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Cotton Research Report

2015

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VII. Extras

I. Cotton Variety Trials

Breeding Cotton for Yield and Quality in Alabama

D. B. Weaver

Continuous cotton breeding has been conducted at Auburn University since 2001. In 2015 cultivar development efforts have been put temporarily on hold, as personnel changes precluded the large-scale field-testing requirements. All experimental populations and breeding materials were safely held in cold storage during 2015 with the intention of resuming these efforts in 2016. Other research efforts continued, starting with our continued participation in the Regional Breeders Testing Network (RBTN) where we moved our Alabama testing location from the Plant Breeding Unit (Tallassee) to the Prattville Experiment Field. In the RBTN we evaluated 23 elite breeding lines for yield, agronomic traits and fiber quality traits against 5 adapted cultivars. A summary of the data we collected is presented in Table 1.

We completed the final year of evaluation of the Ren^{barb2} Quantitative Trait Locus (QTL) as a gene for resistance to reniform nematode. In nematode infested fields, lines with the Ren^{barb2} QTL yielded 240 kg ha^{-1} (about 214 lbs lint per acre) more than susceptible lines, a yield advantage of 29% more than susceptible lines. However in a nematode-free field lines with the Ren^{barb2} QTL yielded 10% less than lines without the QTL, so there is still a significant yield drag associated with the gene. Effects on fiber quality were minimal, but resistant lines with the QTL had 0.5 mm (about 0.13 inches) shorter fiber on average. A summary of a three-year effort to compare several sources of reniform resistance in the same field showed that lines deriving their resistance from *G. barbadense* (including BARBREN-713) had less yield loss in the nematode-infested field than other resistance sources. We are continuing to develop lines with introgressed genes from the BARBREN-713 source of resistance, as well as lines from the M713 series of germplasm releases. These are now at the F2:4 stage and are being evaluated for resistance to reniform. Field testing will follow. We have also continued to work on methods of evaluating cotton genotypes for resistance to target spot (caused by *Corynespora cassiicola*). Greenhouse testing of inoculum level revealed that concentrations of 1×10^3 and 1×10^4 conidia ml^{-1} were better at discriminating among genotypes of known field reaction than higher inoculum levels. Disease reaction could be measured as early as 12 days following inoculation.

Table 1. Data summary of line performance, Regional Breeders Testing Network, Prattville, AL 2015.

Entry	Lint		Micro-naire	Length	Unifor-mity	Strength	Elonga-tion	Short Fiber	QS1	Q2
Name	Yield	Turnout							50-25-10-15	10-10-30-50
Entry	(lbs/acre)	(%)	MIC	UHM	UI	STR	ELO	SFC %		
0043-28 -1	1123	42.6	5.1	1.12	83.9	31.5	6.0	7.4	39.8	57.3
0045-14 -5	1025	40.4	4.7	1.12	84.5	31.8	5.2	7.3	49.5	63.8
PD 07092	1049	39.8	4.5	1.23	86.1	37.1	5.5	6.6	84.5	87.5
PD 07116	875	39.1	4.8	1.19	84.7	35.5	4.6	7.3	68.3	72.0
PD 07105	842	37.5	4.5	1.23	84.7	35.9	4.7	7.3	84.0	76.5
PD 07040	893	39.2	4.4	1.19	84.3	33.1	5.6	7.3	70.5	67.8
Ark 0711-2	1118	41.9	5.0	1.17	85.4	33.8	4.9	7.2	60.5	70.3
Ark 0705-46	1289	42.6	5.0	1.13	84.5	32.0	6.2	7.2	46.5	63.3
Ark 0712-9	829	41.4	5.0	1.19	83.4	30.2	5.9	8.0	61.3	59.3
Ark 0701-17	1276	42.8	4.8	1.15	84.3	31.5	5.5	7.9	54.5	63.8
Ark 0707-33	1083	42.6	4.6	1.15	85.6	31.9	7.1	6.9	59.5	72.5
NM 13P1088	803	37.5	4.4	1.15	85.3	35.8	6.0	6.8	63.0	75.8
NM 13W3017	671	37.0	4.6	1.19	85.3	34.7	4.4	7.1	73.5	76.8
NM 13W3007	987	38.3	4.6	1.22	85.9	36.1	5.2	6.9	82.8	83.5
Acala 1517-08	918	38.4	4.5	1.19	85.3	37.2	5.5	6.8	74.5	81.3
GA 2010102	1024	40.7	5.0	1.18	85.3	36.1	5.1	6.9	62.5	74.8
GA 2011124	1115	43.6	5.1	1.12	83.5	31.5	6.0	7.1	39.0	54.8
GA 2011004	1200	45.5	4.8	1.17	84.8	32.6	6.1	7.0	62.0	69.0
LA12306010	1024	40.3	4.5	1.21	85.1	34.8	5.5	7.1	77.8	75.8
LA12306017	1022	40.7	4.9	1.19	85.5	35.7	5.6	6.8	68.8	76.8
LA12306028	1062	39.8	4.5	1.22	85.6	36.5	5.8	6.8	83.3	83.5
0042-3 -7	1028	39.8	4.3	1.18	84.4	31.9	5.8	7.4	68.8	68.0
0045-14 -8	954	40.6	5.0	1.13	84.9	33.9	5.4	7.3	47.8	66.0
DP 393	1211	42.7	4.9	1.14	84.6	32.9	6.6	7.1	51.0	64.5
SG 105	1090	39.8	5.0	1.14	85.2	31.9	5.5	7.1	49.3	67.0
FM 958	1051	41.9	5.0	1.14	83.8	33.4	4.8	7.7	49.3	61.8
UA 222	1085	41.9	4.5	1.20	85.1	33.4	6.7	7.0	75.5	73.0
DP 491	967	42.2	4.5	1.17	84.2	33.4	5.1	7.5	65.0	66.5

II. Cultural Management

"Continued Support of Long-term Research THE OLD ROTATION"

C. Mitchell, D. Delaney, and K. Balkcom

The "Old Rotation" experiment (circa 1896) is the oldest, continuous cotton study in the world and the third oldest field crops experiment in the U.S. on the same site. With all the renewed interest in "cover crops", we are now claiming that this may be the oldest "cover crop" study in the U.S. We were invited to do presentations and posters at the International Symposium on Soil and Plant Analysis in Kona, HI, in February, at the Soil and Water Conservation Society of America annual meeting in Greensboro, NC, in July, and at the annual Soil Sci. Soc. America meetings in Minneapolis, MN, in November. It is beginning to get more international attention. Many students are using this study for special-problem research and soils from the Old Rotation have been shared with researchers in Ohio, Louisiana and Texas. The Old Rotation is the basis for the soil quality project being conducted.

Corn and cotton yields reflect N availability more than any other factor. There was a response to irrigation in 2015 by cotton, corn and soybean. Wheat always follows corn and soybean is double-cropped behind wheat.

Six soil moisture monitors were installed and monitored in 2015 which resulted in an estimated 50% reduction in total irrigation. A camera was installed in June so visitors to the Old Rotation web site can actually view a live image of crops growing on the Old Rotation. http://cses.auburn.edu/old-rotation/live-cam/

Crop yields on the OLD ROTATION in 2014.										
Plot No.	Description	Vetch dry matter* (lb/a)		Wheat (bu/a)	Corn (bu/acre)		Cotton lint (lb/acre)		Soybean (bu/acre)	
		Irrigated	Non-irrigated		Irrigated	Non-irrigated	Irrigated	Non-irrigated	Irrigated	Non-irrigated
1	no N/no legume	0	0				817	441		
2	winter legume	2128	2220				1849	1633		
3	winter legume	1684	3538				2131	1605		
4	cotton-corn	2689	2901		219.3	193.2				
5	cotton-corn + N	2393	1394		245.3	232.5				
6	no N/no legume	0	0				620	498		
7	cotton-corn	2886	1908				2131	1793		
8	winter legume	1920	3082				2384	1793		
9	cotton-corn + N	2499	2005				1990	1868		
10	3-year rotation	1833	1891		247.9	200.0				
11	3-year rotation	0	0	53*					57.6	47.1
12	3-year rotation	0	0				1399	1061		
13	cont. cotton/no legume +N	0	0				1708	1765		
	Mean	2254	2367		237.5	208.6	1942	1645		
*Winter legume and wheat ares not irrigated. Average total N fixed by legume is 60 lb. N/acre.										

"Continued Support of Long-term Research

CULLARS ROTATION"

C. Mitchell, D. Delaney, and K. Balkcom

The Cullars Rotation (circa 1911) is the oldest, continuous soil fertility study in the Southern U.S. This study is non-irrigated and yields reflect growing conditions during the season. Note the dramatic yield response to added K by cotton. Highest cotton yields (1580 lb. lint/acre) were produced on the treatment receiving a complete fertilizer plus micronutrients (boron). No added P (Plot 2) dramatically reduces wheat and corn yields more than cotton yields. Soybean yields are equally affected by P and K deficiencies. All P and K fertilizers are applied to the cotton and wheat crops. Corn receives 120 lb. N/acre in addition to the fixed N by the winter legume cover crop. Wheat is top dressed in late winter with 80 lb. N/acre. The Cullars Rotation Experiment is an excellent site to see dramatic nutrient deficiencies compared to healthy crops each year. This type of comparison does not exist anywhere else in the USA.

Both oral and poster presentations were made at the International Symposium on Soil and Plant Analysis in Kona, HA in February, at the Soil and Water Conservation Society of America annual meeting in Greensboro, NC, in July, and at the annual Amer. Soc. Agronomy meetings in Minneapolis, MN, in November. Numerous national and international groups were hosted and this experiment and 3 A.U. classes visited the site in 2015.

Crop yields on the CULLARS ROTATION in 2015.

Plot	Treatment description	Vetch/clover dry wt.		Wheat	Corn	Cotton lint	Soybean
		-lb/acre-	Total N fixed (lb/a)	-bu/acre-	-bu/acre-	-lb/acre-	-bu/acre-
A	no N/+legume	2129	55	8.9	103.0	976	55.1
B	no N/no legume	0	0	6.9	48.3	826	53.5
C	Nothing added	0	0	0.4	10.6	0	0.0
1	no legume	0	0	25.9	176.2	1502	45.0
2	no P	1361	35	30.5	81.1	601	35.0
3	complete	2125	55	31.7	140.4	1493	49.4
4	4/3 K	3039	79	34.4	180.0	1361	49.1
5	rock P	2510	65	32.3	168.3	1389	52.2
6	no K	912	24	23.0	22.3	47	22.8
7	2/3 K	2244	58	30.6	163.0	1371	55.0
8	no lime (pH~4.9)	0	0	5.7	0.0	84	3.9
9	no S	2387	62	32.4	172.1	1230	54.8
10	complete+ micros	2644	69	28.5	164.5	1577	61.1
11	1/3 K	1932	50	34.2	127.2	638	50.6
	Mean of all treatments	2280	59	30.8	155.0	1303	52.6

III. Disease Management

Fungicide Seed Treatments for Control of *Rhizoctonia solani* in Upland cotton in Alabama, 2015

S. Till and K.S. Lawrence

New fungicides from Bayer CropScience, along with one experimental, were evaluated in various combinations for the ability to control damping off in cotton at the Tennessee Valley Research and Education Center in Belle Mina, AL. The soil is a Decatur silt loam (24% sand, 28% clay, and 49% silt). Seed treatments were applied by Bayer CropScience to Stoneville 4946 GLB2. Seed were sowed on 5 May. Plots consisted of 4 rows, 7 m long with 1 m row spacing and were arranged in a randomized complete block design with five replications. Two rows were inoculated with *Rhizoctonia solani* at 10g/foot of row and the other 2 were untreated. Blocks were separated by a 6 m wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Plant stand and vigor were counted and rated at 22 DAP for both inoculated and non-inoculated rows in each plot. Plots were harvested on 20 Oct. and data were subjected to analysis of variance in SAS 9.4 (SAS Institute Inc.) and means compared using Tukey Kramer with $P \leq 0.05$. Monthly average maximum temperatures from planting to harvest (May through October) were 27.9, 32.3, 33.1, 31.2, 29.3, and 24.2 °C with average minimum temperatures of 15.6, 20.7, 22.1, 19.8, 17.2, and 10.9°C, respectively. Rainfall accumulation for each month was 11.7, 8.8, 10.6, 5.5, 2.5 and 5.6 cm with a total of 44.7 cm over the entire season.

The fungicide treatments AB0271473 (3) alone or combined with Evergol Prime (4), or Evergol Xtend (6) and combined with Evergol Prime + Evergol Xtend (7) and Proline 480 SC + Evergol Energy (5) all increased plant stand over the Gaucho control (1) in the natural plots. When enhanced with *R. solani*, the combination fungicides AB0271473 combined with Evergol Prime (4), or Evergol Xtend (6) and Proline 480 SC + Evergol Energy (5), and AB0271473 + Evergol Prime + Isotianil (8) all increased plant stand over the Gaucho control (1). The stand count and the final yield indicated that the rows inoculated with *R. solani* had a negative effect on seedling emergence and final yield. The highest yield was the AB0271473 and Evergol Prime combination (4) in both situations (natural and inoculated). The fungicide combination of AB0271473 + Evergol Prime (4) was significantly greater in yield than Proline 480 SC + Evergol Energy (5), AB0271473 + Evergol Xtend (6), and AB0271473 + Evergol Prime + Isotianil (8) in the natural rows, and AB0271473 + Evergol Prime + Isotianil (8) in the inoculated rows.

Table 1: Fungicide Seed Treatment Results for Control of *Rhizoctonia solani*						
No.	Treatment[z]	Rate	22 DAP		168 DAP	
			Stand		Seed cotton (kg/ha)	
			Natural[y]	Inoculated[xy]	Natural	Inoculated[x]
1	Gaucho 600 FS	0.375 mg ai/seed	76.0 b[w]	62.0 b	4398.6 ab	4025.0 ab
2	Spera	54.8 ml/100kg seed	83.0 ab	75.3 a	3907.7 abc	3826.8 ab
	Allegiance FL	48.9 ml/100kg seed				
3	AB0271473	5 g ai/100kg seed	90.8 a	70.3 ab	4178.7 ab	3863.8 ab
4	AB0271473	5 g ai/100kg seed	89.3 a	76.5 a	4691.9 a	4083.7 a
	Evergol Prime	5 g ai/100kg seed				
5	Proline 480 SC	5 g ai/100kg seed	87.0 a	74.5 a	3673.1 bc	3650.8 ab
	Evergol Energy	130 ml/100kg seed				
6	AB0271473	5 g ai/100kg seed	87.5 a	75.3 a	3709.5 bc	3819.7 ab
	Evergol Xtend	65.2 ml/100kg seed				
7	AB0271473	5 g ai/100kg seed	91.3 a	67.5 ab	4347.6 ab	3849.1 ab
	Evergol Prime	5 g ai/100kg seed				
	Evergol Energy	130 ml/100kg seed				
8	AB0271473	5 g ai/100kg seed	84.3 ab	75.0 a	3211.0 c	3335.9 b
	Evergol Prime	5 g ai/100kg seed				
	Isotianil	50 g ai/100kg seed				

[z]Gaucho 600 FS was used in every treatment at the same rate; Spera and Allegiance FL were used in all treatments except Trt 1 at the same rate.
[y]Stand count of plants per 20 ft. of row (100 seeds per row).
[x]Plots were artificially infested with *Rhizoctonia solani* (10 g/row foot)
[w]Means followed by the same letter do not significantly differ according to Tukey-Kramer method ($P \leq 0.05$).

Cotton Seed Treatment Combinations for Maximization of Yield in North Alabama, 2015.

W. Groover and K.S. Lawrence

Gaucho 600 FS, Proline 480 SC, Allegiance FL, Spera, Evergol Prime, Aeris Seed Applied System, Poncho/Votivo, and three experimental compounds were evaluated for yield maximization on cotton. This test was planted in the field at the Tennessee Valley Research and Extension Center near Belle Mina, Alabama. The soil type is Decatur silt loam, which contains 24% sand, 49% silt, 11% clay and 1% organic matter. Seed treatments were applied by Bayer Crop Science to variety ST 4747 GLB2. Seed treatments were applied pre planting, and planting occurred on 5 May. Plots consisted of 4 rows, 7 meters long with 1 meter row spacing. Seed was planted at 2.54 cm depth. The plots were arranged in a randomized complete block design with five replications of each treatment and a 6 meter wide alley. All plots were maintained as recommended via the Alabama Cooperative Extension System with typical pesticide and fertility production practices. Plant stand and vigor data was collected at 22 days post emergence. Only living plants were included in stand counts for data collection. After harvest on 8 October at 156 DAP, data was statistically analyzed by SAS 9.4 (SAS Institute Inc.) and means were compared using Tukey-Kramer with $P \leq 0.05$. Monthly average maximum temperatures from planting in May through harvest in October were 27.9, 32.3, 33.1, 31.2, 29.3, and 24.2°C with average minimum temperatures of 15.6, 20.7, 22.1, 19.8, 17.2, and 10.9°C, respectively. Rainfall accumulation for each month was 11.7, 8.8, 10.6, 5.5, 2.5, and 5.6 cm, respectively.

2015 was a productive year in north Alabama for cotton production. Adequate rainfall was recorded through May, June, and July, but dropped off through August and September. Temperatures did not consistently rise over 38°C, so this season was relatively normal for heat. Plant stands ranged from 76 to 85 plants per 7 meters of row with combination of Gaucho + Poncho/Votivo + L 2082 A (8), supporting more plants per plot than Aeris alone (2) or Aeris + L 2077 A (3). Plant vigor was best in the Gaucho (1) insecticide treatment compared to the combination of the Gaucho + Poncho/Votivo + L 2082 A (8). The combination of Gaucho + Poncho/Votivo + L 2082 A (8) supported the greatest seed cotton yield, which was greater than the Gaucho (1) control and the three Aeris treatment combinations (2, 3, and 4). Gaucho + Poncho/Votivo + L 2082 A (8) treatment increased yield over the Aeris and Gaucho alone treatments by 521 kg/ha which would be a $135/ha increase in gross profits

Table 1: Cotton Yields of Various Treatments in North Alabama, 2015					
No.	Treatment[z]	Rate	22 DAP Stand[y]	22 DAP Vigor[x]	156 DAP kg/hectare
1	Gaucho 600 FS	0.375 mg ai/seed	79 ab[w]	3.6 a	4587 b
2	Aeris Seed Applied System	0.75 mg ai/seed	76 b	3.2 ab	4452 b
3	Aeris Seed Applied System	0.75 mg ai/seed			
	L 2077 a	0.3 ml/1000 seed	76 b	3 ab	4631 b
4	Aeris Seed Applied System	0.75 mg ai/seed			
	L 2080 A	0.3 ml/1000 seed	84 ab	3 ab	4587 b
5	Aeris Seed Applied System	0.75 mg ai/seed			
	L 2082 A	0.3 ml/1000 seed	77 ab	3.4 a	4338 b
6	Gaucho 600 FS	0.375 mg ai/seed			
	Poncho/Votivo	0.424 mg ai/seed	83 ab	3 ab	4717 ab
7	Gaucho 600 FS	0.375 mg ai/seed			
	Poncho/Votivo	0.424 mg ai/seed			
	L 2077 A	0.3 ml/1000 seed	83 ab	3 ab	4725 ab
8	Gaucho 600 FS	0.375 mg ai/seed			
	Poncho/Votivo	0.424 mg ai/seed			
	L 2082 A	0.3 ml/1000 seed	85 a	2.6 b	5040 a

[z] All treatments included Proline 480 SC at 5 g ai/100kg, Allegiance FL at 7.5 g ai/100 kg, Spera at 27 g ai/100kg, and Evergol Prime at 5 g ai/100kg.
[y] Stand was the number of seedlings in 7 meters of row.
[x] Vigor ratings from 1 to 5 with 1 being the worst and 5 the best.
[w] Column numbers followed by the same letter are not significantly different at $P \le 0.05$ as determined by Tukey's multiple-range test.

Seed Treatment Combinations in Cotton for Increase of Yield in North Alabama, 2015.

W. Groover and K.S. Lawrence

Gaucho 600 FS, Proline 480 SC, Allegiance FL, Spera, Evergol Prime, Aeris Seed Applied System, Poncho/Votivo, and three experimental compounds were compared for plant responses on cotton in the field at the Tennessee Valley Research and Extension Center near Belle Mina, Alabama. The soil type is Decatur silt loam, which contains 24% sand, 49% silt, 11% clay and 1% organic matter. Seed treatments were applied pre planting by Bayer Crop Science to variety ST 4946 GLB2, and planting occurred on 5 May. Plots consisted of 4 rows, 7 meters long with 1 meter row spacing. Seed was planted at 2.54 cm depth, and the plots were arranged in a randomized complete block design with five replications of each treatment with a 6 meter wide alley. Typical pesticide and fertility production practices were used for the maintenance and upkeep of the plots as recommended by the Alabama Cooperative Extension System. At 22 days post emergence, plant stand and vigor data were collected. Only living plants were included in stand counts for data collection. Harvest occurred on 8 October. Data was statistically analyzed by SAS 9.4 (SAS Institute Inc.) and means were compared using Tukey-Kramer with $P \leq 0.1$. Monthly average maximum temperatures from planting in May through harvest in October were 27.9, 32.3, 33.1, 31.2, 29.3, and 24.2°C with average minimum temperatures of 15.6, 20.7, 22.1, 19.8, 17.2, and 10.9°C, respectively. Rainfall accumulation for each month was 11.7, 8.8, 10.6, 5.5, 2.5, and 5.6 cm, respectively.

Cotton yields were good during the 2015 growing season of north Alabama. Adequate rainfall was recorded through May, June, and July, but dropped off through August and September. Temperatures did not consistently rise over 38°C, so this season was around average for temperature highs. Plant stands averaged from 11 to 12 plants per meter of row, which is within the optimal range for cotton stand. Plant vigor centered around 4 for all treatments, leading to no statistical differences as well. While there were no significant differences in yield, the highest yield of Aeris (2) alone produced a 6% higher yield than the Gaucho (1) control.

Table 1: Cotton Yields of Various Treatments in North Alabama, 2015					
No.	Treatment[z]	Rate	22 DAP Stand[y]	22 DAP Vigor[x]	156 DAP kg/hectare
1	Gaucho 600 FS	0.375 mg ai/seed	79 a[w]	4 a	3542 a
2	Aeris Seed Applied System	0.75 mg ai/seed	85 a	3.8 a	3765 a
3	Aeris Seed Applied System	0.75 mg ai/seed			
	L 2077 a	0.3 ml/1000 seed	81 a	4 a	3592 a
4	Aeris Seed Applied System	0.75 mg ai/seed			
	L 2080 A	0.3 ml/1000 seed	76 a	4 a	3712 a
5	Aeris Seed Applied System	0.75 mg ai/seed			
	L 2082 A	0.3 ml/1000 seed	80 a	3.8 a	3706 a
6	Gaucho 600 FS	0.375 mg ai/seed			
	Poncho/Votivo	0.424 mg ai/seed	81 a	4.2 a	3486 a
7	Gaucho 600 FS	0.375 mg ai/seed			
	Poncho/Votivo	0.424 mg ai/seed			
	L 2077 A	0.3 ml/1000 seed	87 a	4 a	3621 a
8	Gaucho 600 FS	0.375 mg ai/seed			
	Poncho/Votivo	0.424 mg ai/seed			
	L 2082 A	0.3 ml/1000 seed	79 a	3.8 a	3621 a

[z] All treatments included Proline 480 SC at 5 g ai/100kg, Allegiance FL at 7.5 g ai/100 kg, Spera at 27 g ai/100kg, and Evergol Prime at 5 g ai/100kg.
[y] Stand was the number of seedlings in 7 meters of row.
[x] Vigor ratings from 1 to 5 with 1 being the worst and 5 the best.
[w] Column numbers followed by the same letter are not significantly different at $P \leq 0.1$ as determined by Tukey's multiple-range test.

Seed Treatments on Total Plant Health in Cotton to Increase Yield in North Alabama, 2015

N. Xiang and K.S. Lawrence

Gaucho 600 FS, Spear, Vortex FL, Allegiance FL, Evergol Prime, Votivo 240FS, and a new experimental compound were evaluated for the plant health on cotton in the field at Tennessee Valley Research and Education Center in Belle Mina, AL. The soil is a Decatur silt loam (24% sand, 28% clay, and 49% silt). Seed treatments were applied to Stoneville 4747 GLB2 by Bayer Crop Science. Plots consisted of 4 rows, 7 m long with 1 m row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 6 m wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Plant stand and vigor were counted and rated at 22 DAP. Cotton yield were harvested on 8 Oct at 156 DAP. Data were analyzed in SAS 9.4 by Proc Glimmix procedure with significant level $P \leq 0.10$. Monthly average maximum temperatures from planting in May through harvest in October were 27.9, 32.3, 33.1, 31.2, 29.3, and 24.2 °C with average minimum temperatures of 15.6, 20.7, 22.1, 19.8, 17.2, and 10.9 °C, respectively. Rainfall accumulation for each month was 11.7, 8.8, 10.6, 5.5, 2.5 and 5.6 cm with a total of 44.7 cm over the entire season.

The 2015 had ideal environmental conditions for cotton growth. The rainfall was adequate in May, June, and July but became limited through the remainder of the season. Temperatures did not reach the 100’s thus this season was more normal for heat units. Plant stand among all treatments ranged from 70 to 92 plants per 7 m of row at 22 DAP. The experimental products Spera+Gaucho 600 FS (Trt 2) and Spera+Gaucho 600 FS+SP102000030742 (Trt 5) significantly increased stand compared to the Gaucho+SP102000030742 (Trt 3 & 6) and Gaucho 600 FS+Votivo 240 FS (Trt 7). Plant vigor was similar among all the treatments. Seed cotton yields were very good and were not different ($P \leq 0.10$) but did vary by 420 kg/ha across all treatments. Spera+Gaucho 600 FS+SP102000030742 (Trt 4) increased seed cotton yield ranked the first followed by Spera+Gaucho 600 FS+SP102000030742 high rate (Trt 5) for seed yield at 156 DAP. Overall, the seed treatments performed better on Stoneville 4747 GLB2 than Stoneville 4946 GLB2 in early plant growth and seed cotton yield.

Table 1. Effects of seed treatments on plant health in cotton					
No.	Treatment and rate[y]		22 DAP	22 DAP	156 DAP
			Stand[z] / 7 m row	Vigor[w]	Seed Cotton kg/ha
1	Gaucho 600 FS	0.375 mg ai/seed	77.8 ab[x]	4.0	4393.5
2	Spera	54.8 ml/100 kg	92.2 a	3.8	4367.0
	Gaucho 600 FS	0.375 mg ai/seed			
3	Gaucho 600 FS	0.375 mg ai/seed	71.2 b	3.8	4214.3
	SP102000030742	1 miu/seed			
4	Spera	54.8 ml/100 kg	79.6 ab	4.0	4537.4
	Gaucho 600 FS	0.375 mg ai/seed			
	SP102000030742	1 miu/seed			
5	Spera	54.8 ml/100 kg	86 a	3.8	4446.3
	Gaucho 600 FS	0.375 mg ai/seed			
	SP102000030742	2 miu/seed			
6	Gaucho 600 FS	0.375 mg ai/seed	69.8 b	3.8	4270.1
	SP102000030742	2 miu/seed			
7	Gaucho 600 FS	0.375 mg ai/seed	71.6 b	4.0	4117.4
	Votivo 240FS	1 miu/seed			
8	Spera	54.8 ml/100 kg	82.8 ab	4.0	4390.5
	Gaucho 600 FS	0.375 mg ai/seed			
	Votivo 240FS	1 miu/seed			
	LSD ($P \leq 0.10$)		0.0006	0.7805	0.7703

[Y]Nematicide means treatments 2, 4, 5, and 8 including 5.5 ml/100 kg of Vortex FL, 48.9 ml/10kg of Allegiance FL, and Evergol Prime 5 g ai/100 kg.

[z]Stand was the number of seedlings in 7 meters of row.

[x]Means followed by the same letter do not significantly differ according to Tukey's method ($P \leq 0.10$).

[w]Vigor ratings from 1 to 5 with 5 being the best and 1 the worst.

Cotton Plant Responses to Seed Treatment in Yield Enhancement in North Alabama, 2015

N. Xiang and K.S. Lawrence

Gaucho 600 FS, Spear, Vortex FL, Allegiance FL, Evergol Prime, Votivo 240FS, and a new experimental compound were evaluated for cotton plant responses in the field at Tennessee Valley Research and Education Center in Belle Mina, AL. The soil is a Decatur silt loam (24% sand, 28% clay, and 49% silt). Seed treatments were applied to Stoneville 4946 GLB2 by Bayer Crop Science. Plots consisted of 4 rows, 7 m long with 1 m row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 6 m wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Plant stand and vigor were counted and rated at 22 DAP. Cotton yield were harvested on 8 Oct at 156 DAP. Data were analyzed in SAS 9.4 by Proc Glimmix procedure with significant level $P \leq 0.10$. Monthly average maximum temperatures from planting in May through harvest in October were 27.9, 32.3, 33.1, 31.2, 29.3, and 24.2°C °C with average minimum temperatures of 15.6, 20.7, 22.1, 19.8, 17.2, and 10.9°C, respectively. Rainfall accumulation for each month was 11.7, 8.8, 10.6, 5.5, 2.5 and 5.6 cm with a total of 44.7 cm over the entire season.

The 2015 had ideal environmental conditions for cotton growth. The rainfall was adequate in May, June, and July but became limited through the remainder of the season. Temperatures did not reach the 100's thus this season was more normal for heat units. Plant stand ranged from 56 to 86 plants per 7 m of row at 22 DAP. The experimental products Spera+Gaucho 600 FS+Votivo 240 FS (Trt 8), Spera+Gaucho 600 FS (Trt 2), Spera+Gaucho 600 FS +SP102000030742 (Trt 5) significantly increased plant stand compared to Gaucho+SP102000030742 (Trt 6) and Gaucho 600 FS+Votivo 240 FS (Trt 7). Plant vigor was similar among all the treatments. Seed cotton yields were not statistically different but varied by 534.5 kg/ha across all treatments. Spera+Gaucho 600 FS (Trt 5) increased seed cotton yield ranked the first followed by Gaucho 600 FS+SP102000030742 (Trt 3) for seed cotton yield at 156 DAP.

Table 1. Effects of seed treatments on early plant growth and yield enhancement in cotton				
No.	Treatment and rate[y]	22 DAP	22 DAP	156 DAP
		Stand[z]/7 m row	Vigor[w]	Seed cotton kg/ha
1	Gaucho 600 FS 0.375 mg ai/seed	64 bc[x]	4	3999.9
2	Spera 54.8 ml/100 kg	81 a	3.8	4102.7
	Gaucho 600 FS 0.375 mg ai/seed			
3	Gaucho 600 FS 0.375 mg ai/seed	71 abc	3.4	4308.3
	SP102000030742 1 miu/seed			
4	Spera 54.8 ml/100 kg	80 ab	3.8	3982.3
	Gaucho 600 FS 0.375 mg ai/seed			
	SP102000030742 1 miu/seed			
5	Spera 54.8 ml/100 kg	81 a	3.6	4378.8
	Gaucho 600 FS 0.375 mg ai/seed			
	SP102000030742 2 miu/seed			
6	Gaucho 600 FS 0.375 mg ai/seed	61 c	4	3844.3
	SP102000030742 2 miu/seed			
7	Gaucho 600 FS 0.375 mg ai/seed	56 c	4	3894.2
	Votivo 240FS 1 miu/seed			
8	Spera 54.8 ml/100 kg	86 a	3.6	4114.5
	Gaucho 600 FS 0.375 mg ai/seed			
	Votivo 240FS 1 miu/seed			
LSD *P*=.10				
[x]Means followed by the same letter do not significantly differ according to Tukey's method ($P \leq 0.10$).				
[y]Nematicide means treatments 2, 4, 5, and 8 including 5.5 ml/100 kg of Vortex FL, 48.9 ml/10kg of Allegiance FL, and Evergol Prime 5 g ai/100 kg.				
[z]Stand was the number of seedlings in 7 meters of row.				
[w]Vigor ratings from 1 to 5 with 5 being the best and 1 the worst.				

IV. Weed Management

Evaluating Two-Pass Herbicide Regimes to Reduce Herbicide Resistance Selection Pressure in High-Residue Cover Crop vs. Winter Fallow Conservation Tillage Cotton.

A. Price, S. McElroy, C.H. Burmester, J. T. Ducar, D. Monks

Location: E.V. Smith Research and Extension Center, Shorter, AL.

Results: The following tables provide agronomic details in each of the three studies including cotton population and yield (Tables 1-6). Due to the ever increasing Palmer population, in all three studies, a three pass system was needed to protect yield potential except in the two-pass glufosinate-tolerant cotton system where the two pass intensity resulted in similar yield to the three-pass system. Palmer pigweed and large crabgrass are the main weed species in these experimental areas. Over the past three years we have documented the reduction in control in the glyphosate-tolerant systems. In general, the rye cover crop provided greater early-season weed suppression than the winter fallow system, regardless of weed species. Perfect late-season weed control could not be attained in any three pass herbicide system (data not shown). However, excellent weed control was observed in a few two pass systems in two of the three studies. The use of Valor as an early PRE application, when followed by an additional PRE and POST herbicide application, provided effective season-long weed control of all species present. Observed Palmer amaranth control in glyphosate-tolerant cotton was less than that in the glufosinate-tolerant cotton; due to the expanding population of a glyphosate-resistant Palmer amaranth population at the experiment site. For both cotton systems, the earlier application of Dual Magnum provided greater weed control compared to the later application.

Table 1. Agronomic Response of Cotton to Cover Crop and Post-Application Timing in a Liberty Link (LL) System – E.V. Smith 2015

	Agronomics				
	Cover Crop System[1]			Winter Fallow System[2]	
Weed Control	Cotton Population (plants/Ha)	Seed Cotton Yield (kg/Ha)		Cotton Population (plants/Ha)	Seed Cotton Yield (kg/Ha)
Non-treated[3]	0[c]	0[c]		0[c]	0[c]
A[4]	0[c]	0[c]		0[c]	0[c]
B[5]	0[c]	0[c]		0[c]	0[c]
C[6]	0[c]	0[c]		0[c]	0[c]
A + B	101657[a]	2042[ba]		77738[ba]	1797[ba]
A + C	33487[bc]	847[bc]		0[c]	0[c]
A + B + C	133948[a]	3328[a]		132752[a]	2753[a]
B + C	0[c]	0[c]		0[c]	0[c]
LSD (α=0.10)	31073	852		31073	852

[1]Rye (Wrens Abruzzi) was drilled at 90 lbs/A in the fall of 2014, then rolled flat prior to planting cotton in the spring.
[2]Plots were left fallow throughout the winter, no cover crop planted.
[3]No herbicide was applied.
[4]Liberty (29 fl oz/A) + Dual Magnum (16 fl oz/A) was applied post-emergence at the 2-leaf growth stage.
[5]Liberty (29 fl oz/A) + Dual Magnum (16 fl oz/A) was applied post-emergence at the 8-leaf growth stage.
[6]Valor (1 oz/A) was post-direct applied at LAYBY before the cotton canopy closed.
[*]LS-Means with the same letter are not significantly different.
[**]Proc glimmix was used in SAS for all statistical analysis.

Table 2. Agronomic Response of Cotton to Cover Crop and Post-Application Timing in a Liberty Link (LL) System – E.V. Smith 2015

	Agronomics	
Production System	Cotton Population (Plants/Ha)	Seed Cotton Yield (kg/Ha)
Rye[1]	33637[a]	777[a]
Winter Fallow[2]	26311[a]	569[a]
LSD (α=0.10)	10986	301
Weed Control		
Non-treated[3]	0[c]	0[c]
A[4]	0[c]	0[c]
B[5]	0[c]	0[c]
C[6]	0[c]	0[c]
A + B	89697[b]	1920[b]
A + C	16744[c]	424[c]
A + B + C	133350[a]	3041[a]
B + C	0[c]	0[c]
LSD (α=0.10)	21971	603

[1]Rye (Wrens Abruzzi) was drilled at 90 lbs/A in the fall of 2014, then rolled flat prior to planting cotton in the spring.
[2]Plots were left fallow throughout the winter, no cover crop planted.
[3]No herbicide was applied.
[4]Liberty (29 fl oz/A) + Dual Magnum (16 fl oz/A) was applied post-emergence at the 2-leaf growth stage.
[5]Liberty (29 fl oz/A) + Dual Magnum (16 fl oz/A) was applied post-emergence at the 8-leaf growth stage.
[6]Valor (1 oz/A) was post-direct applied at LAYBY before the cotton canopy closed.
[*]LS-Means with the same letter are not significantly different.
[**]Proc glimmix was used in SAS for all statistical analysis.

Table 3. Agronomic Response of Cotton to Cover Crop and Post-Application Timing in a Roundup Ready (RR) System – E.V. Smith 2015

	Agronomics				
	Cover Crop System[1]			Winter Fallow System[2]	
Weed Control	Cotton Population (plants/Ha)	Seed Cotton Yield (kg/Ha)		Cotton Population (plants/Ha)	Seed Cotton Yield (kg/Ha)
Non-treated[3]	0[a]	0[a]		0[a]	0[a]
A[4]	47839[a]	847[a]		0[a]	0[a]
B[5]	0[a]	0[a]		0[a]	0[a]
C[6]	0[a]	0[a]		0[a]	0[a]
A + B	50230[a]	749[a]		0[a]	0[a]
A + C	0[a]	0[a]		0[a]	0[a]
A + B + C	0[a]	0[a]		0[a]	0[a]
B + C	0[a]	0[a]		0[a]	0[a]
LSD (α=0.10)	41543	677		41543	677

[1]Rye (Wrens Abruzzi) was drilled at 90 lbs/A.
[2]Plots were left fallow throughout the winter, no cover crop planted.
[3]No herbicide was applied.
[4]Roundup Powermax (1 lb a.i./A) + Dual Magnum (16 fl oz/A) was applied post-emergence at the 2-leaf growth stage.
[5]Roundup Powermax (1 lb a.i./A) + Dual Magnum (16 fl oz/A) was applied post-emergence at the 8-leaf growth stage.
[6]Valor (1 oz/A) was post-direct applied at LAYBY before the cotton canopy closed.
[*]LS-Means with the same letter are not significantly different.
[**]Proc glimmix was used in SAS for all statistical analysis.

Table 4. Agronomic Response of Cotton to Cover Crop and Post-Application Timing in a Roundup Ready (RR) System – E.V. Smith 2015

	Agronomics	
Production System	Cotton Population (Plants/Ha)	Seed Cotton Yield (kg/Ha)
Rye[1]	12259[a]	200[a]
Winter Fallow[2]	0[a]	0[a]
LSD (α=0.10)	14687	239
Weed Control		
Non-treated[3]	0[a]	0[a]
A[4]	23919[a]	424[a]
B[5]	0[a]	0[a]
C[6]	0[a]	0[a]
A + B	25115[a]	375[a]
A + C	0[a]	0[a]
A + B + C	0[a]	0[a]
B + C	0[a]	0[a]
LSD (α=0.10)	29374	479

[1]Rye (Wrens Abruzzi) was drilled at 90 lbs/A.
[2]Plots were left fallow throughout the winter, no cover crop planted.
[3]No herbicide was applied.
[4]Roundup Powermax (1 lb a.i./A) + Dual Magnum (16 fl oz/A) was applied post-emergence at the 2-leaf growth stage.
[5]Roundup Powermax (1 lb a.i./A) + Dual Magnum (16 fl oz/A) was applied post-emergence at the 8-leaf growth stage.

[6]Valor (1 oz/A) was post-direct applied at LAYBY before the cotton canopy closed.
[*]LS-Means with the same letter are not significantly different.
[**]Proc glimmix was used in SAS for all statistical analysis.

Table 5. Agronomic Response of Cotton to Cover Crop and Residual Herbicides Applied Pre-Emergence and Post-Emergence in a Roundup Ready (RR) System – E.V. Smith 2015

	Agronomics				
	Cover Crop System[1]			Winter Fallow System[2]	
Weed Control	Cotton Population (plants/Ha)	Seed Cotton Yield (kg/Ha)		Cotton Population (plants/Ha)	Seed Cotton Yield (kg/Ha)
Non-treated[3]	0[a]	0[a]		0[a]	0[a]
A[4]	0[a]	0[a]		0[a]	0[a]
B[5]	0[a]	0[a]		0[a]	0[a]
C[6]	0[a]	0[a]		0[a]	0[a]
D[7]	0[a]	0[a]		0[a]	0[a]
A + B	0[a]	0[a]		0[a]	0[a]
A + C	0[a]	0[a]		0[a]	0[a]
A + D	0[a]	0[a]		0[a]	0[a]
B + C	0[a]	0[a]		0[a]	0[a]
B + D	0[a]	0[a]		0[a]	0[a]
C + D	0[a]	0[a]		82521[a]	1548[a]
A + B + C	0[a]	0[a]		0[a]	0[a]
A + C + D	86109[a]	1765[a]		45447[a]	964[a]
B + C + D	86109[a]	2301[a]		86109[a]	2179[a]
A + B + D	0[a]	0[a]		0[a]	0[a]
A + B + C + D	44251[a]	1256[a]		86109[a]	2185[a]
LSD (α=0.10)	46367	1113		46367	1113

[1]Rye (Wrens Abruzzi) was drilled at 90 lbs/A.
[2]Plots were left fallow throughout the winter, no cover crop planted.
[3]No herbicide was applied.
[4]Valor (1 oz/A) was applied early pre-emergence (before planting).
[5]Prowl H_2O (0.75 lb a.i./A) + Reflex (1pt/A) was applied pre-emergence (at planting).
[6]Roundup Powermax (1 lb a.i./A) was applied post-emergence at the 4-leaf growth stage.
[7]Caparol (24 fl oz/A) + MSMA (40 fl oz/A) were post-direct applied at LAYBY before the cotton canopy closed.
[*]LS-Means with the same letter are not significantly different.
[**]Proc glimmix was used in SAS for all statistical analysis.

Table 6. Agronomic Response of Cotton to Cover Crop and Residual Herbicides Applied Pre-Emergence and Post-Emergence in a Roundup Ready (RR) System – E.V. Smith 2015

	Agronomics	
Production System	Cotton Population (plants/Ha)	Seed Cotton Yield (kg/Ha)
Cover Crop[1]	13529[a]	333[a]
Winter Fallow[2]	18762[a]	430[a]
LSD (α=0.10)	11592	278
Weed Control		
Non-treated[3]	0[b]	0[b]
A[4]	0[b]	0[b]
B[5]	0[b]	0[b]
C[6]	0[b]	0[b]
D[7]	0[b]	0[b]
A + B	0[b]	0[b]
A + C	0[b]	0[b]
A + D	0[b]	0[b]
B + C	0[b]	0[b]
B + D	0[b]	0[b]
C + D	41261[ba]	774[ba]
A + B + C	0[b]	0[b]
A + C + D	65778[a]	1364[ba]
B + C + D	86109[a]	2240[a]
A + B + D	0[b]	0[b]
A + B + C + D	65180[a]	1721[a]
LSD (α=0.10)	32787	787

[1]Rye (Wrens Abruzzi) was drilled at 90 lbs/A.
[2]Plots were left fallow throughout the winter, no cover crop planted.
[3]No herbicide was applied.
[4]Valor (1 oz/A) was applied early pre-emergence (before planting).
[5]Prowl H_2O (0.75 lb a.i./A) + Reflex (1pt/A) was applied pre-emergence (at planting).
[6]Roundup Powermax (1 lb a.i./A) was applied post-emergence at the 4-leaf growth stage.
[7]Caparol (24 fl oz/A) + MSMA (40 fl oz/A) were post-direct applied at LAYBY before the cotton canopy closed.
[*]LS-Means with the same letter are not significantly different.
[**]Proc glimmix was used in SAS for all statistical analysis.

Herbicide Resistant Palmer Amaranth Management, Herbicide Efficacy Evaluation and Resistance Survey in Alabama Cotton

S. Li.

a. Evaluation of Palmer Amaranth Control by Preplant and PRE herbicides in dryland Roundup-Ready cotton

In 2015, 17 soil herbicide treatments, plus a non-treated control (NTC) were evaluated at Centre, Headland and Fairhope AL for weed control, crop tolerance and yield responses. Research trial at each location was taken to yield and was concluded successfully in 2015.

b. Evaluate POST herbicide control efficacy on Palmer Amaranth

In 2015, weeds established for this project in a field at EV smith REC were mowed accidentally. Therefore, pigweed and morningglory were planted in greenhouse as substitution. Morningglory established quicker than pigweed and have been sprayed with 13 POST treatments. Pigweed and cutleaf evening primose will be sprayed with similar treatments in the early spring of 2016.

c. At-harvest herbicide resistance survey

In 2015, 26 populations of pigweed seeds were collected from 18 counties in Alabama. Among those, 20 populations have been dried and cleaned. The remaining 6 will be cleaned in the spring of 2016. All seeds will be planted in greenhouse on Auburn campus in spring and summer of 2016 for resistance screening.

Project results:

Cotton seedling height was affected by Prowl H2O fb Reflex + Direx, Prowl H2O fb Direx + Warrant, Valor fb Direx + Prowl H2O, and Valor fb Warrant + Prowl H2O at 14-15 days after planting (DAP). However, at 27-34 DAP, only Valor fb Warrant + Prowl H2O significantly reduced cotton seedling height. Cotton stand count was not negatively affected by any herbicide treatment at any location. Cotton seedling injury varied greatly among locations and treatments. Fairhope trial seemed to show more injury than other locations, while Valor based treatments tend to cause more injury than other treatments. However, the greatest seedling injury among all treatments was incurred by Valor fb Direx + Prowl, and it did not exceed 15% after average data over 3 locations. Cotton yield was statistically equal or better than NTC except for Valor fb Reflex + Prowl H2O. Pigweed control was 100% at Headland and Fairhope in all treatments. In Centre, most of the treatments had over 90% of pigweed control except for Direx fb Direx + Prowl H2O and Prowl H2O fb Direx + Prowl H2O. Morningglory control varied from 50% to over 90% at three locations. None of the evaluated treatments were particularly effective against morningglory when applied PRE. Average control efficacy ranged from 65% to 85% after combining data across three locations. Although no treatment provided over 90% control in this project, there is still a significant advantage of applying soil herbicides to suppress morningglory since these herbicides effectively reduce the growth speed and weed size as compared to morningglory in the non-treated area. New cotton soil herbicides, Brake F2 and F16 performed well in this trial at all three locations and their evaluation will be continued in 2016.

Morningglory control by POST herbicides has been conducted in greenhouse and data are currently under analysis. Visual rating showed that Aim, Liberty + Dicamba, Liberty + 2, 4-D amine given morningglory control among all treatments.

Project planning for 2016-2017:

1. Cotton tolerance and weed control evaluation by soil herbicides will be continued in 2016. Five to ten important cotton varieties from Deltapine, Phytogen, Americot and Stoneville will be evaluated in this project in 2016. A few important soil herbicides such as Reflex, Valor, Direx, Cotoran, Warrant, etc., will be applied at 1x and 2x rate in 3 locations to each variety, to test for cotton tolerance and yield impact. Promising treatments from 2015 trials will be continued in 2016 for the control of pigweed, morningglory and other troublesome weeds in cotton.
2. Several POST treatments containing Liberty, Roundup, 2,4-D, Dicamba, Aim, Anthem flex and Dual magnum will be applied to pure weed stands (mainly pigweed and morningglory, no cotton), to evaluate weed control and environment impact on herbicide efficacy. Application timing, nozzle types, spray volumes, spray timing and adjuvants will be evaluated in field sites in this project.
3. Pigweed resistance screening will be continued in 2016. Cleaned pigweed seeds will be planted in pots in greenhouse, and seedlings emerged will be sprayed with various herbicides. More pigweed populations will be collected from cotton-growing counties in Alabama in 2016.

V. Insect Management

State Pheromone Trapping Program for Cotton Bollworm, Tobacco Budworm and *Heliothis armigera* (The Old World Bollworm)

T. Reed, R. Smith, and A. Jacobson

Materials and Methods: Large, cone-shaped metal moth traps were erected in Baldwin, Henry , Elmore and Lee counties . Traps were baited with pheromone at each location to lure cotton bollworm, tobacco bollworm, and Heliothis armigera moths. Traps were monitored for the following periods at each location: Baldwin—3rd week of June through 1st week of September; Henry—2nd week of June through 3rd week of September (excluding the second week in July); Elmore and Lee—2nd week of June through 4th week of September; Limestone—1st week of June through the 3rd week of September. Numbers of moths were counted and recorded. **Results: Bollworm Moths**-(=BW)BW moth trap catches increased the 4th week of June in Baldwin county,then declined by about 50% for the next two weeks. A significant BW moth flight began the 3rd week of July and lasted through the 2nd week of August. The BW moth flight began in Elmore and Lee counties one week after the catches jumped in Baldwin County. BW trap catches in Limestone County were highest during the 4th week of July, but numbers of moths caught that week were 32 to 83% less than that caught in Baldwin, Elmore and Lee counties. BW moth catches in Henry county did not increase during the late July to early August period but a small increase in activity occurred in late August and early September.The largest number of BW moths caught in any one week was 87 in Elmore county the 4th week of July. The jump in BW moth activity observed during the late July-early August period is typical for Alabama and knowledge about increased moth activity at this time is useful to Phytogen cotton growers who can receive a significant yield increase by applying a pyrethroid insecticide around the 1st of August.

Tobacco budworm moths- (=TBW) Relatively high numbers of TBW moths were collected in Henry county the 2nd and 3rd week of June and the 3rd week of June in Elmore county. TBW moth activity declined in Henry County by the 4th week of June and did not increase again until the 3rd week of August through the 1st week of September. Increased TBW moth activity was noted in Baldwin County the 3rd week of July and the 2nd week of August. TBW moth activity peaked in Elmore County the 2nd and 3rd weeks of August and again the 3rd and 4th weeks of September. TBW moth catches in Lee County were highest the 2nd and 3rd week of August but numbers were only 17 and 34% as many as were caught in Elmore county. The first TBW moths were caught in Limestone County the first week of July when 15 were collected. Numbers then remained below 10/week until the 3rd and 4th weeks of August when 10 were collected each week.

Heliothis armigera- Bollworm moths and *Heliothis armigera* moths are very similar and BW moths are attracted to the *H. armigera* pheromone. Some of the moths collected in the H. armigera traps were frozen and have been saved for dissection and identification.

Table 1. Number of Bollworm Moths in Pheromone Traps by Week in 2015.

	Henry	Baldwin	Elmore	Lee	Limestone
1st week June	--	--	--	--	0
2nd week June	3	--	2	1	0
3rd week June	5	3	6	0	0
4th week June	3	34	3	2	0
1st week July	3	15	1	2	0
2nd week July	--	17	0	0	0
3rd week July	5	52	2	4	0
4th week July	0	35	87	22	15
1st week August	3	55	--	--	8
2nd week August	0	28	34	35	7
3rd week August	0	9	38	55	3
4th week August	10	12	25	14	2
1st week Sept.	15	36	40	18	0
2nd week Sept.	0		8	14	0
3rd week Sept.	0		31	6	4
4th week Sept.	--		28	12	

Table 2. Number of Tobacco Budworm Moths in Pheromone Traps by Week in 2015.

	Henry	Baldwin	Elmore	Lee	Limestone
1st week June	--	--	--	--	0
2nd week June	48	--	3	2	0
3rd week June	28	8	41	5	0
4th week June	3	4	6	0	0
1st week July	2	10	2	2	15
2nd week July	--	8	23	0	0
3rd week July	15	29	1	1	0
4th week July	0	6	3	0	2
1st week August	3	3	11	2	6
2nd week August	3	26	70	12	4
3rd week August	25	0	43	15	10
4th week August	21	16	15	3	10
1st week Sept.	31	3	4	7	4
2nd week Sept.	0	--	9	9	0
3rd week Sept.	0	--	24	7	0
4th week Sept.			54	2	

Determining Which Insecticide Provides the Most Cost-Effective Control of Plant Bugs Infesting Cotton

T. Reed

Materials and Methods: This study was conducted at the Tennessee Valley Research and Extension Center at Belle Mina. ST 4747 GLB2 cotton (Aeris/Trilex treated seed) was planted May 11, 2015. Plots were 8 rows wide and 30 feet long with a 38 inch row spacing. Insecticide Treatments are presented in Tables 1and 2. Treatments were arranged in a randomized complete block design with 3 replications per insecticide and 6 replications of the No Insecticide treatment. Insecticides were applied on 7/20 and 7/27 using 10X conejet nozzles, 40 psi and 10 gallons of water/acre. Plots were irrigated with 0.6 inches of water 24 hours after insecticide applications on 7/27. Plots were sampled on 7/24 and 7/30 using a ground-cloth and shaking 6 row ft of cotton plants over the cloth in each plot. Plots were harvested at maturity. **Results**: Plant bug counts 4 days after the first application date are presented in Table 1. There was no significant treatment effect with respect to number of small or adult tarnished plant bugs (TPB) at 4DAA. Mean number of small and adult TPB's recovered per 6 row feet at 4DAA was 1.5 and 0.25, respectively. There was a significant treatment effect (P>F=0.0015) at 4DAA with respect to the number of large + medium size TPB's recovered. Number of large + medium TPB's in the No Insecticide treatment were significantly greater than that in the Transform 0.75 oz, Diamond 6 oz, Transform 1.5 oz, Orthene 90 o.33 oz, Bidrin 8 oz + Diamond 6 oz, and Orthene 90 0.55 oz/acre treatments. Plant bug counts made 3 days after the second application of insecticide treatments and yields are presented in Table 2. There was a significant treatment effect with respect to numbers of small, large + medium and adult TPB's recovered on the second sampling date. All treatments except Brigade had significantly fewer small TPB's and large + medium TPB's than the No Insecticide plot (LSD 0.1 =0.5 and 1.06 respectively). Treatments which had numbers of TPB adults that were not significantly less (LSD 0.1=0.95) than the No Insecticide Treatment were Centric 2 oz, Orthene 90 0.33oz, and Brigade 6.4 oz/ac. Treatments which had yields that were not significantly greater than the No Insecticide Treatment were Transform 0.75 and 1.5 oz, Diamond 6 oz, Orthene 90 0.33 and 0.55 oz, and Brigade 6.4 oz. Transform 1.5 oz +Diamond 6 oz had the highest numerical yield.

Table 1. Number of Plant bugs recovered per 6 row feet 4 days following application of different cotton insecticides, Belle Mina, 2015.

TRT #	Treatment Insecticide	Rate/Acre	Small	Large & Medium	Adults	Total
1	Bidrin	8 oz	0.0	2.5	0.5	3.0
2	Bidrin + Diamond	8 oz + 6 oz	0.0	0.75	0.0	0.75
3	Transform	1.5 oz	0.75	1.0	0.0	1.75
4	Transform + Diamond	1.5 oz + 6 oz	0.75	3.5	0.5	4.75
5	Diamond	6 oz	1.0	1.25	0.25	2.5
6	Transform	0.75 oz	0.5	1.75	0.25	2.5
7	Centric	2 oz	0.5	2.75	0.25	3.5
8	Orthene 90	6.0 oz	0.5	1.00	0.0	1.5
9	Orthene 90	10.0 oz	0.0	0.25	0.0	0.25
10	Brigade	6.4 oz	1.0	2.75	0.5	4.25
11	No Insecticide	---	1.5	4.0	0.25	5.75
		P > F =	0.55	0.0015	0.83	0.0000
		LSD 0.1 =	---	2.09	---	2.93

Table 2. Number of Plant bugs recovered per 6 row feet 10 days following application of different cotton insecticides and plant yields, Belle Mina, 2015.

TRT #	Treatment Insecticide	Rate/Acre	Small	Large & Medium	Adults	Total	Lbs seed cotton/ac
1	Bidrin	8 oz	0.0	0.25	0.5	0.75	4478
2	Bidrin + Diamond	8 oz + 6 oz	0.0	0.0	0.0	0.0	4499
3	Transform	1.5 oz	0.25	0.0	0.0	0.25	4170
4	Transform + Diamond	1.5 oz + 6 oz	0.00	0.5	0.0	0.5	4632
5	Diamond	6 oz	0.5	0.75	0.0	1.25	4140
6	Transform	0.75 oz	0.5	0.25	0.75	1.5	4234
7	Centric	2 oz	0.0	0.75	1.25	2.0	4400
8	Orthene 90	6.0 oz	0.0	0.0	0.0	0.0	4025
9	Orthene 90	10.0 oz	0.0	0.0	0.0	0.0	4217
10	Brigade	6.4 oz	1.25	2.0	0.75	4.0	3945
11	No Insecticide	---	1.5	2.75	1.5	5.75	3812
		P > F =	0.0000	0.0010	0.07	0.0000	0.09
		LSD 0.1 =	---	1.06	0.95	0.95	433

Providing Data for the Development and Validation of a Thrips Infestation and Injury Model for Seedling Cotton.

T. Reed

Objective: The objective of this study was to collect data on thrips damage levels to cotton planted at different dates and locations in north Alabama. This data will be provided to modelers to use to refine and validate the cotton seedling growth and thrips injury models currently under development and to facilitate their integration into a single cotton–thrips injury prediction and risk assessment tool to help guide thrips management decisions for cotton in in the southeastern U.S.

Materials and Methods: Ten commercial cotton fields in 5 north Alabama counties were rated for thrips damage during the period 5/19 through 6/18/2015. Damage ratings were made using a scale of 0 (no damage) to 5 (severe damage). Planting dates for these fields ranged from 4/23 to 5/29 and the fields had 6 different cotton varieties. Seed treatments were recorded when available. Thrips damage ratings were also made in small plots of cotton planted on 3 dates at the Tennessee Valley Research and Extension Center (TVREC) at Belle Mina, AL. The 3 planting dates were May 13, May 20 and May 27. Plots on the first 2 planting dates were 4 rows wide and 25 feet long. Plots on the third planting date were one row plots that were 40 feet in length. Plots rated for thrips damage for the first planting date had no insecticide seed treatments. Plots rated for thrips damage for the 2nd and 3rd planting dates were planted with seed treated with Avicta, Aeris or no insecticide. Five plants were collected from each commercial field and the TVREC small plots and placed in jars containing alcohol. The alcohol was filtered and the thrips species and number of thrips present were determined.
Results: Thrips damage ratings for the 10 commercial fields at the time of their inspection ranged from 1 to 3.5 (Table 1).

Table 1. Thrips damage ratings for commercial cotton fields planted on different dates in North Alabama in 2015.

Field Number	Planting Date	Variety	True Leaves	Damage Rating[1]	Plant Height (in)	Sample Date	Location
1	4/23	PHY 333	2-3	2	5	5/19	Madison
2	4/29	ST 4946	2-3	3	4	5/27	Lauderdale
3	5/06	ST 4946	2-3	1	6	5/26	Jackson
4	5/21	PHY 333	3	2	6	6/16	Limestone
5	5/29	PHY 333	2	1	5-6	6/18	Madison
6	5/5	DPL 1321	4	1	4-6	5/29	Lawrence
7	5/8	ST 4946	2-4	2	4	5/29	Lawrence
8	5/5	PHY 333	4	1.5	5	5/29	Lawrence
9	5/8	DPL 1518 B2XF	3	2.5	4	6/2	Lawrence
10	5/5	DPL 1212	2	3.5	3-5	6/2	Lawrence

[1]Damage rating scale of 0 to 5 with 0 indicating no damage and 5 indicating severe damage.

Two of the fields with the highest damage ratings were planted adjacent to wheat. Cotton seedlings in the first planting date at TVREC did not incur thrips damage even when seed were not treated with an insecticide. (Table 2).

Table 2. Thrips damage ratings in seedling cotton planted on 3 different dates at Belle Mina, AL in 2015.

Planting Date	Sampling Date	Number of True Leaves	Damage Rating	Seed Treatment
5/13	5/28	2-3	0.5	No Trt
5/13	6/2	3-4	0.5	No Trt
5/20	6/8	3	3.75	No Trt
5/20	6/8	3	1.0	Aeris
5/27	6/11	2-3	2.0	No Trt
5/27	6/11	2-3	1.0	Avicta
5/27	6/11	2-3	1.0	Aeris
5/27	6/19	5-6	3.0	No Trt
5/27	6/19	5-6	2.5	Avicta
5/27	6/19	5-6	1.0	Aeris

However seedlings from the second planting date (May 20) that did not receive an insecticide seed treatment incurred significant damage within 19 days of planting. Seedling plants developing from Aeris-treated seed for this second planting date had a damage rating of 1 at 19 days after planting. Seedlings that developed from untreated seed for the third planting date reached a damage rating of 3 at 24 days after planting (June 27) while plants protected by Aeris and Avicta seed treatments showed less damage. Tobacco thrips comprised over 94% of the adult thrips collected in the commercial fields (Table 3) and 68% of the thrips collected in small plot samples (Table 4).

Table 3. Thrips species and number of thrips per 5 plants collected from seedling cotton plants in commercial fields in North Alabama in 2015.

Thrips Species					
Planting Date	**Sampling Date**	**Tobacco**	**Flower**	**Soybean**	**Larvae**
5/8	6/2	5	0	0	0
5/20	6/11	4	2	3	10
5/27	6/11	2	0	0	1

Table 4. Thrips species and number of thrips per 5 plants collected from seedling cotton planted on 3 dates at Belle Mina, AL in 2015.

Thrips Species						
Field				**Western**		
Number	**Sampling Date**	**Tobacco**	**Flower**	**Flower**	**Soybean**	**Larvae**
1	5/19	2	0	0	0	0
2	5/27	10	4	0	0	1
3	5/26	1	1	0	1	0
4	6/16	2	0	0	1	0
5	6/18	1	0	0	0	0
6	5/29	28	0	0	0	1
7	5/29	24	0	0	0	0
8	5/29	17	1	0	1	0
9	6/2	29	0	0	0	2
10	6/2	56	2	0	0	18

Cotton Production with Reduced Inputs for 2015

R. H. Smith

Location: Prattville Agricultural Research Unit

Trt. #	Variety	Planting Date	Seed Trt.
1	Conv.	Early	Y
2	Conv.	Early	N
3	Tech.	Early	Y
4	Tech.	Early	N
5	Conv.	Late	Y
6	Conv.	Late	N
7	Tech.	Late	Y
8	Tech.	Late	N

Trial Details: Small plot, 4 rows x 30 ft., 4 replicates, RCB design

Variables:

1. Variety	Conventional Technology	UA222 ST6448 GLB2
2. Plant Date	Early Late	April 24 May 12
3. Seed Treatment	Y = Gaucho N = None (Orthene Foliar Spray)	(Acephate 4 oz. – 6 oz. foliar spray) (Applied at first true leaf) Early Plant 5/8 and 5/15. Late Plant 5/31 and 6/3 (rainfall on 5/31)

Note: Entire trial treated same for all insects, other than thrips.

Herbicide program: Prowl plus Diuron – on both conventional and technology cotton

Objective: Reduce cost of production by 20% (approximately $100/acre) by planting conventional variety, eliminating seed treatment for thrips/nematodes, and planting later to avoid peak thrips numbers and injury.

Thrips Damage Ratings (0-5 scale)

Technology	Plant Date	Thrips Control	2-3 True Leaf	4-5 True Leaf	6-7 True Leaf	Mean
Conventional	Early	Seed	2.5	3.4	3.5	3.1
Conventional	Early	Foliar	2.4	2.3	2.5	2.4
Technology	Early	Seed	3.1	3.8	4.0	3.6
Technology	Early	Foliar	3.1	3.2	2.5	2.9
Conventional	Late	Seed	2.0	3.4	2.8	2.7
Conventional	Late	Foliar*	3.0	3.8	2.8	3.2
Technology	Late	Seed	3.5	2.9	3.1	3.2
Technology	Late	Foliar*	3.5	3.8	3.1	3.5

* Foliar application made 48 hrs. before rating (Rain after 6 hrs., app. reapplied day after rating)

Date	Stage of Cotton	Comments/Ratings
10/6/2015	All Plots 99% Open	
	Early Plant - defoliated	Worm Damaged Bolls/30 ft.
	Conv. Late plant (seed trt.)	2
	Conv. Late plant (foliar spray)	2
	Tech. Late Plant (seed trt.)	0
	Tech. Late Plant (foliar spray)	0
	Late Plant Defoliated	
	Conv. Late plant (seed trt.)	0
	Conv. Late plant (foliar spray)	1
	Tech. Late Plant (seed trt.)	0
	Tech. Late Plant (foliar spray)	0

Yields

Trt. #	Variety	Seed Treatment	Yield (lbs. seed cotton/Ac.)
1	Conv.	Early	4308
2	Conv.	Early	4453
3	Tech.	Early	3848
4	Tech.	Early	3896
5	Conv.	Late	3485
6	Conv.	Late	3146
7	Tech.	Late	3194
8	Tech.	Late	3170

Economic Comparisons – Reduced Input Cotton Trial

Prattville – 2015

Per Acre Basis

Trt. #	Seed Cost	Cost Thrips Control	Cost Weed Control	Total Trial Variable Cost	Lint * Returns	Return Minus Input
1	$18.30	$6.70	$14.20	$39.20	$1,085.61	$1,046.41
2	$18.30	$11.66	$14.20	$44.16	$1,121.16	$1,077.00
3	$90.00	$6.70	$14.20	$110.90	$969.70	$858.80
4	$90.00	$11.66	$14.20	$115.86	$981.79	$865.83
5	$18.30	$6.70	$14.20	$39.20	$878.22	$839.02
6	$18.30	$11.66	$14.20	$44.16	$792.79	$748.63
7	$90.00	$6.70	$14.20	$110.90	$804.89	$693.99
8	$90.00	$11.66	$14.20	$115.86	$798.84	$682.98
Conv. $110/bag		Gaucho $40/bag				
Tech. $540/bag		Orthene $7/lb.				
		(5 oz. + $3.50 app)				
*Assume 40% lint turnout + 63 cents lb. cotton						

Yields

Early Plant – 4126

Late Plant – 3249

Conventional Variety – 3848

Technology Variety – 3527

Seed Treatment – 3709

Foliar Spray – 3666

Conclusions

The greatest variable in treatments was the planting date. The later planted cotton had shorter plants with fewer fruiting branches, fewer bolls, and more weeds, due to the thinner stands, and shorter plants that produced less shade (open canopy). The technology variety selected for this trial (ST-6448) had reduced germ which resulted in a lower plant population. Thrips pressure extended into mid-late May for the third consecutive spring, thereby reducing any advantage of planting late to avoid thrips damage. The conventional variety (UA222) performed outstanding from emergence to harvest.

Take Home Points

1. Early planted yielded more, resulting in more return per acre. Planting date was most important variable in trial.

2. Conventional yielded more than technology in early planting. Conventional yielded about the same as technology in late planting.

3. Foliar spray yielded slightly more or similar to, seed treatments in most comparisons. (Greatest exception was conventional variety planted late.) Peak thrips pressure occurred about mid-May for 4^{th} consecutive year.

4. Delayed planting to avoid thrips damage is not advisable.

5. UA222 is an excellent variety (good germ and vigor as seedling).

6. Foliar sprays, if made at 1-2 true leaf stage, are as good as seed treatment.

7. Worm pressure and damage was extremely light in this trial, as well as most fields in Alabama in 2015.

8. Plant bug numbers were very low but stink bugs increased in late summer. Neither was treated in this trial.

VI. Nematode Management

Cotton Nematode Management Investigations.

K.S. Lawrence C.H. Burmester, D. Monks, J. Luangkhot, and S. Till

Objective 1) enhance cotton seedling growth using plant hormones and starter fertilizers to induce tolerance to the reniform nematode (Justin Luangkhot)

<u>Plant Breeding Unit</u>

Forty-three days after planting there was no significant differences in biomass among the nematicide, starter fertilizer, and hormone treatments (Table 1). The Velum Total in-furrow spray alone or when combined with the Ascend growth hormones or Sure-K and Micro 500 starter fertilizers significantly reduced southern root-knot nematode population densities as compared to the control. The root knot population were reduced an average of 96% as compared to the untreated control.

During the sampling period taken at 63 DAP after the foliar spray of Ascend PGR and Vydate CLV was applied, root fresh weights were recorded. All treatments were similar to control with the exception of the total combination of Velum Total plus Ascend ST +FS and Sure-K and Micro 500 starter fertilizers plus the Vydate CLV foliar spray which supported a smaller root system (Table 1). Southern root-knot eggs per gram of root were statistically similar between all the treatments as compared to the control. Yields were similar among all treatments and there were no significant differences in pounds per acre. Ranking the see cotton yields found Velum Total alone increase yield an average of 337 lbs./a. Overall Velum Total- with or without Ascend PGR and starter fertilizers increased yield by 337 pounds per acre on average. Using the market value of $0.63 per pound of seed cotton currently there is an increase of $212.06 per acre.

Table 1. Plant biomass, root-knot numbers, and yields for Velum Total treatments for PBU trial, 2015.						
		49 DAP		63 DAP		146 DAP
Treatment	Rate/application	Biomass (g)[z]	Southern root-knot eggs/ gram of root	Root fresh weight (g)	Southern root-knot eggs/ gram of root	lbs./acre
Untreated		72.6 a	3641 a	21.4 a	307 a	1959 a
Velum Total	14 oz./acre IFS	86.2 a	159 b	20.3 a	242 a	2368 a
Velum Total Ascend ST Ascend IFS	14 oz./acre IFS 3 oz./cwt 3.2 oz./acre	74.7 a	63 b	18.4 a	185 a	2200 a
Velum Total Sure K Micro 500	14 oz./acre IFS 1 gal/acre 1 qt./ acre	88.6 a	237 b	21.6 a	156 a	2303 a
Velum Total Ascend ST Ascend IFS Sure K Micro 500	14 oz./acre IFS 3 oz./cwt 3.2 oz./acre 1 gal/acre 1 qt./ acre	83.9 a	110 b	19.8 a	212 a	2278 a
Velum Total Vydate CLV Ascend ST Ascend IFS Sure K Micro 500	14 oz./acre IFS 17 oz./acre FS 3 oz./cwt 3.2 oz./acre 1 gal/acre 1 qt./ acre	94.7 a	180 b	17.5 b	227 a	2329 a
[z]Means followed by the same letter are not significantly different. ($\alpha \leq 0.1$, Tukey-Kramer LS-means)						

At the Plant Breeding Unit field plant biomass was similar between all treatments as compared to the control at the first sampling (Table 2). Vydate as in-furrow spray treatment alone or combined with Ascend ST + FS or Sure-K and Micro 500 and the Vydate + Velum Total + Ascend ST+ FS+ Sure-K and Micro 500 reduced southern root-knot nematode eggs per gram of root.

The second sampling at 63 DAP found the root system biomass was similar between all treatments (Table 2). Southern root-knot nematode eggs per gram of root were lower than the first sampling and were similar to the control. Treatments including a nematicide increased yields by 349 pounds per acre on average compared to the untreated control. The Vydate CLV in-furrow spray increased yields the most as compared to the control by 483 pounds per acre or $304.29 per acre at $0.63 per pound of seed cotton.

Table 2. Plant biomass, root-knot numbers, and yields for Vydate CLV treatments for PBU trial, 2015.						
		43 DAP		63 DAP		146 DAP
Treatment	Rate/application	Biomass (g)[z]	Southern root-knot eggs/ gram of root	Root fresh weight (g)	Southern root-knot eggs/ gram of root	lbs./acre
Untreated		72.6 a	3641 a	21.4 a	307 a	1959 a
Vydate CLV	17 oz./acre IFS	90.5 a	572 b	25.1 a	196 a	2442 a
Vydate CLV Ascend ST Ascend IFS	17 oz./acre IFS 3 oz./cwt 3.2 oz./acre	104.7 a	228 b	23.1 a	278 a	2411 a
Vydate CLV Sure K Micro 500	17 oz./acre IFS 1 gal/acre 1 qt./ acre	93.8 a	349 b	21.0 a	91 a	2117 a
Vydate CLV Ascend ST Ascend IFS Sure K Micro 500	17 oz./acre IFS 3 oz./cwt 3.2 oz./acre 1 gal/acre 1 qt./ acre	84.0 a	1388 ab	21.3 a	245 a	2242 a
Velum Total Vydate CLV Ascend ST Ascend IFS Sure K Micro 500	14 oz./acre IFS 17 oz./acre FS 3 oz./cwt 3.2 oz./acre 1 gal/acre 1 qt./ acre	94.7 a	180 b	17.5 a	227 a	2329 a
[z]Means followed by the same letter are not significantly different. ($\alpha \leq 0.1$, Tukey-Kramer LS-means)						

Objective 2) identify cotton varieties that are tolerant to the reniform and root knot nematodes producing optimum yields while determined the yield benefit of the newest nematicide; (Stephen Till)

Tennessee Valley Research Center

The average percent decrease of reniform nematode egg production with the Velum Total seed treatment compared to untreated seed was 64% on total reniform eggs and 67% on eggs per gram of root among all cultivars (Table 1.). Phytogen 487 WRF sustained the highest reniform population at 1641 total eggs without the seed treatment, and was significantly greater than all but two cultivars (Cropland 3885 B2XF and Nexgen 3406 B2XF). Furthermore, Phytogen 487 WRF showed the biggest reduction with the addition of the seed treatment at 77%. Without the seed treatment, Phytogen 499 WRF supported the fewest total reniform eggs and Phytogen 333 WRF supported the fewest reniform eggs per gram of root, and both were statistically lower than PHY 487 WRF. Also, Phytogen 333 WRF had the lowest total egg production with the addition of the seed treatment. The data reciprocates the importance of cultivar selection as an important factor in nematode management.

Table 1. Effects of cotton cultivar and nematicide in the reniform nematode infested field as measured by reniform total eggs per four plants and reniform eggs per grams of root at 35 days after planting as well as seed cotton yield at harvest.				
Cultivar	Reniform eggs		Reniform eggs per gram of root	
	without nematicide	with nematicide	without nematicide	with nematicide
Cropland 3885 B2XF	1023 ab	270 ab	1151 ab	238 abc
Deltapine 1454 NR B2RF	637 b	212 ab	604 bc	174 abc
Deltapine 1558 NR B2RF	618 b	270 ab	513 bc	232 abc
Nexgen 3406 B2XF	811 ab	289 ab	848 abc	263 ab
Phytogen 333 WRF	405 b	115 b	206 c	95 bc
Phytogen 487 WRF	1641 a	366 a	1284 a	250 abc
Phytogen 499 WRF	289 b	154 ab	293 c	100 bc
Stoneville 4747 GLB2	618 b	289 ab	405 bc	187 abc
Stoneville 4946 GLB2	675 b	135 ab	510 bc	87 c
Stoneville 6448 GLB2	540 b	347 ab	578 bc	341 a
[z]Observations followed by same letter within a column are not significantly different according to Tukey's HSD test at the α ≤ 0.05 level.				

The seed treatment (Imidacloprid, 12.8 oz/cwt + Fluopyram, 8.5 oz/cwt) averaged a 5% increase on seed cotton yield in the field infested with reniform in comparison to without the seed treatment (Table 2). The percent increase ranged from 0-22% where Nexgen 3406 B2XF had the highest increase at 22%. Stoneville 4946 GLB2 and Nexgen 3406 B2XF had statistically larger yields than three of the other cultivars with the addition of the seed treatment in the presence of reniform. Cropland 3885 B2XF, Phytogen 333 WRF, Stoneville 4946 GLB2, and Stoneville 6448 had a statistically greater yield than the root-knot nematode resistant cultivar Deltapine 1454 NR B2RF in the presence of reniform without the seed treatment. Reniform nematode reduced yield by an average 39% across all cultivars and ranged from 26-45% decrease. Phytogen 499 WRF saw the greatest reduction in yield at 44.6%, and Nexgen 3406 B2XF had the least reduction in yield at 26%.

Table 2. Effects of cotton cultivar and nematicide in the reniform infested field and unifested clean field as measured by seed cotton yield at harvest			
Cultivar	Yield lbs./a		
	without nematicide[z]	with nematicide	without Reniform
Cropland 3885 B2XF	2541 a	2719 ab	3442 cd
Deltapine 1454 NR B2RF	1617 b	1755 d	3273 d
Deltapine 1558 NR B2RF	2211 ab	2461 abc	3738 abcd
Nexgen 3406 B2XF	2329 ab	2996 a	4203 ab
Phytogen 333 WRF	2857 a	2805 ab	4208 ab
Phytogen 487 WRF	2310 ab	2745 ab	4150 abc
Phytogen 499 WRF	2197 ab	2257 bcd	3971 abcd
Stoneville 4747 GLB2	2336 ab	2587 abc	4145 abc
Stoneville 4946 GLB2	2798 a	2923 a	4303 a
Stoneville 6448 GLB2	2600 a	2072 dc	3558 bcd
[z]Observations followed by the same letter within a column are not significantly different according to Tukey's HSD test at the a ≤ 0.05 level			

Objective 3) continue reniform greenhouse and field screening of Weavers breeding cotton lines;

In 2015 your funding supported Mr. Roelof Sikkens as he worked in my lab and ran the reniform screening for Dr. Weavers cotton lines.

Objective 4) determine the efficacy and economics of recommended and experimental nematicides and biologicals on different cotton varieties for management of both the reniform and root-knot nematodes.

Reniform nematode disease pressure was moderate for irrigated cotton in 2015. Statistically, no interactions occurred between the cotton varieties and nematicides thus data is presented separately. Plant stand at 30 DAP was similar for all varieties and nematicides with an average of 11 plants per m of row which is within the optimal rage of 8 to 12 plants per meter of row. Reniform population densities were moderate at 35 DAP. FM 1740 B2F supported similar numbers of nematodes per gram of root as ST 4946GLB2. All the nematicide combinations supported fewer reniform nematodes eggs per 4 plants and per gram of root compared to the Aeris seed treatment (4) alone. The four Velum Total treatments, Velum Total 14 oz/A plus Aeris (3) Gaucho, + Flupyran seed treatment (5) Velum Total 18 oz/A (6) and Velum Total 14 oz/A + Gaucho, + Flupyran seed treatment (7) supported similar reniform numbers per 4 plants and per gram of root thus the seed treatment and in- furrow spray provided similar reductions in reniform reproduction. Seed cotton yields were greater for the ST 4946 GLB2 cultivar compared to FM 1944 B2RF producing an increase of average of 174 kg/ha increase. The yields varied by 318 kg/ha over all nematicides. The Velum Total 14 oz/A + Gaucho, + Flupyran seed treatment (7) increased yield 219 kg/ha over the industry standard Temik 15 G (2).

		Stand (plants/ 7.6 m row*)	*Rotylenchulus reniformis*		Seed cotton
Cotton variety	Seed treatment and rate	30 DAP	per 4 plants	g/root	(kg/ha)
	1. Gaucho 600 (0.5 mg ai/seed)	82	487 b	414 b	2538 ab
	2. Temik 15 G 0.9 kg/ha	78	556 b	461 b	2429 b
	3. Velum Total (14 oz/A) Aeris (0.75 mg ai/seed)	82	209 b	137 b	2648 ab
	4. Aeris (0.75 mg ai/seed)	78	2850 a	2760 a	2498 ab
	5. Gaucho (0.375 mg ai/seed) Flupyran (0.25 mg ai/seed)	83	464 b	373 b	2556 ab
	6. Velum Total (18 oz/A)	83	170 b	118 b	2642 ab
	7. Velum Total (14 oz/A) Gaucho (0.375 mg ai/seed) Flupyran (0.25 mg ai/seed)	81	170 b	135 b	2747 a
ST 4946GLB2		79	618	517	2667 a
FM 1740 B2F		82	784	740	2493 b

* Stand was the number of seedlings in 7.6 meters of row.

** Means followed by same letter do not significantly differ according to Tukey-Kramer ($P \leq 0.10$).

Root-knot nematode disease pressure was moderate for irrigated cotton in 2015. Statistically, no interactions occurred between the cotton varieties and nematicides thus data is presented separately. Plant stand at 30 DAP was similar for all varieties and nematicides with an average of 10.6 plants per m of row which is within the optimal rage of 8 to 12 plants per meter of row. Root-knot population densities were moderate at 44 DAP. FM 1740 B2F supported similar numbers of nematodes per gram of root as ST 4946GLB2. All the nematicide combinations supported fewer root-knot nematodes eggs per 4 plants and per gram of root compared to the Gaucho seed treatment (1) alone. The two Velum Total treatments, Velum Total plus Aeris (3) and Gaucho, + Flupyran seed treatment (5) supported similar reniform numbers per 4 plants and per gram of root thus the seed treatment and in- furrow spray provided similar reductions in root-knot reproduction. Seed cotton yields were greater for the ST 4946 GLB2 cultivar compared to FM 1944 B2RF producing an increase of average of 312.6 kg/ha increase. The yields varied by 172 kg/ha over all nematicides. The nematicides with included Flupyran, (3 and 5) increased yield an average of 168.7 kg/ha over the industry standard Temik 15 G (2).

		Stand (plants/ 7.6 m row[*])	*Meloidogyne incognita*		Seed cotton
Cotton variety	Seed treatment and rate	30 DAP	per 4 plants	g/root	(kg/ha)
	1. Gaucho 600 (0.5 mg ai/seed)	82	470.0 a	85.0 a	1932.0
	2. Temik 15 G 0.9 kg/ha	77	155.8 b	33.3 b	1884.4
	3. Velum Total(14oz/A) Aeris (0.75 mg ai/seed)	81	59.2 b	11.9 b	2049.6
	4. Aeris (0.75 mg ai/seed)	83	131.3 b	23.0 b	1980.5
	5. Gaucho (0.375 mg ai/seed) Flupyran (0.25 mg ai/seed)	82	236.9 b	32.5 b	2056.6
ST 4946GLB2		77 b	186.4	41.5	2136.9 a
FM 1740 B2F		84 a	234.8	32.6	1824.3 b
[*] Stand was the number of seedlings in 7.6 meters of row.					
[**] Means followed by same letter do not significantly differ according to Tukey-Kramer ($P \leq 0.10$).					

Commercial Cotton Varieties Response to Fusarium wilt/ Root-knot Nematode Complex

K. S. Lawrence, and K. Glass

Evaluation of commercial cotton cultivars for resistance to Fusarium wilt and root-knot nematode.

The trial was conducted at the Plant Breeding Unit near Tallassee, AL on a Kalmia loamy sand (80% sand, 10% silt, 10% clay). The field has a history of continuous cotton production and natural infestations of the causal agents of Fusarium wilt (*Fusarium oxysporum* f. sp. *vasinfectum*) and root-knot nematode (*Meloidogyne incognita*). Plots consisted of one row with 1m row spacing, four replications, and rows were 6 m long with 3 m alleys. Ten commercially available cotton varieties commonly grown in the region were tested for resistance or tolerance to Fusarium wilt and the root-knot nematode and compared to a susceptible check Rowden and a resistant check M-315. Fertilizer and pesticide management practices were applied as necessary according to the Alabama Cooperative Extension System recommendations. The trial was planted 1 June. Initial and final stand counts were made July 1 and September 15, respectively. Five disease incidence evaluations were made throughout the growing season. Root-knot egg counts were obtained from three whole root systems per plot at 45 DAP. Plots were harvested November 16, 2015. Monthly average maximum temperatures from planting in May through harvest in October were 28.9, 31.9, 33.2, 32.5, 29.6 and 25.6°C with average minimum temperatures of 14.7, 19.7, 21.0, 20.1, 17.4 and 11.4°C, respectively. Rainfall accumulation for each month was 19.2, 9.3, 11.8, 8.2, 3.6 and 3.1 cm with a total of 55.2 cm over the entire season. The rainfall was adequate in July but very dry in Aug and Sep.
Data were analyzed by ANOVA using PROC GLIMMIX with SAS 9.4 (SAS Institute, Inc., Cary, NC) and means compared with Tukey's HSD test at the alpha ≤ 0.05 level.

Fusarium wilt incidence in the South field (Table 1) ranged from 0.3 % in the CG 3885 B2XF commercially available cultivar to 45% in the nematode susceptible check Rowden. All cultivars supported less FOV incidence that the standard Rowden. Root-knot nematode eggs were extracted from plants and root system weights were similar between all cultivars and the two controls. Root-knot nematode total egg numbers were exceptionally high in 2015 and ranged from a low of 1966 eggs supported by the resistant standard M-315 to a high of 34541 eggs in ST 6448 GLB2. The resistant check M-315 averaged 1966 compared to the susceptible standard Rowden's 1220381 eggs per gram of root. The root knot numbers of eggs per gram of root standardizes the nematode populations depending on the size of the plant's root system. Root-knot eggs per gram of root varied from a low of 123 again in the M-315 resistant standard to a high of 4350 in in ST 6448 GLB2. The ST 6448 GLB2 cultivar supported similar root-knot egg per gram of root densities as PHY 499 WRF, CG 3885 B2RF, and Rowden. The cultivars DP 1558 NR B2RF, DP 4747 GLB2, DP 1454 NR B2RF, ST 4946 GLB2, PHY 487 WRF, and PHY 333 WRF all supported similar root-knot eggs densities as the M-315 resistant control. All varieties tested yielded significantly higher than the susceptible check Rowden. Raking the cultivars by seed cotton yield in lb/A, the highest yielding variety was DP 1558 NR B2RF followed by DP 4747 GLB2, ST 4946 GLB2, and CG 3885 B2RF. These four cultivars produced a 16% (573 lb/A) increase in yield over the M-315 resistant control.

Table 1. Cotton cultivar response to Root-knot nematode and Fusarium wilt and subsequent yield, 2015.

Cultivar	Root fresh weight gm		Root-knot eggs total		Root-knot eggs/ gm root		% FOV		Seed cotton lb/A	
DP 1558 NR B2RF	12.1	a	8066	cd	563	abc	3.6	b	3775	a
DP 4747 GLB2	12.0	a	10019	bcd	821	abc	2.1	b	3681	a
ST 4946 GLB2	12.9	a	7356	cd	530	abc	2.1	b	3626	a
CG 3885 B2XF	9.0	a	7538	cd	1657	a	0.3	b	3318	a
DP 1454 NR B2RF	11.3	a	12101	bcd	890	abc	7.4	b	2962	ab
PHY 487 WRF	9.6	a	10677	bcd	1092	abc	3.2	b	2777	ab
PHY 333 WRF	9.5	a	9519	bcd	818	abc	1.8	b	2730	ab
NG 3406 B2XF	11.5	a	16320	bc	1318	ab	4.1	b	2596	ab
PHY 499 WRF	11.0	a	28719	ab	2479	a	6.0	b	2527	ab
ST 6448 GLB2	7.7	a	34541	a	4350	a	4.2	b	1931	b
M315	8.7	a	1966	d	123	c	1.2	b	3027	ab
ROWDEN	7.3	a	12203	bcd	1549	a	45.1	a	410	c

Cotton Variety and Nematicide Combinations for Root-Knot Nematode Management in Alabama, 2015

K.S. Lawrence, C. Land, N. Xiang, and J.A. Luangknot

Five nematicide combinations were evaluated for root-knot nematode management on two cotton varieties. The field site is located on the E.V. Smith Research and Education Center near Tallassee, AL. This field has been cultivated in cotton for many years and is naturally infested with *Meloidogyne incognita* race 3. The soil is a Kalmia loamy sand (80% sand, 10% silt, 10% clay). The cotton varieties were treated with nematicide seed treatments by Bayer CropScience. Temik 15 G was applied at planting with granular hoppers attached to the planter. Velum Total was applied as an in-furrow spray with 8002 flat fan nozzles angled diagonally across the seed furrow immediately in front of the seed. Vydate CLV was applied as a foliar spray at the 6 to 8 leaf stage using a CO_2 charged backpack sprayer. Plots were planted on 12 May with a soil temperature of 23.3 °F at a 10 cm depth and adequate soil moisture. Plots consisted of 2 rows, 7.6 m long with 0.91 m row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 4.5 m wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Plots were irrigated with a sprinkler system as needed. Seedling stand was determined 30 days after planting (DAP) on 3 Jun. Nematodes were collected for nematode analysis by digging up 4 random plants per plot on 25 Jun. Nematodes were extracted from the root systems using 6% NaOCl and collecting the nematodes on a 25 µm sieve. Plots were harvested on 6 Oct. Data were statistically analyzed using SAS 9.4 and means compared using Tukey Kramer's test ($p \leq 0.10$). Monthly average maximum temperatures from planting in May through harvest in October were 28.9, 31.9, 33.2, 32.5, 29.6 and 25.6°C with average minimum temperatures of 14.7, 19.7, 21.0, 20.1, 17.4 and 11.4°C, respectively. Rainfall accumulation for each month was 19.2, 9.3, 11.8, 8.2, 3.6 and 3.1 cm with a total of 55.2 cm over the entire season. The rainfall was adequate in July but very dry in Aug and Sep.

Root-knot nematode disease pressure was moderate for irrigated cotton in 2015. Statistically, no interactions occurred between the cotton varieties and nematicides thus data are presented separately. Plant stand at 30 DAP was similar for all varieties and nematicides with an average of 10.6 plants per m of row which is within the optimal rage of 8 to 12 plants per meter of row. Root-knot population densities were moderate at 44 DAP. FM 1740 B2F supported similar numbers of nematodes per gram of root as ST 4946GLB2. All the nematicide combinations supported fewer root-knot nematodes eggs per 4 plants and per gram of root compared to the Gaucho seed treatment (1) alone. The two Velum Total treatments, Velum Total plus Aeris (3) and Gaucho, + Flupyran seed treatment (5) supported similar reniform numbers per 4 plants and per gram of root thus the seed treatment and in-furrow spray provided similar reductions in root-knot reproduction. Seed cotton yields were greater for the ST 4946 GLB2 cultivar compared to FM 1944 B2RF producing an increase of 312.6 kg/ha. The yields varied by 172 kg/ha over all nematicides. The nematicides that included Flupyran, (3 and 5) increased yield an average of 168.7 kg/ha over the industry standard Temik 15 G (2).

		Stand (plants/ 7.6 m row*)	*Meloidogyne incognita* eggs		Seed cotton
Cotton variety	Seed treatment and rate	30 DAP	per 3 plants	/g root	(kg/ha)
	1. Gaucho 600 0.5 mg ai/seed	82	470.0 a	85.0 a	1932.0
	2. Temik 15 G 0.9 kg/ha	77	155.8 b	33.3 b	1884.4
	3. Velum Total 0.16 kg/ha Aeris 0.75 mg ai/seed	81	59.2 b	11.9 b	2049.6
	4. Aeris 0.75 mg ai/seed	83	131.3 b	23.0 b	1980.5
	5. Gaucho 0.375 mg ai/seed Flupyran 0.25 mg ai/seed	82	236.9 b	32.5 b	2056.6
ST 4946GLB2		77 b	186.4	41.5	2136.9 a
FM 1740 B2F		84 a	234.8	32.6	1824.3 b

*Stand was the number of seedlings in 7.6 meters of row.

**Means followed by same letter do not significantly differ according to Tukey-Kramer ($P \leq 0.10$).

Commercial Cotton Varieties Response to Verticillium wilt

K.S. Lawrence, K. Glass, C.H. Burmester, and B. Meyer

Verticillium wilt on-farm cotton cultivar evaluations, 2015.

Twelve cotton cultivars were planted and evaluated for resistance to *Verticillium dahliae*. The trial was planted on the Tate farm in northern Alabama. Plots were one row each, approximately 500 feet long and replicated 4 times in a RCBD. The field was irrigated, when needed, with a drip tape irrigation system. Disease ratings were taken September 1. In 10 ft sections of in each plot, total number of plants were determined, and stems were cut longitudinally to assess disease incidence. Disease severity ratings of foliar symptoms were evaluated on a scale from 1 to 5 with 1= no foliar wilting, 3= interveinal chlorosis and necrosis of the leaves, and 5=completely defoliated plants. Four replications, evenly spaced throughout the field of each variety were counted. Petioles were sampled from infected plants of each variety by re-isolating to confirm the presence of *Verticillium dahliae* by the presence of distinct morphological characteristics. The trial was harvested on 20 Oct. Analysis of variance was conducted using SAS 9.4 (SAS Institute), and means were compared using Tukey-Kramer Honest Significant Difference (HSD) ($\alpha \leq .10$).

Verticillium wilt pressure was medium to high during the 2015 season with 37 to 81 % Verticillium wilt present in each plot. The cultivar with the lowest incidence of Verticillium wilt ST 4747 GLB2 with the 37% of the plants infected with Verticillium although statistically this incidence was similar to all other cultivars in the test. ST 4747 GLB2 was the cultivar with the lowest disease severity (<2) rating of the twelve that were tested. The three cultivars that had the highest ratings were DP 1553 B2RF, DP 1538 B2 RF, and CP 3475 B2RF. These cultivars had mean scores above 3.8, with plants almost completely defoliated. Four cultivars yielded up to 50% higher than the lowest yielding cultivar. ST 4747 GLB2, PHY 312 WRF, PHY 333 WRF, and PHY 499 all produced yields over 2600 lb/A.

Table 1. Cultivar responses to Verticillium wilt as measured by incidence and severity and seed cotton yields, 2015.										
Cultivar	Plants 10 ft row		Verticillium wilt incidence		Percent Verticillium infestation		Verticillium severity		Seed cotton lb/A	
ST 4747 GLB2	33.3	a	12.3	a	37.1	a	1.8	b	3310	a
PHY 312 WRF	29.3	a	16.3	a	56.4	a	2.9	ab	2857	ab
PHY 333 WRF	27.8	a	17.8	a	62.5	a	3.5	ab	2815	ab
PHY 499 WRF	26.8	a	15.3	a	56.9	a	3.1	ab	2607	abc
ST 4946 GLB2	27.8	a	19.0	a	69.9	a	3.6	ab	2213	bcd
DP 1522 B2XF	27.8	a	18.5	a	66.0	a	3.3	ab	2198	bcd
PHY 444 WRF	30.8	a	19.0	a	61.1	a	2.6	ab	2061	bcd
DP 1553 B2XF	28.0	a	20.5	a	73.7	a	3.8	a	1920	bcd
CP 3475 B2XF	31.8	a	25.3	a	79.2	a	3.9	a	1689	cd
DP 1518 B2XF	28.5	a	16.3	a	56.7	a	2.5	ab	1644	cd
CP 3885 B2XF	24.8	a	19.8	a	79.3	a	3.3	ab	1643	cd
DP 1538 B2XF	28.0	a	22.8	a	80.9	a	3.9	a	1254	d

Verticillium wilt on-farm fungicide evaluations, 2015.

Three fungicides were evaluated for Verticillium wilt management on cotton. The trial was planted on the Tate farm in northern Alabama. Plots were one row each, approximately 100 feet long and replicated 4 times in a RCBD. The field was irrigated, when needed, with a drip tape irrigation system. Disease ratings were taken September 1. In 10 ft sections of in each plot, total number of plants were determined, and stems were cut longitudinally to assess disease incidence. Disease severity ratings of foliar symptoms were evaluated on a scale from 1 to 5 with 1= no foliar wilting, 3= interveinal chlorosis and necrosis of the leaves, and 5=completely defoliated plants. Four replications, evenly spaced throughout the field of each variety were counted. Petioles were sampled from infected plants of each variety by re-isolating to confirm the presence of *Verticillium dahliae* by the presence of distinct morphological characteristics. The trial was harvested by hand on 20 Oct. Analysis of variance was conducted using SAS 9.4 (SAS Institute), and means were compared using Tukey-Kramer Honest Significant Difference (HSD) ($\alpha \leq .10$).

Verticillium wilt pressure was medium to high during the 2015. Verticillium wilt incidence average 44.2 % in the untreated control plots. Verticillium wilt severity averaged 1.9 over all the fungicide treatments thus plants sisplayed wilt but had little defoliation. Ranking the fungicides by cotton yield supported, Quilt Xcel produced the largest yield with 2638 lb/a of seed cotton. This was followed by Domark with 2460 lb/A. Both of these fungicides supported more seed cotton than the untreated control.

Table 1. Cultivar responses to Verticillium wilt as measured by incidence and severity and seed cotton yields, 2015.										
Cultivar	Plants per 10 ft row		Verticillium wilt incidence		Percent Verticillium infestation		Verticillium severity (1-5 scale)		Seed cotton lb/A	
Control	34.8	a	14.5	a	44.2	a	1.9	a	2254.3	a
Domark	33.5	a	14.0	a	41.5	a	1.9	a	2460.0	a
Headline SC	33.0	a	16.3	a	47.5	a	1.9	a	2171.0	a
Quilt Xcel	31.5	a	15.3	a	48.5	a	1.9	a	2638.2	a

Cotton Variety and Nematicide Combinations for Reniform Management in North Alabama, 2015

K.S. Lawrence, C. Land, N.Xiang, J.A. Luangkhot, and C. Norris

Seven nematicide combinations were evaluated for reniform nematode management on two cotton varieties. The field site is located on the Tennessee Valley Research and Education Center near Belle Mina, AL. This field has been cultivated in cotton for over 16 years and was infested with the reniform nematode field in 1997. The soil is a Decatur silt loam (24% sand, 49% silt, 28% clay). The cotton varieties were treated with nematicide seed treatments by Bayer CropScience. Temik 15 G was applied at planting with granular hoppers attached to the planter. Velum Total was applied as an in-furrow spray with 8002 flat fan nozzles angled diagonally across the seed furrow immediately in front of the seed. Plots were planted on 5 May with a soil temperature of 24°C at a 10 cm depth and adequate soil moisture. Plots consisted of 2 rows, 7.6 m long with 0.91 m row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 4.5 m wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Plots were irrigated with a sprinkler system as needed. Seedling stand was determined 30 days after planting (DAP) on 3 Jun. Samples were collected for nematode analysis by digging up 4 random plants per plot on 25 June. Nematodes were extracted from the root systems using 6% NaOCl and collecting the nematodes on a 25 µm sieve. Plots were harvested on 6 Oct. Data were statistically analyzed using SAS 9.4 and means compared using Tukey-Kramer's test ($P < 0.10$). Plots were irrigated with a sprinkler system as needed. Seedling stand was determined at 25 days after planting (DAP) on 9 Jun. Nematodes were collected for nematode analysis by digging up 4 random plants per plot on 9 June. Nematodes were extracted from the root systems using 6% NaOCl and collecting the nematodes on a 25 µm sieve. Plots were harvested on 23 Oct. Data were statistically analyzed using SAS 9.4 and means compared using Tukey-Kramer's test ($P \leq 0.10$). Monthly average maximum temperatures from planting in May through harvest in October were and 82.3, 90.1, 91.6, 88.1, 84.8, and 75.5°F with average minimum temperatures of 60.1, 69.2, 71.7, 67.6, 63.1, and 51.6°F, respectively. Rainfall accumulation for each month was 4.62, 3.48, 4.18, 2.16, 0.98, and 2.2 in with a total of 17.62 in over the entire season. The rainfall was adequate in July but very dry in Aug and Sep.

Reniform nematode disease pressure was moderate for irrigated cotton in 2015. Statistically, no interactions occurred between the cotton varieties and nematicides thus data are presented separately. Plant stand at 30 DAP was similar for all varieties and nematicides with an average of 11 plants per m of row which is within the optimal rage of 8 to 12 plants per meter of row. Reniform nematode population densities were moderate at 35 DAP. FM 1740 B2F supported similar numbers of nematodes per gram of root as ST 4946GLB2. All the nematicide combinations supported fewer reniform nematodes eggs per 4 plants and per gram of root compared to the Aeris seed treatment alone. The four Velum Total treatments, Velum Total 14 oz/A plus Aeris Gaucho, + Flupyran seed treatment Velum Total 18 oz/A and Velum Total 14 oz/A + Gaucho, + Flupyran seed treatment supported similar reniform numbers per 4 plants and per gram of root, thus the seed treatment and in-furrow spray provided similar reductions in reniform reproduction. Seed cotton yields were greater for the ST 4946 GLB2 cultivar compared

to FM 1944 B2RF producing an average 174 kg/ha increase. The yields varied by 318 kg/ha over all nematicides. The Velum Total 14 oz/A + Gaucho, + Flupyran seed treatment increased yield 219 kg/ha over the industry standard Temik 15
G.

		Stand*	*Rotylenchulus reniformis* eggs		Seed cotton
Cotton variety	Seed treatment and rate	30 DAP*	per 3 plants	groot	(kg/ha)
	Gaucho 600 (0.5 mg ai/seed)	82	487 b	414 b	2538 ab
	Temik 15 G 0.9 kg/ha	78	556 b	461 b	2429 b
	Velum Total (14 oz/A) Aeris (0.75 mg ai/seed)	82	209 b	137 b	2648 ab
	Aeris (0.75 mg ai/seed)	78	2850 a	2760 a	2498 ab
	Gaucho (0.375 mg ai/seed) Flupyran (0.25 mg ai/seed)	83	464 b	373 b	2556 ab
	Velum Total (18 oz/A)	83	170 b	118 b	2642 ab
	Velum Total (14 oz/A) Gaucho (0.375 mg ai/seed) Flupyran (0.25 mg ai/seed)	81	170 b	135 b	2747 a
ST 4946GLB2		79	618	517	2667 a
FM 1740 B2F		82	784	740	2493 b

*Stand was the number of seedlings in 7.6 meters of row 30 days after planting (DAP).

**Means followed by same letter do not significantly differ according to Tukey-Kramer ($P \leq 0.10$).

Vydate CLV In-Furrow Spray Applications for Reniform Management in North Alabama, 2015

K.S. Lawrence, C. Land, N.Xiang, J.A. Luangkhot, and C.Norris

Vydate CLV in-furrow spray and foliar spray applications were evaluated for reniform nematode management on two cotton varieties. The field site is located on the Tennessee Valley Research Center near Belle Mina, AL. This field has been cultivated in cotton for over 16 years and was infested with the reniform nematode field in 1997. The soil is a Decatur silt loam (24% sand, 49% silt, 28% clay). Vydate CLV applied at planting was added at 12 GPA as an in-furrow spray with 8002 flat fan nozzles angled diagonally across the seed furrow immediately in front of the seed. Vydate CLV was applied as a foliar spray at the 6 to 8 leaf stage using a CO_2 charged backpack sprayer at 20 GPA. Plots were planted on 6 May with a soil temperature of 72 °F at a 10 cm depth and adequate soil moisture. Plots consisted of 4 rows, 25 ft long with 40 in row spacing and were arranged in a randomized complete block design with five replications. Blocks were separated by a 20 ft wide alley. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Plots were irrigated with a sprinkler system as needed. Seedling stand was determined at 25 days after planting (DAP) on 27 May. Samples were collected for nematode analysis by digging up 4 random plants per plot on 9 June. Nematodes were extracted from the root systems using 6% NaOCl and by collecting the nematodes on a 25 µm sieve. Plots were harvested on 23 Oct. Data were statistically analyzed using SAS 9.4 and means compared using Tukey-Kramer test ($P \leq 0.10$). Monthly average maximum temperatures from planting in May through harvest in October were 82.3, 90.1, 91.6, 88.1, 84.8, and 75.5°F with average minimum temperatures of 60.1, 69.2, 71.7, 67.6, 63.1, and 51.6°F, respectively. Rainfall accumulation for each month was 4.62, 3.48, 4.18, 2.16, 0.98, and 2.2 in with a total of 17.62 in over the entire season. The rainfall was adequate in July but very dry in Aug and Sep.

Reniform nematode disease pressure was moderate for irrigated cotton in 2015. Plant stand at 21 DAP was similar for all Vydate applications with an average of 3.1-3.3 plants per ft of row which is within the optimal range for cotton production. The in-furrow spray application of Vydate CLV did not cause any phytotoxicity on the cotton seedlings. Reniform population densities were moderate at 45 DAP. The Vydate CLV in-furrow spray applications at 17 and 34 oz/A and the Vydate CLV foliar spray at 17 oz/A reduced numbers of eggs of reniform nematodes per 4 plants and per gram of root as compared to the untreated control. Seed cotton yields were similar between all treatments varying by140 lb/A between the Vydate CLV in furrow treatments and the untreated control.

	Stand	*Rotylenchulus reniformis* eggs		Seed cotton
Seed treatment and rate and timing	30 DAP	per 4 plants	g/root	(lb/A)
Vydate CLV 17 fl oz in furrow at plant	79.5	204 b	344 b	2956
Vydate CLV 34 fl oz in furrow at plant	79.0	212 b	344 b	2911
Vydate CLV 17 fl oz foliar at pinhead square stage	76.3	397 b	502 b	2797
Vydate CLV 17 fl oz foliar pinhead square stage + 14 days	82.1	535 ab	832 ab	2876
Untreated control	82.6	795 a	1255 b	2816
[*] Stand was the number of seedlings in 25 foot of row 30 days after planting (DAP).				
[**] Means followed by same letter do not significantly differ according to Tukey-Kramer ($P \leq 0.10$).				

Reniform Nematode Management Utilizing Variety Selection With and Without Seed Treatments in Alabama, 2015.

J. A. Luangkhot and K.S. Lawrence

Upland cotton variety selections were screened to test if the addition of a nematicide seed treatment would increase yield in the presence of *Rotylenchulus reniformis*. The trial was located at the Tennessee Valley Research and Extension Center near Belle Mina, AL. The fields in this study have been cultivated in continuous cotton for 16 years. The field was infested in 1997 with reniform nematodes. The nematode infested field (field 55) is separated from the non-infested field by a corn field. These fields are identical in soil type both being a Decatur silt loam (24% sand, 49% silt, 28% clay) trials were duplicated in the nematode infested and the non-infested field for comparison. Ten commercially available upland cotton varieties were selected to test their tolerance to reniform nematode. Each variety was either treated with Gaucho 600 (12.8 fl. oz. per cwt) + Fluopyram (8.5 fl. oz. per cwt) or left untreated. Trials were planted on 5 May. Plot design was set up as a randomized complete block. Plots were two-rows wide, four ft. long with three foot spacing, and 25ft. long. Each of the five replications was separated with a 6 foot wide alley. Management practices for pesticides and fertilizers for cotton were followed according to Alabama Cooperative Extension System. Lateral irrigation was used to supplement water requirements. Observations made were reniform eggs, reniform eggs per gram of root, and seed cotton yield in pounds per acre. Data assessments were made 35 days after planting for reniform egg collection and eggs per gram of root; yield data were collected 168 days after planting. Reniform egg counts were made by sampling roots of 4 random plants from each plot on 9 Jun; eggs per gram of root were calculated by taking the ratio of root fresh weight and eggs counted per plot. Harvest of all plots was completed on 20 Oct. Data for the trial were analyzed by ANOVA using PROC GLIMMIX with SAS 9.4 (SAS Institute, INC., Cary, NC) and means compared with Tukey's HSD test at the $p \leq 0.05$. Monthly average minimum temperatures for the growing season from May until October were 60.1, 69.2, 71.7, 67.6, 63.1 and 51.6°F, respectively. Average maximum temperatures from May until October were 82.3, 90.1, 91.6, 88.1, 84.8, and 75.5°F, respectively. Accumulated rain fall per month from May until October was 4.62, 3.48, 4.18, 2.16, 0.98, and 2.20 inches, respectively, with a total of 17.62 in. over the growing season.

Advantageous soil moisture during the growing season and host plants, planted in reniform contaminated soils resulted in losses due to the nematode pressure. Among all varieties screened, reniform nematode eggs and eggs per gram of root were drastically reduced with the addition of the Gaucho 600 (12.8 fl. oz. per cwt) + Fluopyram (8.5 fl. oz. per cwt) seed treatment as compared to the same varieties without the addition of the seed treatment. While Phytogen 487 WRF sustained the highest number of reniform nematode eggs without the addition of the seed treatment, it also showed the biggest reduction in reniform eggs with the addition of the nematicide. Both varieties Stoneville 4946 GLB2 and Nexgen 3406 B2XF had greater yields than 3 of the other selected varieties with the addition of the nematicide in the presence of reniform nematode. Stoneville 4946 GLB2 in the presence of reniform nematode with and without the seed treatment had a statistically higher yield than the nematode resistant Deltapine 1454 NR B2RF. In the field without reniform nematodes present, Stoneville 4946 GLB2 yielded higher than all other varieties, and yielded statistically higher than Cropland 3885 B2XF, Deltapine 1454 NR B2RF, and Stoneville 6448 GLB2.

Cultivar	Seed Cotton Yield lbs./a without Nematicide[z]	Seed Cotton Yield lbs./a with Nematicide	Seed Cotton Yield lbs./a without Reniform	Reniform eggs without Nematicide	Reniform eggs with Nematicide	Eggs/g without Nematicide	Eggs/g with Nematicide
Cropland 3885 B2XF	2541.0 a	2719.2 ab	3442.6 cd	1023.56 ab	270.37 ab	1151.57 ab	238.13 abc
Deltapine 1454 NR B2RF	1617.0 b	1755.6 d	3273.6 d	637.31 b	212.44 ab	604.90 bc	174.50 abc
Deltapine 1558 NR B2RF	2211.0 ab	2461.8 abc	3738.2 abcd	618.00 b	270.37 ab	513.37 bc	232.20 abc
Nexgen 3406 B2XF	2329.8 ab	2996.4 a	4202.9 ab	811.12 ab	289.69 ab	848.90 abc	263.73 ab
Phytogen 333 WRF	2857.8 a	2805.0 ab	4208.2 ab	405.56 b	115.88 b	206.83 c	95.45 bc
Phytogen 487 WRF	2310.0 ab	2745.6 ab	4150.1 abc	1641.56 a	366.94 a	1284.43 a	250.38 abc
Phytogen 499 WRF	2197.8 ab	2257.2 bcd	3970.6 abcd	289.69 b	154.50 ab	293.95 c	100.52 bc
Stoneville 4747 GLB2	2336.4 ab	2587.2 abc	4144.8 abc	618.00 b	289.69 ab	405.82 bc	187.90 abc
Stoneville 4946 GLB2	2798.4 a	2923.8 a	4303.2 a	675.94 b	135.19 ab	510.62 bc	87.18 c
Stoneville 6448 GLB2	2600.4 a	2072.4 dc	3558.7 bcd	540.75 b	347.63 ab	578.40 bc	341.90 a

[z] Means followed by same letter within a column are not different according to Tukey's HSD test at $p \leq 0.05$.

In-Furrow Sprays on Cotton to Manage Southern Root-Knot Nematode in Alabama, 2015.

J.A. Luangkhot and K.S. Lawrence

In-furrow sprays were tested for their efficacy to manage Southern root-knot nematode. This trial was located on the Plant Breeding Unit extension of the E.V. Smith Research Center located near Tallassee, AL. The field in this study has been cultivated in continuous cotton production and is naturally infested with the causal organism Southern root-knot nematode. Soil type in this trial was Kalmia loamy sand (80% sand, 10% silt, 10% clay). Two varieties, Stoneville 6448 GLB2 and Stoneville 4946 GLB2, were selected to test efficacy of in-furrow sprays in the presence of Southern root-knot nematode. Planting date for the trial was 12 May. Plots were arranged in randomized complete block design with 4 row plots, 25 ft. long rows, 3 ft. spacing on rows with 20 ft. alleys, and 5 replications. Cotton management recommendations for pesticides and fertilizers were followed according to the Alabama Cooperative Extension System. Supplemental irrigation for the trial was done using center pivot irrigation. Observations made were stand counts, root-knot eggs per gram of root, and yield in pounds per acre; observations were made 22, 44, and 147 days after planting, respectively. Stand counts were made on 3 Jun. Root-knot eggs were collected from 4 randomly selected whole root systems from each plot on 25 Jun. Plot harvest occurred on 6 Oct. Treatments are listed in groups of two to represent the two cotton cultivars per application method of pesticides. All data were analyzed by ANOVA using PROC GLIMMIX with SAS 9.4 (SAS Institute, INC., Cary, NC) and means compared with Tukey's HSD test at $p \leq 0.05$. Monthly average minimum temperatures for the growing season from May until October were 58.4, 67.5, 69.9, 63.3, and 52.5°F, respectively. Maximum monthly temperatures from May until October were 84.1, 89.4, 91.8, 90.5, 85.2, and 78°F, respectively. Monthly rainfall for the growing season was 7.55, 3.66, 4.64, 3.23, 1.4, and 1.24 in. per month from May until October with total rainfall of 21.72 in.

Cotton production had adequate soil moisture for root-knot nematode pressure during this growing season due to consistent rainfall over most of the season. Cotton crops were planted late due to excessive rainfall in the earliest part of the season. Stoneville 6448 GLB2 showed a statistical increase in stand with the addition of Velum Total (18 fl. oz./a) compared to the treatment Proline 480 SC (2.85 fl. oz./a) + Admire Pro (9 fl. oz./a). The addition of nematicide and insecticides did not affect the stand for Stoneville 4946 GLB2. Both cultivars, when treated with a combination of Proline 480 SC (5.7 fl. oz./a or 2.85 fl. oz./a) + Admire Pro (9 fl. oz./a) had statistically lower root-knot nematode populations in comparison to Stoneville 4946 GLB2 treated with Admire Pro alone. Seed yields were statistically similar across all treatments for both cultivars tested.

		Stand[y]		Eggs/gram root		Seed Yield lb./a	
Treatment Number[z]	Treatment and Rate/A.	ST 6448 GLB2	ST 4946 GLB2	ST 6448 GLB2	ST 4946 GLB2	ST 6448 GLB2	ST 4946 GLB2
1&7	Admire Pro 9 fl. oz.	64.2 ab	78.0 a	25.8 ab	76.8 a	3610.3 a	3561.5 a
2&8	Velum Total 18 fl. oz.	76.0 a	63.8 ab	45.2 ab	48.4 ab	3641.6 a	3619.6 a
3&9	Proline 480 SC 5.7 fl. oz. Admire Pro 9 fl. oz.	68.8 ab	66.2 ab	16.4 b	21.4 b	3781.6 a	3921.6 a
4&10	Proline 480 SC 2.85 fl. oz. Admire Pro 9 fl. oz.	49.0 b	60.8 ab	16.2 b	19.2 b	3365.2 a	3509.2 a
5&11	Propulse 13.7 fl. oz. Admire Pro 9 fl. oz.	61.8 ab	83.8 a	30.2 ab	47.2 ab	3724.1 a	3488.3 a
6&12	Propulse 6.8 fl. oz. Admire Pro 9 fl. oz.	68.6 ab	72.6 a	29.8 ab	49.2 ab	3251.3 a	3369.8 a

[z] Treatment numbers represent different cultivars with respective pesticides applied.
[y] Stand represents plants/ 25 ft. on 3 Jun.
Observations followed by the same letter within a column are not significantly different Tukey’s HSD test at the $p \leq 0.05$ level.

VII. Extras

Maintenance and Expansion of the ACES/Auburn Univ. Web Site for Alabama Crops, 2015

D. Delaney, C. Dillard, and D. Monks

The www.alabamacrops.com website was developed to serve as a central site for research and extension information on Alabama field crops. The effort has been successful for delivering several types of information including IPM guides, research updates and reports, and extension information. The site has been especially useful for rapid delivery of crop variety and pest control information. Single-year variety yield data sets are often analyzed and posted 3 weeks before publication of the full Official Variety Report. While this does not provide 2- and 3-year averages, it does provide current information to producers, county agents, crop advisors, and industry representatives on how well specific entries performed across the state. IPM Guides were also available on-line weeks before paper publication.

The Alabama Crops site also serves as the hub for crops-related sites in areas such as Soil Testing, Newsletters, on-farm research trial reports, and variety trials. Our Web Manager Mr. Jon Brasher develops and manages the www.alabamacrops.com site and assists in the development and maintenance of the Alabama Official Variety Testing web site. The web site includes links to information on, but not limited to: corn, cotton, soybeans, forages, wheat, small grains, stored grains, IPM guides, OVT research information, on-farm research and development, hay and pasture weed control, enterprise budgets, precision ag, soil fertility, plant diagnostics and soil testing A Crops Calendar keeps users informed of training opportunities, conferences, and meetings. Twitter and Facebook feeds notify participants when new information is posted.

Jon's assistance to the Agronomic Crops team has been expanded to planting and harvesting on-farm tests, equipment maintenance and management, and a variety of other team activities. Jon has been trained to analyze, tabulate, and prepare research and demonstration results for posting to the web site.

Funding for this project was secured from the Alabama Soybean Producers, Alabama Wheat and Feed Grains Committee and Alabama Cotton Commission for 2015 and will be requested for 2016. Common feedback has been that this website has been a major improvement in how we deliver our row crop information through the web.

Web statistics as of December 17th indicate that the Alabama Crops web site had 30,624 visits and 63,790 page views in 2015. The web site averaged 87 visits per day for that time period. A visit is a series of actions that begins when a visitor views their first page from the server, and ends when the visitor leaves the site or remains idle beyond the idle-time limit. Views are hits to any file classified as a page. After the home page, the pages for the Alabama Variety Testing Program and Alabama Corn Production were the most visited.

2015 Agriculture Discovery Day

D. Monks, L. Kriese-Anderson, G. Pate, K. Smith, C. Hicks and P. Mask

Objective.
Conduct education awareness of traditional Alabama agriculture and advanced production technologies for the community and producers.

Activity.

The majority of American consumers have little understanding of the significant role agriculture plays in their lives, from the food they eat, to the clothes they wear. According to the United States Department of Agriculture, fewer than 2% of Americans farm for a living and only 17% live in rural areas compared with 30% who farmed for a living and 50% who lived in rural areas a century ago.

Therefore, the Alabama Cooperative Extension System, AU College of Agriculture, and Alabama Experiment Station have started planning for the 4th Agricultural Discovery Day in order to promote our industry and educate Alabamians on its importance to our economy and livelihood. This event will be held again at the EV Smith Research Center in late September or early October 2016. Currently, planning is ongoing to include various education events and tours for youth and adults. Advertisement of this event will start in March to help promote to surrounding counties and school systems.

2015 Results.
The 2015 Ag Adventure Discovery Day drew over 1900 participants, up from 1600+ in 2014. We have had an increase of 300 to 400 participants each year and expect to break 2000 at the 2016 event. This does not include over 200 volunteers that work together to make it possible. The overall budget is just over $40,000 which does not include donations of food, supplies, etc. We appreciate the support that you have provided and feel that this continues to be a major educational event for the state. We have begun to see more visitors from western Georgia and southern Tennessee as a destination event as well.

Restoration of Antique Cotton Pickers

C. C. Mitchell, D. Delaney, K. Balkcom, T. McDonald and J. P. Fulton

With additional support from Dean of the College of Agriculture, Dr. William Batchelor, one of two antique cotton pickers that we use to harvest the Old Rotation and the Cullars Rotation, was fully repaired and painted. It was used for harvest the 2015 cotton crop on the Old Rotaion and Cullars. Work was done by
Randy Bodine of Auburn, AL The picker is currently stored at the Seed Technology Building at Auburn University because no other facility is available for its storage or display.