Texas A&M AgriLife Extension

Texas A&M University

June 18, 2013

2013 Stiles Farm Field Day

50th Annual Stiles Farm Field Day

James E. Stiles

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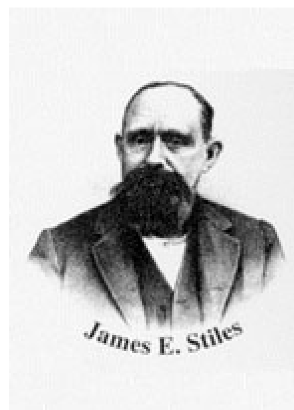
STILES FARM FOUNDATION

Leading the Way for Agriculture in the Central Texas Blacklands

History of the Stiles Farm Foundation

Archie Abrameit
Stiles Farm Foundation Manager



The Stiles Farm Foundation originated with the visionary Stiles family at Thrall in Williamson County. Longtime farmers J.V. and H.A. Stiles wanted to commemorate their father, James E. Stiles, and the land he worked. They also wanted to help their neighbors and others in the Central Texas Blacklands learn about new farming practices. They envisioned a model demonstration farm where farmers could see such new practices in action. So in 1961, they established the Stiles Farm Foundation with its land holdings of about 3,000 acres as a bequest to the Board of Directors of the Agricultural and Mechanical College of Texas (now the Board of Regents of The Texas A&M University System).

As the Foundation's trustees, the Texas A&M Board of Directors asked Texas Cooperative Extension and the Texas Agricultural Experiment Station (now the Texas A&M AgriLife Extension Service and Texas A&M AgriLife Research) to manage the farm according to the expressed purposes. Since November 1985, the farm's operation has been under the auspices of the director of the Texas A&M AgriLife Extension Service. Current land holdings (about 2,800 acres) include some 1,800 acres of cropland and the remainder in pasture and stock ponds.

Among the expressed purposes of the Foundation are the following:

- To encourage and develop sound, profitable farm operations and land usage by practical demonstration.
- To stimulate and conduct demonstration, research, and experimental work for the study of any practical, economic, social, education, and scientific problem of importance to any substantial portion of the rural population of Texas.
- To disseminate educational and useful information developed as a result of any such study, demonstration, research, and experimentation.

- To promote and enlarge the intellectual and cultural interests and opportunities of the rural population of Texas.
- To establish, maintain, and operate a model or demonstration farm.
- To assist in the education or training of people engaged in agricultural production or in preparing themselves for careers in the field of agriculture.

Calvin Rinn was hired as farm manager in 1962 to work with Extension Specialists, Research Scientists and county agents to establish demonstration plots and also to manage most of the farm as a full-scale commercial operation. With money from that operation, scholarships and a chair of agricultural finance were established at Texas A&M University in 1969. Ten $2,000 scholarships have been given annually since that time to outstanding Central Texas high school seniors to study some field of agriculture at Texas A&M University. In addition, support has been provided to the Stiles Chair in Agricultural Finance in the Department of Agricultural Economics at Texas A&M.

Over the years the farm has been a showplace for a wide ranging, diversified agriculture. New crops have been tried and new farming practices have graced the demonstration plots. Crops that have been planted on the farm, in addition to the traditional corn, grain sorghum, cotton, wheat and oats, include sunflowers, soybeans, peaches, grapes, Christmas trees, vegetables, and rapeseed. Of course, with these crops have come test plots with many different varieties available commercially as well as experimental types. The livestock component of the operation has included a cow-calf entity, stockers, swine, and catfish.

Overview of Operation

Various farming practices also have been demonstrated to determine their viability. For example, furrow diking and conservation tillage have been used to increase rainfall efficiency. Cropping systems have included narrow row cotton and broadcast grain sorghum, and there have been numerous demonstrations of different fertilizer sources, rates, and placements as well as seeding rates, methods, and planting dates. Various weed, disease, and insect control practices serve as longtime standards among demonstration plots at the farm. Stocker cattle and grazing studies have highlighted livestock operations along with a farrow-to-finish swine operation that was discontinued in 1992. Marketing of agricultural enterprises has also been explored, including such practices as forward contracts, futures, and options.

Information Outreach

Field days have been conducted annually at the farm since 1963 (except in 1996 when the event was cancelled because of drought conditions). This event attracts large groups, sometimes totaling more than 1,000 from across the Central Texas area to view the demonstrations and educational exhibits. Resource persons for the field day represent the various entities of the Agriculture Program in the Texas A&M University System. The field day also features equipment and machinery displays by area agribusinesses. A barbecue concluding the day's activities is sponsored by the Taylor Chamber of Commerce and businesses in Williamson County and the surrounding area. The extraordinary support from local businesses and the community has provided the impetus for an ongoing partnership to fulfill the original purposes for the farm as envisioned by the Stiles family.

A handbook of the demonstration work under way at the farm has been published since 2002. This valuable reference for producers provides firsthand information on results of various farming operations that can serve as a management guide. The handbook is available from County Extension Offices throughout the Blacklands region and on the Stiles Farm website (http://agrilife-extadmin.tamu.edu/sff/handbook.htm). The farm is also open for individual and group visits, and tours are commonplace.

The Future

Calvin Rinn managed Stiles Farm until his retirement in January 1997. During his 35-year tenure, the farm was at the heart of agricultural innovativeness in the Central Texas Blacklands and a showplace for those who desired new knowledge.

Archie Abrameit became the farm manager in early 1997 after managing the Luling Foundation Farm for more than 18 years. His energy, enthusiasm, and cooperative spirit have moved the Stiles Farm to new heights as a field laboratory for agricultural producers in the region. His vision is to make the farm a learning center that transfers the science and knowledge generated within The Texas A&M University System to practical applications that benefit producers and citizens regionally and state-wide.

The Stiles Farm is on the cutting edge of technology as it evolves from The Texas A&M University System and its industry partners. This includes being a site for assessing new practices on a larger scale and giving producers a more realistic view of what they might incorporate into their own operations.

The farm continues to serve as a bridge between the laboratory and actual application of new farming and ranching practices. It also serves by demonstrating a “systems approach” to profitable farming operations. Agricultural producers must be increasingly flexible to deal with risk, and Stiles Farm strives to demonstrate new technologies and practices that impact economic survival.

Stiles Farm is committed to fulfilling the vision of the Stiles family whose faith and trust in The Texas A&M University System inspired them to establish the farm foundation for the betterment of Central Texas agriculture. To that end, The Stiles Farm, along with the Texas A&M AgriLife Extension Service and The Texas A&M University System, will continue its commitment and its search for excellence.

Central Texas Blacklands Tillage Trails
Stiles Farm Foundation

Archie Abrameit
Extension Specialist and Stiles Farm Foundation Manager

Background:

The Stiles Farm Foundation has as one of its objectives to evaluate tillage practices and tillage methods and to provide educational information to growers in the region.

The summary that follows is a compilation of 8 years of data from 2003-2010 comparing no till, conventional tillage and strip tillage in five rotations: corn09/corn10 etc., cotton 09/corn10 etc., sorghum09/cotton10 etc., corn09/cotton10 etc., and cotton09/sorghum10 etc.

Discussion:

The tillage plots are designed as large scale plots that are machine harvested by custom harvesters. The plots are 16 rows each on 38 inch row spacing with each tillage treatment replicated three times in each rotation. Depending on the field row length, each 16 row tillage treatment encompasses from 2 to 4 acres. All of the plots are dryland and receive no supplemental irrigation. The plots are grown on a Burleson Clay vertisol soil. Over the range of these years, growing conditions have ranged from very dry years to very optimal moisture years.

Conventional tillage consists of either chiseling with sweeps or heavy discing followed by multiple passes with a field cultivator. Strip tillage in 2003 was achieved using a DMI 5310 strip till unit. The 2004-2006 strip till plots were done with a Yetter Maverick 8 row strip till unit. The 2007-2010 plots were treated with the Orthman 1-tRIPr strip till tool.

The 2003-2010 tillage trials results listed show the rotation, yield and net income. Net income includes the value of the individual crop at harvest time with expense deductions that includes tillage trips, spraying, planting and harvesting as well as any other treatments at custom rates for the region. Other expenditures were actual costs as incurred during the season.

Summary:

There are benefits to some tillage in high clay content soils in the thermic regions prevalent in the Central Texas Blacklands. It may not be necessary to do whole acre tillage each year however. An annual check of compaction will be a good guide to determine if tillage is necessary as many factors are involved in compacted soils. Growers may not need to till the entire field depending on the crop to be planted and the previous crop but may want to consider some type of zone tillage such as strip tillage. Strip tillage allows for a narrow band of “clean soil” in the row with residue in the middles for moisture conservation. The soil band left after strip tillage will generally warm sooner in cool springs. In addition, strip till enables application of fall or winter fertilizer placed strategically where the crop can use it more efficiently. Soil quality makes marked improvements by increasing the water holding capacity of the soil.

Including RTK guidance systems as a part of the strip till program further increases efficiency and results in cost savings with better fertilizer placement and a uniform crop stand.

2003-2010 Tillage Trials: Stiles Farm Foundation

ROTATION	YIELD	NET PROFIT
CORN/CORN		
No Till	84.4 bu/ac	$72.73
Strip Till	88.0 bu/ac	$72.19
Conventional Till	90.5 bu/ac	$57.40
COTTON/CORN		
No Till	76.4 bu/ac	$37.17
Strip Till	82.3 bu/ac	$45.32
Conventional Till	78.0 bu/ac	$01.55
COTTON/SORGHUM*		
No Till	4414 lb/ac	$85.85
Strip Till	4683 lb/ac	$93.76
Conventional Till	4806 lb/ac	$87.26
CORN/COTTON		
No Till	536 lb/ac	$04.92
Strip Till	593 lb/ac	$30.99
Conventional Till	620 lb/ac	$07.73
SORGHUM/COTTON		
No Till	590 lb/ac	$51.69
Strip Till	651 lb/ac	$69.87
Conventional Till	686 lb/ac	$66.23

*Represents 7 years data due to sorghum wind damage in 2005.

Replicated Agronomic Cotton Evaluation (RACE) South, East and Central Regions of Texas, 2012

Dr. Gaylon Morgan[1], Professor and Extension Cotton Specialist
Dr. Dan D. Fromme[2], Assistant Professor and Extension Agronomist
Dale Mott[1], Extension Program Specialist – Cotton
Dusty Tittle[14], County Extension Agent; Jared Ripple[16], Extension Agent - IPM
Dustin Coufal[16], County Extension Agent; Jon Gersbach[17], County Extension Agent
Logan Lair[18], County Extension Agent

Texas A&M AgriLife Extension Service

Acknowledgements

Appreciation is expressed to the cooperators that provided their land, equipment and time in assisting with prepping, planting, managing and harvesting of these plots throughout the year. All cooperators are listed in Table 1.

Appreciation is extended to the **Texas Department of Agriculture** for funding that supports the fiber grading/analysis performed at the Fiber and Biopolymer Research Institute in Lubbock. Without this support, these trials would not be possible. Also, appreciation is extended to all of the local cooperators who take time to plant, manage and harvest all of these trials with their own equipment. Finally, we would like to extend our appreciation to **Cotton Incorporated** through the **Texas State Support Committee** for their partial funding of these trials.

2012 Highlights

Variety selection is the most important decision made during the year. Unlike herbicide or insecticide decisions that can be changed during the season to address specific conditions and pests, variety selection is made only once, and variety selection dictates the management of a field for the entire season. Variety decisions should be based on genetics first and transgenic technology second. Attention should be focused on agronomic characteristics such as yield, maturity, and fiber quality when selecting varieties. Figure 1 outlines the Best Management Practices for variety selection.

Texas producers planted 6.6 million acres of cotton in 2012 which was about 0.5 million less than 2011. In the east/south Texas regions (Lower Rio Grande Valley, Southern and Northern Blacklands, South Texas/Wintergarden and Upper Coastal Bend), 1.11 million acres were planted in 2012.

Transgenic varieties accounted for 99% of the state acreage in 2012 which is up from 86% in 2011. According to the USDA-Agricultural Marketing Service “Cotton Varieties Planted 2012 Crop” survey, the estimated percentage of upland cotton planted to specific Brands in Texas are as follows, Alltex had 8.6%, Americot/NexGen had 18.6%, Bayer CropScience – FiberMax had

40%, Bayer CropScience – Stoneville had 2.3%, Croplan Genetics had 0.3%, Delta Pine had 19%, Dyna-Grow had 2.4%, FiberMax had 45%, Phytogen had 8.4% and other at 0.4%.

To assist Texas cotton producers in remaining competitive in the Lower Rio Grande Valley, Blacklands, South Texas/Wintergarden and Upper Coastal Bend regions, the Texas A&M AgriLife Extension Service-Cotton Agronomy program has been conducting, large plot, on-farm, replicated variety trials for the past eight years (Figure 2). This approach provides a good foundation of information that can be utilized to assist the variety selection process.

Twenty-two Replicated Agronomic Cotton Evaluation (RACE) Trials were planted in 2012 and are listed in Table 1. The 2012 season began with good rainfall prior to cotton planting, but beginning mid- March, the rainfall events were poorly timed. In general, it remained relatively dry through late May when some areas began to receive some isolated rainfall events. Isolated rain showers occurred periodically through early July. Some isolated locations received suffered some fruit loss due to extended, cloudy-wet conditions in early July which had a negative effect on yields and delaying crop maturity. Despite the challenges of 2012, some great yields were obtained in the Upper Coastal Bend, Winter Garden, and other isolated areas that received some timely rains. The exception to this general 2012 season summary is the Coastal Bend of Texas, very little precipitation fell and the majority of the cotton was not harvested.

All the cotton seed companies with RoundupFlex® or Glytol® and Bt2® or Widestrike® technology had the opportunity to include at least one variety in the RACE trial at each location. All varieties were treated with either Aeris or Avicta Complete Pak seed treatment. Included in this publication are the cotton variety descriptions provided by company. See descriptions on page 8-10.

In addition to the RACE trials, a Liberty Link (LL), and two Monster cotton variety trials were conducted in 2012 and the final yields and grades from these are included in this publication. Table 1 provides a list of planting and harvest dates, row spacing and plot area for each location. Table 2 shows numerical rankings based upon lint yield for the varieties. Tables 3 to 6 include the cotton variety yield data and fiber analysis for each individual location. Data featured in these tables include, statistical analysis of yield, turnout, fiber quality parameters, loan and gross lint value/acre. Most locations were ginned with a 10-saw table-top gin with no lint cleaner. This method consistently produces higher lint turnout percentages than would be common in a commercial gin. Consequently, higher turnouts equate to lint yields which are generally higher than area-wide commercial yields. Additionally, all data were standardized to a color grade and leaf of 41-4.

The statistical analysis quantifies the variability of the test site conditions, such as soil type, harvesting, insect damage, etc. A CV (coefficient of variation) of 15% or less is generally considered acceptable and means the data are dependable. A trial with a small LSD (least significant difference), indicates more consistency within the trial and higher likelihood of identifying differences among varieties. A trial location with a large LSD and large CV indicates a higher degree of variability at the trial location. Non-significance is represented as “NS” and indicates no differences among the varieties within the data column at a 5% significance level.

Table 1. Trial, cooperator, planting date, harvest date, row spacing, plot dimensions and area of 2012 Texas A&M AgriLife Extension RACE Trials harvested.

County	Cooperator	Planting Date	Harvest Date	Row Spacing (inches)	Plot Dimensions	Irrigated or Dryland	Area harvested/plot
Burleson (B2F)	Wilder Farms	Apr 23	Oct 8	40	4 rows x 1000 ft	Irrigated	0.31
Williamson (B2F)	Greg and Adam Shirocky	Apr 12	Aug 29	30	6 rows x 2786 ft	Dryland	0.96
Milam (B2F)	Jay Beckhusen	Apr 18	Sep 5	30	4 rows x 1355 ft	Dryland	0.31
Navarro (B2F)	Danny Ferrer	Apr 11	Sep 6	38	6 rows x 600 ft	Dryland	0.26

Table 2. Variety ranking based on lint yield, Blacklands and Brazos Bottom Regions of Texas, 2012.

Variety	Trial			Mean
	Milam	Navarro	Williamson	
PHY 499WRF	1	1	1	**1.0**
NG 1511B2RF	2	2	2	**2.0**
PHY 375WRF	5	4	3	**4.0**
DP 1044B2F	3	6	4	**4.3**
ST 545 B2F	4	5	6	**5.0**
AT Nitro 44B2RF	6	3	7	**5.3**
FM 1944GLB2	8	8	5	**7.0**
FM 2989GLB2	7	7	8	**7.3**

Table 3. Uniform Stacked-Gene Cotton Variety Trials, 2012
Burleson County[1]
Cooperator: Joe and Jay Wilder
Dusty Tittle, County Extension Agent
Dr. Gaylon D. Morgan, State Extension Cotton Agronomist
Dale A. Mott, Extension Program Specialist

Variety	Yield (lbs/acre)		Turnout %		Micronaire		Length (inches)		Strength (g/tex)		Uniformity		Loan Value (¢/lbs)		Lint Value ($/Ac)[2]	
NG 1511B2RF	1505	a	39.6	b	3.9	abc	1.12	c	31.0	abc	83.3	a	53.97	a	812	a
PHY 499WRF	1449	a	40.1	b	3.9	abc	1.17	b	32.0	a	84.1	a	53.40	ab	772	a
CG 3787B2RF	1441	ab	38.8	bc	4.0	ab	1.18	b	30.5	a-d	82.6	a	53.82	ab	775	a
ST 5458B2F	1405	abc	36.2	de	3.8	bc	1.17	b	29.9	bcd	82.3	a	53.67	ab	754	ab
DP 1048B2F	1350	a-d	42.1	a	4.2	a	1.13	c	28.7	d	83.2	a	53.63	ab	724	abc
DP 1044B2F	1252	b-e	35.1	e	3.2	f	1.13	c	29.1	cd	82.5	a	50.08	d	626	cd
PHY 375WRF	1245	cde	37.4	cd	3.5	def	1.14	bc	26.7	e	82.6	a	52.15	bc	650	bcd
FM 1944GLB2	1189	de	37.1	cd	3.7	cd	1.22	a	29.2	cd	82.5	a	53.52	ab	636	cd
AT Nitro 44B2RF	1184	de	35.8	de	3.3	ef	1.24	a	31.8	ab	83.3	a	51.47	cd	606	d
FM 2989GLB2	1113	e	35.7	de	3.6	cde	1.16	bc	29.6	cd	83.4	a	53.65	ab	597	d
Mean	**893**		**40.4**		**4.7**		**1.08**		**30.1**		**81.7**		**52.13**		**451**	
P>(F)	0.0001		0.0001		0.0017		0.0541		0.1673		0.9191		0.2742		0.0001	
LSD (P=.05)	56.33		1.331		0.273		0.0402		2.164		2.418		2.9594		42.04	
STD DEV	32.83		0.78		0.16		0.02		1.26		1.41		1.73		24.51	
CV %	3.68		1.92		3.39		2.18		4.19		1.73		3.31		5.43	

[1] Indicates the location was irrigated

[2] Lint values were calculated using the 2011 Upland Cotton Loan Valuation Model from Cotton Incorporated.

AT =AllTex, CG= Croplan Genetics, DP=DeltaPine, DG= DynaGrow, FM=FiberMax, NG=NexGen, PHY=Phytogen, ST= Stoneville.

Table 4. Uniform Stacked-Gene Cotton Variety Trials, 2012
Williamson County
Cooperator: Greg and Adam Shirocky
Jared Ripple, Extension Agent - IPM
Dr. Gaylon D. Morgan, State Extension Cotton Agronomist
Dale A. Mott, Extension Program Specialist

Variety	Yield (lbs/acre)		Turnout %		Micronaire		Length (inches)		Strength (g/tex)		Uniformity		Loan Value (¢/lbs)		Lint Value ($/Ac)[1]	
DP 0935 B2F	661	a	38.0	a	4.7	bc	0.98	d	80.5	cd	26.7	de	47.37	cd	313	a
PHY 499 WRF	654	a	37.0	ab	4.8	ab	1.01	cd	81.8	ab	30.3	ab	49.00	b	320	a
NG 1511 B2RF	629	ab	37.2	ab	4.7	bc	1.00	cd	80.8	bc	29.8	b	48.53	bcd	306	a
PHY 375 WRF	620	abc	36.9	ab	4.6	cd	0.99	d	80.9	bc	27.5	cde	47.83	bcd	296	ab
DP 0949 B2F	615	abc	37.2	ab	4.5	d	1.02	bc	80.6	cd	27.9	cd	49.05	b	302	a
PHY 367 WRF	607	abc	36.4	abc	4.5	cd	1.00	cd	79.9	cd	27.6	cde	48.65	bc	296	ab
DP 1044 B2F	597	abc	35.2	cd	4.5	cd	1.01	cd	80.5	cd	28.1	c	48.30	bcd	289	ab
FM 1740 B2F	594	abc	35.8	bcd	4.7	bc	0.99	cd	80.8	bc	27.8	cde	48.30	bcd	287	ab
FM 1944 GLB2	562	bcd	34.5	d	4.6	bcd	1.05	ab	80.4	cd	26.9	cde	50.78	a	286	ab
ST 5458 B2F	560	bcd	34.8	cd	4.9	a	1.00	cd	79.7	d	26.5	e	47.07	d	264	bc
AT Nitro 44	553	cd	32.2	e	4.2	e	1.07	a	82.2	a	31.6	a	51.93	a	288	ab
FM 2989 GLB2	504	d	34.6	d	4.8	ab	1.01	cd	80.3	cd	27.5	cde	48.65	bc	245	c
Mean	596		35.8		4.6		1.01		80.7		80.7		48.79		291	
P>(F)	0.0054		0.0001		0.0001		0.0002		0.0102		0.0001		0.0001		0.032	
LSD (P=.05)	70.34		1.665		0.188		0.03		1.187		1.304		1.5391		38.24	
STD DEV	41.54		0.98		0.11		0.02		0.70		0.77		0.91		22.58	
CV %	6.97		2.75		2.41		1.75		0.87		2.73		1.86		7.76	

[1] Lint values were calculated using the 2012 Upland Cotton Loan Valuation Model from Cotton Incorporated.

AT =AllTex, CG= Croplan Genetics, DP=DeltaPine, DG= DynaGrow, FM=FiberMax, NG=NexGen, PHY=Phytogen, ST= Stoneville.

Table 5. Uniform Stacked-Gene Cotton Variety Trials, 2012
Milam County
Cooperator: Jay Beckhusen
Jon Gersbach, County Extension Agent and Jared Ripple – Extension Agent-IPM
Dr. Gaylon D. Morgan, Professor and Extension Agronomist
Dale A. Mott, Extension Program Specialist

Variety	Yield (lbs/acre)		Turnout %		Micronaire		Length (inches)		Strength (g/tex)		Uniformity		Loan Value (¢/lbs)		Lint Value ($/Ac)[1]	
PHY 499 WRF	1055	a	43.2	a	5.0	a	1.07	a	30.4	a	81.9	a	50.50	a	522	a
NG 1511B2RF	1016	a	44.2	a	4.9	ab	1.03	a	29.7	a	82.0	a	49.90	a	498	ab
DP 1048B2F	924	b	40.6	bc	4.8	ab	1.08	a	31.1	a	80.9	a	52.17	a	468	bc
DP 1044B2F	911	b	39.1	d	4.5	cd	1.07	a	32.0	a	81.9	a	52.07	a	458	bc
ST 5458B2F	885	bc	40.6	b	4.8	ab	1.06	a	29.4	a	81.1	a	51.70	a	444	c
PHY 375WRF	884	bc	41.3	b	4.6	bc	1.08	a	29.4	a	81.7	a	52.73	a	454	c
AT Nitro 44B2RF	881	bc	39.2	d	4.3	d	1.11	a	30.7	a	81.1	a	53.50	a	456	bc
CG 3787B2RF	850	c	39.3	cd	4.8	ab	1.08	a	29.3	a	82.3	a	52.98	a	436	c
FM 2989GLB2	764	d	39.1	d	4.7	abc	1.10	a	30.0	a	82.3	a	53.25	a	393	d
FM 1944GLB2	755	d	37.7	e	4.6	bc	1.07	a	29.0	a	81.7	a	52.48	a	380	d
Mean	**893**		**40.4**		**4.7**		**1.08**		**30.1**		**81.7**		**52.13**		**451**	
P>(F)	0.0001		0.0001		0.0017		0.0541		0.1673		0.9191		0.2742		0.0001	
LSD (P=.05)	56.33		1.331		0.273		0.0402		2.164		2.418		2.9594		42.04	
STD DEV	32.83		0.78		0.16		0.02		1.26		1.41		1.73		24.51	
CV %	3.68		1.92		3.39		2.18		4.19		1.73		3.31		5.43	

[1] Lint values were calculated using the 2012 Upland Cotton Loan Valuation Model from Cotton Incorporated.
AT =AllTex, CG= Croplan Genetics, DP=DeltaPine, DG= DynaGrow, FM=FiberMax, NG=NexGen, PHY=Phytogen, ST= Stoneville.

Table 6. Uniform Stacked-Gene Cotton Variety Trials, 2012
Navarro County
Cooperator: Danny Ferrer
Logan Liar, County Extension Agent
Dr. Gaylon D. Morgan, Professor and Extension Agronomist
Dale A. Mott, Extension Program Specialist

Variety	Lint (lbs/acre)		Turnout %		Micronaire		Length (inches)		Strength (g/tex)		Uniformity		Loan Value (¢/lb)		Lint Value ($/acre)[1]	
PHY 499 WRF	1356	a	43.3	a	5.1	a	1.04	d	29.6	ab	85.3	a	49.13	bcd	652	a
NG 1511 B2RF	1224	b	40.9	ab	5.1	a	1.03	d	30.0	a	84.1	a	48.00	d	569	bc
AT Nitro 44B2RF	1202	b	39.7	bc	4.5	a	1.08	bc	29.4	ab	86.2	a	53.03	a	618	ab
PHY 375 WRF	1183	b	41.0	ab	4.8	a	1.03	d	28.3	c	82.8	a	50.00	bc	575	b
ST 5458 B2F	1160	b	39.6	bc	5.1	a	1.05	cd	28.7	bc	83.7	a	48.93	cd	547	bcd
DP 1044 B2F	1121	b	38.5	bcd	4.8	a	1.05	cd	30.3	a	57.1	a	50.83	b	548	bcd
FM 2989 GLB2	975	c	36.9	d	4.7	a	1.10	ab	28.8	bc	84.4	a	53.20	a	497	cd
FM 1944 GLB2	918	c	37.9	cd	4.8	a	1.13	a	30.4	a	85.0	a	53.90	a	475	d
Mean	**1142**		**39.7**		**4.8**		**1.06**		**29.4**		**81.1**		**50.88**		**560**	
P>F	0.0008		0.0125		0.0561		0.001		0.0105		0.4841		0.0008		0.0114	
LSD (P=.05)	116.81		2.662		0.358		0.0306		1.016		32.111		1.8694		75.17	
STD DEV	49.39		1.13		0.15		0.01		0.43		13.58		0.79		31.78	
CV%	4.32		2.84		3.13		1.22		1.46		16.75		1.55		5.68	

[1] Lint values were calculated using the 2012 Upland Cotton Loan Valuation Model from Cotton Incorporated.
AT =AllTex, CG= Croplan Genetics, DP=DeltaPine, DG= DynaGrow, FM=FiberMax, NG=NexGen, PHY=Phytogen, ST= Stoneville.

Yield Response of Dryland Cotton to Soil-Applied Potassium in the Upper Gulf Coast and Central Blacklands of Texas

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Summary

The frequency and severity of potassium (K) deficiency symptoms in the Central Blacklands and Upper Gulf Coast regions of Texas have increased in recent years. While very dry conditions have contributed to this response, the clay-dominated soils in these areas have traditionally provided adequate K for optimum production. Studies were initiated at two field sites, Williamson county in the Central Blacklands and Wharton county in the Upper Gulf Coast where mid-season K deficiencies had been observed to investigate cotton yield response to soil-applied K fertilizer. In mid-April, cotton cv. Phytogen 499 was planted into a Lake Charles clay loam at the Wharton site and cv. DP 0935 into a Burleson clay at the Williamson site. Based on soil test results, 60 and 35 pounds K_2O per acre were recommended for the Williamson and Wharton sites, respectively. Treatments were 0, 25, 50, 75 and 100 pounds of K_2O per acre applied shortly after planting using liquid 2-6-12 at the Wharton site, and 0, 40, 80 and 120 pounds of K_2O per acre applied both as liquid 2-6-12 and as granular 0-0-62 before planting at the Williamson site.

Monthly rainfall during the season was below normal at both study sites. Lint yield responded to rates of applied K equal to and greater than that recommended at both sites. Liquid K applied in a subsurface band had a greater, positive effect on lint yield compared to granular K surface band applied and incorporated. Applied K improved length, strength and uniformity at the Williamson site. These studies will be repeated to better assess the influence of seasonal differences in rainfall, crop rotation and soil properties on the results. Below are some result summary graphs and tables demonstrating the impact of the potassium application on cotton lint yields, quality, and net returns.

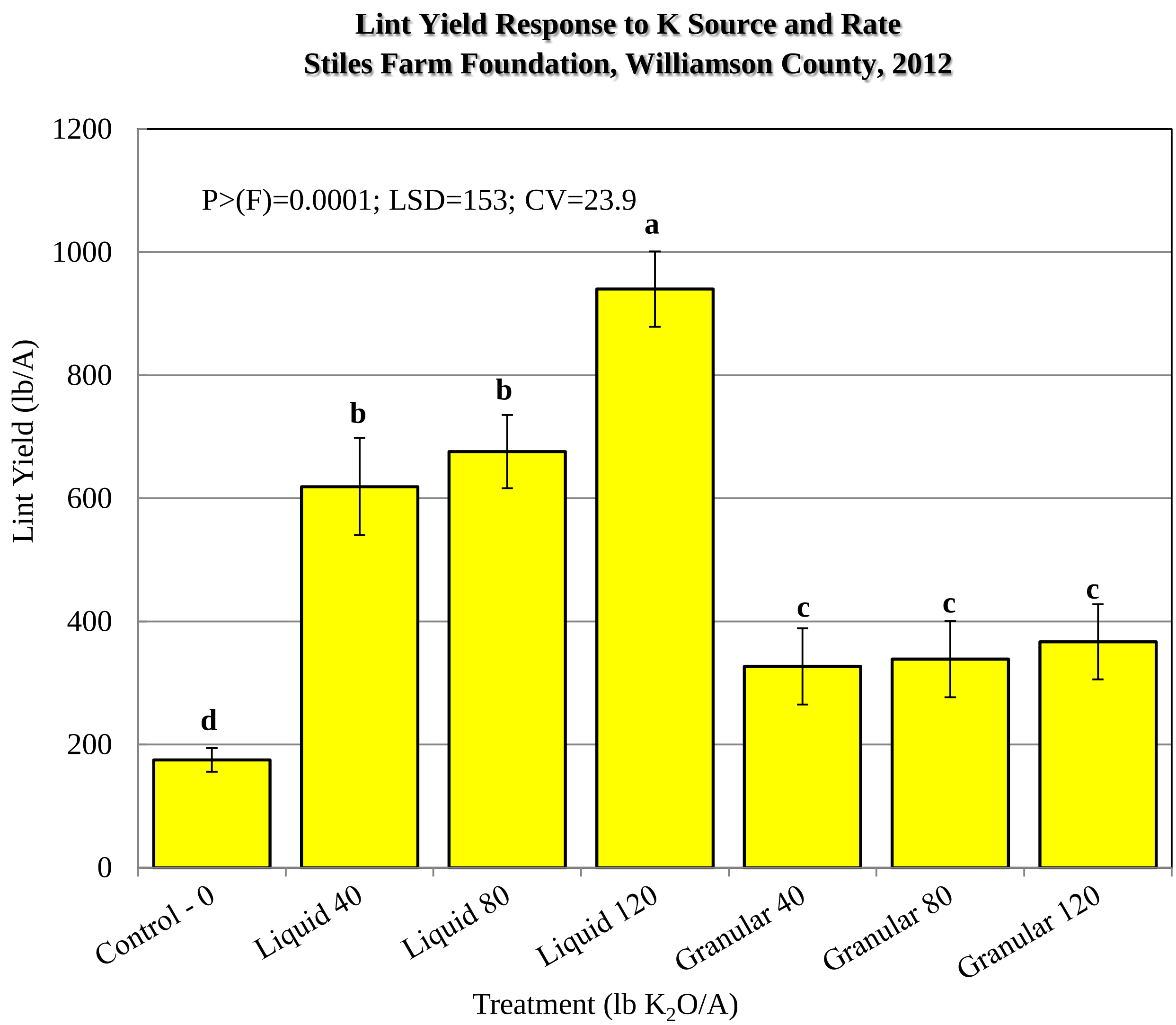

Figure 1. Cotton yield response to numerous application rates of potassium and two application methods at the Stiles Farm Foundation in Williamson county in 2012.

Table 1. Cotton fiber quality and gin turnout in response to numerous application rates of potassium and two application methods at the Stiles Farm Foundation in Williamson county in 2012.

Effect of Applied K on Loan Value and Fiber Quality of Cotton
Stiles Farm Foundation, Williamson County, TX

Treatment						
Source	K_2O Rate	Loan	Micronaire	Length	Strength	Uniformity
	(lb/A)	(cents/lb)	(units)	(inches)	(g/tex)	(ratio)
None	0	38.70 d†	2.54 d	1.03 c	23.44 d	79.0 c
Liquid 2-6-12‡	40	46.70 b	3.06 bc	1.06 ab	26.98 ab	80.38 ab
Liquid 2-6-12	80	47.31 b	3.28 ab	1.05 abc	26.06 abc	80.42 ab
Liquid 2-6-12	120	50.37 a	3.44 a	1.07 a	27.08 a	81.16 a
Granular 0-0-62§	40	41.15 cd	2.78 cd	1.03 c	24.48 cd	78.52 c
Granular 0-0-62	80	39.05 d	2.58 d	1.04 c	24.72 cd	79.12 c
Granular 0-0-62	120	42.92 c	2.82 cd	1.04 bc	25.4 bc	79.56 bc
LSD (P=0.05)		3.02	0.33	0.02	1.26	1.14
CV		5.29	8.61	1.81	4.98	1.1

†Means followed by the same letter within a row do not differ significantly (P=0.05, LSD).

‡Subsurface band applied six inches from seed row and five inches deep.

Chemical Cotton Stalk Destruction Options in ENLIST^{TM} Cotton

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Introduction

The perennial life-cycle of cotton allows it to regrow following harvest in eastern and southern Texas and provides the potential for development of hostable fruit (squares and bolls) for boll weevil feeding and reproduction. Early harvest followed by stalk destruction are among the most effective cultural practices for managing over-wintering boll weevils when performed on an area-wide basis. Chemical stalk destruction provide producers with a timely, economical, and effective option for destroying cotton stalks, especially in reduced tillage systems. In eastern and southern cotton production regions of Texas, chemical stalk destruction has become a standard management strategy, because of its effectiveness, time efficiency, and economical feasibility.

Several herbicides have been registered for cotton stalk destruction since the inception of the boll weevil eradication program. Herbicides available include 2,4-D (ester and salt formulations) and several dicamba products (Weedmaster, Clarity, Banvel). Previous research has proven 2,4-D to be one of the most effective (high efficacy and consistency) and economically feasible product for cotton stalk destruction. Sparks et al. (2002) reported herbicide applications made shortly after shredding showed the best results, potentially due to the wounding effect and the lack of callus formation. However, Lemon et al. (2003) reported that herbicide, either 2,4-D amine or ester, application timing following shredding did not diminish the regrowth control from these products.

Now with various cotton seed companies developing transgenic cotton that will be tolerant to multiple herbicides, including 2,4-D and Dicamba, there is a lot of interest from producers and the Boll Weevil Eradication Program to look for alternative chemistries to aid with cotton stalk destruction. These chemical stalk destruction treatments should be as effective at preventing cotton from re-growing and developing boll weevil hostable fruit following harvest, should have minimal crop plant-back restrictions, and the system should be economically comparable to the current producer standard of 2,4-D.

Objectives

To identify chemical stalk destruction herbicides for controlling the 2,4-D tolerant cotton, Enlist^{TM} Cotton.

To determine the impact of application timing on the efficacy of the evaluated herbicides for controlling cotton regrowth and fruit development.

Materials and Methods

Multiple studies with identical treatments were conducted in the Upper Gulf Coastal and Blacklands of Texas by Drs. Fromme and Morgan and supported by Dow AgroSciences. Enlist™ Cotton seed was planted in late-May at each location and was allowed to grow until the flowering stage when all treatments were mowed to a height of 4-6 inches. Five herbicides were applied to the cotton stalks at two different applications timings. See Table 1 and Table 2 for products, rates, and timings. The first application timing was within hours of shredding the cotton stalks. The second herbicide application timing was two weeks after shredding. A non-ionic surfactant 0.25%v/v was included in each of the treatments presented in this poster. However, comparable herbicides and rates were evaluated without the addition of a surfactant, and the efficacy very similar.

Treatments were rated for percent regrowth at 2,4,6, and 8 weeks after shredding the cotton stalks. Additionally, at 6 and 8 weeks after shredding, cotton plant height and percent hostable plants where quantified by measuring 10 consecutive plants within a row. General observations of Enlist™ plant growth were noted, but not reported in this poster. This poster only includes the results from the 6 and 8 week after shredding for percent regrowth and percent hostable (fruting structure present).

Table 1. Location, Agronomics, and Application Information for Burleson and Ft. Bend County, TX 2012.

	Locations	
County of Study	Ft. Bend	Burleson
Variety	Enlist™ Cotton	Enlist™ Cotton
Shredding Date	July 25	July 16
Application Dates	July 25 and August 7	July 16 and July 30
Nozzles	11003	8002XR
GPA	12	15

Table 2. Herbicide product, rate, and active ingredients for Burleson and Ft. Bend County, TX 2012.

Amt Prod/A	Total lbs ae/A	2,4-D	2,4-DP	Dicamba
Superbrush Killer				
64 fl oz	1.65	0.95	0.47	0.24
Weedmaster				
32 fl oz	0.974	0.72		0.25
Clarity				
16 fl oz	0.5			0.5
Dichlorprop				
60 fl oz	2.0		2.0	

Results

Burleson County Location:
The 2,4-D applications did not suppress regrowth or fruit development compared to the untreated check (Table 3). There was no difference in herbicide efficacy for regrowth between the 0 and 14 days after shredding timing, except for Clarity at the 56 DAT rating at this location. Clarity and Weedmaster applications at 0 or 14 days after shredding did provide sufficient control of the cotton stalks at 39 days after shredding. However, substantial regrowth and hostable plants were observed by the 56 days after shredding rating. All the herbicides applied 14 days after shredding did have fewer hostable plants at the final rating date compared to the herbicides being applied at 0 days after shredding. The Dichlorprop provided the best overall regrowth and fruit development suppression at 56 days after shredding, regardless of the application timing. At the 14 days after shredding application, Super Brush Killer (2,4-D, 2,4-D-p-k, and dicamba) and Dichlorprop had only 5% and 0% hostable plants, respectively.

Ft. Bend County Location:
Similar to Burleson county site, the 2,4-D applications had no suppression of regrowth or fruit development when applied immediately after shredding (Table 4). The 2,4-D did numerically suppress regrowth of the Enlist cotton when applied at 14 days after shredding; however, there was no suppression of fruit development. Each of the herbicides was more efficacious when applied at 14 days after shredding at this location. At 42 and 56 days after shredding rating, the

cotton regrowth and presence of fruit was 12 and 10%, respectively, for Clarity. Weedmaster (2,4-D + dicamba) did not provide satisfactory control of cotton stalks with over 50% of the plants with hostable fruit. At the 56 days after shredding rating, Dichlorprop and the Super Brush Killer (2,4-D, 2,4-D-p, and dicamba) both suppressed regrowth to 5% or less and reduced fruiting plants to 7% or less when applied 14 days after shredding.

Table 3. Cotton Stalk Regrowth and Hostable Plants Following the Application of Numerous Herbicides at 0 and 14 Days After Shredding in Burleson County, TX 2012.

Treatment	**Rate (ae/a)**	**App. Timing (days after mowing)**	**Regrowth (%)**		**Hostable (%)**	
			39 DAS[1]	56 DAS	39 DAS	56 DAS
2,4-D	1.0	0	83 a[2]	91 a	70 b	90 abc
2,4-D	1.0	14	88 a	93 a	70 b	100 a
Dichlorprop	2.0	0	1.5 e	3 e	0 d	24 ghi
Dichlorprop	2.0	14	0 e	0 e	0 d	0 i
Clarity	0.5	0	12 cde	43 cd	15 c	93 abc
Clarity	0.5	14	5 e	84 ab	0 d	14 hi
Super Brush Killer	1.65	0	6 de	31 d	5 cd	81 a-d
Super Brush Killer	1.65	14	4 e	30 d	0 d	5 i
Weedmaster	0.974	0	19 c	45 cd	0 d	81 a-d
Weedmaster	0.974	14	8 cde	50 cd	0 d	31 f-i
Untreated		0	89 a	94 a	73 ab	98 ab

[1] Days after shredding
[2] Means followed by same letter do not significantly differ (P=.05, LSD)

Table 4. Cotton Stalk Regrowth and Hostable Plants Following the Application of Numerous Herbicides at 0 and 14 Days After Shredding in Ft. Bend County, TX 2012.

Treatment	Rate (ae/a)	App. Timing (days after shredding)	Regrowth (%)		Hostable (%)	
			42 DAS[1]	56 DAS	42 DAS	56 DAS
2,4-D	1.0	0	87 ab[2]	87 ab	77 ab	83 a
2,4-D	1.0	14	57 cd	73 abc	87 ab	90 a
Dichlorprop	2.0	0	25 efg	38 de	20 cd	23 cd
Dichlorprop	2.0	14	2 g	3 f	3 d	7 d
Clarity	0.5	0	33 def	47 cd	43 bc	47 bc
Clarity	0.5	14	12 fg	12 ef	10 cd	10 d
Super Brush Killer	1.65	0	43 cde	58 bcd	70 ab	77 ab
Super Brush Killer	1.65	14	3 g	5 f	3 d	3 d
Weedmaster	0.974	0	63 bc	70 abc	90 a	90 a
Weedmaster	0.974	14	53 cd	57 bcd	43 bc	50 bc
Untreated		0	92 a	97 a	93 a	97 a

[1] Days after shredding
[2] Means followed by same letter do not significantly differ (P=.05, LSD)

Conclusions

The 2,4-D applications provided no or minimal suppression of regrowth or fruit development on the Enlist™ Cotton. The herbicide applications at 14 days after shredding were the most efficacious for minimizing cotton stalk regrowth and fruit development for all the herbicides containing dicamba, dichlrorprop, or combinations of these products. For both locations and both applications timings, dichlorprop was identified as an effective herbicide for killing cotton stalks in Enlist™ Cotton.

Acknowledgements

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Cotton Leaf Grade as Influenced by Cotton Defoliation and Varieties

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Abstract

Defoliation of cotton, *Gossypium hisrutum* L., has been referred to as more art than a science by industry leaders. The remnants of leaf material in harvested cotton can significantly increase leaf grade values and result in dockage to the producer. Cotton classed through the USDA-AMS Classing office in Corpus Christi, Texas has reported increases in leaf grade values beginning in 2000, which have resulted in significant financial loss by Texas producers. The impacts of the agronomic variables were studied during the 2010 to 2012 growing seasons and data collected were used to identify possible contributors to increasing leaf grade, including leaf pubescence and harvest-aid treatments. Harvest-aid and harvest-aid by variety trials were initiated in 2010, 2011 and 2012. Variety by harvest-aid trials provided an approach to analyze the combined impact of both factors. All samples were ginned on a miniature gin in Lubbock, and fiber analyses were conducted with HVI. Wide ranges of percent defoliation and desiccation levels were obtained with the harvest-aid treatments but had no significant impact on leaf grade during 2010, 2011, or 2012. In the variety by defoliation trial, hairy leaf varieties of cotton had higher mean leaf grade values than the smooth leaf variety across multiple levels of defoliation in 2010, 2011 and 2012. Overall leaf grades were lower in 2011 due to more suitable weather conditions between harvest-aid application and harvesting.

Introduction

Cotton leaf grade is a visual estimation of the amount of plant material in a lint sample on a scale of 1 to 7, with 1 being the ideal score (Larson and English, 2001). Plant material in harvest lint is waste, and can result in price dockage for the producer because additional processing is required to remove the plant material. Currently, several factors are believed to negatively influence the leaf grade values: 1. the level of leaf defoliation and desiccation prior to harvest; 2. the varietal characteristics, such as leaf hairiness, bract hairiness, and leaf and bract size. The efficacy of chemical defoliation can be an unpredictable process but is vital for the harvest efficiency and to minimize dockage from plant materials (Valco and Snipes, 2001). Factors impacting defoliation vary from harvest-aid selection, plant condition, weather prior to and during application, spray coverage, canopy density, translocation, and varietal traits (Cathey, 1986, Oosterhuis et al. 1991). Additionally, hairier varieties are suspected of contribute to higher leaf grades through a “velcro effect”. Currently, the leaf hairiness of commercial cotton varieties is assigned by a subjective rating system (smooth to very-hairy); however, inconsistencies exist between varietal ratings available to producers.

Materials and Methods

Comparisons of harvest-aid treatments by leaf grade were conducted from 2010-2012 in the Upper Coastal Bend of Texas and at the TAMU research farm using replicated variety trials. Additionally, leaf hairiness by defoliation was conducted in the Coastal Bend region during this time period.

All trials were four rows wide by 40 feet long. Treatments were applied with a Lee Spider sprayer with 11 GPA using XR flat fan tips. Percent defoliation, desiccation and green leaf were rated at 7 and 14 days after treatment. Untreated check was rated as zero and complete absence of leaves was 100%. Plots were mechanically harvested with a spindle picker. Samples were ginned in a miniature gin, and leaf grade and fiber quality parameters were processed at the Fiber and Biopolymer Research Institute using HVI analysis.

In the defoliation trials, treatments were superimposed over a field of Phytogen 375WRF. Twenty defoliation treatments were applied to obtain a wide range of defoliation and desiccation levels in 2010, whereas only sixteen defoliation treatments were selected for the 2011 and 2012 trials.

For the leaf hairiness by defoliation trials, five defoliation treatments were used, intended to produce diverse defoliation levels, in a four replication, split-block design. The trial was conducted in Colorado County with Stoneville 5458B2RF, a hairy leaf variety, and DynaGro 2570B2RF, a smooth leaf variety. In 2011 and 2012, a variety by defoliation trial was conducted in Burleson County using, smooth leaf varieties, DeltaPine 0935 B2RF, and FiberMax 1740 B2F, and hairy leaf varieties, DeltaPine 0949 B2RF and Stoneville 5458 B2RF. ANOVA was performed and means separation using LSD with P=0.05 (data not shown). Kruskal-Wallis was used to identify significance between leaf grades.

Results and Discussion

<u>Defoliation Trial:</u> A wide range of defoliation and desiccation levels were obtained with the selected defoliation treatments. Despite the range of defoliation levels, no differences were observed in leaf grade values. The 2010 and 2012 seasons had leaf grades of 3 and 4, while in 2011 leaf grade values did not rise above 2. Low leaf grades in 2011 were the result of weather conditions more suitable for harvest, compared to 2010 and 2012.

<u>Variety Hairiness by Defoliation:</u> A good range of defoliation levels were obtained with the 5 defoliation treatments and efficacy was comparable for the smooth leaf and hairy leaf varieties. Leaf grade values were consistently lower across all defoliation levels for the smooth leaf variety. Leaf grade ratings were greater than 2 regardless of the defoliation level or variety hairiness. Though 2011 weather conditions were suitable for low leaf grade, there was a variety affect on the scores in all years.

Summary

- Cotton leaf grade was not influenced by the defoliation or desiccation levels
- Leaf hairiness influences leaf grade more than defoliation when environmental conditions are conducive for higher leaf grades
- Differences between years indicate specific environmental conditions, such as rainfall after harvest-aid application, increase the probability for higher leaf grade

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Evaluation of Apparent Soil Electrical Conductivity to Delineate Crop Management Zones

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Introduction

Assessing variability within fields is essential for managing crop inputs on a site-specific basis. On-the-go measurement of apparent soil electrical conductivity (EC_a) is one method used to determine variability across fields and to create management zones for various crops in Texas. Management zones delineated by EC_a are used to guide soil sampling schemes and variable rate application of lime and fertilizer nutrients. However, several soil factors can influence EC_a readings and several commercial instruments are available for collecting EC_a data. It is important to understand how the instruments work for proper collection, interpretation and use of the data.

Background

There are two types of commercially available instruments commonly used to collect EC_a data. One is an electrode-based sensor requiring soil contact, such as the Veris 3100 (Veris Technologies, Salina KS). The second type of sensor is non-contact, using electromagnetic induction (EM). The EM38 (Geonics Limited, Mississauga, Ont., Canada) is the most commonly used EM sensor. With the advancement in GPS and GIS technology, both instruments are capable of providing georeferenced data that can be quickly processed to create maps using modern GIS software (Figure 1).

Commercial electrode-based and EM instruments provide measurements of soil apparent electrical conductivity or EC_a. Soil EC_a does not provide the same measurement as typical soil test measurements for EC. Conductivity is a measure of the ability of material to transmit (conduct) an electrical charge. Soil test EC indirectly measures the amount of soluble salts in soil extracts or saturated paste, also referred to as salinity. Measurement of EC_a differs due to the fact that bulk soil properties are measured. This means that conductance is measured through soil solution and solid soil particles. Measurements of EC_a will not necessarily correlate with soil test measurements of EC.

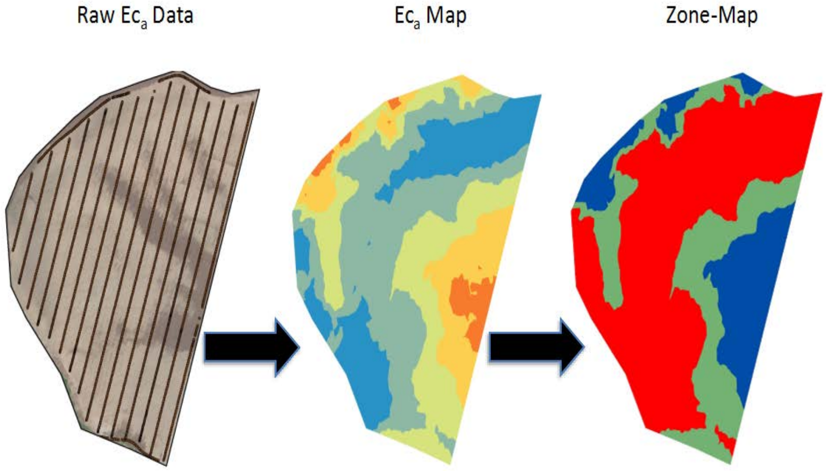

Figure 1. Using EC_a data to create management zones.

Electrode-Based Sensors

One of the earliest forms of the electrode based sensor was used to measure and map soil salinity in the late 1970's. It was later adapted for mobile use by mounting on a tractor and connecting to a GPS receiver and data logger (Carter et al., 1993). The concept was commercialized in 1999 by Veris Technologies (Lund et al., 1999). The Veris 3100 has six rolling coulters that provide two continuous measurements of EC_a (Figure 2).

Figure 2. Veris 3150 with pH mapper used to collect EC data.

Electrode based sensors work by measuring the electrical resistivity of bulk soil. Electrical conductivity (EC_a) is the reciprocal of resistance. Considering a six-coulter device, coulters number 2 and 5 introduce an electrical current into the soil (transmission). The remaining coulters serve as the potential electrodes and measure the current flow potential (receiving). The distance between the coulters (transmitting and receiving) affects the depth and volume of measurement. For the Veris 3100, about 90% of the response is obtained in the upper 12 inches for the shallow reading. About 90% of the response is obtained from a 36-inch soil depth for the deep reading.

Measurements of soil EC_a by electrode-based sensors are affected by four main factors: soil water content, salinity of pore water, exchangeable cations associated with clay particles, and soil particles in direct continuous contact. As these factors change with contrasting soil types and conditions across Texas, so will EC_a response. This may lead to inconsistent correlation with soil physical and chemical properties. The dominant soil properties influencing EC_a readings must be understood to properly interpret the information provided by an EC_a map. Only then will EC_a maps be useful for delineating zones for managing crops on a site-specific basis.

Following creation of an EC_a map, values are typically classified into zones at the discretion of the user for site-specific management. For example, some may choose to use three zones for a given field rather than five or six. The objective is to separate areas with low, medium and high EC_a values that can be grouped for soil sampling and analysis. Soil EC_a data can be combined with yield maps, elevation maps, soil survey maps, etc., to help identify management zones and develop sampling strategies. The goal is to identify areas within fields that when managed on a site-specific basis provides a similar response to crop inputs (fertilizer, lime, irrigation, etc.).

On-going Research

Field-scale studies are currently underway at the Texas A&M AgriLife Research Farm – IMPACT Center (Snook, TX) and Stiles Farm (Thrall, TX) to determine dominate soil factors influencing soil EC_a readings for contrasting soil types. Results will be used to develop guidelines for EC_a data collection and interpretation and ultimately site-specific crop management.

Soil pH and Forage Production

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Many Texas soils have an acid soil pH; that is, the soil pH is less than 7.0. Soil acidity is caused by various environmental, climatic, and cultural factors. The most common of these factors are:

1) Parent material from which the soil is derived.
2) Leaching by rainfall or irrigation that removes basic elements such as calcium, magnesium, and sodium from the soil profile leaving acidic elements hydrogen, aluminum, and manganese.
3) Cultural practices such as nitrogen fertilization, removal of harvested crops and associated basic elements, and soil erosion, which results in a loss of basic elements.

Optimum nutrient uptake by most crops occurs at a soil pH near 7.0. The availability of fertilizer nutrients such as nitrogen (N), phosphorus (P), and potassium (K) generally is reduced as soil pH decreases. Phosphorus is particularly sensitive to pH and can become a limiting nutrient in strongly acid soils. Thus, reduced fertilizer use efficiency and crop performance occurs when soil acidity is not managed by the addition of limestone. Another important benefit of applying limestone to acid soils is to limit the solubility of the potentially toxic elements aluminum, hydrogen, and manganese. As soil pH drops below 5.5, the concentration of soluble aluminum increases and becomes toxic to plant roots when it exceeds 1.0 part per million (ppm). Below pH 5.2, the concentration of manganese also can become toxic to plants. Hydrogen ions only become toxic to plants in extremely acid soils (pH<4.0) and at very low calcium levels.

Soil pH also affects the types, concentrations, and activities of soil microorganisms. Soil microbes play critically important roles in the recycling of soil nutrients through mineralization of organic matter and N fixation associated with forage legumes. As pH drops below 5.5, the soil microbe population changes and is reduced due to aluminum and manganese toxicity and lower nutrient availability.

Finally, some plants are more sensitive to acid soil conditions than others. It is important to understand which species are most sensitive to soil acidity so limestone inputs may be made at the appropriate time. Table 1 presents a list of common forage species in Texas and suggested soil pH ranges for optimum production.

Soil pH should be routinely monitored as part of annual soil testing to determine crop nutrient needs. The Texas A&M AgriLife Extension Service's Soil, Water, and Forage Testing Laboratory in College Station evaluates soil pH and provides a limestone recommendation, where appropriate, as part of a routine soil test (http://soiltesting.tamu.edu). Various commercial laboratories offer similar services.

For additional information on managing soil acidity, including comparing limestone products and determining appropriate application rates, see SCS-2001-05, *Managing Soil Acidity* or SCS-2001-06, *Soil Acidity and Liming*.

Warm-Season Perennial Grasses	**Optimum Soil pH**
Bermudagrass	5.5 - 8.0
Bahiagrass	5.0 - 6.0
Dallisgrass	5.0 - 7.5
Johnsongrass	5.0 - 7.5
Kleingrass	5.5 - 7.5
Native Species	6.0 - 8.0
Old World Bluestems	6.0 - 8.0
Wilman Lovegrass	5.5 - 7.5
Weeping Lovegrass	5.0 - 8.0
Warm-Season Annual Grasses	
Corn	6.0 - 7.5
Crabgrass	5.5 - 7.0
Millets (Pearlmillet, browntop, foxtail)	5.5 - 7.0
Forage sorghum, sorghum-sudan hybrids	6.0 - 7.5
Cool-Season Perennial Grasses	
N/A in Texas	
Cool-Season Annual Grasses	
Barley	6.0 - 7.0
Oat	5.5 - 7.0
Rye	5.0 - 7.0
Ryegrass (annual)	6.0 - 7.0
Triticale	5.5 - 7.0
Wheat	6.0 - 7.0
Warm-season Legumes	
Cowpea	5.5 - 8.0
Lablab	6.0 - 7.0
Lespedeza (annual)	5.5 - 6.5
Rhizoma (perennial) Peanut	6.0 - 7.0
Soybean	6.0 - 7.0

Cool-season Legumes	
Alfalfa	6.5 - 7.5
Arrowleaf Clover	6.0 - 7.0
Austrian Winter Pea	6.0 - 7.5
Ball Clover	6.5 - 8.5
Berseem Clover	6.5 - 7.0
Bur Medic	6.5 - 7.5
Crimson Clover	6.0 - 7.0
Persian Clover	6.0 - 8.0
Red Clover	6.5 - 8.0
Rose Clover	5.5 - 7.5
Sweetclover	6.5 - 8.0
Hairy Vetch	5.5 - 7.0
White Clover	5.5 - 7.5

Enhancing Sorghum Nitrogen Use Efficiency Through Fertilizer Management In Texas

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Technical Objective

Evaluate selected nitrogen slow release and stabilizer products in comparison with standard inorganic fertilizer nitrogen sources to optimize grain sorghum production.

Background

Grain sorghum is a major crop in Texas and the second most important crop grown for feed and bio-fuel feedstock in the United States. Managing input costs, particularly fertilizer in light of recent substantial increases in material costs, is critical to maintain the economic viability of sorghum production. Nitrogen (N) is an essential plant nutrient and the one applied in the greatest amounts for crop growth. However, N also is the most dynamic of all the essential nutrients, being subject to loss by leaching, runoff, and denitrification (volatilization). Enhancing N use efficiency through the use of slow release nitrogen sources or by addition of compounds which stabilize N in the soil environment could help optimize fertilizer application rates, increase profits, and reduce potential environmental impacts.

Slow release N sources have been marketed extensively in the horticultural sector as a means for limiting N losses and enhancing plant recovery. ESN (Agrium) is a granular, plastic coated urea product designed to retard release of N to the environment for 4 to 6 weeks. Urease inhibitors, such as Agrotain (Agrotain International), are designed to stop the hydrolysis of urea to ammonia for 10 to 14 days under normal field conditions and thereby reduce ammonia volatilization. SuperU (Agrotain International) is a granular N source with a urease inhibitor and a nitrification inhibitor to potentially reduce ammonia volatilization and denitrification or leaching.

Materials and Methods

Background soil samples were collected from multiple locations in both the Central Texas and High Plains project areas to identify sites with low residual N levels suitable for field studies. It is important to note that the majority of the fields tested had elevated residual N levels that precluded their use. However, three locations in the Blacklands and two locations in the High Plains regions had sufficiently low residual soil N levels (< 36 lbs N/acre in the upper 24 inches) and were selected for the 2012 project.

All study locations were in dryland production. Additional soil sampling was subsequently conducted at each location and results of the nutrient analyses used to determine treatment strategies. Urea ammonium nitrate (UAN, 32-0-0) and granular urea (46-0-0) were used as standard N sources. UAN was applied alone at rates of 0, 30, 60, 90, and 120 lb N/A to verify the yield response to supplemental N. UAN also was applied at three rates (30, 60, and 90 lb N/A) with addition of the urease/ nitrification inhibitor Agrotain Plus. Urea was hand applied at three rates (30, 60, and 90 lb N/A) and used as a standard N source for comparison with the slow-release nitrogen products SuperU and ESN. Specific treatments used at each location and field site information are presented below.

Monthly rainfall accumulation during February and March ranged from average to 500 percent of long-term average across study sites. However, percent of average monthly rainfall for April, May, and June, respectively, was 88, 30, and 47 for Hill County, 54, 50, and 23 for Hunt County, and 6, 75, and 5 for Williamson County.

Central Blacklands:

The study site was a Burleson clay soil under strip-tillage management in Williamson County at the Stiles Farm Foundation near Thrall, Texas. Soil samples collected in January 2012 had residual soil test NO_3-N levels of 8, 8, and 20 lb/A for depths of 0 to 6, 6 to 12, and 12 to 24 inches, respectively. In late January, 200 lb of 2-6-12 liquid fertilizer was subsurface banded in the seed row. On April 2, grain sorghum hybrid DK 3707 was planted at a density of 65,000 seed per acre.

Experimental plots were 60 feet in length and four rows wide, with 38-inch spacing between rows. Treatments were replicated five times and arranged in a randomized complete block design. Rates of N, P, and Zn fertilizer were based on soil test results utilizing a crop yield goal of 5,000 lb per acre. Phosphorus was applied at 12 lb P_2O_5/A as ammonium polyphosphate (10-34-0) and Zn at 5 lb/A as TraFix ZnXL (Helena Chemical Co.) across all treatments in the study. Fertilizer treatments were side-dress banded at planting on April 2 and 3. Except where indicated, UAN was the sole source of N fertilizer applied. Agrotain was added at a rate of 1.5 quarts/ton of UAN based on label recommendations. Treatments included in the study at Stiles Farm Foundation are shown in Table 1.

In-season measurements included uppermost leaf chlorophyll (SPAD 502, Minolta) and total N at peak flower based on eight subsamples per experimental unit. Whole-plant biomass samples were collected at the soft dough stage from five feet on each of two yield rows and processed separately as stover and grain for determination of total N. Ten feet from each of two center rows of each plot was harvested by hand on August 3. Plant population counts were made from the harvested area. Heads of harvested grain were later threshed with a portable Amalco thresher, plot weights measured, and test weight and grain moisture determined using a stationary Dickey Jon meter.

Mid-Northern Blacklands:

The study site was a Houston Black clay soil located in Hill County on a producer field near Hillsboro, Texas. Soil samples collected March 1 had residual soil test NO_3-N levels of 2, 4, and

Table 1. Fertility treatments, application method, and timing of treatment installation for the study site at Stiles Farm Foundation, Williamson County, Texas. 2012.

Treatment	Application Method	Timing
1. 0 lb N	Coulter	At planting
2. 30 lb N as UAN	Coulter	At planting
3. 60 lb N as UAN	Coulter	At planting
4. 90 lb N as UAN	Coulter	At planting
5. 120 lb N as UAN	Coulter	At planting
6. 30 lb N as UAN	Surface dribble	At planting
7. 60 lb N as UAN	Surface dribble	At planting
8. 90 lb N as UAN	Surface dribble	At planting
9. 30 lb N as UAN with Agrotain Plus	Surface dribble	At planting
10. 60 lb N as UAN with Agrotain Plus	Surface dribble	At planting
11. 90 lb N as UAN with Agrotain Plus	Surface dribble	At planting
12. 30 lb N as urea	Surface dribble	At planting
13. 60 lb N as urea	Surface dribble	At planting
14. 90 lb N as urea	Surface dribble	At planting
15. 30 lb N as SuperU	Surface dribble	At planting
16. 60 lb N as SuperU	Surface dribble	At planting
17. 90 lb N as SuperU	Surface dribble	At planting
18. 30 lb N as ESN	Surface dribble	At planting
19. 60 lb N as ESN	Surface dribble	At planting
20. 90 lb N as ESN	Surface dribble	At planting

10 lb/A for depths of 0 to 6, 6 to 12, and 12 to 24 inches, respectively. Grain sorghum hybrid DKS 44-20 was planted on March 28 at a density of 70,000 seed/A. At planting, liquid fertilizer containing 6-20-0 with 0.77% Zn was applied in-furrow at a rate of 33 lb/A.

Plots were 65 feet in length and four rows wide, with 30-inch spacing between rows. Treatments were replicated five times and arranged in a randomized complete block design. Rates of N and P fertilizer were based on soil test results with a yield goal of 5,000 lb/A. Phosphorus was applied at 35 lb P_2O_5/A as 10-34-0 and Zn at 5 lb/A as TraFix ZnXL across all treatments in the study. Conventional tillage used at the site included planting on a flat surface. Thus, all fertilizer treatments were side-dress banded after crop emergence, stage 2 on April 18. Except where indicated, UAN was the sole source of N fertilizer applied. Agrotain was added at a rate of 1.5 quarts/ton of UAN based on label recommendations. Treatments included in the study near Hillsboro are shown in Table 2.

In-season measurements included uppermost leaf chlorophyll (SPAD 502, Minolta) and total N at peak flower. Measurements were based on subsampling eight leaves per experimental unit. Ten feet from each of two center rows of each plot was harvested by hand on July 23. Plant population counts were made from the harvested area. Heads of harvested grain were later threshed with a portable Amalco thresher, plot weights measured, and test weight and grain moisture determined using a stationary Dickey Jon meter.

Table 2. Fertility treatments, application method, and timing of treatment installation for the study site in Hill County, Texas. 2012.

Treatment	**Application Method**	**Timing**
1. 0 lb N	Coulter	Post plant
2. 30 lb N as UAN	Coulter	Post plant
3. 60 lb N as UAN	Coulter	Post plant
4. 90 lb N as UAN	Coulter	Post plant
5. 120 lb N as UAN	Coulter	Post plant
6. 30 lb N as UAN	Surface dribble	Post plant
7. 60 lb N as UAN	Surface dribble	Post plant
8. 90 lb N as UAN	Surface dribble	Post plant
9. 30 lb N as UAN with Agrotain Plus	Surface dribble	Post plant
10. 60 lb N as UAN with Agrotain Plus	Surface dribble	Post plant
11. 90 lb N as UAN with Agrotain Plus	Surface dribble	Post plant
12. 30 lb N as urea	Surface dribble	Post plant
13. 60 lb N as urea	Surface dribble	Post plant
14. 90 lb N as urea	Surface dribble	Post plant
15. 30 lb N as SuperU	Surface dribble	Post plant
16. 60 lb N as SuperU	Surface dribble	Post plant
17. 90 lb N as SuperU	Surface dribble	Post plant
18. 30 lb N as ESN	Surface dribble	Post plant
19. 60 lb N as ESN	Surface dribble	Post plant
20. 90 lb N as ESN	Surface dribble	Post plant

Northern Blacklands:

The study site was a Houston Black clay soil located in far western Hunt County on a producer field near Floyd, Texas. Soil samples collected March 2 had residual soil test NO_3-N levels of 1, 9, and 18 lb/A for depths of 0 to 6, 6 to 12, and 12 to 24 inches, respectively. Grain sorghum hybrid Pioneer 84G62 was planted on April 4 at a density of 70,000 seed/A.

Plots were 65 feet in length and four rows wide, with 30-inch spacing between rows. Treatments were replicated five times and arranged in a randomized complete block design. Rates of N and P fertilizer were based on soil test results with a yield goal of 5,000 lb/A. Phosphorus was applied at 35 lb P_2O_5/A as 10-34-0 and Zn at 5 lb/A as TraFix ZnXL across all treatments in the study. Conventional tillage used at the site included planting on a flat surface. Thus, all fertilizer treatments were side-dress banded after crop emergence, stage 2 on April 25. Except where indicated, UAN was the sole source of N fertilizer applied. Agrotain was added at a rate of 1.5 quarts/ton of UAN based on label recommendations. Treatments included in this study are shown in Table 3.

In-season measurements included uppermost leaf chlorophyll (SPAD 502, Minolta) and total N at peak flower. Measurements were based on subsampling eight leaves per experimental unit. Whole-plant biomass samples were collected at the soft dough stage from five feet of each of two yield rows and processed separately as stover and grain for determination of total N. The two center rows from each plot were harvested on August 24 with a JD 3300 combine equipped with a Harvestmaster Grain Gauge that measured plot weight, test weight, and grain moisture. Plant population counts were made from the harvested area.

High Plains:

Two study sites were located in Oldham County on producer fields, one near Wilderado and the second near Umbarger, Texas. Both sites were on Pullman clay loam soils. For the Wilderado site, soil samples collected in April 2012 had residual soil test NO_3-N levels of 30, 11, and 24 lbs/A for depths of 0 to 12, 12 to 24, and 24 to 36 inches, respectively. Soil samples collected at the Umbarger site in May 2012 had residual soil test NO_3-N levels of 20, 15, and 12 lbs/A for depths of 0 to 12, 12 to 24, and 24 to 36 inches, respectively. At both locations, experimental plots were 50 feet in length and four rows wide, with 30-inch spacing between rows. Treatments were replicated four times and arranged in a randomized complete block design (Table 4). Rates of N and P fertilizer were based on soil test results utilizing a crop yield goal of 5,000 lb/A. Sidedress treatments were applied June 14 at both locations using coulters set for a 5 x 2-inch placement. Granular N sources were surface, dribble applied five inches off the seed row. Except where indicated, UAN was the sole source of N fertilizer applied. Agrotain was added at a rate of 1.5 quarts/ton of UAN based on label recommendations.

For all harvested sites, data were analyzed by analysis of variance and means separated using Fisher's Least Significant Difference (LSD) at the five percent level ($P \leq 0.05$), where appropriate.

Table 3. Fertility treatments, application method, and timing of treatment installation for the study site in Hunt County, Texas. 2012.

Treatment	**Application Method**	**Timing**
1. 0 lb N	Coulter	Post plant
2. 30 lb N as UAN	Coulter	Post plant
3. 60 lb N as UAN	Coulter	Post plant
4. 90 lb N as UAN	Coulter	Post plant
5. 120 lb N as UAN	Coulter	Post plant
6. 30 lb N as UAN	Surface dribble	Post plant
7. 60 lb N as UAN	Surface dribble	Post plant
8. 90 lb N as UAN	Surface dribble	Post plant
9. 30 lb N as UAN with Agrotain Plus	Surface dribble	Post plant
10. 60 lb N as UAN with Agrotain Plus	Surface dribble	Post plant
11. 90 lb N as UAN with Agrotain Plus	Surface dribble	Post plant
12. 30 lb N as urea	Surface dribble	Post plant
13. 60 lb N as urea	Surface dribble	Post plant

14. 90 lb N as urea	Surface dribble	Post plant
15. 30 lb N as SuperU	Surface dribble	Post plant
16. 60 lb N as SuperU	Surface dribble	Post plant
17. 90 lb N as SuperU	Surface dribble	Post plant
18. 30 lb N as ESN	Surface dribble	Post plant
19. 60 lb N as ESN	Surface dribble	Post plant
20. 90 lb N as ESN	Surface dribble	Post plant

Table 4. Fertility treatments, application method, and timing of treatment installation for study sites in Oldham County, Texas. 2012.

Treatment	**Application Method**	**Timing**
1. 0 lb N	Coulter	Post plant
2. 30 lb N as UAN	Coulter	Post plant
3. 60 lb N as UAN	Coulter	Post plant
4. 90 lb N as UAN	Coulter	Post plant
5. 120 lb N as UAN	Coulter	Post plant
6. 30 lb N as UAN	Surface dribble	Post plant
7. 60 lb N as UAN	Surface dribble	Post plant
8. 90 lb N as UAN	Surface dribble	Post plant
9. 30 lb N as UAN with Agrotain Plus	Surface dribble	Post plant
10. 60 lb N as UAN with Agrotain Plus	Surface dribble	Post plant
11. 90 lb N as UAN with Agrotain Plus	Surface dribble	Post plant
12. 30 lb N as urea	Surface dribble	Post plant
13. 60 lb N as urea	Surface dribble	Post plant
14. 90 lb N as urea	Surface dribble	Post plant
15. 30 lb N as SuperU	Surface dribble	Post plant
16. 60 lb N as SuperU	Surface dribble	Post plant
17. 90 lb N as SuperU	Surface dribble	Post plant
18. 30 lb N as ESN	Surface dribble	Post plant
19. 60 lb N as ESN	Surface dribble	Post plant
20. 90 lb N as ESN	Surface dribble	Post plant

Results and Discussion

Central, Mid-Northern and Northern Blacklands: Yields of grain sorghum increased with increasing rate of applied N as UAN up to 60 lb/A in Hill and Hunt Counties. In contrast, there was no response to N rate in Williamson County (Table 5) due largely to limited rainfall in the weeks prior to planting and continuing through flowering.

No fertilizer rate by source interactions were observed for grain yield. In addition, no significant differences in grain yield were observed between conventional N fertilizer sources and granular slow-release N sources or conventional liquid N (32%) with the N stabilizer additive within rates of N application at the three study locations (Tables 6-8). Below average rainfall early in the season may have limited the potential for a response to the products. However, yields in Hill and Hunt Counties were at or above average ranging from 4765 to 6177 lbs/acre.

Table 5. Effects of N (UAN) rate on grain sorghum yield at study sites in Hill, Hunt, and Williamson Counties, Texas. 2012.

Treatments		Grain Yield†		
Source	N Rate	Hill County	Hunt County	Williamson County
	(lb/A)	----------------------------(lb/A)------------------------		
None	0	4828 c‡	4400 b	2633§
UAN	30	5459 b	4446 b	3006
UAN	60	6103 a	5522 a	2714
UAN	90	6038 a	5746 a	3424
UAN	120	6297 a	6009 a	2911
LSD		366	493	
P>(F)		0.0001	0.0001	0.2548
CV		4.7	7	19.3

†Grain yield corrected to 14% moisture.
‡Means within a column followed by the same letter are not different according to LSD (P≤0.05).
§Means within a column were not different (P≤0.05).

Table 6. Effects of N rate and source on grain sorghum yield in Hill County, Texas. 2012.

	Grain Yield†		
N Source	30 lb N/A	60 lb N/A	90 lb N/A
	----------------------------(lb/A)------------------------		
UAN	5663‡	6177	5911
UAN + Agrotain Plus	5658	5982	5719
Urea	5674	5682	6138
SuperU	5665	5974	5980
ESN	6032	5789	6100
P>(F)	0.5948	0.3929	0.7871
CV	7.5	6.9	9.5

†Grain yield corrected to 14% moisture.
‡Means within a column were not different (P≤0.05).

Table 7. Effects of N rate and source on grain sorghum yield in Hunt County, Texas. 2012.

N Source	Grain Yield†		
	30 lb N/A	60 lb N/A	90 lb N/A
	---------------------------(lb/A)-----------------------		
UAN	4784‡	5155	5605
UAN + Agrotain Plus	4817	5254	5673
Urea	4960	5290	5732
SuperU	4765	5455	5783
ESN	5081	5588	5779
P>(F)	0.4076	0.1598	0.8625
CV	6	5.2	5.2

†Grain yield corrected to 14% moisture.
‡Means within a column were not different ($P \leq 0.05$).

Table 8. Effects of N rate and source on grain sorghum yield in Williamson County, Texas. 2012.

N Source	Grain Yield†		
	30 lb N/A	60 lb N/A	90 lb N/A
	---------------------------(lb/A)-----------------------		
UAN	3108‡	3214	3068
UAN + Agrotain Plus	2875	3097	3175
Urea	3046	2729	2779
SuperU	2685	3161	3355
ESN	2961	2758	2567
P>(F)	0.9361	0.6045	0.4227
CV	28.3	20.6	23.2

†Grain yield corrected to 14% moisture.
‡Means within a column were not different ($P \leq 0.05$).

UAN alone at all rates significantly increased leaf chlorophyll at flowering compared to the zero N control (Fig. 1). However, there were no differences observed in leaf chlorophyll readings due to N source for any of three rates applied (Fig. 2a-c). UAN alone at rates of 60, 90, and 120 lbs N/acre significantly increased N concentration in mature leaves at flowering in Hunt County compared to the check (0 N) and 30 lbs N/acre; however, the same response was not observed at the study sites in Hill or Williamson Counties (Table 9). There were no differences in mature leaf N concentration between conventional and slow-release N fertilizer sources or the N stabilizer additive across rates of N fertilizer at any of the three study sites in the Central Texas Blacklands (Tables 10-12).

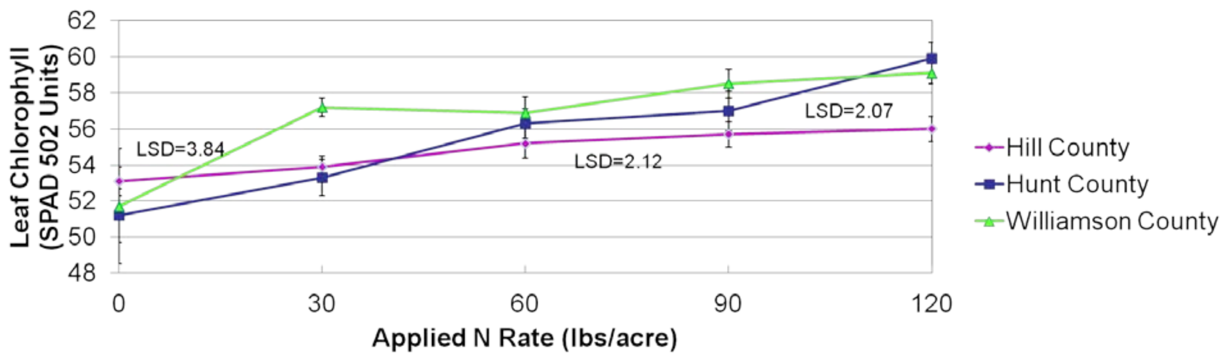

Fig. 1. Effects of N (UAN) rate on leaf chlorophyll at flowering at three locations in the Central Texas Blacklands, 2012. Means within a county were significantly different at increased rates of N according to LSD (P≤0.05). Standard error bars represent treatment means.

When UAN was applied alone, grain and total N contents of sorghum biomass at the Hunt County site increased at rates of 60 lb N/A and above (Table 13). In contrast, stover, grain, and total N content of harvested sorghum biomass were not affected by N rate in Williamson County (Table 14).

There were no differences in stover, grain, or total N content of plant biomass due to N source at the study site in Hunt County (Table 15). In contrast, plots in Williamson County receiving UAN at 60 lbs N/acre with Agrotain had greater stover N content compared to other treatments (Table 16). In addition, Williamson County plots receiving SuperU at 90 lbs N/acre had higher grain N content compared to other treatments (Table 16). However, similar results were not observed for total N content at lower or higher N rates with these products.

<u>High Plains:</u>
As with the previous cropping season, the High Plains experienced historically low levels of precipitation and soil moisture became inadequate to support full production of grain sorghum. Thus, both of the studies in Oldham County had to be abandoned prior to the flowering stage.

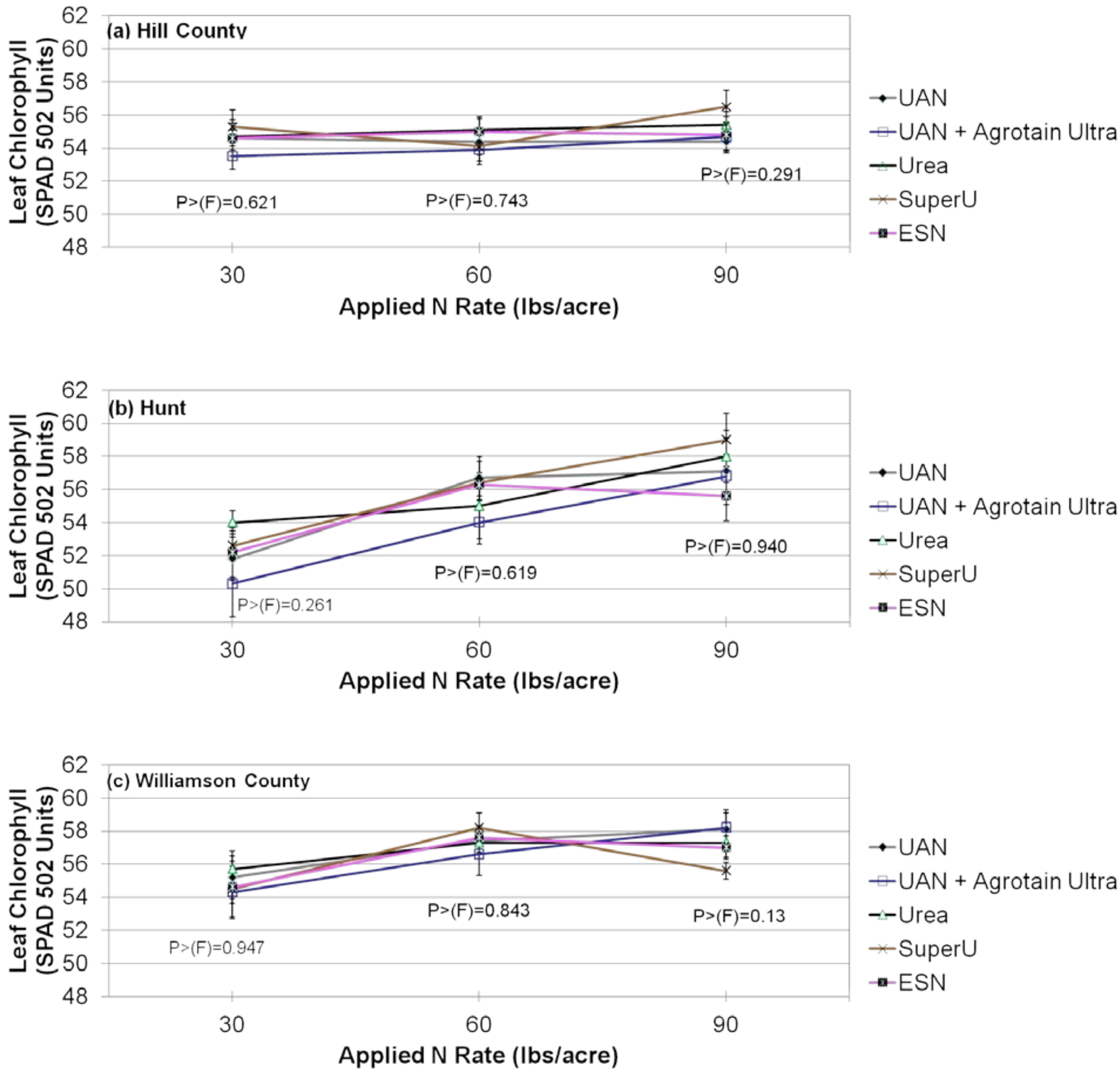

Fig. 2a-c. Effects of N rate and source on leaf chlorophyll at flowering at three locations in the Central Texas Blacklands, 2012. Means within a rate of N were not significantly different (P≤0.05). Standard error bars represent treatment means.

Table 9. Effects of N (UAN) fertilizer rate on leaf N concentration at flowering at three study sites in the Central Texas Blacklands. 2012.

Treatments		Leaf N Concentration†		
Source	N Rate	Hill County	Hunt County	Williamson County
	(lb/A)	---------------------------(%)-------------------------		
None	0	2.63‡	2.34 c§	3.19
UAN	30	2.58	2.28 c	3.40
UAN	60	2.61	2.69 b	3.53
UAN	90	2.52	2.78 ab	3.53
UAN	120	2.68	2.89 a	3.61
LSD			0.194	
P>(F)		0.7726	0.0001	0.0682
CV		7.5	5.6	6.3

†Second leaf below the flag leaf.
‡Means within a column were not different (P≤0.05).
§Means within a column followed by the same letter are not different according to LSD (P≤0.05).

Table 10. Effects of N fertilizer treatment at three rates of application on grain sorghum leaf N concentration at flowering, Hill County, Texas. 2012.

	Leaf N Concentration†		
N Source	30 lb N/A	60 lb N/A	90 lb N/A
	---------------------------(%)------------------------		
UAN	2.56‡	2.61	2.77
UAN + Agrotain Plus	2.56	2.54	2.73
Urea	2.63	2.59	2.67
SuperU	2.58	2.61	2.63
ESN	2.62	2.62	2.67
P>(F)	0.9624	0.9473	0.6231
CV	7.5	6.7	5.7

†Second leaf below the flag leaf.
‡Means within a column were not different (P≤0.05).

Table 11. Effects of N fertilizer treatment at three rates of application on grain sorghum leaf N concentration at flowering, Hunt County, Texas. 2012.

	Leaf N Concentration†		
N Source	30 lb N/A	60 lb N/A	90 lb N/A
	---------------------------(%)-----------------------		
UAN	2.37‡	2.71	2.62
UAN + Agrotain Plus	2.33	2.45	2.76
Urea	2.52	2.56	2.77
SuperU	2.48	2.60	2.84
ESN	2.43	2.66	2.69
P>(F)	0.3775	0.2253	0.0605
CV	6.7	6.8	4.1

†Second leaf below the flag leaf.
‡Means within a column were not different (P≤0.05).

Table 12. Effects of N fertilizer treatment at three rates of application on grain sorghum leaf N concentration at flowering, Williamson County, Texas. 2012.

	Leaf N Concentration†		
N Source	30 lb N/A	60 lb N/A	90 lb N/A
	---------------------------(%)-----------------------		
UAN	3.32‡	3.5	3.54
UAN + Agrotain Plus	3.35	3.5	3.51
Urea	3.46	3.41	3.53
SuperU	3.36	3.53	3.49
ESN	3.34	3.46	3.52
P>(F)	0.4222	0.5852	0.9772
CV	3.6	3.3	3.7

†Second leaf below the flag leaf.
‡Means within a column were not different (P≤0.05).

Table 13. Effects of N (UAN) rate on N content in biomass of mature grain sorghum, Hunt County, Texas. 2012.

Treatments		N Content of Biomass		
Source	N Rate	Stover	Grain	Total
	(lb/A)	-------------------------------(lb/A)--------------------------		
None	0	21.4†	31.1 b‡	52.5 b
UAN	30	22.0	35.2 b	57.3 b
UAN	60	29.4	59.6 a	89.0 a
UAN	90	27.3	62.5 a	89.8 a
UAN	120	27.0	65.2 a	92.3 a
LSD			13.0	17.2
P>(F)		0.2499	0.0006	0.0012
CV		18.5	13.6	12.0

† Means within a column were not different (P≤0.05).
‡Means within a column followed by the same letter are not different according to LSD (P≤0.05).

Table 14. Effects of N (UAN) rate on N content in biomass of mature grain sorghum, Williamson County, Texas. 2012.

Treatments		N Content of Biomass		
Source	N Rate	Stover	Grain	Total
	(lb/A)	-------------------------------(lb/A)--------------------------		
None	0	17.8†	28.2	46.0§
UAN	30	22.6	43.0	65.6
UAN	60	24.9	45.0	70.0
UAN	90	23.4	46.9	70.4
UAN	120	30.0	49.3	79.3
P>(F)		0.4645	0.0662	0.1578
CV		32.2	18.4	21.7

†Means within a column were not different (P≤0.05).

Table 15. Effects of N source and rate on N content of mature sorghum biomass, Hunt County, Texas. 2012.

N Source	N Content of Biomass								
	30 lb N/A			60 lb N/A			90 lb N/A		
	Stover	Grain	Total	Stover	Grain	Total	Stover	Grain	Total
	(lb/A)								
UAN	22.7†	34.9	57.6	30.8	56.1	86.9	25.8	60.1	85.9
UAN + Ag‡	17.8	33.1	50.9	26.9	50.6	77.6	22.7	62.2	84.9
Urea	20.5	41.2	61.7	26.2	62.6	88.8	25.8	62.8	88.6
SuperU	20.9	43.5	64.4	24.4	51.5	75.9	27.7	66.1	93.8
ESN	23.8	49.7	73.4	21.3	52.3	73.5	27.5	61.3	88.8
P>(F)	0.4261	0.0655	0.1007	0.0861	0.5774	0.4239	0.7716	0.9556	0.9338
CV	18	15.5	14	13.4	17.9	14.1	20	15.9	15.3

†Means within a column were not different (P≤0.05).
‡UAN + Agrotain Plus

Table 16. Effects of N source and rate on N content of mature sorghum biomass, Williamson County, Texas. 2012.

N Source	N Content of Biomass								
	30 lb N/A			60 lb N/A			90 lb N/A		
	Stover	Grain	Total	Stover	Grain	Total	Stover	Grain	Total
	(lb/A)								
UAN	17.7†	38.1	55.9	22.6	49.4 ab‡	72.1	17.1 b	44.2	61.3
UAN + Ag§	20.0	39.7	59.7	25.8	61.7 a	87.5	15.0 b	41.8	56.8
Urea	17.1	45.6	62.7	23.4	42.9 b	66.4	21.9 b	41.9	63.8
SuperU	13.8	35.0	48.7	20.9	45.1 b	65.9	39.6 a	50.1	80.1
ESN	18.7	34.5	53.2	17.6	39.5 b	57.2	18.5 b	36.3	54.8
LSD					12.7		7.1		
P>(F)	0.5747	0.7528	0.804	0.6918	0.0276	0.1273	0.0005	0.4363	0.4135
CV	26.3	29.1	26.6	31.6	14.1	17.6	16.4	19.5	25.8

†Means within a column were not different (P≤0.05).
‡Means within a column followed by the same letter are not different according to LSD (P≤0.05).
§UAN + Agrotain Plus

Summary

Dry weather conditions resulted in only three of the five implemented study locations being taken to harvest. Yield of grain sorghum and uppermost leaf chlorophyll responded to increased rates of applied N as UAN in two of three locations where seasonal rainfall was more comparable to long-term averages. However, neither UAN applied in combination with a urease-nitrification inhibitor (Agrotain) or slow-release granular N sources (ESN and SuperU) increased grain yield , leaf chlorophyll, or total leaf N when compared to conventional UAN or urea alone. At one location, grain and stover N content were affected by N treatment, but results were not consistent across rates or locations. Overall, results of the project showed that the selected N slow-release and stabilizer products do not offer yield advantages for grain sorghum production compared to conventional N sources under the conditions experienced during these studies.

In spite of severe drought, four field studies were completed over two years in the Central Texas Blacklands to evaluate alternative N products. This work was part of a multi-state USCP project initiated by Dr. Dave Mengel at Kansas State University that also included Oklahoma and Arkansas. In addition, this funding enabled Texas A&M AgriLife Extension to leverage funds and facilitate a complementary multi-state project through the USDA National Institute for Food and Agriculture (NIFA). Results of that project were recently published as a Southern Region Bulletin and provide regional verification of the results reported here. The bulletin is available at: http://repo.lib.auburn.edu/repo/bitstream/handle/123456789/44121/scsb-416.pdf?sequence=2

An important related finding of this work was that elevated residual N levels measured in 75% of the fields evaluated as potential study sites limited site selection. These results further substantiate over 10 years of previous research in cotton and limited recent work in corn and grain sorghum indicating high levels of residual soil N in production regions across the state. This research has shown that residual soil N to depths of 24 inches are effectively recovered by these crops and can be credited at 100% to reduce supplemental fertilizer needs. Certainly, crop failures and yield reductions due to periodic, and more recently, persistent drought conditions have played a role in nutrient build-up in some areas. However, given the widespread occurrence of the phenomenon additional research is needed to better define field soil sampling protocols that can enable targeted deep (upper 18 to 24 inches) sampling to measure and credit residual soil N. Combinations of yield mapping, veris technology, and other tools may provide new opportunities to do so. Efficient utilization of this highly mobile nutrient not only can improve production economics, but also will enhance the potential for grain sorghum producers to practice and be recognized for employing sound environmental management.

Acknowledgements

Funding support for this project was provided by the United Sorghum Checkoff Program as part of a multistate collaborative project initiated by Dr. Dave Mengel at Kansas State University. Thanks also to Koch Agronomic Services, Crop Production Services (Agrium), and Simplot for donations of fertilizer and related products.

Wheat and Oat Variety Performance in Central Texas

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Texas AgriLife Extension Service

The Texas A&M AgriLife Extension Service has overseen the wheat and oat variety trial in Williamson County for three consecutive years and is part of the statewide network of uniform variety trials. Local variety trials are important in testing adaptation of new variety releases and comparing them to already established lines used by producers. Data collection for multiple years and multiple sites is critical for appropriate variety selection. Environmental conditions vary each year and certain characteristics may be advantageous under certain conditions, but are not representative of the site on average. New varieties can offer better yield and more disease and insect resistance options for producers as well. Many producers use this information to decide which varieties to plant each season. Variety selection not only influences yield potential, but also other management practices such as grazing, fertility, and insecticide and fungicide applications.

Varieties included in this study included 20 hard red winter wheat (HRWW) and eight oat varieties. Wheat and oats were planted on November 7 and harvested on May 24, 2013. This study has been conducted over three years. Grain yield, seed moisture, and test weight data were collected and analyzed as a four replicate, randomized complete block design in ARM 9 using ANOVA and LSD for mean separation.

Summarized data for the HRWW and oat varieties are presented in Tables 1 and 2, respectively. Tables include recorded yields in 2011, 2012, 2013, and the 3-year average along with test weights. Yield is considerably lower in 2011 due to severe drought conditions that year. TAM 304, Duster, Billings, Gallagher, Shocker, Fannin, Armour, and Ruby Lee were statistically all top yielding varieties in 2013; however, Billings ranks the highest on the 3-year average. The only significant difference in test weights for 2013 was a very low weight recorded for Garrison, which was the lowest yielding variety as well. TAMO 411 is a new oat variety release that has performed well at this location the past two years. Statistically, TAMO 411 along with a new entry Harrison, yielded the same in 2013 as Horizon 201, which was the highest yielding oat over the 3-year average.

This information is important in highlighting yield-stability of varieties over years. When developing small grains management practices, selection of multiple varieties is a recommended practice in order to spread out risk due to inherent environmental variability. For more information on variety performance across the state, please visit our website at http://varietytesting.tamu.edu/wheat.

The authors would like to thank Archie Abrameit and others at the Stiles Farm Foundation for their participation in land preparation and cooperation in making this a successful trial.

Table 1: Hard Red Winter Wheat variety yields for 2011, 2012, 2013 and the 3-year yield average at the Stiles Farm.

Variety†	2013 Yield (bu/a)‡		2012 Yield (bu/a)‡		2011 Yield (bu/a)‡		3-Year Average (bu/a)	2013 Test Weight (lbs/bu)	
Billings	54.5	a	70.7	a	21.8	c-g	49.0	60.0	a
TAM 304	55.1	a	57.5	ab	24.7	bc	45.8	57.7	a
Fannin	51.6	ab	55.5	abc	22.2	c-g	43.1	59.5	a
TAM 203	39.4	c-f	63.7	a	25.9	ab	43.0	57.6	a
Duster	54.9	a	43.8	bcd	24.0	bcd	40.9	60.0	a
Greer	36.6	ef	58.7	ab	24.8	abc	40.0	56.4	a
TAM 401	35.3	efg	61.6	ab	19.8	e-h	38.9	56.2	a
Coronado	20.4	h	53.4	abc	24.5	bc	32.8	60.7	a
Fuller	-		64.1	a	23.1	b-e	-	-	
Gallagher	53.8	a	-		-		-	59.8	a
Shocker	53.0	a	-		-		-	58.9	a
Armour	48.2	abc	-		-		-	57.2	a
Ruby Lee	47.3	abc	-		-		-	59.4	a
Cedar	46.7	a-d	-		-		-	59.2	a
TAM 305	42.9	b-e	-		-		-	60.0	a
WB-4458	37.5	def	-		-		-	58.0	a
Santa Fe	33.3	fg	-		-		-	58.6	a
Doans	32.0	fg	-		-		-	58.7	a
Iba	31.6	fg	-		-		-	56.0	a
Jackpot	26.2	gh	-		-		-	58.7	a
Garrison	10.6	i						43.9	b
LSD (P = .05)	9.3		18.4		3.5		-	9.9	
Std Dev.	6.6		12.8		2.4		-	7.0	
CV	16.2		23.5		11.2		-	12.1	
Grand Mean	40.5		54.7		21.9		-	57.8	

†Ranked according to 3-year average.

‡Letters denote significant differences in yield.

Table 2: Oat variety yields for 2011, 2012, 2013 and the 3-year yield average at the Stiles Farm.

Variety†	2013 Yield (bu/a)‡		2012 Yield (bu/a)‡		2011 Yield (bu/a)‡		3-Year Average (bu/a)	2012 Test Weight (lbs/bu)
Horizon 201	56.6	a	84.7	a	37.1	ab	59.5	33.1
Horizon 270	38.8	b	85.6	a	44.7	a	56.4	35.0
RAM 99016	37.5	b	71.8	ab	31.5	bc	46.9	36.0
TAMO 406	41.0	b	58.9	bc	28.6	c	42.8	35.8
TAMO 606	37.2	b	43.3	d	35.6	bc	38.7	31.5
Bob	36.8	b	46.1	cd	28.7	c	37.2	32.9
TAMO 411	50.2	a	85.5	a	-		-	36.6
Harrison	49.8	a	-		-		-	-
LSD (P = .05)	7.4		15.6		8.3		-	1.4
Std Dev.	5.0		11.0		5.5		-	1.0
CV	11.6		22.4		16.1		-	1.9
Grand Mean	43.5		49.1		34.4		-	34.4

†Ranked according to 3-year average.

‡Letters denote significant differences in yield.

Evaluation of Newer Corn and Sorghum Herbicides

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Mr. Archie Abrameit, Extension Specialist and Stiles Farm Manager
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Several newer herbicides were evaluated in 2012 for their effectiveness in corn and sorghum weed control. Currently, annual and perennial grasses are the most difficult to manage in grain sorghum production. Most of the traditional preemergence herbicides applied to sorghum do a relatively good job of controlling annual grasses until mid to late season flushes occur. For this reason, Dupont/Pioneer are in the process of developing ALS-tolerant grain sorghum which will aid in addressing the grass weed problems in Texas sorghum fields. Previous work with this technology was done and presented at the Stiles Farm Field day in 2009 and 2010. Fortunately, Dupont/Pioneer expects to have limited commercially available varieties of ALS-tolerant sorghum in 2014.

Table 1 shows results from the 2012 Corn Herbicide demonstration at the Stiles Farm. There are several products that have received registration over the last couple of years. For example, Dupont has introduced Realm™ Q for postemergence use in corn, and Instigate™ for preemergence use in corn. Both products control a number of annual grasses and broadleaf weeds. In addition, two newer products from BASF include Armezon (applied post up to V7 corn), and Zidua, which may be applied preemergence to corn. Both products control a number of annual grasses and broadleaf weeds, and are highly effective. Furthermore, Balance FLEXX, Corvus, and Capreno are newer products offered by Bayer Crop Science, all providing effective weed control in corn. All of the aforementioned products have herbicidal modes of action that differ from Roundup (or glyphosate products) which are important tools when managing Roundup resistant weeds.

Table 2 shows results from the Sorghum Herbicide Demonstration in 2012. As shown in the table, all products received a preemergence treatment which was highly effective in controlling Palmer Amaranth or Palmer pigweed. Post treatments in this study included Huskie, Cadet, and Aim, all of which provide effective control of Palmer Amaranth when a timely application is made to less than 4” tall weeds. Keep in mind that both Aim and Cadet will cause some injury to sorghum following application. However, sorghum grows out of it and previous studies have shown no statistical yield loss as a result of it.

Finally, please remember to always read product labels as these labels are often updated with important information regarding their use.

Table 1. Corn Herbicide Demonstration

Experiment #:	PB12-10	**Crop:**	Corn
Location:	Stiles	**Crop variety:**	DKC 68-05RR
Experimental design:	Randomized Complete Block	**Sand/Silt/Clay Percent:**	17/38/45
Plot size:	12.67' x 30'	**Planting Date:**	4-19-12
Number of reps:	3	**Fertility:**	Good
Row width:	38"	**pH:**	7.2
Soil type:	Branyon Clay	**% OM:**	1.75

Application Code	**A**	**B**	**B**
Timing	PRE	MPOST	LPOST
Date applied:	4-19-12	5-24-12	6-01-12
Time:	6:30 PM	5:30 PM	3:00 PM
Air Temp. [°F]:	83°F	92°F	93°F
Soil 4" Temp[°F]:	74°F	82°F	80°F
R. Humidity [%]:	44%	54%	40%
Wind [mph]:	S @ 6.5 mph	S @ 7 mph	SE @ 5 mph
Cloud Cover:	30%	5%	Clear
Dew Presence:	No	No	No
Soil Surface:	Dry	Dry	Dry
Soil Moisture:	Good	Good	Good
Sprayer Type:	Tractor CO_2	Backpack CO_2	Backpack CO_2
Nozzle Size/Type:	8003 DG	9504E w/drop nozzles	9504E w/drop nozzles
Boom Height:	19"	19"	19"
Nozzle Spacing:	19"	19"	19"
GPA/PSI:	15/32	15/38	15/38
Speed [MPH]:	4.0	3.0	3.0

Weed/Crop	**A (Size/Density)**	**B (Size/Density)**	**C (Size/Density)**
Corn (ZEAMX)		V6 (28-34")	42"
Johnson grass (SORHA)		1-3"/ 1/ft^2	24-30"/ 1/ft^2
Palmer Amaranth (AMAPA)		1-3"/ 1-3/ft^2	3-4"/ 1-3/ft^2

Texas A&M AgriLife Extension Service

Corn Herbicide Demonstration

Trial ID: PB12-10 Protocol ID: PB12-10
Location: Stiles Farm Study Director:
Investigator: Dr. Paul A. Baumann

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	1	2	3	4
	Pest Type							W Weed	W Weed	W Weed	W Weed
	Pest Code							PANFA	AMAPA	PANFA	SORHA
	Pest Name							Browntop pa>	Palmer amar>	Browntop pa>	Johnson gra>
	Rating Date							5/24/12	5/24/12	6/18/12	6/18/12
	Rating Data Type							Control	Control	Control	Control
	Rating Unit							Percent	Percent	Percent	Percent
1	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	POST	B	.	.	100.0	95.0
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	POST	B				
	Mesotrione	50	WG	1.25	oz ai/a	POST	B				
	Abundit S	4	SL	32	fl oz/a	POST	B				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	POST	B				
2	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	POST	B	.	.	95.0	95.0
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	POST	B				
	Mesotrione	50	WG	1.25	oz ai/a	POST	B				
	Abundit S	4	SL	32	fl oz/a	POST	B				
	Atrazine 90 DF	90	WG	16	oz ai/a	POST	B				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	POST	B				
3	Cinch ATZ	5.5	EC	0.75	qt/a	PREPRE	A	75.0	100.0	80.0	85.0
	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	LPOST	C				
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	LPOST	C				
	Mesotrione	50	WG	1.25	oz ai/a	LPOST	C				
	Crop Oil (COC)	99	SL	1	% v/v	LPOST	C				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	LPOST	C				
4	Cinch ATZ	5.5	EC	0.75	qt/a	PREPRE	A	80.0	100.0	99.0	99.0
	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	LPOST	C				
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	LPOST	C				
	Mesotrione	50	WG	1.25	oz ai/a	LPOST	C				
	Abundit S	4	SL	32	fl oz/a	LPOST	C				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	LPOST	C				
5	Rimsulfuron (Instigate)	25	SG	0.25	oz ai/a	PREPRE	A	70.0	100.0	98.0	100.0
	Mesotrione	50	WG	2.25	oz ai/a	PREPRE	A				
	Atrazine 4L	4	SL	1.0	lb ai/a	PREPRE	A				
	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	LPOST	C				
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	LPOST	C				
	Mesotrione	50	WG	1.25	oz ai/a	LPOST	C				
	Abundit S	4	SL	32	fl oz/a	LPOST	C				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	LPOST	C				
6	Atrazine 4 L	4	SL	1	qt/a	PRE	A	0.0	100.0	85.0	85.0
	Warrant	3	CS	4	pt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	32	fl oz/a	MPOST	B				
7	Atrazine 4 L	4	SL	1	qt/a	MPOST	B	.	.	100.0	99.0
	Warrant	3	CS	4	pt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	32	fl oz/a	MPOST	B				
8	Atrazine 4 L	4	SL	1	qt/a	PRE	A	98.0	100.0	100.0	100.0
	Warrant	3	CS	4	pt/a	PRE	A				
	Roundup PowerMax	5.5	SL	32	fl oz/a	MPOST	B				
9	Zidua	85	WG	3	oz wt/a	PRE	A	99.0	100.0	100.0	99.0
	Status	56	WG	5	oz wt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	32	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
10	Zidua	85	WG	3	oz wt/a	PRE	A	98.0	100.0	100.0	99.0
	Armezon	2.8	SL	0.75	fl oz/a	MPOST	B				
	Aatrex	4	SL	1	pt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
	MSO	100	EC	1	% v/v	MPOST	B				

Pest Type							W Weed	W Weed	W Weed	W Weed
Pest Code							PANFA	AMAPA	PANFA	SORHA
Pest Name							Browntop pa>	Palmer amar>	Browntop pa>	Johnson gra>
Rating Date							5/24/12	5/24/12	6/18/12	6/18/12
Rating Data Type							Control	Control	Control	Control
Rating Unit							Percent	Percent	Percent	Percent
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code 1	2	3	4
11	Verdict	5.57	EC	18	fl oz/a	PREPRE	A	99.0	100.0	100.0	99.0
	Status	56	WG	5	oz wt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
12	Anthem ATZ	4.5	SE	9	fl oz/a	PREPRE	A	99.0	100.0	100.0	99.0
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
13	Anthem ATZ	4.5	SE	36	fl oz/a	PREPRE	B	97.0	100.0	100.0	98.0
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
14	Balance FLEXX	4	SC	3	fl oz/a	PREPRE	A	100.0	100.0	100.0	90.0
	Atrazine 4L	4	SL	2	pt/a	PREPRE	A				
15	Corvus	4	SC	3	fl oz/a	PREPRE	A	98.0	100.0	100.0	100.0
	Atrazine 4L	4	SL	1	qt/a	PREPRE	A				
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
16	Balance FLEXX	4	SC	3	fl oz/a	PREPRE	A	99.0	100.0	100.0	92.0
	Atrazine 4L	4	SL	2	pt/a	PREPRE	A				
	Capreno	3.45	SC	6	fl oz/a	MPOST	B				
	COC	99	SL	1	% v/v	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
17	Untreated							0.0	0.0	0.0	0.0
18	Bicep II Magnum	5.5	EC	1.3	qt/a	PREPRE	A	.	100.0	.	98.0
	Halex GT	4.38	CS	3.6	pt/a	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
19	Bicep II Magnum	5.5	EC	1.3	qt/a	PREPRE	B	.	100.0	.	97.0
	Sequence	5.25	SC	3	pt/a	MPOST	B				
20	Bicep II Magnum	5.5	EC	1.3	qt/a	PREPRE	B	.	100.0	.	98.0
	Peak 57 WDG	57	WG	0.50	oz wt/a	MPOST	B				
	Touchdown Total	4.17	SL	24	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
21	Bicep II Magnum	5.5	EC	1.0	qt/a	PREPRE	A	.	100.0	.	99.0
	Halex GT	4.38	CS	3.6	pt/a	MPOST	B				
	Aatrex	4	SL	1	qt/a	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
22	Status	56	WG	2.5	oz wt/a	MPOST	B	.	.	.	95.0
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
23	Warrant	3	CS	3	pt/a	MPOST	B	.	.	.	99.0
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
24	Aatrex	4	SL	1.0	qt/a	MPOST	B	.	.	.	100.0
	Peak 57 WDG	57	WG	0.50	oz wt/a	MPOST	B				
	Touchdown Total	4.17	SL	24	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
25	Aatrex	4	SL	1.0	qt/a	MPOST	B	.	.	.	100.0
	Halex GT	4.38	CS	3.6	pt/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
26	Sequence	5.25	SC	3	pt/a	MPOST	B	.	.	.	95.0
	Peak 57 WDG	57	WG	0.50	oz wt/a	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
27	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B	.	.	.	100.0
28	Untreated							.	0.0	.	0.0

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

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Pest Type							W Weed	W Weed	W Weed	W Weed
Pest Code							AMAPA	PANFA	SORHA	AMAPA
Pest Name							Palmer amar>	Browntop pa>	Johnson gra>	Palmer amar>
Rating Date							6/18/12	7/31/12	7/31/12	7/31/12
Rating Data Type							Control	Control	Control	Control
Rating Unit							Percent	Percent	Percent	Percent
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	5	6	7	8
1	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	POST	B	100.0	95.0	92.0	99.0
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	POST	B				
	Mesotrione	50	WG	1.25	oz ai/a	POST	B				
	Abundit S	4	SL	32	fl oz/a	POST	B				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	POST	B				
2	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	POST	B	100.0	90.0	92.0	98.0
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	POST	B				
	Mesotrione	50	WG	1.25	oz ai/a	POST	B				
	Abundit S	4	SL	32	fl oz/a	POST	B				
	Atrazine 90 DF	90	WG	16	oz ai/a	POST	B				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	POST	B				
3	Cinch ATZ	5.5	EC	0.75	qt/a	PREPRE	A	100.0	75.0	80.0	100.0
	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	LPOST	C				
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	LPOST	C				
	Mesotrione	50	WG	1.25	oz ai/a	LPOST	C				
	Crop Oil (COC)	99	SL	1	% v/v	LPOST	C				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	LPOST	C				
4	Cinch ATZ	5.5	EC	0.75	qt/a	PREPRE	A	100.0	95.0	97.0	100.0
	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	LPOST	C				
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	LPOST	C				
	Mesotrione	50	WG	1.25	oz ai/a	LPOST	C				
	Abundit S	4	SL	32	fl oz/a	LPOST	C				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	LPOST	C				
5	Rimsulfuron (Instigate)	25	SG	0.25	oz ai/a	PREPRE	A	100.0	95.0	98.0	100.0
	Mesotrione	50	WG	2.25	oz ai/a	PREPRE	A				
	Atrazine 4L	4	SL	1.0	lb ai/a	PREPRE	A				
	Rimsulfuron (Realm Q)	25	SG	0.30	oz ai/a	LPOST	C				
	Isoxadifen-ethyl	50	WG	0.15	oz ai/a	LPOST	C				
	Mesotrione	50	WG	1.25	oz ai/a	LPOST	C				
	Abundit S	4	SL	32	fl oz/a	LPOST	C				
	Ammonium Sulfate (AMS)	100	GR	2	lb/a	LPOST	C				
6	Atrazine 4 L	4	SL	1	qt/a	PRE	A	100.0	80.0	80.0	100.0
	Warrant	3	CS	4	pt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	32	fl oz/a	MPOST	B				
7	Atrazine 4 L	4	SL	1	qt/a	MPOST	B	100.0	100.0	98.0	100.0
	Warrant	3	CS	4	pt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	32	fl oz/a	MPOST	B				
8	Atrazine 4 L	4	SL	1	qt/a	PRE	A	100.0	97.0	99.0	100.0
	Warrant	3	CS	4	pt/a	PRE	A				
	Roundup PowerMax	5.5	SL	32	fl oz/a	MPOST	B				
9	Zidua	85	WG	3	oz wt/a	PRE	A	100.0	100.0	98.0	100.0
	Status	56	WG	5	oz wt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	32	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
10	Zidua	85	WG	3	oz wt/a	PRE	A	100.0	100.0	97.0	100.0
	Armezon	2.8	SL	0.75	fl oz/a	MPOST	B				
	Aatrex	4	SL	1	pt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
	MSO	100	EC	1	% v/v	MPOST	B				
11	Verdict	5.57	EC	18	fl oz/a	PREPRE	A	100.0	95.0	98.0	100.0
	Status	56	WG	5	oz wt/a	MPOST	B				
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
12	Anthem ATZ	4.5	SE	9	fl oz/a	PREPRE	A	100.0	100.0	97.0	100.0
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				

Texas A&M AgriLife Extension Service

Pest Type							W Weed	W Weed	W Weed	W Weed
Pest Code							AMAPA	PANFA	SORHA	AMAPA
Pest Name							Palmer amar>	Browntop pa>	Johnson gra>	Palmer amar>
Rating Date							6/18/12	7/31/12	7/31/12	7/31/12
Rating Data Type							Control	Control	Control	Control
Rating Unit							Percent	Percent	Percent	Percent
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code 5	6	7	8
13	Anthem ATZ	4.5	SE	36	fl oz/a	PREPRE	B	100.0	100.0	96.0	100.0
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
14	Balance FLEXX	4	SC	3	fl oz/a	PREPRE	A	100.0	98.0	88.0	100.0
	Atrazine 4L	4	SL	2	pt/a	PREPRE	A				
15	Corvus	4	SC	3	fl oz/a	PREPRE	A	100.0	98.0	100.0	100.0
	Atrazine 4L	4	SL	1	qt/a	PREPRE	A				
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
16	Balance FLEXX	4	SC	3	fl oz/a	PREPRE	A	100.0	98.0	90.0	100.0
	Atrazine 4L	4	SL	2	pt/a	PREPRE	A				
	Capreno	3.45	SC	6	fl oz/a	MPOST	B				
	COC	99	SL	1	% v/v	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
17	Untreated							0.0	0.0	0.0	0.0
18	Bicep II Magnum	5.5	EC	1.3	qt/a	PREPRE	A	100.0	.	97.0	100.0
	Halex GT	4.38	CS	3.6	pt/a	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
19	Bicep II Magnum	5.5	EC	1.3	qt/a	PREPRE	B	100.0	.	95.0	100.0
	Sequence	5.25	SC	3	pt/a	MPOST	B				
20	Bicep II Magnum	5.5	EC	1.3	qt/a	PREPRE	B	100.0	.	97.0	100.0
	Peak 57 WDG	57	WG	0.50	oz wt/a	MPOST	B				
	Touchdown Total	4.17	SL	24	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
21	Bicep II Magnum	5.5	EC	1.0	qt/a	PREPRE	A	100.0	.	98.0	100.0
	Halex GT	4.38	CS	3.6	pt/a	MPOST	B				
	Aatrex	4	SL	1	qt/a	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
22	Status	56	WG	2.5	oz wt/a	MPOST	B	95.0	.	90.0	90.0
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
23	Warrant	3	CS	3	pt/a	MPOST	B	99.0	.	97.0	96.0
	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B				
24	Aatrex	4	SL	1.0	qt/a	MPOST	B	100.0	.	92.0	99.0
	Peak 57 WDG	57	WG	0.50	oz wt/a	MPOST	B				
	Touchdown Total	4.17	SL	24	fl oz/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
25	Aatrex	4	SL	1.0	qt/a	MPOST	B	100.0	.	100.0	100.0
	Halex GT	4.38	CS	3.6	pt/a	MPOST	B				
	AMS	100	GR	8.5	lb/100 gal	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
26	Sequence	5.25	SC	3	pt/a	MPOST	B	100.0	.	90.0	99.0
	Peak 57 WDG	57	WG	0.50	oz wt/a	MPOST	B				
	NIS	100	EC	0.25	% v/v	MPOST	B				
27	Roundup PowerMax	5.5	SL	22	fl oz/a	MPOST	B	99.0	.	95.0	99.0
28	Untreated							0.0	.	0.0	0.0
LSD (P=.05)							.	.	.	.
Standard Deviation							.	.	.	.
CV							.	.	.	.
Bartlett's X2							.	.	.	.
P(Bartlett's X2)							.	.	.	.

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

Table 2. Sorghum Herbicide Demonstration

Experiment #:	PB12-13	**Crop:**	Sorghum
Location:	Stiles	**Crop variety:**	DKS-53-67
Experimental design:	Randomized Complete Block	**Sand/Silt/Clay Percent:**	17/38/45
Plot size:	12.67' x 100'	**Planting Date:**	4-19-12
Number of reps:	1	**Fertility:**	Good
Row width:	38"	**pH:**	7.2
Soil type:	Branyon Clay	**% OM:**	1.75

Application Code	**A**	**B**
Timing	PRE	POST
Date applied:	4-19-12	6-01-12
Time:	6:30 PM	4:00 PM
Air Temp. [°F]:	83°F	93°F
Soil 4" Temp[°F]:	74°F	82°F
R. Humidity [%]:	44%	54%
Wind [mph]:	S @ 6.5 mph	S @ 4 mph
Cloud Cover:	30%	5%
Dew Presence:	No	No
Soil Surface:	Dry	Dry
Soil Moisture:	Good	Good
Sprayer Type:	Tractor CO_2	Backpack CO_2
Nozzle Size/Type:	8003 DG	9504E w/drop nozzles
Boom Height:	19"	19"
Nozzle Spacing:	19"	19"
GPA/PSI:	15/32	15/38
Speed [MPH]:	4.0	3.0

Weed/Crop	**A**	**B**
	(Size/Density)	**(Size/Density)**
Grain Sorghum (SORVU)		(30")
Palmer Amaranth (AMAPA)		3-4"/ 1-3/ft^2

Texas A&M AgriLife Extension Service

Sorghum Herbicide Demonstration

Trial ID: PB12-13 Protocol ID: PB12-13
Location: Stiles Farm Study Director:
Investigator: Dr. Paul A. Baumann

Pest Type								W Weed	W Weed	W Weed
Pest Code								AMAPA	AMAPA	AMAPA
Pest Name								Palmer amar>	Palmer amar>	Palmer amar>
Rating Date								5/24/12	6/18/12	7/31/12
Rating Data Type								Control	Control	Control
Rating Unit								Percent	Percent	Percent
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	1	2	3
1	Atrazine	4	L	1	qt/a	PRE	A	100.0	100.0	100.0
	Warrant	3	CS	4	pt/a	PRE	A			
	Huskie	2.14	EC	16	fl oz/a	POST	B			
	AMS	100	SG	1	lb/a	POST	B			
2	Atrazine	4	L	1	qt/a	PRE	A	100.0	95.0	95.0
	Huskie	2.14	EC	16	fl oz/a	POST	B			
	AMS	100	SG	1	lb/a	POST	B			
3	Dual Magnum	7.62	EC	1.33	pt/a	PRE	A	100.0	100.0	100.0
	Cadet	0.91	EC	0.90	fl oz/a	POST	B			
	NIS	100	EC	0.25	% v/v	POST	B			
4	Dual Magnum	7.62	EC	1.33	pt/a	PRE	A	100.0	100.0	100.0
	Aim	2	EC	0.50	fl oz/a	POST	B			
	NIS	100	EC	0.25	% v/v	POST	B			
5	Dual Magnum	7.62	EC	1.33	pt/a	PRE	A	100.0	100.0	100.0
	Huskie	2.14	EC	16	fl oz/a	POST	B			
	AMS	100	SG	1	lb/a	POST	B			
6	Dual Magnum	7.62	EC	1.33	pt/a	PRE	A	100.0	99.0	99.0
7	Cinch ATZ	5.5	EC	1.6	pt/a	PRE	A	100.0	100.0	100.0
8	Untreated							0.0	0.0	0.0
LSD (P=.05)								.	.	.
Standard Deviation								.	.	.
CV								.	.	.
Bartlett's X2								.	.	.
P(Bartlett's X2)								.	.	.

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

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