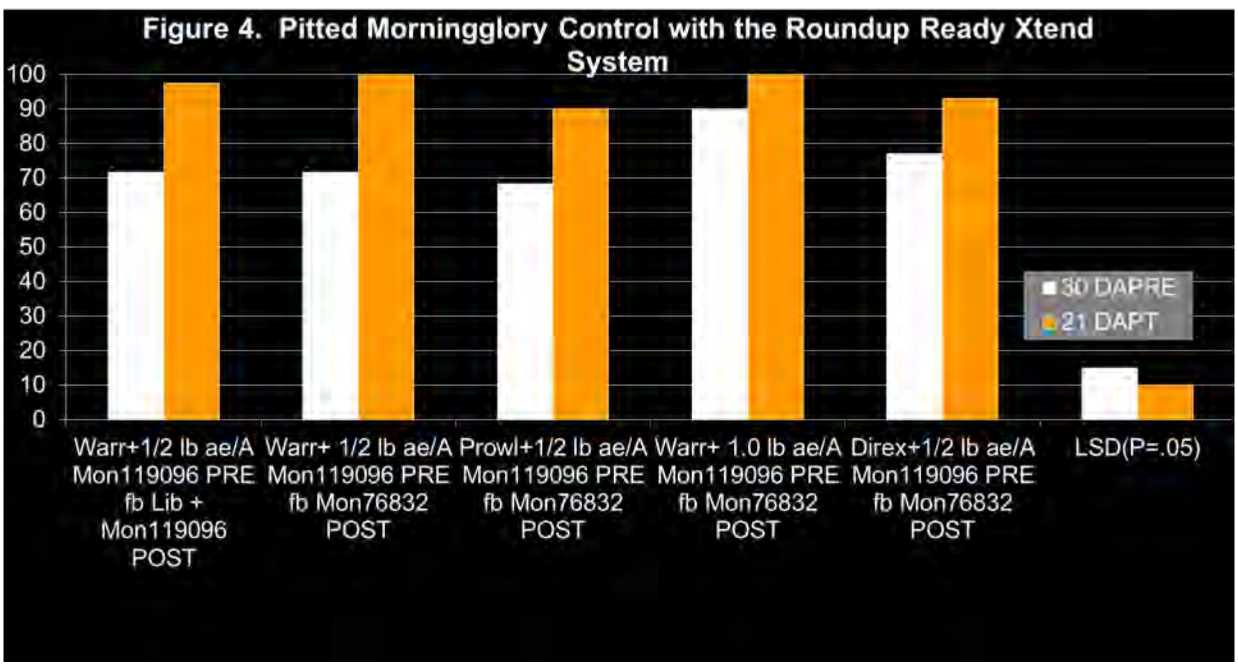

Figure 4. Pitted morningglory control with the Roundup Ready Xtend System.

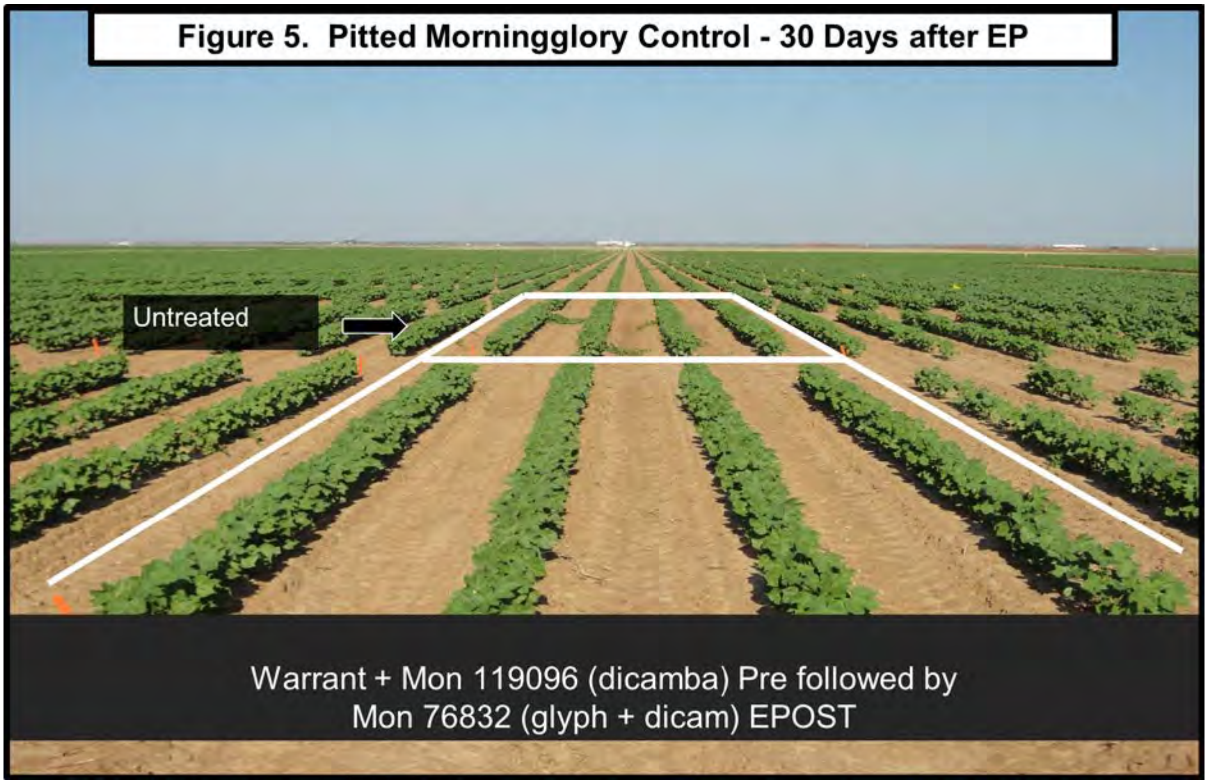

Figure 5. Pitted morningglory control – 30 DAEP.

The fourth project assessed germplasm performance. Seven Bollgard II XtendFlex lines were compared to 4 standard varieties in a center pivot irrigated setting. Resutls are presented below in figure 6. Deltapine 1518 B2XF produced 2041 lbs lint/A. This was statistically similar to lint yields (1884-1980 lbs/A) from six other entries (DP 1522 B2XF, DP 0912 B2RF, ST 4946 GLB2, DP 14R935 B2XF, DP 1549 B2XF and DP 1553 B2XF. Deltapine 1044 produced 1840 lbs lint/A which was similar to yields produced by DP 14R960 B2XF and DP 14R934 B2XF. Fibermax 1944 GLB2 produced 1649 lbs lint/A.

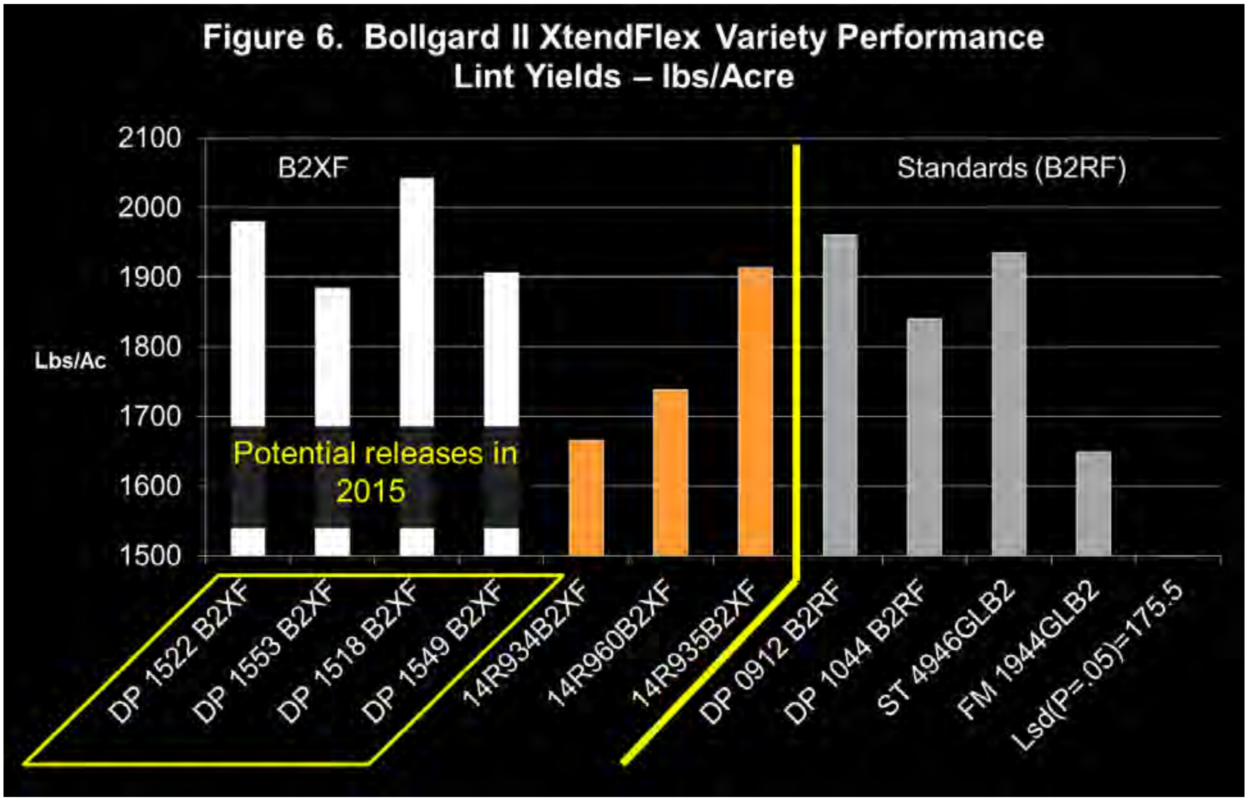

Figure 6. Bollgard II XtendFlex variety performance lint yields – lbs/Acre.

Summary

Results indicate that Engenia provided similar horseweed control compared to Clarity. It should be noted that the horseweed population was not believed to be GR. If GR horseweed is present higher rates of dicamba may be more appropriate. In addition, while Mon 76832 effectively controlled large (12-24 inch) pigweed, multiple considerations must be addressed. First, growing conditions at application time were excellent, with excellent moisture and mild temperatures. This may have contributed to results. Also, it should be noted that the pigweed population within this trial was not GR. In the presence of GR pigweed, control from Mon 76832 would essentially be equivalent to that observed from Mon 119096 alone (75%). This level of GR pigweed control is not acceptable. Also, prior research (data not shown) indicates that effective control can be achieved from either treatment when applications are made to appropriate size (2-4 inches) pigweed. Therefore, growers should continue to target small weeds.

Although drought conditions affected overall weed pressure, early season results suggest improved PRE control of pitted morningglory when the Mon 119096 rate was increased from 0.5 lb ae/A to 1 lb ae/A. It should also be noted that dry conditions following the activation of PRE treatments may have extended morningglory control beyond typical expectations. Following any PRE treatment with any POST combination including Mon 119096 resulted in excellent morningglory control.

Germplasm evaluation results indicate that the seven Bollgard II XendFlex cotton varieties performed as well or better when compared to current commercial standards. Although not presented, fiber properties were also competitive with current standard entries. It is anticipated that four of these “B2XF” varieties will potentially be released after deregulation of the technology.

Based on results from various projects, the Roundup Ready Xtend Crop System should provide an effective platform to control Oklahoma’s three most troublesome weeds while also offering varieties that produce yield and fiber quality comparable to current standards.

Disclaimers

MONITORING ROOT ZONE SALT AND WATER DYNAMICS UNDER DRIP AND SPRINKLER IRRIGATED COTTON

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Abstract

This study was conducted at three Oklahoma cotton fields under subsurface drip and sprinkler irrigation systems. Different types of soil moisture and salinity sensors were installed in order to monitor salt and water dynamics in cotton root zone during the growing season. The results confirmed that soil sensors provide valuable information that can assists producers in making informed decisions. Water availability in the root zone was strongly related to the amount of applied water (precipitation and/or irrigation) as well as cotton water use (influenced by both crop condition and atmospheric demand). Comparing soil salinity levels between two adjacent fields, one under subsurface drip and another under sprinkler irrigation, revealed that soil salinization under drip irrigation may become a major issue in the future since salts tend to accumulate at the outer edges of the wetting front under this type of irrigation system.

Introduction

Cotton is the dominant irrigated crop in the southwest Oklahoma, accounting for about 60,000 irrigated acres based on the Farm and Ranch Irrigation Surveys conducted in 2003 and 2008 by the USDA National Agricultural Statistics Service. In the past several years, however, this region has experienced prolonged periods of severe to exceptional drought and consequently a significant decline in freshwater resources. For example, water level in the Lake Altus has dropped to 31 ft below the normal pool elevation as of Jan. 13th, 2015 (the Oklahoma Water Resources Board). As a result, no irrigation water has been delivered to over 40,000 acres of farmlands in the Lugert-Altus Irrigation District since 2011. The scarcity of water supplies was the main reason behind a significant decrease in irrigated cotton acres to about 26,000 acres in 2013. The most recent drought monitor map (1/13/2015) shows that the four southwest counties of Harmon, Greer, Jackson, and Tillman are almost entirely under the most intense category of drought: D4 (exceptional drought). The condition does not seem to improve in the near future, as the seasonal drought outlook published by the NOAA Climate Prediction Center indicates that drought will persist or intensify over the western Oklahoma for the period of January 15 to April 30, 2015.

The current and predicted water scarcity in the region necessitates major improvements in irrigation efficiencies and minimization of water losses. Recent technological advances have resulted in irrigation systems that apply water efficiently and allow growers to apply a high level of control on irrigation management. Examples include the ability to monitor and control center pivot movements and operation at or near real-time through web-based user interfaces and smart-phone applications. However, hardware improvements will not translate into actual water conservation and increased water productivity unless they are accompanied by software improvements, i.e. irrigation management. Even the most advanced irrigation systems will result in water loss if water is applied in excess of moisture deficit in the crop root zone. One approach to improve irrigation management is to make irrigation decisions based on data collected by soil moisture sensors installed at multiple depths within the root zone. Some of the main advantages of irrigation scheduling using soil moisture sensors are the level of accuracy that can be achieved, the ease of practical implementation of this approach, the availability of many commercial systems, and the ability to automate irrigation scheduling (Jones, 2004). Vellidis et al. (2008) recently developed a cost-effective wireless soil moisture sensor array that can be used to apply precision irrigation management in fixed and variable-rate irrigation systems.

A field study was conducted in Oklahoma during the 2014 growing season to evaluate the potential of different types of soil moisture sensors to be used for precision irrigation scheduling of cotton. Improvements in irrigation scheduling can lead to water conservation, which will help cotton growers during drought years. A second objective of the project was to investigate the potential for salt accumulation under Subsurface Drip Irrigation (SDI) systems. The need to study the risk of salt accumulation also stems from the recent water scarcity in the region. As freshwater supplies diminish, cotton growers consider converting to more water-conserving irrigation systems such as SDI. They also explore using alternative sources of water, such as shallow groundwater resources with low quality. The combination of low-quality irrigation water, below-normal rainfall (required to leach the salts), and SDI systems which apply small amounts of water to a portion of the field may result in soil salinization to levels beyond cotton salt tolerance. In addition, accumulation of other toxic elements such as boron and selenium may cause significant sustainability issues (Ayars et al., 1993).

Materials and Methods

A demonstration/research project was conducted during 2014 growing season at a cotton field near Hydro, OK and two fields near Martha, OK. Different types of sensors were installed at these fields to study salt and water dynamics in the root zone of cotton. Weather data were obtained from nearby Mesonet stations (McPherson et al., 2007).

Hydro Site

The field at Hydro had a recently-installed center-pivot system (Valley® 8000 series) equipped with a TouchProTM control panel. Three irrigation treatments were selected for this study at full well capacity (100%), 75% of the full treatment (75%), and dryland (0%). The dominant soil type at this site was Pond Creek Loam. Cotton (NG 1511 B2RF) was planted on May 20, 2014 at the seeding rate of 48,000 and row spacing of 36 inches. Six Watermark sensors (Irrometer Company, Inc., CA, USA) were installed at each irrigation treatment at three depths of 10, 24, and 36 inches below the soil surface and two replications. A soil temperature sensor was also installed at each replication to correct for the effect of soil temperature on Watermark readings. In addition, two tipping-bucket rain gauges were installed at 100% and 75% irrigation treatments to measure irrigation and rainfall amounts. The top of the rain collectors were at 40 inches above the ground, providing enough clearance for the center pivot nozzles that were 60 inches above the ground. Data measurement and storage was conducted on an hourly basis and controlled by an Irrometer data logger (model 900M). Figure 1 presents photos of the instrumentation site at the 75% irrigation treatment, taken on three different days during the season.

Figure 1. Instrumentation site at 75% treatment on Jun 12 (left), Aug 5 (center), and Nov 7 (right), 2014.

Martha Site

Two adjacent cotton fields were instrumented at Martha site. The first field was under a center pivot irrigation system, while the second site was under a Subsurface Drip Irrigation (SDI) system. Soil moisture was monitored using Acclima sensors (Acclima, Inc., ID, USA), which take advantage of the Time Domain Transmissivity (TDT) method to measure soil moisture and salinity (electrical conductivity). Eight Acclima sensors were installed at the SDI field at two depths below the soil surface (15 and 30 inches), two distances from the drip tapes (zero and 36 inches), and two replications. The two distances were selected to explore the accumulation of salts in between the drip tapes, installed at 72 inches spacing. Cotton (DP 1219) was planted on Jun. 1, 2014 at the SDI field. Six Acclima sensors were installed at the center pivot field at three depths of 10, 24, and 36 inches below the soil surface and two replications. Cotton (DP 1044) was planted on May 29, 2014 at the center pivot field. Data measurement and storage was controlled using an Acclima data-logger (DataSnap). Irrigation water and soil type were similar for both fields, with Sandy Loam texture for the top 15 inches and Sandy Clay Loam for 15-30 inches zone. Figure 2 demonstrates photos taken at the SDI field at three different dates during the season.

Figure 2. Instrumentation site at the SDI field on Jul 15 (left), Aug 18 (center), and Nov 3 (right), 2014.

Results and Discussion

Hydro Site

During the 146-day study period from mid-June to early November, the rain gauges at the Hydro site recorded 15.6 and 15.9 inches of rainfall at the 100% and 75% irrigation treatments, respectively. These estimates agree well with the 15.6 inches of rainfall measured at the closest Mesonet Station at Hinton, OK. The cumulative irrigation depths over the same period were 6.6 and 4.9 inches at the 100% and 75% irrigation treatments, respectively. The average depths of water applied in each irrigation event were 0.4 and 0.3 inches, considerably less than the depths entered in the control panel by the grower, which were 0.8 inches for the full treatment and 0.6 inches for reduced treatment (75%). Since the system was new and no leaks were observed, the difference between programmed and applied depths is probably due to diminished well capacities. Part of this difference may be also due to direct evaporation of droplets and wind drift losses before irrigation water reached the rain gauges. Figure 3 demonstrates measured irrigation depths plotted against time of the day and day of the year. As the plots suggest, there is a significant variation in irrigation depths, but no daily or seasonal trend could be observed in the data. This was against the expectation that smaller depths should be recorded for irrigation events that occurred during warmer times of the day (due to losses) and toward the end of the season (due to groundwater decline). The reasons behind measuring significantly smaller irrigation depths are still under investigation.

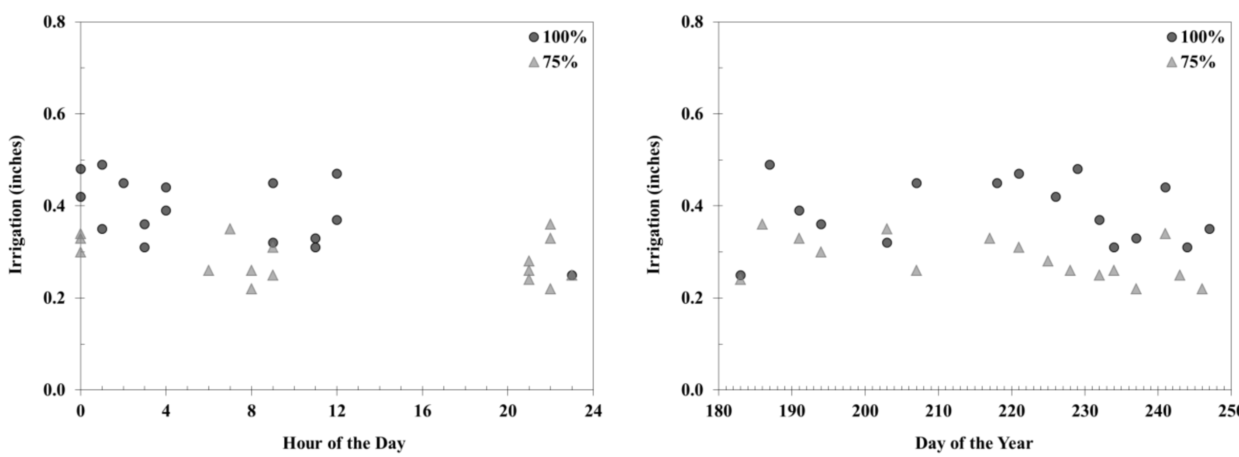

Figure 3. Depths of applied irrigation water measured plotted against hour of the day and day of the year.

Soil moisture data provided valuable information about soil moisture fluxes. Figure 4 presents time series of soil matric potential measured by the Watermark sensors for the three irrigation treatments. Several observations can be made based on the data. For example, the graphs for 100% and 75% irrigation show that the soil profile was almost full until about late July. In particular, the sensors at 36 inches were relatively constant at about 20 centibars, which is close to the Field Capacity (FC) limit. This means that applying irrigation water prior to this date was not very useful in helping the crop going through the upcoming hot and dry periods, since any applied water would be lost to deep percolation. The data also shows when the crop starts to extract water from different depths. As an example, water extraction started in late June, early July, and late July at 10, 24, and 36 inches at the 100% treatment. At this treatment, the slope of soil moisture decline in the beginning of the season was largest for the shallowest sensor and smallest for the deepest sensor, indicating that more roots were present at shallower depths and thus extracting more water. The depletion of soil moisture was larger at the 75% treatments compared to the full treatment and even the 2.5 inches of rainfall that occurred on July 30 was not enough to fully refill the top-soil to the FC level.

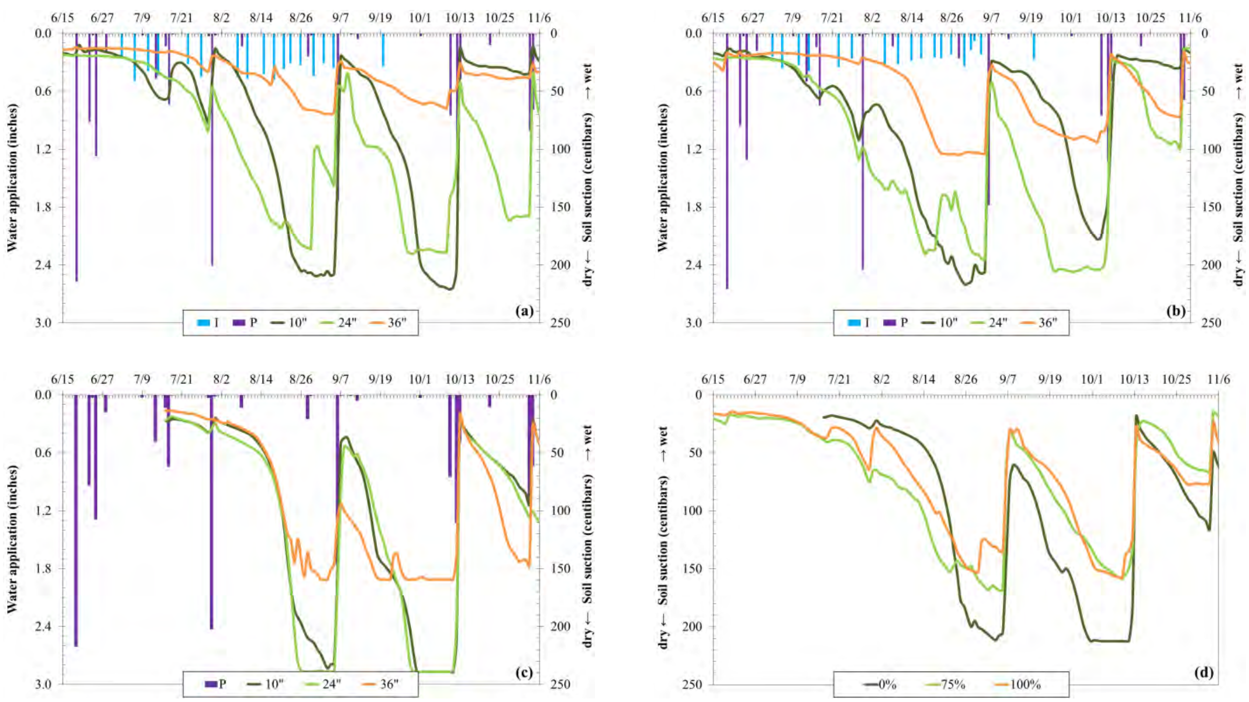

Figure 4. Time series of soil matric potential measured at three depths at treatments 100% (a), 75% (b), and dryland (c), as well as average matric potential for all three treatments (d). When applicable, irrigation and precipitation depths are also presented on a separate ordinate.

When averaged over all three depths (Figure 4d), the dryland treatment had the largest moisture depletion, with average soil matric potential values that reached over 200 centibars. However, this treatment had the smallest moisture depletion for a short period at the beginning of data collection (prior to mid-Aug), most probably because of the poor stand and reduced water extraction capacity of cotton. The difference between 100% and 75% treatments was more significant during the first 2.5 months of study, but the average soil matric potential graphs were very similar after the 1.8 inches of rainfall that occurred on Sep 6, 2014. The total depth of applied water (both irrigation and precipitation) was 23.9, 22.2, and 17.3 inches at 100%, 75%, and dryland treatments for the period between planting (May 20) and Sep 30, 2014. The total cotton evapotranspiration based on the data collected by the Mesonet station at Hinton was 27.9 inches for the same period, suggesting that even the 100% treatment may have been under some level of water stress. This observation is supported by soil matric potential data, as most irrigation scheduling plans suggest irrigating before the matric potential reaches levels measured in the present study.

Martha Site

The Acclima soil moisture sensors provided valuable information about the two irrigated cotton fields near the city of Martha, OK. Figure 5 demonstrates time series of daily averaged soil moisture measurements in volumetric percentage. At the SDI field soil moisture was at higher levels during the first month of data collection and responded to irrigation application, but decreased at all depths and distances in mid-July and remained at the same levels for the rest of the season. This suggests that irrigation could not keep up with increased water use of crop during this period. According to the precipitation data from the Mesonet station at Altus (the closest weather station), only 2.0 inches of rainfall was recorded during the two months of August and September. The largest average soil moisture during the data collection period belonged to the sensor closest to the tape at the shallowest depth (0”-15”), with a value of 14.1%. The second largest value was recorded at the sensor farthest from the drip tape and 30” depth (36”-30”), with a value of 12.2%. The sensor closest to the tape at 30” depth (0”-30”) was the next with an average soil moisture of 10.4%. The smallest average soil moisture was recorded at the sensor farthest from the tape at shallowest depth (36”-15”) with an average value of 10.0%.

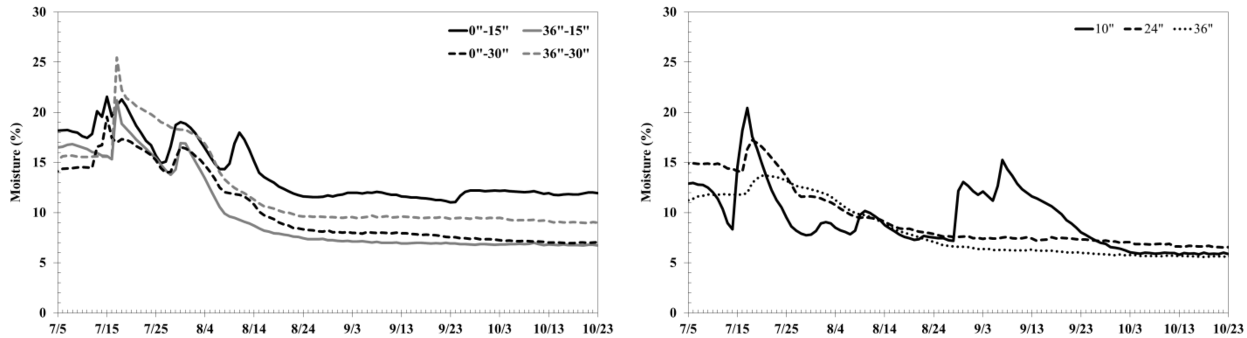

Figure 5. Daily averaged volumetric soil moisture at the SDI (left) and center pivot (right) fields.

The soil moisture data collected at the center pivot field was similar to the SDI field, with the exception that irrigation events in early September were able to increase the water content in the top-soil. However, the applied water did not make it to deeper layers as sensors at 24 and 36 inches did not show any increase in volumetric water content. Water dynamics at this field during the month of July represent a classic example of soil moisture fluctuations, where fluctuations decrease with the measurement depth. Soil moisture data averaged over the study period were 9.4, 9.4, and 8.3% at 10, 24, and 36 inches depths.

Since Acclima measurements are based on TDT principals, soil electrical conductivity (EC) estimates are affected by the soil volumetric water content. Thus, a salinity comparison between the SDI and center pivot fields is only valid if soil moisture data are taken into consideration. Figure 6 presents Acclima EC plotted against corresponding soil moisture for the two fields. Salinity levels were clearly higher at the SDI field for the same values of soil moisture. This finding suggests that salt buildup under SDI may become an issue at the studied field unless enough irrigation and/or precipitation water is applied to leach the salts below the root zone.

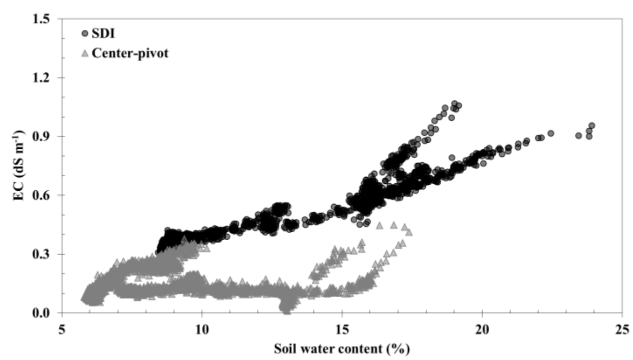

Figure 6. Daily averaged volumetric soil moisture at the SDI (left) and center pivot (right) fields.

Salinization Risk for Southwest Oklahoma

The salinization risk could be serious for southwest Oklahoma under current and predicted water scarcity. This is especially the case if growers decide to use lower-quality water supplies for irrigation purposes. Several previous studies have shown that saline water irrigation could be sustainable, but only if it is used in conjunction with high-quality water through cyclic use or blending (Rhoades et al., 1989). In a furrow-irrigated cotton field in southwest

Spain, Moreno et al. (2001) reported that only one irrigation with saline water (22.7 dS m^{-1}) increased soil salinity of the top soil and impacted cotton growth. It took five irrigations with high quality water (0.9 dS m^{-1}) to bring soil salinity to levels before the saline water irrigation. In northwest China, Chen et al. (2010) concluded that deficit irrigation of cotton with saline water was not sustainable. The average soil salinity in the top 3.3 ft of the soil increased by 336% and 547% after three years of irrigation with saline water of 3.6 and 6.7 dS m^{-1}, compared to the plot that received high-quality irrigation water (0.3 dS m^{-1}). Irrigation water samples from southwest Oklahoma usually exceed these levels, with values reaching 30 dS m^{-1}. Another issue is the presence of toxic elements in irrigation water. Ayars et al. (1993) reported that irrigating with water that has a boron level above 4 mg L^{-1} is not sustainable and can have a considerable negative impact on production of even boron-tolerant crops. Many irrigation water samples from the area have very low boron levels, but some have higher levels reaching 6 mg L^{-1}.

Summary

The results of a research and demonstration project conducted at three irrigated cotton fields revealed that soil moisture sensors can be used effectively to provide detailed information on soil water dynamics. The information collected by commercially-available sensors can assist growers with implementing precision irrigation management strategies. Examples of the information that can be obtained include, but are not limited to: the moisture status of soil profile at different times (e.g. before planting), the effectiveness of rainfall events in refilling the root zone, and the infiltration depth of irrigation water. The soil salinity data collected at two adjacent fields with similar soil types and irrigation water showed that soil salinity was higher at the SDI field compared to the field under center pivot irrigation. This is most probably due to reduced leaching under SDI systems and suggests that soil salinization may become an issue in southwest Oklahoma if SDI systems are used with low-quality irrigation water during drought years when the rainfall does not provide the required leaching.

Acknowledgements

The authors are grateful to Mr. Matt Muller and Mr. Merlin Schantz for their significant contribution to this research and demonstration project. The funding was provided by the Oklahoma Cooperative Extension Service, Oklahoma State University.

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Red River Crops Conference

Planning for a new Extension crop production conference specifically tailored to agricultural producers in north Texas and southwest Oklahoma was initiated in the summer of 2013. The Red River Crop Conference brought together resources of two land-grant institutions - Texas A&M AgriLife Extension Service and OSU - Oklahoma Cooperative Extension Service.

The planning committee included: Stan Bevers, Professor & Extension Economist, Texas A&M AgriLife Extension Service, Vernon; Dr. Randy Boman, Research Director and Cotton Extension Program Leader, Oklahoma Cooperative Extension Service, Altus; Joshua Brooks, Hall County Agricultural Extension Agent, Texas A&M AgriLife Extension Service, Memphis; Mark Gregory, Area Extension Agronomy Specialist, Oklahoma Cooperative Extension Service, Duncan; Leonard Haynes, Donley County Agricultural Extension Agent, Texas A&M AgriLife Extension Service, Clarendon; Aaron Henson, Tillman County Extension Educator, Oklahoma Cooperative Extension Service, Frederick; Lonnie Jenschke, Childress County Agricultural Extension Agent, Texas A&M AgriLife Extension Service, Childress; Marty New, Comanche County Extension Educator, Oklahoma Cooperative Extension Service, Lawton; Jason Pace, Area Agricultural Economist, Oklahoma Cooperative Extension Service, SW District, Duncan; Langdon Reagan, Wilbarger County Agricultural Agent, Texas A&M AgriLife Extension Service, Vernon; Steven Sparkman, Hardeman County Agricultural Extension Agent, Texas A&M AgriLife Extension

Service, Quanah; Gary Strickland, Jackson County Extension Educator, Oklahoma Cooperative Extension Service, Altus; Dianna Thompson, Southwest Technology Center, Altus; and Lawrence Tomah, Harmon County Extension Educator, Oklahoma Cooperative Extension Service, Hollis.

The crop conference was planned to rotate between Altus, OK and Childress, TX, with the inaugural 2014 crop conference being held at the Southwest Technology Center at Altus on January 28th and 29th. Due to the complexity of agricultural production in the area, it was decided to have a full meeting day focusing exclusively on cotton (January 28), and another day to provide programming for other crops including wheat, canola, guar, sesame, pastures, etc. (January 29). IPM topics were discussed by speakers on both days.

Day 1 (cotton) program began with Mark Lange, President and CEO of the National Cotton Council. Following Mark, Dr. John Robinson from Texas provided his opinion of the cotton market and outlook. Dr. Randy Boman from Oklahoma provided an update on ongoing varietal and technology research, while Shane Osborne from Oklahoma discussed weed resistance and herbicide use options. After lunch, Dr. Jason Woodward from Texas provided results from his seed treatment and plant disease work. Dr. Paul DeLaune from Texas discussed his research on nitrogen availability from irrigation water and its quality. The final portion of the day one program was a panel of representatives from the cotton industry discussing new developments in technology. The panel included Dr. Ty Witten (Monsanto), Dr. Jonathan Siebert (Dow AgroSciences), and Mr. Jared Hayes (John Deere).

Day 2 (other crops) started with Stan Bevers from Texas discussing the market outlook for grains and cattle. Dr. Brett Carver followed with an update on his wheat breeding program in Oklahoma. Dr. Larry Redmon from Texas provided a management update for improved pastures. Prior to lunch, Garrett King, Oklahoma agricultural liaison from Representative Frank Lucas office provided an update on the Farm Bill. He provided the news that the Farm Bill had been passed by the House of Representatives the previous afternoon. Bryan Rupp, meteorologist and On-line Weather Producer from KFDX-TV in Wichita Falls, Texas provided an update on the changing climate. Dr. Mark Gregory from Oklahoma provided an update on canola production and it's possibilities. Finally, Dr. Calvin Trostle from Texas provided an update on sesame and guar production and management.

Total conference participants during Day 1 of the program were 148 people. This included 105 registered participants, ten committee members, and eight speakers. Day 2 included 144 total participation including 102 registrations, seven speakers, and ten committee members. Thus, total participation over the two days was 292 participants. Obviously, the participants were from Oklahoma and Texas.

A total of 3 ODAFF and 12 Certified Crop Advisor CEUs were offered for both days of the meeting. A total of 18 Oklahoma producers and 6 CCA professionals were provided these CEUs. Therefore, 54 ODAFF and 72 CCA CEUs were allocated by the meeting for a total of 126.

Eighteen agri-businesses choose to support the conference. These included: Signature Sponsors – AgPreference, Oklahoma Cotton Council, and Rolling Plains Cotton Growers; Platinum Sponsors – Apache Farmers Coop, Bayer CropScience, Nichino America, Americot, and Monsanto; Gold Sponsors – Crop Protection Services, Dow AgroSciences, Humphreys Coop Gin and Elevator, Producers Cooperative Oil Mill, Western Equipment, Plains Cotton Cooperative Association, Eco-Drip Irrigation, and Helena; Silver Sponsors – DuPont Crop

Protection and Shamrock Bank.

Stan Bevers with Texas A&M AgriLife Extension Service generated an evaluation instrument that was used for both days and he also summarized the results. Based on daily evaluation results, the average Day 1 participant planted 1,002 acres of cotton and the average Day 2 participant planted 2,518 acres of crops other than cotton.

To finalize each day of the program, participants were asked to provide their candid responses to an evaluation. These results were compiled following the conference and are provided below.

The first three questions were scaled one to five with one being poor and five being excellent.

Day 1 (Cotton) Results

1. How would you rate the quality of speakers? 4.59 (Frequency: 1=0 observations; 2=0; 3=1, 4=26; 5=41)
2. How would you rate the facilities? 4.74 (Frequency: 1=0 observations; 2=0; 3=0, 4=18; 5=50)
3. How would you rate the overall conference? 4.64 (Frequency: 1=0 observations; 2=0; 3=0, 4=24; 5=43)

Of particular note regarding the first three questions, none of the respondents rated the speakers, facilities, or the overall conference less than 3.

The fourth question captured whether the participants felt as if they would make changes to pending production and/or marketing plans based on the information they received at the conference. The question was scaled such that 1 represented "definitely will not", 3 equaled "undecided" and 5 was "definitely will". Frequency of responses included: 1=2; 2=1; 3=16; 4=31; and 5=8. Based on these results, 67 percent expected to, at least minimally, change their production and/or marketing plan based on the information they received at the conference.

Day 2 (Other Crops) Results

1. How would you rate the quality of speakers? 4.61 (Frequency: 1=0 observations; 2=1; 3=0, 4=17; 5=33)
2. How would you rate the facilities? 4.63 (Frequency: 1=0 observations; 2=0; 3=2, 4=15; 5=34)
3. How would you rate the overall conference? 4.71 (Frequency: 1=0 observations; 2=0; 3=0, 4=15; 5=36)

The fourth question was as before. The question was again scaled such that 1 represented "definitely will not", 3 equaled "undecided" and 5 was "definitely will". Frequency of responses included: 1=0; 2=3; 3=24; 4=16; and 5=4. Based on these results, 43 percent expected to, at least minimally, change their production and/or marketing plan based on the information they received at the conference.

Based on the specific respondents that said they would at least minimally change their plans and the average number of acres of cotton or other crops planted annually, a financial impact figure was determined. It was assumed that those that indicated a 5 on question 4 for cotton (definitely would change their plans) would increase their net income $10 per acre for the acres of cotton planted and $7.50 per acre for the other crops. Likewise, for those respondents indicating a 4, it was assumed that an improvement of $7.50 per acre of cotton planted and

$5.00 per acre of other crops planted. These changes would be in the form of better marketing, risk management, varietal selection, etc. Given these hypotheses, the financial impact of attending the 2014 Red River Crops Conference was estimated to be $5,620 per respondent.

Excellent media coverage leveraged dissemination of the information. Ron Smith, editor of the Southwest Farm Press magazine and Southwest Farm Press Daily email attended the meeting. He expressed his opinion in a follow-up email to Dr. Randy Boman and Stan Bevers when he wrote, "…I think this could become one of the most important crops conferences in the Southwest region. It's certainly one of the best I've attended in some time." At least 9 SWFP email articles discussing various speaker topics were generated by Ron Smith. He recently indicated the distribution of the email was 11,435. This would total a direct distribution of the articles by SWFP Daily email edition would be 102,915. This is a very conservative number as the articles were also distributed by Cotton eNews which is produced by the National Cotton Council of America and disseminated to recipients across the Cotton Belt. Other media outlets also ran or quoted the articles. All SWFP Daily email articles were also printed in the SWFP magazine. Ron Smith recently noted the circulation of that magazine at about 30,000. Since 9 articles were generated, it would appear that an additional 270,000 contacts were made. Combining the SWFP magazine and SWFP Daily email distribution, this would indicate a total of 372,915.

Peer Reviewed Journal Article

Comparison of A Wire Belt Conveyor And Cross Auger Conveyor For Conveying Bur Cotton On A Stripper Harvester.

The degradation of cotton fiber naturally begins shortly after boll opening. Current mechanical harvesting processes (stripper harvesting) may have additional ramifications with regard to the degradation of cotton fiber. This project was focused on potential differences in fiber quality and/or degradation between traditional conveyance techniques (cross augers and pneumatic) currently used in cotton strippers and a redesigned wire belt conveyance system.

COMPARISON OF A WIRE BELT CONVEYOR AND CROSS AUGER CONVEYOR FOR CONVEYING BUR COTTON ON A STRIPPER HARVESTER

W. M. Porter, J. D. Wanjura, R. K. Taylor, R. K. Boman, M. D. Buser

ABSTRACT. *Cotton fiber quality begins to degrade naturally with the opening of the boll, and mechanical harvesting processes are perceived to exacerbate fiber degradation. Previous research indicates that stripper-harvested cotton generally has lower fiber quality including on average lower micronaire, length, strength, and uniformity, and higher foreign matter content than picker-harvested cotton. Results of previous work indicate that the cross auger and pneumatic conveying systems on stripper harvesters could be redesigned to help improve seed cotton cleanliness while preserving fiber quality. Thus, the cross auger was targeted for improvement. The main objective of this project was to design and test a wire belt to convey cotton laterally in a cotton stripper header. Tests were conducted to evaluate the influence of the wire belt conveyor on seed cotton cleanliness and fiber quality. Foreign matter content and fiber quality results from the wire belt were comparable to those of bur cotton conveyed by a standard cross auger. The results did not favor either the wire belt or the standard cross auger, meaning the wire belt must be optimized to perform better than the cross auger.*

Keywords. *Cotton, Cotton stripper, Cross auger, Fiber quality, Harvest, Mechanical conveying.*

Stripper harvesting is predominately confined to the Southern Plains of the United Stated due to several factors including: low humidity levels during daily harvest intervals, tight boll conformations and compact plant structures adapted to withstand harsh weather during the harvest season, and sometimes reduced yield potential due to limited rainfall and irrigation capacity. Based on USDA Data (2011), approximately 50% of the total number of cotton bales produced in the United States came from Texas and Oklahoma. A majority of the cotton harvested in these two states in combination with Kansas was harvested with stripper harvesters (Boman et al., 2011; Wanjura et al., 2013). Stripper-harvested cotton typically has lower micronaire, length, and length uniformity and higher foreign matter content than picker-harvested cotton (Wanjura et al., 2013). More research and work should be done to increase the amount of foreign matter removed and better preserve fiber quality during stripper harvesting.

The highest level of cotton fiber quality is observed with the opening of the boll. Due to maturity differences within a field and even an entire plant, not all bolls are ready for harvest at the same time. Thus, part of the fiber must be exposed to the elements until the rest of the field is ready for harvest. Mechanical action only increases fiber degradation.

Previous research has investigated the overall quality of stripper-harvested cotton, quality of stripper-harvested cotton versus picker-harvested cotton, and a cost comparison of the two harvest methods (Kerby et al., 1986; Nelson et al., 2001; Faulkner et al., 2011a, 2011b). Other research focused on the use of field cleaners on strippers and proved that they are an effective system for removing foreign matter from stripper-harvested cotton (Wanjura and Baker 1979; Smith and Dumas 1982; Wanjura and Brashears 1982; Brashears 2005; Wanjura et al., 2011). Few studies have investigated individual conveyance/cleaning components on stripper harvesters. Brashears (1994) investigated the attachment of square key stock to the outer edge of the cross auger flights. Brashears (1994) found that the key stock attachments aided in increasing the amount of foreign matter removed by up to 60%.

A study conducted by Laird and Baker (1985) investigated using a wire belt to convey machine-stripped cotton on an inclined plane into a feeder house at a cotton gin. In this study, the belt was set at different inclines to determine the optimal incline seed cotton could be effectively conveyed without rolling back down the incline. Density from this study was reported to range from 27.2 to 35.2 kg m^{-3} (1.7 to 2.2 lb ft^{-3}). Laird and Baker (1985)

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reported a range of angles of repose from 65°-85° based on the moisture and foreign matter content.

However, only the work by Porter et al. (2012, 2013) addressed the influence of the individual harvesting and conveying systems of a stripper harvester on fiber quality. Porter et al. (2012, 2013) reported that the conveying/cleaning components of a stripper harvester located between the row units and field cleaner did not significantly improve foreign matter removal or the preservation of fiber quality. Porter et al. (2012, 2013) found that an optimal point of research could begin with redesign of the cross auger to increase foreign matter removal while preserving fiber quality. The main objective of this study was to use and expand upon the findings of Porter et al., 2012 and 2013 to determine a new method of conveying cotton from the row units to the field cleaner with the goal of increased foreign matter removal and fiber quality preservation. The specific objectives were to design an alternative conveyance method for moving bur cotton from the row units on a cotton stripper to the separation duct, and to test the new conveyance method in comparison to the conventional cross auger from the standpoint of foreign matter removal and fiber quality preservation.

METHODS

A wire-belt conveyor was designed and built to convey bur cotton at a target rate of 136 kg min^{-1} (300 lb min^{-1}). This material flow rate is equal to two cotton stripper row units (1.0 m row spacing) harvesting an estimated common average lint yield in the Southern High Plains of 1558 kg ha^{-1} (1390 lb $acre^{-1}$) with (25% turnout) at 6.4 km h^{-1} (4 mi h^{-1}). The trough was built 0.33 m (13 in) wide to match the cross section width of the cross auger trough on a John Deere 7460 stripper (John Deere, Moline, Ill.).

The Laird and Baker (1985) study outlined the foundation for the design of a wire belt conveyor for conveying bur cotton that would be feasible by reporting parameters about bur cotton including density and angle of repose.

The equation used to calculate material conveyance on a belt is:

$$Q = \rho * A * V \quad (1)$$

Q is the material flow rate in kg s^{-1} (lb s^{-1}), ρ is the density of the material in kg m^{-3} (lb ft^{-3}), A is the cross-sectional area of bulk solid material on the belt in m^2 (ft^2), and V is the belt velocity in m s^{-1} (ft s^{-1}). The density of the material was assumed to be 32.0 kg m^{-3} (2.0 lb ft^{-3}) based on Laird and Baker (1985). The density of bur cotton is variable, depending on moisture and foreign matter content. The angle of repose of seed cotton and the width of the auger trough were used to calculate the cross-sectional area of cotton on the belt. An angle of repose of 75° was chosen for the cross-sectional area calculation to fall within the middle of the range of the reported angles of repose as reported by Laird and Baker (1985). The only user controlled factor during this conveyance process is the speed of the belt. Thus, using equation 1, the estimated belt velocity needed to achieve the target material conveyance rate is approximately 4.0 m s^{-1} (13 ft s^{-1}).

Two cultivars were grown for use in this project FiberMax 9170 B2F (Bayer CropSciences, Cary, N.C.) and Stoneville 5458 B2F (Bayer CropSciences, Cary, N.C.). Both cultivars are common in the Southern High Plains and have inherently different leaf pubescence properties (FM 9170 B2F - smooth leaf, STV 5458 B2F – hairy leaf). One hundred rows of each cultivar that were 1 m (40 in.) wide were grown in a row irrigated field that was 236 m (775 ft) long and the cotton was stripper harvested using a four-row John Deere 7460. Before harvest, the cross auger was removed from the right side of the stripper header so that the cotton harvested by the row units on the right side of the stripper header could be dropped into the empty auger trough for collection without being exposed to the action of the auger. Cotton harvested by the two row units on the left side of the stripper header was conveyed to the center of the machine by the cross auger and collected in a bag attached to the outlet of the auger. The harvester moved through the field at approximately 4.8 km h^{-1} (3.0 mi h^{-1}) until the right side of the auger trough was full of cotton. Once the harvester was stopped, the cotton from the right side auger trough was removed by hand and placed in a bag. This collection process was conducted ten times for each cultivar such that a total of 40 samples of approximately 9.0 kg were obtained; half of which had not been exposed to the conveying action of the cross auger.

After harvest, the samples were transported to the USDA ARS Cotton Production and Processing Research Unit (CPPRU) in Lubbock, Texas, and weighed (Electroscale Model LC2424, capacity: 99.8 kg, Display: Electroscale Weigh Master 551, capacity: 90.7 kg, resolution 0.005 kg, Santa Rosa, Calif.). The four treatment combinations evaluated were: standard cross auger without field cleaning (CA), 2) the standard cross auger with field cleaning (CA+FC), 3) the wire belt conveyor without field cleaning (BC), and 4) the wire belt conveyor with field cleaning (BC+FC). A total of five replications per treatment were collected and processed. The samples collected from the right side auger trough (not exposed to the cross auger) were divided in half and loaded onto two belt conveyors (fig. 1) that fed the cotton onto the experimental wire belt conveyor (fig. 2). The wire belt had rectangular slots that were 1.27 cm by 2.54 cm (fig. 3). The belt conveyor was driven by a single v-belt using a 110 V

Figure 1. The two flow rate simulators used to control the material being conveyed onto the wire belt conveyor.

Figure 2. The wire belt conveyor used as a comparison to the cross auger.

electric motor with a variable frequency drive. The conveyor was 2.0 m long, or the equivalent to two row widths and 0.33 m wide to match the current width of the cross auger trough.

The belt conveyors were used to simulate the feeding action of two row units depositing cotton onto the wire belt conveyor at the same rate that the cotton was harvested in the field. Bur cotton weights were recorded before and after the wire belt conveyor and all material separated by the wire belt was weighed and recorded. Half of the samples collected in the field that were exposed to the cross auger and half of the samples that were processed on the wire belt conveyor in the laboratory were passed through a field cleaner in the laboratory (fig. 3). The field cleaner is a laboratory replica of a field cleaner on a cotton stripper, it has been modified to be used as a standalone machine. Samples were fed into the field cleaner by a belt conveyor at a rate equal to the loading rate (i.e., mass per time per unit width of cleaner) of the field cleaner on the stripper when harvesting at the rate observed in the field. The feed width into the field cleaner was reduced to one half of the full width to simulate the loading that a field cleaner on a machine would see under full load from two harvester rows. Bur cotton weights before and after the field cleaner were recorded along with the weight of trash removed by the cleaner.

All cotton samples were processed through an extractor-feeder (fig. 4) (Continental Gin Company-Moss Gordin, Birmingham, Ala., Type C-95, top saw 0.36 m diameter @ 374 rpm, middle saw 0.36 m diameter @ 374 rpm, bottom saw 0.36 m diameter @ 77 rpm), 16-saw gin stand (Continental Gin Company, Birmingham, Ala., Model: 610, Type: 16B79, Saw Cylinder 0.41 m diameter @ 720 rpm originally 21 saws, and doffer brush speed 1830 rpm), and one stage of saw-type lint cleaning (Continental Gin Company Birmingham, Ala., Model: 620, Type: G120B, upper roller speed 86 rpm, feed roller speed 91.5 rpm, main saw 0.41 m diameter @ 882 rpm, doffer brush speed 1472 rpm). Prior to ginning, each bur cotton sample was weighed and one fractionation sample (a sample to determine the composition of foreign material present) was collected before the bur cotton was introduced into the extractor-feeder. A moisture sample was collected from the extractor-feeder apron during ginning. Analysis of the fractionation and moisture content samples was performed as outlined by the standard procedures developed by USDA (Shepherd, 1972). The cleaned lint was weighed to obtain lint turnout and the trash collected from the extractor-feeder and seeds from the gin stand were collected and weighed. Two samples of the cleaned cotton lint from each sample were collected and sent to the Texas Tech University, Fiber and Biopolymer Research Institute in Lubbock, Texas, for High Volume Instrument (HVI) (Uster Technologies, Charlotte, N.C., HVI 1000) and Advanced Fiber Information System (AFIS) (Uster Technologies AFIS Pro 2, Charlotte, N.C.) fiber analysis. Analysis of Variance (ANOVA) was performed using the

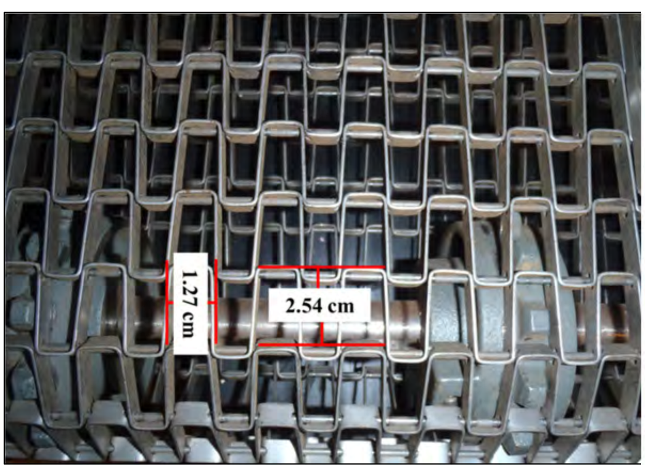

Figure 3. The dimensions of the wire belt that was used for the wire belt conveyance of bur cotton.

Figure 4. The flow rate simulator used to control the material being conveyed into the laboratory field cleaner.

general linear model in Minitab Statistical Software (V.16, Minitab Inc., State College, Pa.). Tukey's standardized range test was used to separate significantly different treatment means ($\alpha = 0.10$) for all parameters reported from the ginning and fiber quality analyses.

RESULTS AND DISCUSSION

Different cotton cultivars typically have different fiber quality traits. To ensure that the differences in traits did not affect the results of this study, each of the tested parameters in the tables below was tested for statistical cultivar difference. If no statistical difference was found, then the data for cultivars were combined. If a statistical difference between cultivars was found, the data were analyzed separately by cultivar to prevent cultivar effect from misrepresenting the data.

Lint turnout and percent trash, based on total sample bur cotton weight, and the fractionation results are presented in table 1 for the four treatments. Analysis of the lint turnout data shows that the field cleaner removed a substantial amount of foreign material from the bur cotton. There were no significant differences in the lint turnout data between cultivars, thus the data for the two were pooled. The BC had the lowest lint turnout percentage while the CA increased turnout to a significantly higher level than that of the BC. Even though the BC turnout was statistically lower initially, the field cleaner was able to remove enough foreign matter from both the BC and CA treatments so that turnout was not different between CA+FC or BC+FC.

Based on the fractionation results it can be inferred that neither the CA nor the BC treatment are doing consistently better than the other at removing foreign matter. The BC+FC resulted in better removal of all types of foreign matter except for motes than the BC, or the CA treatments. Even though the BC treatment seemed to have a high percentage of burs, the field cleaner was still able to remove these to the same level as the CA+FC treatment. Even though the wire belt did not remove as many burs as the cross auger, it did not appear it was entangling the burs to the point they became difficult to remove. The fractionation data support the belief that a field cleaner is an integral part of the cotton stripper and does a very good job at removing foreign matter.

As presented in table 2, there was no apparent or consistent difference between the treatments for yellowness (+b). Similar to +b there were no consistent differences between reflectance (Rd) independent of cultivar difference. No differences in micronaire were observed among treatments for the Stoneville cultivar and only slight natural variations of no importance were observed for FiberMax (table 2). Average micronaire was 3.6 for the FiberMax and 3.9 for the Stoneville. This observation was expected since mechanical conveyance has no influence on the maturity level of cotton fibers unless a significant portion of fibers were being lost or removed. The same statistical similarities can be observed in the fiber length as reported by HVI in table 2. Only natural variations are present in fiber length, and no statistically significant differences.

HVI trash (table 2) was reported higher initially for both cultivars by both conveyance methods, but only statistically different for FiberMax especially the CA and then was reduced once the bur cotton passed through the field cleaner. The data support a higher trash removal by the BC in only the FiberMax variety, this can be attributed to the smooth leaf of the FiberMax cultivar and the hairier leaf of the Stoneville cultivar. The field cleaner was able to reduce the HVI trash to the same level for all treatments in both varieties.

Fiber uniformity and HVI strength data is presented in table 3. The uniformity was not statistically different due to

Table 1. Lint turnout and Fractionation data as reported from lint turnout, trash weight and standard fractionation procedures by percentage of total sample weight.[a]

Treatment	Turnout (%)	Trash (%)	Burs (%)	Sticks and Stems (%)	Leaf Trash (%)	Motes (%)	Fine Trash (%)
BC	28.23_{C}	20.34_{A}	23.2_{A}	3.2_{AB}	2.2_{B}	1.1_{A}	1.6_{A}
BC+FC	37.03_{A}	6.38_{C}	5.7_{C}	2.0_{B}	1.7_{B}	1.1_{A}	1.2_{A}
CA	30.95_{B}	18.73_{B}	17.8_{B}	3.9_{A}	2.7_{A}	1.0_{A}	1.5_{A}
CA+FC	37.95_{A}	6.26_{C}	5.1_{C}	2.5_{B}	1.8_{B}	1.0_{A}	0.9_{A}
P-Value	<0.0001	<0.0001	<0.0001	0.002	<0.0001	0.143	0.161

[a] Treatments with the same letter are significant at $\alpha = 0.10$ level.

Table 2. HVI fiber parameters in which the cultivars were statistically significant different.[a]

Treatment	+b (Yellowness)	Rd (Reflectance)	Micronaire	Length (cm)	HVI Trash (%)
		FiberMax			
BC	8.4	79.2_{B}	3.47_{B}	2.87_{AB}	16.3_{B}
BC+FC	8.1	80.0_{AB}	3.59_{AB}	2.84_{B}	13.3_{B}
CA	7.9	80.2_{AB}	3.58_{A}	2.90_{A}	22.5_{A}
CA+FC	7.8	80.8_{A}	3.62_{A}	2.90_{AB}	13.1_{B}
P-Value	0.051	0.031	0.039	0.053	0.001
		Stoneville			
BC	8.5_{A}	77.2_{BC}	3.88_{A}	2.80_{A}	26.3_{A}
BC+FC	8.5_{A}	78.0_{AB}	3.93_{A}	2.80_{A}	23.5_{A}
CA	8.6_{A}	76.8_{C}	3.96_{A}	2.80_{A}	27.1_{A}
CA+FC	8.3_{A}	78.3_{A}	3.88_{A}	2.80_{A}	24.8_{A}
P-Value	0.299	<0.0001	0.253	0.847	0.639

[a] Treatments with the same letter are significant at $\alpha = 0.10$ level.

Table 3. HVI parameters in which there were no statistically significant differences between cultivars.[a]

Treatment	Uniformity (%)	Strength (g/Tex)
BC	79.49_{B}	31.84_{AB}
BC+FC	79.41_{B}	30.96_{C}
CA	79.98_{A}	32.33_{A}
CA+FC	79.80_{AB}	31.35_{BC}
P-Value	0.011	<0.0001

[a] Treatments with the same letter are significant at α = 0.10 level.

passing through the field cleaner in either case. The decreases in uniformity were not statistically different within each conveyor type but were different among treatments. In this case the statistical difference is insignificant from a practical standpoint. Thus, it can be inferred that neither the cross auger nor the wire belt conveyor results in practical effects on fiber uniformity. The fiber strength was reduced slightly as the fibers passed through the mechanical conveyance locations within the harvester. The field cleaner caused a lower strength than did either the wire belt conveyor or the auger conveyor. Thus, these two methods do not have a significant effect on the HVI strength of the fiber.

Selected AFIS parameters are presented in table 4. Trash content was similar within each cultivar for both the BC and CA treatments. Porter et al. (2012, 2013) reported trends of increasing trash levels as the bur cotton was allowed to pass across the cross auger and up to before the field cleaner. Similar to Porter et al. (2012, 2013) the data in table 4 shows a reduction in trash levels once the cotton is allowed to pass through the field cleaner. It is possible that the conveyance of the bur cotton through the cross auger and across the belt conveyor is causing slight entanglements in the fibers not allowing as much trash and dust to be separated. A significant amount of AFIS trash was removed by the field cleaner from both the BC and CA treatments. Less trash was removed from the Stoneville cultivar than the FiberMax cultivar by the field cleaner. The higher amount of trash still present in the Stoneville cultivar could be explained by this cultivar's higher leaf pubescence, making leaf trash more difficult to remove from the fiber. In both cultivars, the CA treatment had higher amounts of dust present in the sample over the BC treatment even though not statistically significant, which is important to note was collected from the same area as the BC samples. Neither conveyance method was significantly better than the other at removing dust. The field cleaner removed a significant amount of dust, when compared to the previous treatments especially in the FiberMax cultivar.

Nep size and nep count as determined by the AFIS were both unaffected by mechanical conveyor type or field cleaning. There was a higher nep count from the FiberMax BC treatment, even though this same trend was not observed in the Stoneville cultivar. This could possibly be attributed to sample or field variation.

Trivial reductions were observed in short fiber content as the fiber was allowed to pass through the machine. Since it is obvious that the fibers cannot be repaired, these anomalies can be attributed to field and sample variation, or cotton loss.

Visible foreign matter (VFM) was reduced by the mechanical actions of the field cleaner in all instances. Even though the CA treatment had a higher level of VFM in both cultivars the field cleaner was able to remove the foreign matter to statistically the same level after treatment. Thus, the higher level of VFM in the CA treatment was not significant.

CONCLUSION

A wire belt conveyor was compared to the standard auger conveyor on a stripper harvester. The cross auger was field tested on the machine, while the wire belt conveyor was tested in the lab. Fiber quality and foreign matter content data were collected and analyzed. Minimal differences in terms of foreign matter content and fiber quality parameters were observed between the two conveyor systems. Foreign matter content of cotton conveyed by either system was substantially reduced by the use of a field cleaner with no damage to fiber quality. Future optimization work performed on wire belt conveyors could increase their cleaning ability to higher levels than currently possible with the cross auger. Optimization would could be performed on the cross auger to increase its levels of foreign matter removal and fiber quality preservation. Research focused on increasing the cleaning and fiber quality preservation abilities of a wire belt conveyor could make it a viable replacement for the current cross auger used on a cotton stripper harvester.

Table 4. Cotton fiber quality parameters as reported by AFIS from each sample treatment.[a]

Treatment	Trash (Cnt/g)	Dust (Cnt/g)	Nep Size (um)	Nep Count (Cnt/g)	SFC (w%)	VFM (%)
			FiberMax			
BC	74.3_{A}	354.4_{A}	722.9_{A}	555.4_{A}	14.0_{A}	1.47_{A}
BC+FC	40.2_{B}	224.3_{B}	721.4_{A}	496.6_{AB}	13.7_{AB}	0.90_{B}
CA	88.5_{A}	427.3_{A}	717.6_{A}	461.2_{B}	13.28_{AB}	1.80_{A}
CA+FC	46.8_{B}	235.8_{B}	718.3_{A}	461.8_{B}	12.4_{B}	0.94_{B}
P-Values	<0.0001	<0.0001	0.754	0.006	0.092	<0.0001
			Stoneville			
BC	88.6_{AB}	359.6_{AB}	713.1_{A}	380.8_{A}	15.3_{A}	1.68_{AB}
BC+FC	74.2_{B}	353.4_{AB}	706.5_{A}	390.3_{A}	14.9_{A}	1.45_{B}
CA	98.0_{A}	417.9_{A}	710.1_{A}	348.0_{A}	14.1_{A}	1.94_{A}
CA+FC	75.4_{B}	327.8_{B}	708.2_{A}	378.1_{A}	14.0_{A}	1.34_{B}
P-Values	0.001	0.048	0.633	0.191	0.174	<0.0001

[a] Treatments with the same letter are significant at α = 0.10 level.

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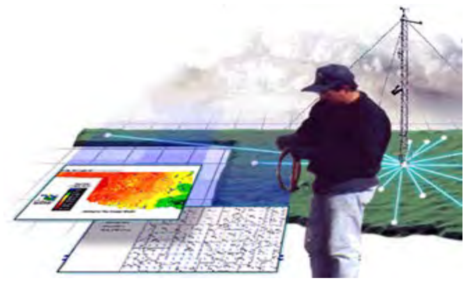
Appendix

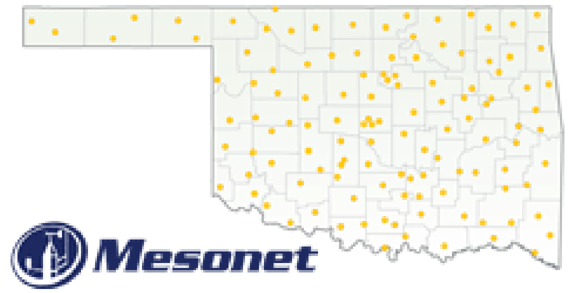


About the Mesonet The Oklahoma Mesonet is a world-class network of environmental monitoring stations. The network was designed and implemented by scientists at the University of Oklahoma (OU) and at Oklahoma State University (OSU). The Oklahoma Mesonet consists of 120 automated stations covering Oklahoma. There is at least one Mesonet station in each of Oklahoma's 77 counties. At each site, the environment is measured by a set of instruments located on or near a 10-meter-tall tower. The measurements are packaged into "observations" every 5 minutes, then the observations are transmitted to a central facility every 5 minutes, 24 hours per day year-round. The Oklahoma Climatological Survey (OCS) at OU receives the observations, verifies the quality of the data and provides the data to Mesonet customers. It only takes 5 to 10 minutes from the time the measurements are acquired until they become available to the public.

History of the Mesonet In 1982, Oklahoma scientists recognized the need for a statewide monitoring network. At OSU, agricultural scientists wanted to upgrade weather instruments at their research sites. Their primary goal was to expand the use of weather data in agricultural applications.Meanwhile, scientists from the OU meteorological community were helping to plan and implement a flood-warning system for Tulsa. The success of Tulsa's rain gauge network pointed to the potential for a more extensive, statewide network. OSU and OU joined forces in 1987 when they realized that one system would help both universities achieve their respective missions. The two universities approached the Governor's Office and, in December of 1990, the Oklahoma Mesonet Project was funded with $2.0 million of oil-overcharge funds available from a court settlement. Both universities contributed almost $350,000 each to bring the grand total to $2.7 million. In addition, the Oklahoma Law Enforcement Telecommunications System (OLETS) donated the use of their communications infrastructure to help move the data from the remote sites to OU. Once funding was available, the Mesonet Project progressed quickly. Committees were formed, potential station sites were located and surveyed and instruments were chosen. In late 1991, the first Mesonet towers were installed and, by the end of 1993, 108 sites were completely operational. Three more sites were added soon thereafter to supplement a U. S. Department of Agriculture network in the Little Washita River Basin. In 1996, three sites were added near Tulsa for an Oklahoma Department of Environmental Quality study of air pollution. Thus, by the fall of 1996, the total number of Oklahoma Mesonet sites was 114. Since 1996, 8 sites have relocated to other areas in the same town, 4 sites have been retired, and 10 sites have been added resulting in our current 120 station network. A 2009 National Research Council report named the Oklahoma Mesonet as the "gold standard" for statewide weather and climate networks. The Mesonet is unique in its capability to measure a large variety of environmental conditions at so many sites across an area as large as Oklahoma. In addition, these conditions are relayed to a wide variety of customers very quickly after the observations are taken.

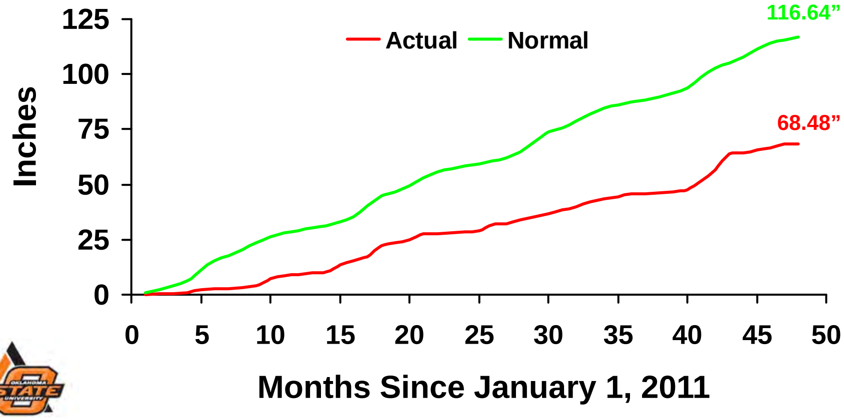
Agriculture Agricultural applications of the Mesonet include improved insect and disease advisories, spraying recommendations, irrigation scheduling, frost protection, planting and harvesting recommendations and prescribed burn advisories. Agriculture is such a large Oklahoma industry that any increase in efficiency from more accurate environmental information can translate into several million dollars in statewide savings each year. Visit our Agweather site at: agweather.mesonet.org.

Appendix (continued)



During the months of August and September, the Mesonet station at the Caddo Research Station at Fort Cobb missed several days of weather data due to instrument failure. We have included the nearest Mesonet station to Fort Cobb (Apache - which is only a few miles away). The background information for the Caddo Research Station OVT site provides actual Fort Cobb rainfall as measured by the personnel there (standard rain gauge) as well as the center pivot irrigation amounts and timing.

Altus Mesonet Actual January 2011 – December 2014 and Normal Accumulated Precipitation



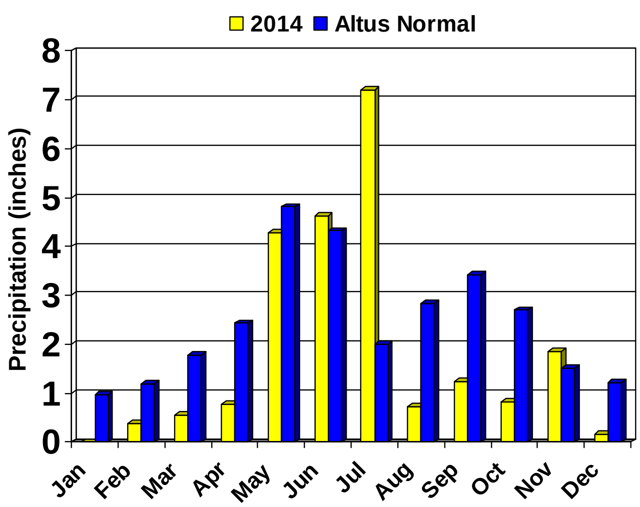
Through July 2012 51% of normal

July 2013 51% of normal

July 2014 61% of normal

Deficit from Jan 2011 thru Dec 2014 48.16”

Altus Normal (1971-2000) and Mesonet 2014 Rainfall



Altus Normal From January 1 – April 30 6.37”

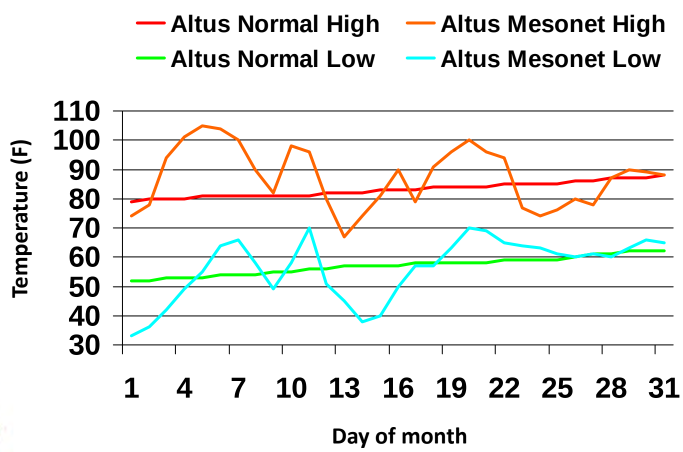
Altus Actual From January 1 – April 30 1.71” 27% of normal

Altus Normal From April 1 – July 31 13.56”

Altus Actual From April 1 – July 31 16.89” 25% above normal

Source: http://climate.ok.gov/index.php/climate/county_climate_by_county/jackson

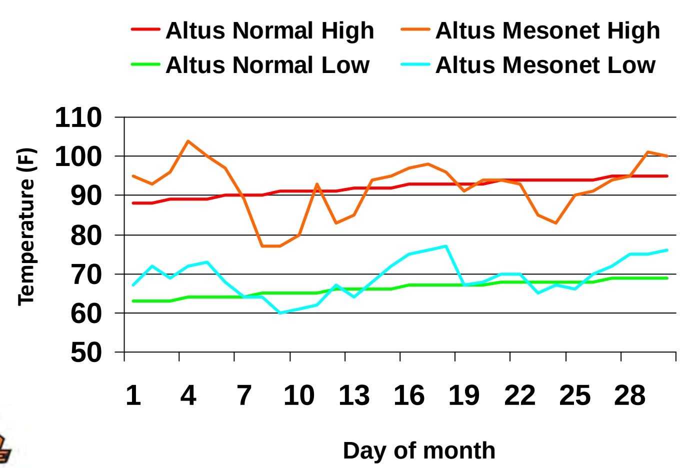
Altus
Normal (1971-2000) and Mesonet Air Temperatures
May 2014



Heat Units

Normal: 314
2014: 386
% of normal: +23

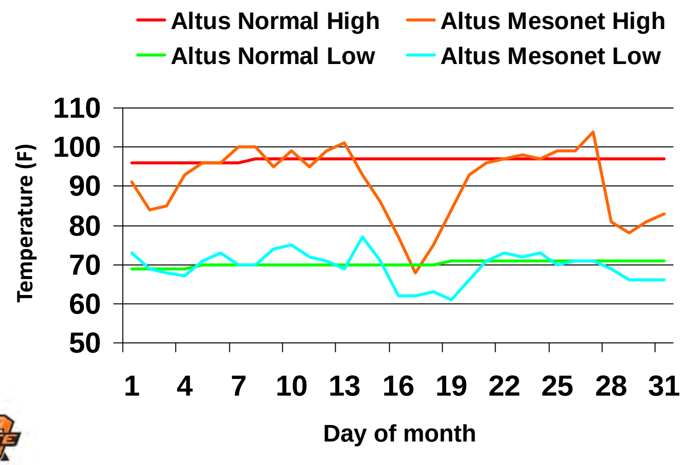
Altus
Normal (1971-2000) and Mesonet Air Temperatures
June 2014



Heat Units

Normal: 575
2014: 616
% of normal: +7

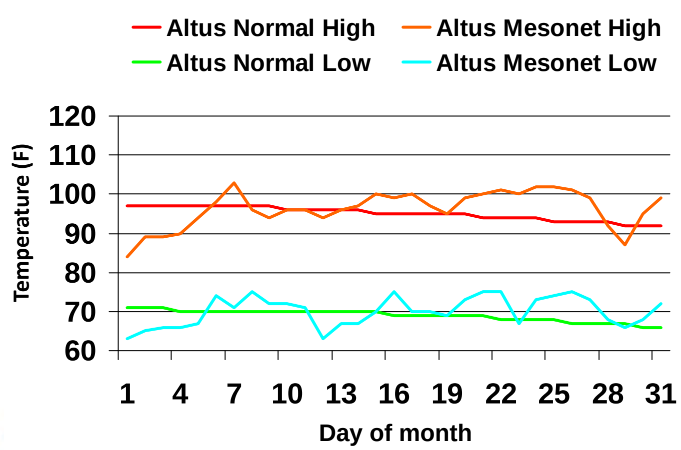
Altus
Normal (1971-2000) and Mesonet
Air Temperatures
July 2014



Heat Units

Normal: 730
2014: 628
% of normal: -14

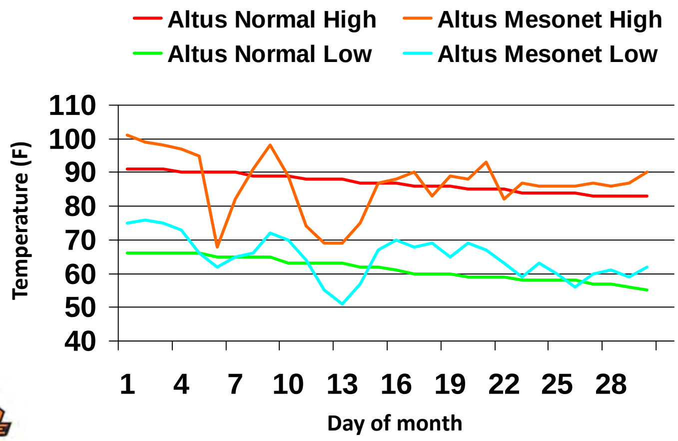
Altus
Normal (1971-2000) and Mesonet
Air Temperatures
August 2014



Heat Units

Normal: 683
2014: 718
% of normal: +5

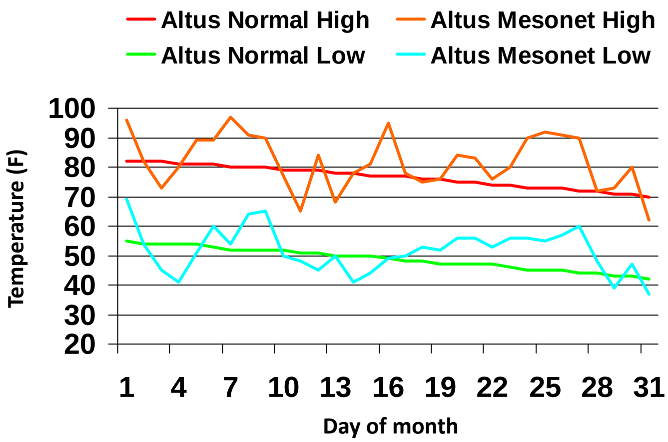
Altus
Normal (1971-2000) and Mesonet
Air Temperatures
September 2014



Heat Units

Normal: 424
2014: 473
% of normal: +12

Altus
Normal (1971-2000) and Mesonet
Air Temperatures
October 2014

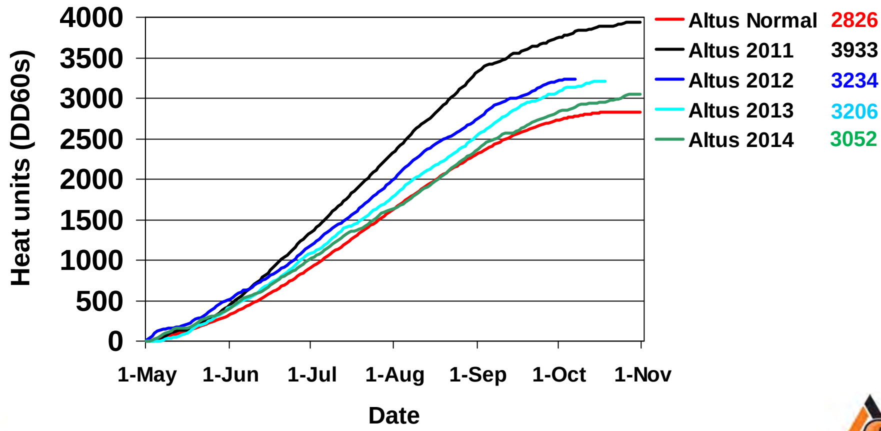


Heat Units

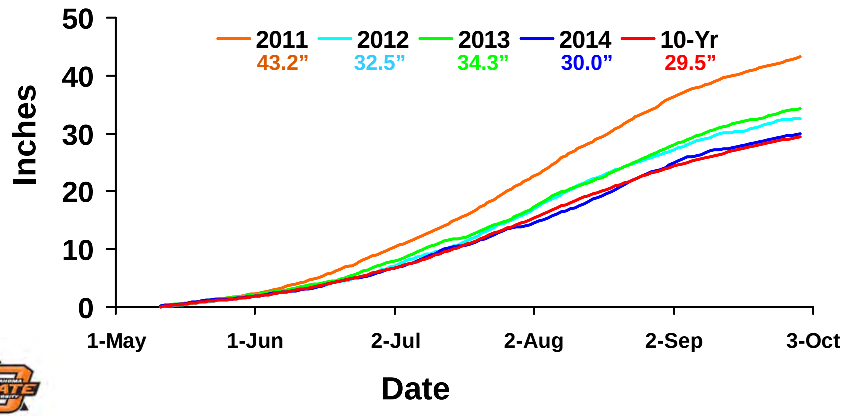
Normal: 102
2014: 231

% of normal: +128

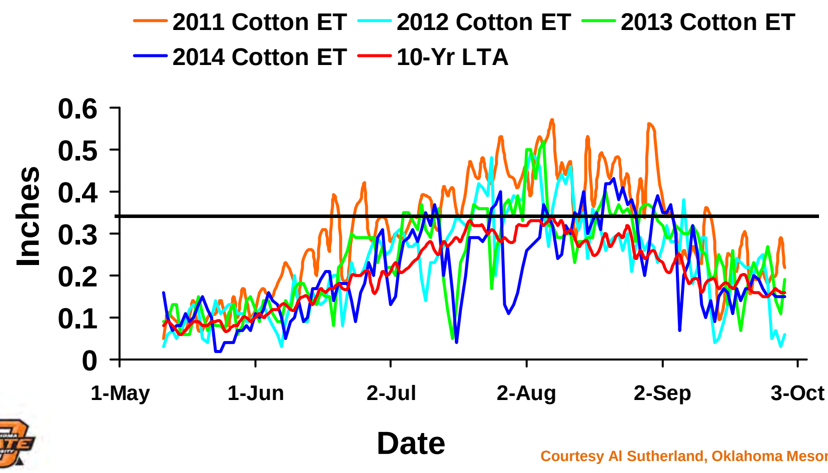
Altus
30-Yr Normal - 2011, 2012, 2013, and 2014
Cotton Heat Unit Accumulation



Altus Mesonet
May 11- September 30
Accumulated Cotton ET
(May 10 Planting Date)



Altus Mesonet
May-September LTA, 2011 - 2014
Daily Cotton ET (May 10 Planting Date)



Courtesy Al Sutherland, Oklahoma Mesonet

MESONET CLIMATOLOGICAL DATA SUMMARY May 2014 Time Zone: Midnight-Midnight CST
(FTCB) Fort Cobb Nearest City: 4.0 NNW Fort Cobb County: Caddo
Latitude: 35-08-55 Longitude: 98-27-57 Elevation: 1385 feet

DAY	TEMPERATURE (F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m2)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	71	34	53.3	29.4	13	0	79	18	46	0.00	28.63	30.11	NW	8.0	26.7	29.14	60.2	62.8	72	54
2	75	40	58.1	29.8	7	0	75	13	41	0.00	28.53	30.00	NW	5.7	19.6	29.60	62.6	66.1	76	57
3	90	40	68.2	32.7	0	0	87	12	34	0.00	28.48	29.95	SSE	9.4	25.4	29.44	64.8	69.1	79	59
4	97	52	78.1	32.9	0	10	64	8	24	0.00	28.38	29.85	S	14.5	38.4	29.65	67.7	73.1	82	64
5	97	62	80.6	42.7	0	15	54	14	28	0.00	28.27	29.73	SSE	14.2	31.3	29.19	70.3	76.2	85	68
6	97	63	80.0	55.7	0	15	77	17	48	0.00	28.16	29.62	SSE	17.1	36.5	27.36	72.8	78.4	85	71
7	92	64	74.9	63.3	0	13	95	34	70	0.82	28.22	29.67	SSE	17.5	45.8	24.06	73.3	77.5	85	73
8	83	62	70.9	60.0	0	8	95	30	72	0.25	28.29	29.75	SSE	10.8	45.1	26.43	72.0	73.2	79	68
9	77	54	65.4	51.8	0	1	100	36	65	0.00	28.40	29.87	NNE	6.6	21.2	26.91	71.4	70.8	77	64
10	89	56	73.8	59.5	0	7	96	35	64	0.00	28.29	29.75	SE	14.7	33.6	28.63	71.0	70.9	79	63
11	88	68	77.6	64.1	0	13	90	40	65	0.00	28.20	29.66	SSE	22.8	44.7	27.38	72.4	75.7	84	69
12	76	52	61.9	51.3	1	0	93	45	70	0.11	28.45	29.92	NNW	13.6	35.5	14.87	70.1	70.6	76	65
13	65	45	55.6	36.3	10	0	73	29	51	0.00	28.76	30.24	N	11.6	31.0	20.88	64.8	65.6	73	59
14	71	40	55.9	33.1	10	0	84	19	48	0.00	28.77	30.25	NW	6.3	20.8	26.68	64.3	66.5	76	58
15	73	39	57.8	37.6	9	0	85	26	51	0.00	28.69	30.17	N	6.3	22.3	25.49	64.9	67.7	77	59
16	82	42	64.2	43.6	3	0	94	20	54	0.00	28.54	30.01	SSE	10.5	37.0	28.86	66.6	70.1	79	61
17	73	51	61.0	48.6	3	0	90	44	65	0.00	28.57	30.04	NNE	11.5	35.7	22.37	67.8	70.6	77	65
18	84	54	67.7	56.5	0	4	94	44	70	0.00	28.52	29.99	ESE	14.8	33.2	22.88	68.9	71.7	79	65
19	91	64	76.4	57.8	0	12	82	29	56	0.00	28.37	29.83	SSE	19.8	39.3	28.85	71.7	75.6	83	69
20	95	67	79.9	56.5	0	16	75	24	48	0.00	28.38	29.85	S	17.4	35.3	27.44	73.7	78.2	85	72
21	93	69	80.2	59.5	0	16	72	30	51	0.00	28.47	29.94	S	15.4	29.4	26.39	75.4	80.2	87	74
22	92	65	77.8	60.4	0	13	85	32	58	0.00	28.55	30.03	SSE	10.2	26.0	28.11	76.7	81.7	89	75
23	73	64	68.6	63.7	0	4	99	61	85	2.07	28.57	30.04	ESE	6.5	38.8	4.56	73.5	75.6	81	71
24	81	64	68.5	65.0	0	7	99	65	90	0.69	28.53	30.00	S	5.8	34.7	13.92	71.9	72.4	78	69
25	82	62	70.5	62.9	0	7	98	52	78	0.04	28.50	29.97	SSE	7.9	30.5	17.00	71.9	71.7	76	68
26	79	59	66.9	62.1	0	4	98	55	86	1.33	28.51	29.99	S	7.5	30.8	12.95	71.0	69.9	75	66
27	74	61	66.7	61.8	0	3	99	63	85	0.06	28.46	29.93	NNE	5.2	20.0	16.09	71.1	70.6	75	67
28	85	59	72.1	62.4	0	7	99	46	74	0.01	28.50	29.97	NNE	5.8	19.6	26.47	72.7	72.5	80	65
29	88	62	75.4	62.8	0	10	98	37	69	0.00	28.47	29.94	E	4.4	20.8	28.20	75.4	75.5	83	68
30	84	65	74.5	64.6	0	9	95	47	73	0.00	28.48	29.95	ENE	6.9	21.9	26.35	76.4	75.8	81	70
31	85	67	74.7	65.2	0	11	97	46	75	0.00	28.50	29.97	ESE	5.2	20.2	23.02	77.0	77.6	87	71
	83	56	69.6	52.7	<- Monthly Averages ->						28.47	29.94	SSE	10.8	45.8	24.17	70.5	72.7	80	66

Temperature - Highest: 97
Lowest: 34

Degree Days - Total HDD: 56
Total CDD: 204

Rainfall: Monthly Total: 5.38 in.
Greatest 24 Hr: 2.07 in.

Humidity - Highest: 100
Lowest: 8

Number of Days With:
Tmax ≥ 90: 9 Rainfall ≥ 0.01 inch: 9
Tmax ≤ 32: 0 Rainfall ≥ 0.10 inch: 6
Tmin ≤ 32: 0 Avg Wind Speed ≥ 10 mph: 16
Tmin ≤ 0: 0 Max Wind Speed ≥ 30 mph: 18

 * Denotes incomplete record

Monthly data generated on Friday, September 12, 2014 at 17:30 UTC

MESONET CLIMATOLOGICAL DATA SUMMARY June 2014 Time Zone: Midnight-Midnight CST
(FTCB) Fort Cobb Nearest City: 4.0 NNW Fort Cobb County: Caddo
Latitude: 35-08-55 Longitude: 98-27-57 Elevation: 1385 feet

DAY	TEMPERATURE (F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m2)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	90	65	77.6	66.1	0	13	98	41	71	0.00	28.42	29.88	SSE	12.9	33.0	23.12	77.1	79.6	88	73
2	92*	69*	79.9*	65.8*	0*	16*	82*	42*	64*	0.00*	28.46*	29.93*	SE *	12.9*	29.0*	NA	77.7*	82.6*	91*	76*
3	94	69	81.5	66.0	0	16	92	35	62	0.00	28.46	29.93	S	13.6	31.6	26.95	78.7	84.0	91	77
4	99	71	85.0	65.5	0	20	87	28	56	0.00	28.29	29.76	S	14.0	32.8	29.47	80.0	85.7	93	79
5	97	73	83.1	67.2	0	20	83	32	62	0.00	28.29	29.75	SSE	12.5	25.7	27.21	81.3	86.9	94	80
6	88	65	77.3	68.8	0	12	95	55	76	0.65	28.40*	29.86*	SE	11.1	39.8	19.22	79.8	81.7	86	77
7	82	65	72.8	65.7	0	8	97	52	80	0.02	28.45	29.92	NE	7.2	24.0	15.12	77.2	76.8	81	74
8	75	65	69.5	64.7	0	5	97	65	85	1.59	28.45	29.92	E	10.1	28.0	16.20	75.2	74.6	78	72
9	76	60	66.9	56.8	0	3	97	42	73	0.58	28.31	29.77	WNW	15.8	41.3	25.84	73.2	72.0	77	68
10	80	62	69.5	59.6	0	6	92	45	73	0.00	28.39	29.86	NNW	8.8	25.4	21.80	72.9	71.4	78	67
11	92	59	77.1	60.4	0	11	95	33	61	0.00	28.35	29.82	SSE	11.0	27.7	29.97	74.3	73.2	79	67
12	81	66	73.1	64.1	0	8	95	55	75	0.09	28.48	29.95	NNE	9.2	37.1	18.19	75.2	73.8	77	70
13	84	61	72.6	60.7	0	8	93	45	68	0.00	28.54	30.01	SE	6.8	19.6	29.27	75.7	76.5	87	68
14	92	69	80.5	65.4	0	16	87	34	63	0.00	28.32	29.79	SSE	17.6	34.5	28.39	76.7	81.0	89	74
15	92	73	82.3	68.7	0	18	87	45	65	0.00	28.35	29.82	SSE	13.1	29.0	25.97	78.3	84.2	92	77
16	95	74	83.2	68.5	0	19	87	42	63	0.00	28.42	29.88	SSE	18.0	33.8	25.33	79.1	84.7	91	79
17	96	74	84.2	68.6	0	20	85	39	61	0.00	28.40	29.87	S	18.0	33.2	25.86	80.1	85.6	91	80
18	94	76	83.4	68.0	0	20	78	40	61	0.00	28.41	29.88	S	16.7	32.7	25.45	80.9	86.1	92	81
19	88	65	75.7	68.3	0	12	96	60	79	0.82	28.52	29.99	S	13.2	40.7	19.69	80.0	81.7	85	77
20	90	67	78.5	65.0	0	14	94	34	67	0.00	28.58	30.05	SSE	9.8	25.4	29.69	79.2	78.9	85	73
21	90	66	77.4	65.9	0	13	94	46	69	0.07	28.50	29.97	S	8.1	26.4	22.21	79.5	78.3	84	74
22	87	68	77.4	68.5	0	12	95	56	75	0.00	28.41	29.88	S	11.6	32.4	25.99	79.5	80.3	90	73
23	83	64	73.4	65.0	0	8	98	50	77	1.14	28.48	29.95	N	7.6	34.3	26.43	79.1	79.1	85	73
24	86	64	76.1	65.3	0	10	98	45	72	0.00	28.56	30.04	SSE	6.3	28.3	23.33	79.6	78.2	83	73
25	89	65	76.3	66.4	0	12	93	48	74	0.00	28.53	30.01	SSE	8.4	27.6	24.43	79.6	78.0	84	72
26	87	71	77.7	69.6	0	14	95	56	77	0.00	28.44	29.91	SSE	13.2	26.3	20.82	79.1	78.0	82	75
27	91	72	80.7	69.4	0	16	92	47	70	0.16	28.31	29.77	SSE	19.9	37.0	24.88	78.7	79.5	87	74
28	89	66	78.5	70.6	0	12	95	59	78	0.31	28.37	29.83	SSE	13.7	44.3	17.52	78.1	78.2	82	75
29	95	74	83.8	71.3	0	20	90	44	68	0.00	28.43	29.89	SSE	16.4	31.4	27.78	79.5	79.4	84	75
30	97	75	85.2	67.3	0	21	87	31	58	0.00	28.36	29.82	S	16.1	32.0	29.25	80.2	82.3	91	76
	89*	68*	78.0*	66.1*	<- Monthly Averages ->						28.42*	29.89*	SSE*	12.4*	44.3*	24.32*	78.2*	79.7*	86*	74*

Temperature - Highest: 99*
Lowest: 59*

Rainfall: Monthly Total: 5.43* in.
Greatest 24 Hr: 1.59* in.

Degree Days - Total HDD: 0*
Total CDD: 402*

Humidity - Highest: 98*
Lowest: 28*

Number of Days With:
Tmax ≥ 90: 16* Rainfall ≥ 0.01 inch: 10*
Tmax ≤ 32: 0* Rainfall ≥ 0.10 inch: 7*
Tmin ≤ 32: 0* Avg Wind Speed ≥ 10 mph: 21*
Tmin ≤ 0: 0* Max Wind Speed ≥ 30 mph: 17*

 * Denotes incomplete record

Monthly data generated on Friday, September 12, 2014 at 17:30 UTC

MESONET CLIMATOLOGICAL DATA SUMMARY July 2014 Time Zone: Midnight-Midnight CST
(FTCB) Fort Cobb Nearest City: 4.0 NNW Fort Cobb County: Caddo
Latitude: 35-08-55 Longitude: 98-27-57 Elevation: 1385 feet

DAY	TEMPERATURE (F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m2)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	84	71	77.7	65.5	0	13	81	54	67	0.00	28.51	29.98	NNE	8.8	33.4	21.19	79.7	83.4	90	78
2	83*	68*	75.2*	62.5*	0*	11*	88*	45*	66*	0.00*	28.64*	30.12*	NE *	7.8*	25.1*	NA	79.0*	82.8*	88*	78*
3	84	63	73.4	60.3	0	9	89	42	66	0.00	28.71	30.18	SE	8.0	22.2	24.05	77.8	81.8	89	76
4	92	63	78.1	65.6	0	13	93	40	68	0.00	28.70	30.18	SE	9.9	24.6	27.01	79.1	83.9	92	77
5	94	71	81.6	67.3	0	17	93	37	65	0.00	28.62	30.10	SSE	12.0	26.0	27.17	80.9	85.9	93	79
6	97	72	84.1	63.5	0	19	87	29	54	0.00	28.51	29.98	S	12.4	25.1	29.09	81.8	87.3	94	81
7	100	70	85.6	62.7	0	20	91	24	51	0.00	28.45	29.92	S	9.4	22.4	29.43	82.8	88.6	96	82
8	95	72	83.4	63.4	0	18	72	39	52	0.00	28.51	29.98	NE	8.6	20.0	25.91	83.7	89.1	96	83
9	88	70	77.9	64.6	0	14	79	46	65	0.00	28.56	30.04	ESE	9.4	20.6	21.49	82.9	87.2	92	83
10	96	71	83.4	64.4	0	19	92	28	57	0.00	28.50	29.97	SSE	10.5	27.3	27.72	83.6	88.2	95	82
11	94	71	83.5	61.1	0	17	79	31	49	0.00	28.58	30.05	S	12.8	29.3	29.05	83.8	88.4	94	83
12	98	70	85.2	55.8	0	19	75	19	40	0.00	28.61	30.09	S	12.7	31.0	28.91	83.8	88.5	95	83
13	100	68	83.8	60.1	0	19	78	17	49	0.00	28.56	30.03	SW	7.6	28.9	26.61	84.0	88.7	96	82
14	89	74	79.8	69.4	0	16	87	51	71	0.00	28.55	30.02	NNE	5.1	34.8	15.43	84.1	87.7	91	85
15	82	66	73.4	53.4	0	9	76	31	52	0.00	28.64	30.12	NE	9.8	21.1	24.14	83.0	86.0	91	82
16	76	62	66.3	57.4	0	4	90	49	74	0.10	28.56	30.03	ESE	10.2	28.1	13.33	79.6	80.4	84	77
17	67	61	64.0	63.0	1	0	98	85	96	0.52	28.52	30.00	NE	7.2	18.2	3.69	75.5	73.7	77	72
18	71	62	66.0	62.1	0	1	97	72	88	0.00	28.57	30.05	ESE	5.1	14.0	9.35	75.0	72.7	75	70
19	84	58	70.5	63.0	0	6	100	56	79	0.00	28.55	30.02	SSE	7.2	21.5	22.61	76.1	74.5	82	68
20	93	64	78.2	67.4	0	14	92	45	72	0.00	28.50	29.97	SSE	11.7	24.8	28.30	78.7	80.0	90	71
21	97	72	83.0	71.0	0	19	97	38	71	0.00	28.54	30.01	SSE	10.8	25.5	26.85	81.6	85.1	93	78
22	97	73	84.2	70.2	0	20	92	35	66	0.00	28.60	30.07	SSE	7.6	16.4	27.37	83.7	87.8	95	81
23	98	70	84.7	69.9	0	19	95	33	65	0.00	28.63	30.11	NNE	5.1	16.3	25.89	85.0	88.8	95	83
24	95	71	83.2	68.6	0	18	92	38	64	0.00	28.57	30.04	SSE	6.8	18.9	26.83	85.8	89.6	96	84
25	101	72	86.7	62.9	0	21	84	23	50	0.00	28.47	29.94	S	12.9	29.3	28.97	85.4	89.2	95	84
26	100	73	88.4	63.2	0	22	75	27	46	0.00	28.46	29.93	SSW	11.8	25.1	28.89	85.6	89.5	95	84
27	98	70	84.9	65.1	0	19	85	35	54	0.06	28.55	30.02	NE	10.0	33.6	26.72	86.1	89.9	95	85
28	84	68	74.7	66.1	0	11	93	51	76	0.42	28.72	30.20	NW	4.5	24.9	9.49	82.1	83.2	89	81
29	86	68	74.0	66.1	0	12	93	43	78	0.03	28.67	30.15	WSW	5.9	30.2	16.36	80.6	80.5	85	78
30	79	64	69.8	67.3	0	6	97	78	92	1.05	28.56	30.03	SSE	10.1	28.7	5.84	77.0	76.0	78	74
31	79	64	70.1	65.5	0	7	97	60	86	0.04	28.61	30.08	NNE	9.5	20.3	12.97	75.9	NA	NA	NA
	90*	68*	78.5*	64.1*	<- Monthly Averages ->						28.57*	30.05*	SSE*	9.1*	34.8*	22.36*	81.4*	84.6*	91*	80*

Temperature - Highest: 101*
Lowest: 58*

Degree Days - Total HDD: 1*
Total CDD: 431*

Rainfall: Monthly Total: 2.22* in.
Greatest 24 Hr: 1.05* in.

Humidity - Highest: 100*
Lowest: 17*

Number of Days With:
Tmax ≥ 90: 17* Rainfall ≥ 0.01 inch: 7*
Tmax ≤ 32: 0* Rainfall ≥ 0.10 inch: 4*
Tmin ≤ 32: 0* Avg Wind Speed ≥ 10 mph: 12*
Tmin ≤ 0: 0* Max Wind Speed ≥ 30 mph: 5*

 * Denotes incomplete record

Monthly data generated on Tuesday, September 30, 2014 at 12:54 UTC

MESONET CLIMATOLOGICAL DATA SUMMARY — August 2014 — Time Zone: Midnight-Midnight CST
(FTCB) Fort Cobb — Nearest City: 4.0 NNW Fort Cobb — County: Caddo
Latitude: 35-08-55 — Longitude: 98-27-57 — Elevation: 1385 feet

DAY	TEMPERATURE (F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m2)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	84	60	72.7	64.1	0	7	99	47	77	0.00	28.61	30.09	NW	3.7	12.1	26.88	77.7	NA	NA	NA
2	88	63	75.1	64.9	0	11	98	34	74	0.00	28.64	30.11	ESE	4.0	18.4	25.95	80.0	NA	NA	NA
3	88	63	76.0	62.6	0	10	96	31	67	0.00	28.65	30.12	ESE	3.4	12.7	26.77	80.8	NA	NA	NA
4	90	64	77.0	63.2	0	12	94	33	66	0.00	28.62	30.09	SE	4.5	13.6	27.31	81.3	NA	NA	NA
5	92	63	78.3	64.7	0	12	92	35	66	0.00	28.59	30.06	SE	6.7	17.7	25.63	81.8	NA	NA	NA
6	96	72	83.0	67.0	0	19	88	32	62	0.02	28.48	29.95	SSE	10.8	23.6	19.58	81.9	NA	NA	NA
7	99	71	84.9	65.8	0	20	81	26	56	0.00	28.40	29.87	SSE	7.5	16.4	26.87	83.2	NA	NA	NA
8	92	72	81.8	69.1	0	17	90	39	68	0.00	28.47	29.93	ENE	8.2	26.8	19.53	83.8	NA	NA	NA
9	94	73	82.1	67.7	0	18	95	33	65	0.00	28.50	29.97	SE	4.9	17.5	16.91	83.7	NA	NA	NA
10	92	71	80.9	69.5	0	17	92	47	70	0.09	28.55	30.02	NNE	6.1	22.4	19.56	83.7	NA	NA	NA
11	93	68	80.1	64.7	0	15	93	35	62	0.00	28.63	30.11	N	5.9	20.5	23.43	83.5	NA	NA	NA
12	89	62	75.8	57.9	0	10	89	31	57	0.00	28.65	30.12	NNE	5.6	14.5	26.51	82.8	NA	NA	NA
13	92	64	77.3	60.9	0	13	91	32	61	0.00	28.61	30.09	SE	7.2	18.8	25.85	83.2	NA	NA	NA
14	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00*	28.54*	30.01*	SE *	9.1*	21.9*	NA	83.3*	NA	NA	NA
15	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.46	29.93	SSE	10.2	26.4	25.31	83.9	87.4	94	81
16	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.43	29.89	S	6.0	18.7	14.66	83.9	87.1	93	84
17	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.46	29.93	SE	5.4	15.1	25.22	84.8	89.0	97	82
18	99*	70*	83.1*	64.7*	0*	19*	94*	25*	60*	0.00*	28.43*	29.90*	SSW*	9.7*	30.4*	NA	85.7*	90.0*	96*	84*
19	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.41	29.88	SSE	10.9	29.2	24.93	85.1	88.8	94	83
20	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.41	29.88	SSE	13.3	30.8	24.11	85.2	88.7	94	84
21	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.46	29.93	SSE	13.9	32.1	23.90	85.7	89.1	95	84
22	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.47	29.94	SSE	12.7	30.9	25.46	86.1	89.6	96	84
23	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.45	29.91	S	12.1	32.1	24.83	85.1	88.4	94	83
24	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.43	29.90	SSE	11.9	27.8	24.69	85.5	88.9	95	83
25	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.48	29.95	SE	7.9	17.8	23.69	86.4	90.3	97	84
26	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.56	30.04	SE	7.7	25.6	24.95	87.0	91.1	98	85
27	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.57	30.04	SE	7.2	18.1	21.33	86.8	90.3	96	85
28	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.35	28.48	29.95	SSE	9.6	38.2	12.88	83.9	85.5	92	77
29	83	64	73.1	67.3	0	9	98	61	83	0.00	28.45	29.92	SSW	7.8	24.1	17.20	79.1	77.7	82	74
30	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.47	29.94	SE	4.1	12.0	24.03	81.0	80.3	88	74
31	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.39	29.86	S	13.6	32.4	22.91	81.2	79.7	85	75
	91*	67*	78.7*	64.9*	<- Monthly Averages ->						28.51*	29.98*	SE *	8.1*	38.2*	23.13*	83.4*	87.2*	93*	82*

Temperature - Highest: 99*
Lowest: 60*

Degree Days - Total HDD: 0*
Total CDD: 211*

Rainfall: Monthly Total: 1.46* in.
Greatest 24 Hr: 1.35* in.

Humidity - Highest: 99*
Lowest: 25*

Number of Days With:
Tmax ≥ 90: 10* Rainfall ≥ 0.01 inch: 3*
Tmax ≤ 32: 0* Rainfall ≥ 0.10 inch: 1*
Tmin ≤ 32: 0* Avg Wind Speed ≥ 10 mph: 9*
Tmin ≤ 0: 0* Max Wind Speed ≥ 30 mph: 7*

* Denotes incomplete record

Monthly data generated on Friday, October 31, 2014 at 12:58 UTC

MESONET CLIMATOLOGICAL DATA SUMMARY — September 2014 — Time Zone: Midnight-Midnight CST
(FTCB) Fort Cobb — Nearest City: 4.0 NNW Fort Cobb — County: Caddo
Latitude: 35-08-55 — Longitude: 98-27-57 — Elevation: 1385 feet

DAY	TEMPERATURE (F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m2)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.35	29.81	S	14.0	27.6	24.03	81.7	83.4	92	76
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.43	29.90	SSE	11.6	29.0	21.24	82.4	85.9	93	80
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.44	29.91	S	12.6	29.0	23.56	82.8	86.4	94	80
4	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.49	29.96	SSW	13.7	29.4	24.51	82.9	86.6	93	81
5	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.10	28.60	30.07	SSE	9.8	29.8	21.83	83.2	86.7	95	81
6	69	60	63.3	60.9	1	0	97	80	92	1.06	28.71	30.19	NNE	9.3	24.4	5.22	75.9	74.2	81	71
7	80	59	68.9	60.8	0	4	98	51	77	0.01	28.65	30.12	NNE	4.4	15.1	23.22	75.2	74.3	83	67
8	88	64	75.6	67.6	0	11	99	51	78	0.00	28.52	29.99	SSE	8.6	22.5	19.56	77.4	76.2	81	72
9	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.37	29.83	S	13.7	33.7	22.79	78.5	77.7	83	73
10	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.35	29.82	N	12.1	26.2	17.84	78.3	79.2	85	74
11	73	63	66.8	60.0	0	3	88	65	79	0.00	28.59	30.07	NNE	11.2	23.8	11.81	75.1	75.4	80	72
12	66	53	57.8	52.7	6	0	93	74	83	0.10	28.78	30.26	NNE	16.5	30.5	4.95	71.3	69.0	75	63
13	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.81	30.30	NE	7.9	23.6	19.56	68.7	67.2	77	60
14	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02	28.70	30.18	S	7.4	18.3	13.07	70.4	70.8	77	66
15	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.65	30.13	S	6.9	14.4	12.60	73.0	74.3	81	69
16	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.61	30.09	S	5.0	12.6	20.95	76.6	79.9	89	73
17	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.46	29.93	WSW	7.3	20.0	17.05	77.2	80.9	87	75
18	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.46	29.93	ESE	7.1	32.8	16.28	77.4	80.6	85	77
19	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.50	29.97	SSE	6.4	19.7	19.48	77.0	80.0	86	74
20	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.53	30.00	SSE	7.1	16.9	17.09	78.0	81.1	87	77
21	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.65	30.12	NNE	6.2	26.8	15.00	77.6	80.1	85	76
22	82*	59*	68.7*	50.1*	0*	5*	82*	26*	55*	0.00	28.74	30.22	ESE	7.0	17.8	21.56	76.1	78.3	85	72
23	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.66	30.14	SE	10.2	21.9	20.91	75.2	77.2	84	72
24	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.67	30.15	SSE	8.6	20.8	17.82	75.5	77.5	83	73
25	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.69	30.17	SE	6.4	16.2	19.96	75.3	77.2	84	72
26	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.64	30.11	SE	6.7	15.8	21.37	75.1	77.1	84	71
27	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.59	30.07	SE	7.8	18.9	17.04	75.2	77.2	83	73
28	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.60	30.07	ESE	5.3	13.5	18.75	75.2	77.3	84	72
29	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.53	30.01	SE	5.4	14.8	16.93	75.2	77.2	83	72
30	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00	28.36	29.82	SSE	11.2	29.3	18.83	75.4	77.5	83	73
	76*	59*	66.9*	58.7*	<- Monthly Averages ->						28.57	30.04	SSE	8.9	33.7	18.16	76.6	78.2	85	73

Temperature - Highest: 88*
Lowest: 53*

Rainfall: Monthly Total: 1.29 in.
Greatest 24 Hr: 1.06 in.

Degree Days - Total HDD: 6*
Total CDD: 23*

Humidity - Highest: 99*
Lowest: 26*

Number of Days With:
Tmax ≥ 90: 0* Rainfall ≥ 0.01 inch: 5
Tmax ≤ 32: 0* Rainfall ≥ 0.10 inch: 3
Tmin ≤ 32: 0* Avg Wind Speed ≥ 10 mph: 10
Tmin ≤ 0: 0* Max Wind Speed ≥ 30 mph: 3

* Denotes incomplete record

Monthly data generated on Sunday, November 30, 2014 at 12:59 UTC

MESONET CLIMATOLOGICAL DATA SUMMARY — October 2014 — Time Zone: Midnight-Midnight CST
(FTCB) Fort Cobb — Nearest City: 4.0 NNW Fort Cobb — County: Caddo
Latitude: 35-08-55 — Longitude: 98-27-57 — Elevation: 1385 feet

DAY	TEMPERATURE (F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m2)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	92	69	79.5	63.1	0	15	82	31	60	0.00	28.26	29.72	S	12.3	27.3	20.01	76.8	79.5	85	75
2	80	51	69.3	57.9	0	1	92	41	69	0.00	28.37	29.84	NNW	10.1	32.5	18.47	76.9	78.7	83	74
3	68	44	55.7	40.4	9	0	91	28	61	0.00	28.72	30.20	N	8.9	37.6	20.63	72.6	72.4	78	68
4	78	38	58.0	37.1	7	0	89	22	52	0.00	28.61	30.09	SW	8.3	27.9	20.27	69.9	69.7	76	64
5	86	46	66.4	47.5	0	1	88	23	54	0.00	28.39	29.86	SE	4.5	22.7	17.23	70.9	71.7	79	65
6	86	54	70.8	56.0	0	5	97	29	64	0.06	28.38	29.85	S	6.4	22.2	18.88	72.5	74.1	81	68
7	93	63	75.7	58.7	0	13	95	21	62	0.00	28.38	29.85	S	5.8	16.4	19.47	73.9	76.4	84	70
8	90	62	74.9	61.5	0	11	89	36	66	0.00	28.47	29.94	SSE	9.9	23.8	15.46	74.2	76.6	82	72
9	88	64	75.6	63.1	0	11	94	39	68	0.00	28.42	29.89	SSE	10.1	26.8	15.25	75.0	77.2	82	73
10	75	50	62.3	59.3	3	0	97	68	90	0.75	28.49	29.96	N	12.2	33.0	4.25	72.0	72.0	76	64
11	62	48	53.5	46.6	10	0	96	53	79	0.01	28.62	30.10	N	9.2	26.0	8.56	65.2	61.8	64	60
12	76	43	59.9	52.0	5	0	99	48	78	0.44	28.30	29.76	SSE	12.4	46.8	16.82	64.9	62.2	67	56
13	65	49	56.7	49.3	8	0	98	44	79	0.79	28.31	29.77	NW	13.7	39.4	8.35	63.5	60.6	63	56
14	74	45	57.6	41.9	5	0	88	25	60	0.00	28.59	30.06	WNW	8.1	23.6	19.38	61.3	58.0	65	52
15	79	42	59.1	45.0	5	0	97	27	66	0.00	28.57	30.04	SSE	5.0	12.4	19.10	62.4	60.2	69	53
16	88	47	66.8	47.9	0	2	93	21	58	0.00	28.36	29.82	SW	8.2	30.6	17.85	63.1	61.2	67	55
17	77*	56*	65.4*	47.4*	0*	1*	81*	28*	56*	0.00*	28.51*	29.99*	NNE*	8.7*	24.3*	NA	63.7*	62.2*	67*	58*
18	71	52	60.3	46.6	4	0	84	35	63	0.00	28.68	30.15	NE	7.7	20.9	16.39	63.0	61.5	67	57
19	73	49	61.5	52.8	4	0	89	52	74	0.00	28.63	30.10	SSE	7.8	22.3	13.36	63.0	62.5	68	58
20	82	54	67.1	58.0	0	3	98	41	75	0.00	28.56	30.04	S	5.1	15.2	15.28	65.1	66.5	75	60
21	82	55	67.5	56.5	0	4	98	41	71	0.00	28.58	30.06	S	6.0	18.8	13.71	66.0	68.0	75	62
22	77	55	64.6	57.2	0	1	98	42	79	0.08	28.63	30.11	S	7.4	22.7	12.84	65.4	67.0	73	62
23	80	61	67.1	60.0	0	5	98	50	80	0.00	28.61	30.09	SSE	6.9	24.6	14.83	67.0	68.8	76	64
24	87	55	69.1	58.4	0	6	98	36	73	0.00	28.59	30.07	SSE	8.1	21.9	16.15	67.2	69.6	78	63
25	91	53	70.7	54.8	0	7	99	24	64	0.00	28.58	30.05	S	6.0	21.9	16.84	67.3	70.8	79	64
26	89	57	73.9	52.7	0	8	89	25	52	0.00	28.38	29.84	S	13.1	36.8	16.79	67.3	71.1	78	65
27	85	62	70.4	52.2	0	9	72	34	54	0.00	28.30	29.77	S	10.0	31.1	11.97	67.5	71.2	77	67
28	69	44	58.4	38.7	8	0	82	28	50	0.00	28.64	30.12	NNE	10.2	33.1	13.83	65.5	67.8	73	64
29	73	38	54.1	34.6	10	0	90	15	56	0.00	28.71	30.19	S	5.5	16.2	16.85	62.7	63.9	72	57
30	76	45	59.4	40.7	4	0	81	23	54	0.00	28.67	30.15	NNE	6.8	23.3	15.99	62.5	64.2	72	59
31	59	34	49.8	33.3	18	0	80	28	55	0.00	28.89	30.38	NNE	11.0	28.1	16.27	61.0	61.6	67	58
	79*	51*	64.5*	50.7*	<- Monthly Averages ->						28.52*	30.00*	S *	8.6*	46.8*	15.70*	67.4*	68.0*	74*	63*

Temperature - Highest: 93*
Lowest: 34*

Degree Days - Total HDD: 101*
Total CDD: 104*

Rainfall: Monthly Total: 2.13* in.
Greatest 24 Hr: 0.79* in.

Humidity - Highest: 99*
Lowest: 15*

Number of Days With:
Tmax ≥ 90: 4* — Rainfall ≥ 0.01 inch: 6*
Tmax ≤ 32: 0* — Rainfall ≥ 0.10 inch: 3*
Tmin ≤ 32: 0* — Avg Wind Speed ≥ 10 mph: 10*
Tmin ≤ 0: 0* — Max Wind Speed ≥ 30 mph: 9*

* Denotes incomplete record

Monthly data generated on Thursday, December 04, 2014 at 12:59 UTC

MESONET CLIMATOLOGICAL DATA SUMMARY   November 2014   Time Zone: Midnight-Midnight CST
(FTCB) Fort Cobb   Nearest City: 4.0 NNW Fort Cobb   County: Caddo
Latitude: 35-08-55   Longitude: 98-27-57   Elevation: 1385 feet

DAY	TEMPERATURE (F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m2)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	61	30	45.4	25.4	19	0	81	23	50	0.00	28.82	30.30	SSE	11.8	27.0	14.69	57.9	57.0	63	52
2	65	45	54.8	40.7	10	0	71	44	59	0.00	28.65	30.12	SSE	18.0	33.2	9.81	58.2	58.2	62	55
3	66	52	59.9	53.6	6	0	97	67	80	0.35	28.57	30.04	S	15.7	34.8	5.46	59.7	60.2	63	58
4	57	46	48.6	44.3	14	0	97	67	86	1.05	28.74	30.22	N	9.2	26.7	3.65	57.6	55.2	61	53
5	61	40	49.1	41.7	15	0	97	41	78	0.00	28.75	30.23	SW	3.8	10.7	9.40	56.0	53.6	58	51
6	65	40	52.3	37.4	12	0	94	30	61	0.00	28.87	30.36	NNE	6.3	20.0	15.35	54.9	52.7	59	48
7	71	37	54.2	39.8	11	0	94	35	62	0.00	28.61	30.09	SSW	11.4	33.2	15.24	54.1	51.8	58	46
8	63	38	54.5	38.6	15	0	88	30	58	0.00	28.68	30.16	N	10.3	35.2	15.00	55.4	53.5	58	50
9	76	36	56.5	41.1	9	0	90	28	61	0.00	28.42	29.89	S	11.4	31.5	14.72	54.1	52.3	59	46
10	81	37	61.3	44.1	6	0	80	28	56	0.00	28.11	29.56	SSW	18.9	45.8	14.77	56.0	56.8	65	51
11	39	28	32.9	18.4	32	0	72	41	55	0.00	28.72	30.20	N	16.5	40.3	14.55	51.4	48.9	54	44
12	28	21	25.1	9.7	41	0	71	36	53	0.00	29.00	30.49	NNE	17.4	31.9	5.16	45.1	40.1	43	38
13	32	23	26.3	6.7	37	0	67	33	43	0.00	29.06	30.55	N	9.9	27.3	13.18	43.2	39.9	46	37
14	37	21	29.1	15.0	36	0	87	29	58	0.00	28.85	30.33	SE	5.6	16.6	9.68	42.7	40.0	46	37
15	53	27	38.3	25.2	25	0	93	39	61	0.00	28.57	30.05	SSE	13.2	35.4	12.52	43.2	42.4	49	38
16	38	17	25.7	23.3	38	0	96	76	91	0.00	28.69	30.17	NNE	13.0	31.4	3.09	42.4	39.5	43	37
17	35	13	24.5	16.2	41	0	93	45	72	0.17	28.87	30.35	NNW	6.3	20.6	14.30	41.7	36.9	38	36
18	52	19	34.8	22.7	30	0	96	31	65	0.00	28.79	30.27	WSW	10.0	25.4	14.01	41.3	37.5	43	35
19	60	26	43.4	26.9	22	0	87	25	55	0.00	28.65	30.13	NNE	5.9	18.6	13.06	42.0	40.5	48	36
20	62	31	44.1	33.4	18	0	84	40	67	0.00	28.57	30.05	E	6.7	16.2	12.60	43.1	42.2	49	37
21	61	43	52.2	48.2	13	0	99	62	87	0.00	28.55	30.03	SSW	8.4	21.8	6.23	46.7	47.5	52	43
22	61	51	55.9	55.1	9	0	99	89	97	1.45	28.41	29.88	SE	11.1	32.4	0.49	50.2	51.6	53	49
23	62	40	51.1	45.2	14	0	100	46	82	0.03	28.10	29.55	S	13.0	41.7	10.36	51.6	52.2	57	47
24	58	30	42.7	26.4	21	0	82	19	56	0.00	28.53	30.00	WNW	7.8	28.3	12.85	47.6	45.2	51	40
25	53	29	41.0	28.7	24	0	86	33	63	0.00	28.69	30.17	NW	6.8	19.7	13.26	45.9	43.8	50	39
26	57*	30*	43.0*	29.1*	22*	0*	91*	32*	61*	0.00*	28.71*	30.19*	NNW*	8.2*	26.8*	NA	45.4*	42.9*	49*	39*
27	52	27	38.7	25.1	25	0	90	27	61	0.00	28.93	30.42	S	6.9	18.9	12.88	44.4	41.7	48	38
28	67	35	51.3	37.3	14	0	80	37	61	0.00	28.52	30.00	SSE	12.2	25.0	12.75	45.2	44.0	51	38
29	74	45	59.9	39.7	5	0	72	28	49	0.00	28.29	29.75	SSW	13.0	29.8	13.07	47.8	47.9	54	43
30	65	27	48.2	32.3	19	0	77	36	55	0.00	28.49	29.96	NNE	14.3	32.0	13.03	49.1	48.3	54	42
	57*	33*	44.8*	32.4*	<- Monthly Averages ->						28.64*	30.12*	NNE*	10.8*	45.8*	11.21*	49.1*	47.5*	53*	43*

Temperature - Highest: 81*
Lowest: 13*

Degree Days - Total HDD: 602*
Total CDD: 0*

Rainfall: Monthly Total: 3.05* in.
Greatest 24 Hr: 1.45* in.

Humidity - Highest: 100*
Lowest: 19*

Number of Days With:
Tmax ≥ 90: 0*   Rainfall ≥ 0.01 inch: 5*
Tmax ≤ 32: 2*   Rainfall ≥ 0.10 inch: 4*
Tmin ≤ 32: 16*   Avg Wind Speed ≥ 10 mph: 17*
Tmin ≤ 0: 0*   Max Wind Speed ≥ 30 mph: 13*

    * Denotes incomplete record

Monthly data generated on Thursday, December 04, 2014 at 11:51 UTC

MESONET CLIMATOLOGICAL DATA SUMMARY August 2014 Time Zone: Midnight-Midnight CST
(APAC) Apache Nearest City: 4.0 ENE Apache County: Caddo
Latitude: 34-54-51 Longitude: 98-17-31 Elevation: 1444 feet

DAY	TEMPERATURE (F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m2)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	84	61	71.6	63.6	0	8	100	45	79	0.01	28.55	30.08	NNE	4.4	17.8	24.25	76.8	NA	NA	NA
2	87	62	74.6	63.9	0	10	98	43	72	0.00	28.57	30.11	ESE	5.7	16.7	24.82	77.9	NA	NA	NA
3	88	63	76.0	62.4	0	11	94	35	66	0.00	28.58	30.12	ESE	4.7	16.0	25.75	77.9	NA	NA	NA
4	90	64	76.3	63.1	0	12	94	35	67	0.00	28.55	30.09	SSE	6.3	16.6	28.28	78.6	NA	NA	NA
5	92	65	77.8	63.4	0	13	87	34	64	0.00	28.53	30.06	S	8.2	20.2	25.97	79.2	NA	NA	NA
6	96	74	82.7	66.8	0	20	90	31	62	0.02	28.42	29.96	SSE	11.9	24.3	19.39	79.8	NA	NA	NA
7	99	72	84.7	65.1	0	21	77	29	55	0.00	28.34	29.87	S	9.9	22.9	26.44	80.7	NA	NA	NA
8	92	71	82.2	68.6	0	16	90	39	66	0.00	28.39	29.92	ENE	9.5	29.7	20.76	81.4	NA	NA	NA
9	92	72	82.1	66.4	0	17	93	34	63	0.00	28.44	29.97	S	5.6	19.9	18.72	81.3	NA	NA	NA
10	94	71	81.2	68.8	0	17	92	44	68	0.00	28.48	30.01	S	7.3	22.4	20.07	81.1	NA	NA	NA
11	92	68	80.5	63.8	0	15	92	35	60	0.00	28.56	30.10	NNE	8.6	21.1	26.02	81.5	NA	NA	NA
12	89	62	75.4	56.5	0	10	84	33	55	0.00	28.58	30.12	NNE	7.6	20.0	26.98	80.3	NA	NA	NA
13	92	64	77.4	57.9	0	13	81	29	55	0.00	28.55	30.08	SE	7.6	18.2	26.62	80.0	NA	NA	NA
14	96*	62*	80.2*	59.8*	0*	14*	89*	29*	54*	0.00*	28.48*	30.01*	SSE*	10.5*	22.9*	NA	80.8*	NA	NA	NA
15	98	67	84.0	60.3	0	17	82	25	48	0.00	28.40	29.93	S	12.4	25.1	26.28	81.7	87.2	98	77
16	92	76	82.5	63.9	0	19	74	34	55	0.00	28.36	29.89	S	9.4	21.0	11.82	81.6	85.3	90	81
17	97	66	82.2	66.1	0	16	93	34	62	0.00	28.40	29.93	SSE	7.3	20.9	26.21	82.2	87.9	101	77
18	99	68	83.5	63.2	0	19	88	25	55	0.00	28.38	29.90	SSW	11.4	26.0	26.15	83.1	88.5	99	80
19	95	69	81.9	63.1	0	17	87	31	56	0.00	28.35	29.88	SSE	11.6	27.6	25.51	82.9	87.8	97	79
20	98	73	85.4	61.9	0	21	74	26	48	0.00	28.36	29.89	S	15.3	36.2	25.38	83.0	88.2	98	80
21	100	75	86.6	66.0	0	22	77	28	53	0.00	28.41	29.94	SSE	15.4	32.9	25.39	83.7*	89.0	98	81
22	100	76	87.5	59.3	0	23	67	20	42	0.00	28.42	29.95	S	14.7	30.9	25.41	84.0	89.3	99	82
23	100	68	84.8	55.1	0	19	69	19	40	0.00	28.39	29.92	S	13.3	30.5	24.06	83.0	87.6	96	79
24	100	71	86.2	60.5	0	20	75	23	45	0.00	28.38	29.90	S	12.9	25.7	22.93	83.1	87.8	96	80
25	102	74	87.2	61.3	0	23	71	22	45	0.00	28.42	29.95	SE	10.1	19.6	24.00	83.9	89.3	99	81
26	99	70	84.6	63.3	0	19	86	26	53	0.00	28.50	30.04	SE	8.6	26.7	22.60	84.0	89.3	98	81
27	97	69	82.7	64.0	0	18	90	29	57	0.00	28.51	30.04	SE	8.4	24.2	23.59	83.9	88.7	99	80
28	96	66	76.8	63.7	0	16	98	30	69	1.32	28.42	29.95	SSE	10.4	29.3	16.67	81.9	84.1	95	75
29	82	65	72.8	67.0	0	8	97	57	83	0.04	28.39	29.92	S	8.6	21.4	17.64	78.6	76.7	83	72
30	93	68	79.6	64.3	0	15	94	28	64	0.00	28.40	29.94	S	5.7	12.9	24.04	79.8	79.5	89	72
31	95	70	82.7	67.1	0	18	94	35	63	0.00	28.34	29.87	S	15.7	32.6	24.44	80.7	79.1	86	73
	94*	68*	81.1*	63.2*	<- Monthly Averages ->						28.45*	29.98*	S *	9.6*	36.2*	23.54*	81.2*	86.2*	95*	78*

Temperature - Highest: 102*
Lowest: 61*

Degree Days - Total HDD: 0*
Total CDD: 508*

Rainfall: Monthly Total: 1.39* in.
Greatest 24 Hr: 1.32* in.

Humidity - Highest: 100*
Lowest: 19*

Number of Days With:
Tmax ≥ 90: 26* Rainfall ≥ 0.01 inch: 4*
Tmax ≤ 32: 0* Rainfall ≥ 0.10 inch: 1*
Tmin ≤ 32: 0* Avg Wind Speed ≥ 10 mph: 13*
Tmin ≤ 0: 0* Max Wind Speed ≥ 30 mph: 5*

 * Denotes incomplete record

Monthly data generated on Friday, October 31, 2014 at 12:58 UTC

MESONET CLIMATOLOGICAL DATA SUMMARY — September 2014 — Time Zone: Midnight-Midnight CST
(APAC) Apache — Nearest City: 4.0 ENE Apache — County: Caddo
Latitude: 34-54-51 — Longitude: 98-17-31 — Elevation: 1444 feet

DAY	TEMPERATURE (F) MAX	MIN	AVG	DEWPT	DEG DAYS HDD	CDD	HUMIDITY (%) MAX	MIN	AVG	RAIN (in)	PRESSURE (in) STN	MSL	WIND SPEED (mph) DIR	AVG	MAX	SOLAR (MJ/m2)	4" SOIL TEMPERATURES SOD	BARE	MAX	MIN
1	97	74	84.8	68.1	0	20	85	33	60	0.00	28.29	29.82	S	17.3	33.6	23.85	81.2	82.6	93	75
2	95	75	83.6	67.7	0	20	82	37	61	0.00	28.37	29.90	SSE	12.7	34.8	22.40	81.6	85.2	96	76
3	95	73	83.8	66.7	0	19	89	36	59	0.00	28.39	29.92	S	13.9	31.8	23.95	81.7	86.3	97	77
4	94	73	83.4	63.1	0	19	78	29	53	0.00	28.44	29.97	S	14.9	32.8	24.12	81.3	86.3	97	77
5	93	64	80.0	64.6	0	13	90	34	62	0.09	28.53	30.07	S	11.1	34.4	22.54	81.5	86.4	98	78
6	65	60	62.5	61.1	3	0	97	89	95	0.36	28.63	30.17	NNE	11.1	24.9	4.09	76.2	71.6	78	68
7	80	58	69.0	61.0	0	4	99	51	78	0.00	28.58	30.11	NE	5.7	17.8	21.56	74.9	73.2	84	65
8	89	67	77.2	67.4	0	13	99	45	75	0.01	28.46	29.99	S	9.9	22.2	21.64	77.7	78.4	89	71
9	95*	71*	83.0*	64.0*	0*	18*	88*	30*	57*	0.00*	28.31*	29.84*	S *	15.0*	33.2*	NA	NA	NA	NA	NA
10	89	66	78.2	64.1	0	12	79	45	63	0.00	28.29	29.81	S	14.6	29.3	21.04	79.0	83.7	94	77
11	74	63	67.4	59.6	0	3	90	61	77	0.00	28.52	30.05	NNE	12.8	23.1	14.35	76.4	77.5	85	73
12	66	52	56.5	52.8	6	0	97	78	87	0.20	28.69	30.24	NNE	16.5	32.1	4.11	72.0	67.2	75	60
13	67	47	55.6	47.5	8	0	89	50	75	0.00	28.74	30.29	NNE	8.3	26.2	17.14	68.3	64.5	76	57
14	74	56	64.9	58.6	0	0	94	59	81	0.02	28.64	30.18	S	8.1	21.8	14.49	70.5	69.4	79	63
15	84	66	73.0	65.8	0	10	96	52	80	0.02	28.59	30.13	S	7.8	17.8	10.69	73.0	73.2	81	68
16	88	67	76.5	66.5	0	13	97	46	74	0.00	28.55	30.08	SSE	6.2	17.0	16.68	75.6	78.6	89	70
17	90	68	78.3	66.3	0	14	95	42	70	0.00	28.40	29.93	S	7.9	23.1	16.40	76.7	80.3	90	72
18	85	65	73.9	66.1	0	10	96	51	78	0.00	28.40	29.93	S	7.9	30.0	14.33	76.6	79.3	87	74
19	87	63	74.4	64.6	0	10	99	42	75	0.00	28.43	29.96	ESE	8.1	21.4	19.49	75.9	79.2	90	70
20	88	69	76.6	67.1	0	14	97	46	75	0.00	28.47	30.00	SSE	8.8	18.8	16.67	77.0	80.7	91	73
21	90	66	75.2	62.7	0	13	93	43	67	0.00	28.58	30.11	NE	8.2	30.6	17.12	76.9	80.7	90	73
22	82	56	68.5	48.8	0	4	78	29	52	0.00	28.67	30.21	ESE	8.2	20.1	21.76	75.2	78.1	89	69
23	84	55	69.2	51.5	0	4	84	34	56	0.00	28.60	30.14	SSE	11.6	24.3	21.13	74.3	76.8	87	68
24	85	60	70.8	49.9	0	7	72	30	50	0.00	28.61	30.15	SSE	10.6	24.6	20.68	74.9	78.0	88	70
25	85	56	69.5	48.2	0	5	78	24	51	0.00	28.63	30.17	SE	7.5	23.2	21.30	74.6	77.5	89	69
26	85	55	69.6	53.4	0	5	93	30	61	0.00	28.57	30.11	SE	7.3	16.7	19.77	74.0	76.6	87	68
27	85	60	71.8	54.8	0	8	82	29	58	0.00	28.53	30.06	SE	8.7	20.6	17.11	74.4	76.9	85	70
28	85	58	70.7	56.5	0	6	93	34	64	0.00	28.53	30.07	ESE	6.7	17.5	19.44	74.5	77.3	88	69
29	85	59	71.4	56.2	0	7	92	36	62	0.00	28.47	30.00	SE	7.0	16.3	15.69	74.2	76.7	85	69
30	89	63	76.0	58.3	0	11	85	31	58	0.00	28.30	29.83	SSE	13.5	31.4	18.71	74.8	77.6	87	71
	85*	63*	73.2*	60.1*	<- Monthly Averages ->						28.51*	30.04*	S *	10.3*	34.8*	18.01*	76.0*	77.9*	88*	70*

Temperature - Highest: 97*
Lowest: 47*

Degree Days - Total HDD: 17*
Total CDD: 283*

Rainfall: Monthly Total: 0.70* in.
Greatest 24 Hr: 0.36* in.

Humidity - Highest: 99*
Lowest: 24*

Number of Days With:
Tmax ≥ 90: 8* — Rainfall ≥ 0.01 inch: 6*
Tmax ≤ 32: 0* — Rainfall ≥ 0.10 inch: 2*
Tmin ≤ 32: 0* — Avg Wind Speed ≥ 10 mph: 13*
Tmin ≤ 0: 0* — Max Wind Speed ≥ 30 mph: 10*

* Denotes incomplete record

Monthly data generated on Sunday, November 30, 2014 at 12:59 UTC

Evaluating Field Trial Data

This article has been reprinted from Southwest Farm Press Vol 25, Number 11, April 9, 1998.

Field Trials can provide helpful information to producers as they compare products and practices for their operations. But field trials must be evaluated carefully to make sure results are scientifically sound, not misleading and indicate realistic expectations for on-farm performance.
This fact sheet is designed to give you the tools to help you determine whether data from a field trial is science fact or science fiction.

What are the best sources of field trial data?

Field trials are conducted by a broad range of individuals and institutions, including universities, ag input suppliers, chemical and seed companies and growers themselves. All are potentially good sources of information.

What are the common types of field trials?

Most field trials fall into one of two categories: side-by-side trials (often referred to as strip trials) or small-plot replicated trials. Side-by-side trials are the most common form of on-farm tests. As the name suggests, these trials involve testing practices or products against one another in plots arrayed across a field, often in strips the width of the harvesting equipment.
These strips should be replicated across the field or repeated at several locations to increase reliability.
Small-plot replicated trials often are conducted by universities and companies at central locations because of the complexity of managing them and the special planting and harvesting equipment often required.
Replicated treatments increase the reliability of an experiment. They compare practices or products against one another multiple times under uniform growing conditions in several randomized small plots in the same field or location.
Small-plot replicated trials also may be conducted on farmers' fields where special conditions exist, for example, a weed infestation that does not occur on an experiment station.

Are side-by-side plots more valuable than small-plot replicated trials, or vice versa?

Both types of plots can provide good information. The key is to evaluate the reliability of the data. It is also important to consider the applicability of the trial to your farming operation.

When is plot data valid, and when isn't it?

There isn't a black-and-white answer to that questions. But there are good rules of thumb that can help guide you. Consider these three field trial scenarios:

Scenario 1:

A single on-farm side-by-side trial comparing 10 varieties. Each variety is planted in one strip the width of the harvesting equipment and is 250 to 300 feet long.

What you can learn:

This trial will allow you to get a general feel for each variety or hybrid in the test, including how it grows and develops during the season.
However, this trial, by itself, probably won't be able to reliably measure differences in yield. This is because variability within the field, even if it appears to be relatively uniform, may be large enough to cause yield variations that mask genetic difference among the varieties. Other varietal characteristics, such as maturity or micronaire in cotton, can also be masked by soil variation.

Scenario 2:

Yield data from side-by-side variety trials conducted on the same varieties on multiple farms in your region.

What you can learn:

When data from multiple side-by-side trials are considered together, reliability increases. In this case, the more trials comparing the same varieties, the better. As you go from three to five to 10 or more locations, the certainty goes up that yield differences represent genetic differences and not field variability. Be aware, however, that small differences between treatments (in this case varieties) may still be within the margin of random variability of the combined trial and may not indicate actual genetic differences. One treatment will almost always be numerically higher. Statistical analysis helps determine if differences are significant (consistent).

Scenario 3:

A university-style small-block replicated trial comparing the same 10 varieties.

What can you learn:

Data from such trials, if they are designed well and carried out precisely, generally are reliable. This is, the results generally determine the yield potential of crop varieties. However, it is still important to consider whether results are applicable to your farming operation and are consistent with other research.

How do I know whether differences in yield, for example, are real and not caused by field variability or sloppy research?

Scientists use statistical analysis to help determine whether differences are real or are the result of experimental error, such as field variation. The two most commonly used statistics are **Least Significant Difference (LSD)** and the **Coefficient of Variation (CV)**, both of which can provide insight on the validity of trial data. If these values aren't provided with trial results, ask for them.

Least Significant Difference (LSD) is the minimum amount that two varieties must differ to be considered significantly different. Consider a trial where the LSD for yield is four bushels per acre. If one variety yields 45 bushels per acre and another yields 43 bushels per acre, the two are not statistically different in yield. The difference in their yields is due to normal field variation, not to their genetics. In this example, a variety that yields 45 bushels per acre is significantly better than those yielding less than 41 bushels per acre. In many research trials, LSDs are calculated at confidence level of 75 to 95 percent. For example, a confidence level of 95 percent means you can be 95 percent certain that yield differences greater than the LSD amount are due to genetics and not to plot variability.

Coefficient of Variation (CV) measures the relative amount of random experimental variability not accounted for in the design of a test. It is expressed as a percent of the overall average of the test.

For measuring yield differences, CV's of up to five percent are considered excellent; 5.1 to 10 percent are considered good; and 10.1 to 15 percent are fair.

A high CV means there must be larger differences among treatments to conclude that significant differences exist. The bottom line: <u>When considering yield test data, be skeptical when the CV exceeds 15 percent.</u>

Is a one-year test valid, or are several years of results necessary to know whether one product or practice is superior to another?

In an ideal world, having several years of tests to verify use of a practice or product is best. But where changes are rapid, such as with crop varieties, having university data from multiple years isn't always possible.

When multi-year university data aren't available, pay more careful attention to statistical measures like CV and LSD, and the number of locations and testing environments.

Multi-year data on yield and performance can also be requested from the developers of new products prior to university testing. In either case, be cautious about making major production changes and trying large acreages of a given variety based on one year's data.

How should I evaluate trial results that are markedly different from other research in my area?

When research results are at odds with the preponderance of scientific evidence, examine the new research with extra care.

Pay special attention to factors that might have influenced the outcome, such as soil type, planting date, soil moisture and other environmental conditions, and disease, insect and weed pressures. For example, was the growing season unusually wet or unusually dry? When was it dry or wet? What was the crop growth stage when it was wet or dry?

Was there a disease that affected one variety or hybrid more than another one? Were there insect problems? Could this have influenced the trial's outcome and its applicability to your operation? If you determine that unusual circumstances affected the outcome, be cautious about how you use the results.