Partners in Progress
PEANUTS

Peanut Research at OSU 2016

Supported by the

Oklahoma Peanut Commission

and the

National Peanut Board

Oklahoma State University
Division of Agricultural Sciences
and Natural Resources
Oklahoma Agricultural Experiment Station
Oklahoma Cooperative Extension Service

In cooperation with the
U.S. Department of Agriculture -
Agricultural Research Service

P-1049

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Foreword

Oklahoma State University has a long-standing partnership with the Oklahoma Peanut Commission and the peanut producers of this state. There have been good times and bad times in terms of state budget restraints, shifts in peanut production locations in the state and changes in the federal peanut program. Together, we have survived and are looking forward to a brighter future.

Our *Partners in Progress Peanut Research at OSU 2016* report serves as a means to highlight significant accomplishments in research and Extension programs that have been supported in partnership with the OPC and the National Peanut Board. With all the work that has been accomplished, it is important to recognize that much more research and Extension programming needs to be done to keep our peanut producers competitive and in business. Therefore, our work must be focused on solving meaningful issue-based problems facing the peanut producers in Oklahoma.

This report is one means of being accountable for the funds we have received and communicating the latest results of our programs to peanut producers as rapidly as possible.

Keith Owens
Assistant Vice President and Director
Oklahoma Agricultural Experiment Station
Division of Agricultural Sciences and Natural Resources
Oklahoma State University

Oklahoma State University Division of Agricultural Sciences and Natural Resources Mission Statement

The mission of the Oklahoma State University Division of Agricultural Sciences and Natural Resources is to discover, develop, disseminate and preserve knowledge needed to enhance the productivity, profitability and sustainability of agriculture; conserve and improve natural resources; improve the health and well-being of all segments of our society; and to instill in its students the intellectual curiosity, discernment, knowledge and skills needed for their individual development and contribution to society.

Enhancing Peanut Production Profitability through Research and Extension

The Oklahoma and national agricultural industries continue in somewhat of a downturn, and with both seeking some good news, there were positive developments in the state's 2016 peanut crop. Due to changes in planted acres in other parts of the peanut belt, Oklahoma producers were offered more contracting opportunities than last year, and planted acres increased by 35 percent between 2015 and 2016. This positive trend is welcomed by an industry still adjusting to structural changes resulting from governmental policies and the earlier loss of what was once the major peanut purchaser in Oklahoma. In addition to the increase in acres planted, a favorable growing season followed by good maturing conditions resulted in an excellent crop in terms of both production and quality.

Unfortunately, due to the continued national oversupply of peanuts, contract prices were less than desired by producers, requiring them to carefully manage inputs in every phase of production. Despite tight margins, peanuts can still produce a profit for efficient growers and with the prospects for the overall farm economy to remain in the doldrums, peanuts will continue to find favor with those having experience and commitment to the crop.

The results of Oklahoma State University and United States Department of Agriculture-Agricultural Research Service, USDA-ARS, research programs have helped mitigate some of the negative impact of low prices. New peanut varieties released by USDA-ARS at the Peanut Improvement Center in Stillwater have been well received by producers and the industry. Due to their high yielding ability, outstanding quality and disease resistance, the varieties are positively impacting the Oklahoma peanut industry and the state's economy. Similarly, OSU and USDA-ARS research programs are providing growers with much needed answers for vexing disease and weed problems. Partial funding for this research is being provided through the National Peanut Board, NPB.

The NPB is a grower-funded national research, promotion and education checkoff program with growers from 10 states submitting funds and in turn, receiving research and promotion funds back in those states. As part of an ongoing partnership, in fiscal year 2016 the Oklahoma Peanut Commission, OPC, teamed with OSU and USDA-ARS to submit research proposals to the NPB. NPB provided $20,239 in research funding for OSU and USDA-ARS. Funded research projects included: Integrated Management of Peanut Diseases Evaluation of Advanced Breeding Lines and Current Peanut Varieties across Oklahoma and Weed Management in Oklahoma Peanuts. Results of those research projects will be of great interest to Oklahoma producers and are presented in this report.

On an additional positive note, the national peanut industry is benefiting from increasing per capita peanut consumption. For Oklahoma to profit from this development, growers must continue to have access to research-based results and recommendations as they make production decisions. The OPC will continue to team with OSU and USDA-ARS, which will provide critical assistance, and NPB, which will deliver essential resources. All have a commitment to a robust peanut industry in the state, and Oklahoma's peanut growers are very appreciative of that fact.

Oklahoma's peanut producers are proud of their long and productive history with OSU, USDA-ARS and NPB, and look forward to the future shared benefits of continuing this partnership.

Ron Sholar
Executive Director
Oklahoma Peanut Commission

Peanut Variety Tests

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2016 progress made possible through OPC and NPB support

- **Performance of runner varieties depended on location, but long-term averages across locations indicate advanced breeding lines ARSOK-R47A and ARSOK-R37 were the top performers, followed by cultivars Tamrun OL11 and Lariat.**
- **Cultivar AT98-99 was consistently the highest yielder across locations and years, most likely due to the prostrate runner growth habit. No significant differences were seen between Spanish cultivars OLé and Tamnut OL06 across locations and over years.**
- **The new Virginia breeding line ARSOK-V377 out-yielded all other Virginia entries across locations in 2016. However, among those Virginia entries tested for at least four years, no significant differences were observed in yield or grade.**

Methods

All entries in the Oklahoma Peanut Variety trials were high-oleic. The following entries were included in all locations in 2016:

- 12 runner types: Tamrun OL11, Red River Runner, Lariat, Webb, Flavor Runner 458, ARSOK-R37, ARSOK-R47A, ARSOK-R60A, ARSOK-R90-12, ARSOK-R92-13, ARSOK-93-10 and ARSOK-R94-4
- Four Spanish types: AT98-99, OLé, Tamnut OL06 and ARSOK-S88-1
- Eight Virginia types: Jupiter, Florida Fancy, VENUS, Wynne, ARSOK-V31, ARSOK-V85-7, ARSOK-V-86 and ARSOK-V377.

All variety trials were conducted under an extensive pest management program. The objective was to prevent as much outside influence from pest pressures (weed, disease and insect) on yield and grade as possible. The interaction between variety and location was significant, so the results were separated by location. Since the varieties and advanced lines response differed by location, growers may find the data for the county closest to their location to be the most useful in selecting a variety or varieties to grow. All test plots were planted using two 36-inch rows that were 20 feet long. Plots were seeded at a rate of five seeds per row foot (139,392 seeds per acre). Trials were conducted using randomized, complete block design with four replications. The entire plot was dug and then thrashed two to three days later. Peanuts were placed in a dryer until moisture reached 10 percent. Total sound mature kernels, TSMK, were determined on a 200-gram sample from each plot.

Revenue per acre was determined by converting estimated plot yields to tons/acre and using the current market price values from the U.S. Department of Agriculture-Farm Service Agency for each market type (runner = $424 per ton; Spanish = $409 per ton; Virginia = $423 per ton) as of December 2016 (USDA FSA). No adjustments were

made for damaged kernels or concealed damage. Calculations of dollars per acre are based on yield and grade only, and do not include possible input costs. The following formula was used:

$/A = yield × (tons/A) × market price ($/ton) × grade

Virginia market-type pod distribution was determined for all replications and locations for each entry on a 500-gram pod sample. Pod brightness (Hunter L score) for each Virginia market-type entry also was determined on the 500-gram samples using a Hunter Lab D25 NC colorimeter.

Pod rot ratings were made within five hours of digging by visually estimating the percentage of discolored pods within each two-row plot. Data were analyzed using one-way ANOVA in PROC GLIMMIX of SAS (ver. 9.3). The Type I error rate for pairwise comparisons of varieties within each market type was controlled using the Tukey-Kramer adjustment.

Interpreting data

Details of establishment and management of each test are listed in footnotes below the tables. Least significant differences, or LSD, are listed at the bottom of all but the performance summary tables. Differences between varieties are significant only if they are equal to or greater than the LSD value. If a given variety outyields another variety by as much or more than the LSD value, then there is a 95 percent chance the yield difference is real, with only a 5 percent probability the difference is due to chance alone. For example, if variety X is 500 pounds per acre higher in yield than variety Y, then this difference is statistically significant if the LSD is 500 or less. If the LSD is 500 or greater, then there is less confidence variety X really is higher yielding than variety Y under the conditions of the test.

The coefficient of variation, or CV value, listed at the bottom of each table is used as a measure of the precision of the experiment. Lower CV values generally will relate to lower experimental error in the trial. Uncontrollable or immeasurable variations in soil fertility, soil drainage and other environmental factors contribute to greater experimental error and higher CV values. Results reported here should be representative of what might occur throughout the state but would be most applicable under environmental management conditions similar to those of the trials. The relative yields of all peanut varieties are affected by crop management and by environmental factors including soil type, summer conditions, soil moisture, disease and insects.

2016 Caddo County Peanut Variety Trial

Location: Caddo Research Station, Ft. Cobb
Date Planted: 5/11/2016
Date Dug: 10/24/2016
Date Threshed: 10/26/2016

The trial was planted May 11, 2016. A conventional-till seedbed was used and managed for foliar and soil-borne disease throughout the season.

Average yield for the runner test was 5,844 pounds per acre and average grade was 69 percent TSMK (Table 1) with entries Tamrun OL11, Lariat and ARSOK-R37 having higher yields as compared to other genotypes tested. Grades were lower than expected due to unusually cool months of August and September.

Among the Spanish varieties or lines tested, the average yield and grade were 4,855 pounds per acre and 63 percent TSMK, respectively. AT98-99 was numerically the top performer, but no significant differences were found

among all entries. Again, grades were lower than expected.

Entries in the Virginia test averaged 5,273 pounds per acre with an average grade of 65 percent TSMK. Florida Fancy was the top yielder, followed closely by breeding lines ARSOK-V377 and ARSOK-V31. North Carolina variety Wynne was the poorest performer at 4,767 pounds per acre.

Table 2 contains Caddo County yield and grade data for the last four years. Runner entries Lariat, ARSOK-R37 and ARSOK-R47A were the top yielders over the four-year period at 4,864 pounds per acre, 5,022 pounds per acre and 4,912 pounds per acre, respectively. No significant differences were found among all Spanish entries over the four years. Florida Fancy topped the Virginia entries with a yield of 5,165 pounds per acre.

2016 Custer County Variety Trial

Location: Les Crall Farms, Thomas
Date Planted: 5/10/2016
Date Dug: 10/31/2016
Date Threshed: 11/2/2016

The trial was planted May 10, 2016, into a conventional-till seedbed and managed for foliar and soil-borne disease throughout the season.

Average yield for the runner test was 5,844 pounds per acre with an average grade of 69 percent TSMK. Tamrun OL11 was the top performer, and yields were higher than in past years overall. Breeding line ARSOK-R94-4 had the poorest performance at 5,163 pounds per acre and 70 percent TSMK.

For the Spanish varieties or lines tested, the average yield was ,646 pounds per acre and the average grade was 68 percent TSMK. No significant differences were noted in yield among the genotypes tested, but AT98-99 and OLé were the top performers numerically.

Virginia entries averaged 5,328 pounds per acre and a grade of 70 percent TSMK. No significant differences in yield were noted among the top three performers, which were ARSOK-V377, Florida Fancy and Wynne. ARSOK-V31 had the poorest performance at 4,513 pounds per acre and a grade of 71 percent TSMK.

Table 4 contains yield and grade data for the last four years along long term averages in Custer and Blaine counties. Tamrun OL11 was the top performer numerically among runners tested, but no statistically significant differences among entries existed. The same was true among Spanish and Virginia types tested, with AT98-99 and Florida Fancy, respectively, leading numerically.

2016 Tillman County Variety Trial

Location: Joe D. and Gayle White Farms, Davidson
Date Planted: 6/8/2016
Date Dug: 10/25/2016
Date Threshed: 10/27/2016

The trial was planted June 8, 2016, into a conventional-till seedbed and managed for foliar and soil-borne disease throughout the season. Table 5 shows the yield and grade data from Tillman County.

Average yield and grade for the runner test was 5,844 pounds per acre and 69 percent TSMK. Tamrun OL11 was the top yielder numerically, but statistical differences in yield were not observed among the top six entries. ARSOK-R94-4 was the poorest performer at 5,193 pounds per acre and 70 percent TSMK.

The average yield and grade among Spanish varieties or lines tested were 5,227 pounds per acre and 68 percent TSMK. AT98-99 was the top yielder numerically at 5,904 pounds per acre but no significant differences in yield were observed among all entries.

Average yield and grade in the Virginia test were 5,582 pounds per acre and 68 percent TSMK. The top

Table 1. Yields and grades from Caddo County peanut variety trials, 2016.[4]

Variety or line	*Yield (lbs/A)*	*Percent of trial average*	*Grade[2] (% TSMK)*	*Revenue[3] ($/A)*
Runner[1]				
Tamrun OL11	6,146a	110	71a	839
Lariat	6,122a	109	68ab	800
ARSOK-R37	6,086a	108	69ab	807
ARSOK-R47A	5,989ab	107	69ab	794
Red River Runner	5,941ab	106	69ab	788
ARSOK-R60A	5,832bc	104	62de	695
Webb	5,493b-d	98	63c-e	665
ARSOK-R94-4	5,324cd	95	60e	614
ARSOK-R92-13	5,324cd	95	68ab	696
ARSOK-R90-12	5,251c-e	94	65b-d	656
Flavor Runner 458	5,057de	90	66bc	642
ARSOK-R93-10	4,670e	83	56f	503
Mean	5,844		69	
CV	9.9		5.3	
LSD (0.05)	980		6.1	
Spanish[1]				
AT-98-99	5,057	104	65a	609
Tamnut OL06	4,840	99	62b	556
ARSOK-S88-1	4,791	97	65a	579
OLé	4,731	97	62b	544
Mean	4,855		63	
CV	4.4		2.4	
LSD (0.05)	346 (NS)		2.4	
Virginia[1]				
Florida Fancy	5,731a	109	63c	692
ARSOK-V377	5,662ab	107	65bc	706
ARSOK-V31	5,469ab	104	68b	714
VENUS	5,324a-c	101	64c	654
ARSOK-V85-7	5,203bc	99	72a	719
Jupiter	5,166b-d	98	63c	624
ARSOK-V86	4,864cd	92	63c	588
Wynne	4,767d	90	63c	576
Mean	5,273		65	
CV	6.5		3.5	
LSD (0.05)	505		3.4	

[1] Market Type.
[2] % TSMK = Percent total sound mature kernels.
[3] Calculated based on peanut market-type price December 2016 (USDA-FSA).
[4] Values within the same column followed by the same letter are not significantly different at P = 0.05; NS = not significantly different.

Table 2. Peanut yields and grades from Caddo County variety trials in 2015 and 2016 along with multi-year averages (2013—2016) and estimated revenue.[4,5]

Variety or line	*Yield (lbs/A)*	*Grade[2] (% TSMK)*	*Yield (lbs/A)*	*Grade[2] (% TSMK)*	*Yield (lbs/A)*	*Grade[2] (% TSMK)*	*Revenue[3] ($/A)*
	----2015----		----2016----		----4-year average----		
Runner[1]							
ARSOK-R37	5,022a	65ab	6,086a	69ab	5,859a	70ab	789
ARSOK-R47A	4,912a	67a	5,989ab	69ab	5,747a	69ab	762
ARSOKR60A	4,065c	62b	5,832bc	62c	5,465ab	65b	683
Lariat	4,864a	65ab	6,122a	68ab	5,333ab	71a	728
Tamrun OL11	4,186bc	67a	6,146a	71a	5,205ab	72a	723
Red River Runner	4,598ab	67a	5,941ab	69ab	5,078ab	72a	720
Flavor Runner 458	3,944c	64ab	5,057c	66bc	4,473b	70ab	602
Mean	4,483	64	5,844	69	5,309	70	
CV	6.5	4.2	9.9	5.3	14.2	5.5	
LSD (0.05)	429	4.1	980	6.1	1127	5.7	
Spanish[1]							
AT-98-99	3,605a	65ab	5,057	65a	4,328	68	546
Tamnut OL06	3,146b	68a	4,840	62b	4,262	67	529
OLé	3,460ab	64b	4,731	62b	4,178	68	528
Mean	3,215	64	4,855	63	4,259	67.5	
CV	6.9	3.2	4.4	2.4	3.8	2.5	
LSD (.05)	36	3.3	NS	2.4	NS	ns	
Virginia[1]							
Florida Fancy	4,077a	64c	5,731a	63c	5,165a	66b	654
ARSOK-V31	3,351b	69ab	5,469ab	68b	4,706b	70a	632
VENUS	3,279b	66bc	5,324a-c	64c	4,569b	68ab	596
Mean	3,744	67	5,273	65	4,813	68	
CV	7.1	3.0	6.5	3.5	2.6	2.5	
LSD (0.05)	426	3.2	505	3.4	292	2.0	

[1] Market Type.
[2] % TSMK = Percent total sound mature kernels.
[3] Calculated based on peanut market-type price December 2016 (USDA-FSA).
[4] Data not shown for all varieties tested in 2013 and used to calculate mean, CV and LSD.
[5] Values within the same column followed by the same letter are not significantly different at P = 0.05; NS = not significantly different.

Table 3. Yields and grades from Custer County peanut variety trials, 2016.

Variety or line	*Yield (lbs/A)*	*Percent of trial average*	*Grade[3] (%TSMK)*	*Revenue[4] ($/A)*
Runner[1]				
Tamrun OL11	6,679a	114	71ab	912
ARSOK-R47A	6,550ab	112	73a	920
ARSOK-R37	6,469a-c	110	71ab	884
Red River Runner	6,421a-d	109	69abc	852
Lariat	5,776a-e	99	70abc	778
Flavor Runner 458	5,727a-e	97	66bc	727
Webb	5,630b-e	96	64c	693
ARSOK-R92-13	5,566c-e	95	68a-c	728
ARSOK-R60A	5,485de	94	67a-c	707
ARSOK-R90-12	5,340e	91	68a-c	699
ARSOK-R93-13	5,324e	91	68a-c	696
ARSOK-R94-4	5,163e	88	70a-c	695
Mean	5,844		69	
CV	9.9		5.3	
LSD (0.05)	980		6.1	
Spanish[1]				
AT-98-99	5,904	104	71a	777
OLé	5,648	100	69b	724
ARSOK-S88-1	5,614	99	69b	719
Tamnut OL06	5,227	93	64c	621
Mean	5,646		68	
CV	8.1		1.1	
LSD (.05)	918 (NS)		1.5	
Virginia[1]				
ARSOK-V377	6,074a	114	72ab	839
Florida Fancy	5,844a	110	68c	762
Wynne	5,602a	105	70b	753
ARSOK-V86	5,517ab	104	71b	752
VENUS	5,457ab	102	68c	713
ARSOK-V85-7	4,936cb	93	74a	701
Jupiter	4,682c	87	67c	602
ARSOK-V31	4,513c	85	71b	615
Mean	5,328		70	
CV	8.3		2.2	
LSD (0.05)	652		2.2	

[1] Market Type.
[2] % TSMK = Percent total sound mature kernels.
[3] Calculated based on peanut market-type price December 2016 (USDA-FSA).
[4] Values within the same column followed by the same letter are not significantly different at P = 0.05; NS = not significantly different.

Table 4. Peanut yields and grades from Custer/Blaine counties variety trials in 2015 and 2016 along with multi-year averages (2013-2016) and estimated revenue.[4]

Variety or line	*Yield (lbs/A)*	*Grade[2] (%TSMK)*	*Yield (lbs/A)*	*Grade[2] (% TSMK)*	*Yield (lbs/A)*	*Grade[2] (% TSMK)*	*Revenue[3] ($/A)*
	----2015----		----2016----		----4-year average----		
Runner[1]							
Tamrun OL11	4,997a	76a	6,679a	71ab	5,544	74	789
ARSOK-R37	5,493a	77a	6,469a-c	71ab	5,535	75	799
Lariat	5,142a	77a	5,776a-e	70abc	5,530	74	787
Red River Runner	5,009a	76a	6,421a-d	69abc	5,377	73	755
ARSOK-R47A	5,203a	77a	6,550ab	71ab	5,320	75	768
ARSOK-R60A	5,178a	73b	5,485de	73a	5,208	71	727
Flavor Runner 458	4,017b	74b	5,727a-e	66bc	4,633	71	633
Mean	4,965	75	5,844	69	5,307	73	
CV	12.8	1.3	9.9	5.3	13.7	7.7	
LSD (0.05)	941	1.5	980	6.1	NS	ns	
Spanish[1]							
AT-98-99	4,247	72ab	5,904	71a	4,743	70	616
OLé	4,343	71ab	5,648	69b	4,625	69	593
Tamnut OL06	4,525	70b	5,614	64c	4,358	70	566
Mean	4,250	72	5,646	68	4,575	70	
CV	10.8	1.8	8.1	1.1	6.7	1.3	
LSD (.05)	NS	2	NS	1.5	NS	ns	
Virginia[1]							
Florida Fancy	4,961	70b	5,844a	68b	5,541	70b	744
VENUS	5,082	71b	5,457ab	68b	5,279	70b	710
ARSOK-V31	5,094	73ab	4,513c	71a	4,860	74a	690
Mean	5,094	72	5,328	70	5,227	71	
CV	8.9	3.0	8.3	2.2	7.3	1.1	
LSD (0.05)	NS	3.5	652	2.2	NS	1.8	

[1] Market type.
[2] % TSMK = Percent total sound mature kernels.
[3] Calculated based on peanut market-type price December 2016 (USDA-FSA).
[4] Values within the same column followed by the same letter are not significantly different at P = 0.05; NS = not significantly different.
[5] Data not shown for all varieties tested in 2013 and used to calculate mean, CV and LSD.

Table 5. Yields and grades from Tillman County peanut variety trials, 2016.[4]

Variety or line	*Yield (lbs/A)*	*Percent of trial average*	*Grade[2] (% TSMK)*	*Revenue[3] ($/A)*
Runner[1]				
Tamrun OL11	6,679a	114	71ab	912
ARSOK-R47A	6,550ab	112	73a	920
ARSOK-R37	6,469a-c	110	71ab	884
Red River Runner	6,421a-d	109	69a-c	852
Lariat	5,776a-e	99	70a-c	778
Flavor Runner 458	5,727a-e	98	66bc	727
Webb	5,630b-e	96	64c	693
ARSOK-R92-13	5,566c-e	95	68a-c	728
ARSOK-R60A	5,485de	94	67a-c	707
ARSOK-R90-12	5,340e	91	68a-c	699
ARSOK-R93-10	5,324e	91	68a-c	696
ARSOK-R94-4	5,163e	88	70a-c	695
Mean	5,844		69	
CV	9.9		5.3	
LSD (0.05)	980		6.1	
Spanish[1]				
AT-98-99	5,904	104	70a	767
OLé	5,840	103	69b	748
ARSOK-S88-1	5,614	99	69b	719
Tamnut OL06	5,227	93	64c	621
Mean	5,646		68	
CV	8.1		1.1	
LSD (0.05)	918 (NS)		1.5	
Virginia[1]				
ARSOK-V377	6,614a	108	67bc	850
Jupiter	6,566a	107	67bc	844
ARSOK-V86	6,308ab	103	70ab	811
ARSOK-V31	6,227ab	102	69bc	825
Wynne	5,905ab	96	66bc	747
ARSOK-V85-7	5,904ab	96	73a	827
Florida Fancy	5,889ab	96	67bc	757
VENUS	5,582b	91	65c	696
Mean	6,124		68	
CV	7.1		3.6	
LSD (0.05)	758		4.3	

[1] Market Type.
[2] % TSMK = Percent total sound mature kernels.
[3] Calculated based on peanut market-type price December 2016 (USDA-FSA).
[4] Values within the same column followed by the same letter are not significantly different at P = 0.05; NS = not significantly different.

yielder numerically was breeding line ARSOK-V377 at 6,614 pounds per acre, but no statistical differences were observed among most entries.

The performance of entries over a two-year period in Tillman County is shown in Table 6. Top performers among runner types included Tamrun OL11 and ARSOK-R47A, although they were not statistically different from any entry except the poorest performer, Flavor Runner 458. No statistical differences were observed among Spanish or Virginia entries when performances were averaged over the two-year period.

Performance across locations, pod rot incidence and pod brightness

Table 7 includes yield and grade data averaged across locations for 2016. Among the runner types tested, Tamrun OL11 and ARSOK-47A outyielded all others, although the statistical differences among most entries was small. The top-yielding Spanish line across locations was AT98-99, most likely due to its prostrate runner growth habit. No differences were seen among the other Spanish lines tested. Topping the Virginia lines tested were breeding lines ARSOK-V377 and Florida Fancy.

Table 8 shows peanut yields and grades averaged across years and all locations, along with estimated revenue for each entry. The top performing runner entry numerically was breeding line ARSOK-R47A, but no statistical differences were observed among entries with the exception of Flavor Runner 458, which averaged only 4,817 pounds per acre, making it the poorest performer overall. Among the Spanish entries, AT98-99 again was the top yielder. No long-term significant differences were seen among the Virginia entries.

The incidence of pod rot in Custer and Tillman counties was less than 5 percent for all entries, so data from these counties were not analyzed. In addition, pod rot levels in Spanish and runner entries in Caddo County were too low to analyze. However, moderately low levels of pod rot were observed in the Caddo County Virginia entries. Differences among entries in pod rot incidence were nearly statistically significant (Table 9).

Table 10 shows pod brightness values and percent fancy pods of Virginia trial entries averaged across locations for 2016. Very little difference was noted among entries, but Florida Fancy was lowest in pod brightness with a Hunter L score of 46.6 and ARSOK-V86 was lowest in percentage of fancy pods at 64 percent.

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Table 6. Peanut yields and grades from Tillman County variety trials in 2015 and 2016 along with two-year averages (2015-2016) and estimated revenue.[4]

Variety or line	*Yield (lbs/A)*	*Grade[2] (% TSMK)*	*Yield (lbs/A)*	*Grade[2] (% TSMK)*	*Yield (lbs/a)*	*Grade[2] (% TSMK)*	*Revenue[4] ($/A)*
	--------2015--------		--------2016--------		----2-year average----		
Runner[1]							
Tamrun OL11	7102ab	73bc	6679a	71ab	6890a	72a-c	954
ARSOK-R47A	7199a	75ab	6550ab	73a	6875a	74a	979
Red River Runner	6679a-c	76a	6421a-d	69a-c	6550ab	73ab	920
ARSOK-R37	6388bc	73bc	6469a-c	71ab	6429ab	72a-c	890
Lariat	6695a-c	76a	5776a-e	70a-c	6235ab	73ab	876
ARSOK-R60A	6594a-c	70d	5485de	67a-c	6039b	69c	802
Flavor Runner 458	6025c	73bc	5727a-e	66bc	5876b	70bc	791
Mean	6668	73	5844	69	6414	72	
CV	8.2	2.7	9.9	5.3	4.5	2.2	
LSD (0.05)	806	2.8	980	1.5	710	3.8	
Spanish[1]							
AT-98-99	6703a	69a	5904	70a	6304	69	807
OLé	3496c	61b	5840	69b	4668	67	580
Tamnut OL06	3738c	65ab	5227	64c	4483	65	540
Mean	4806	65	5646	68	5151	67	
CV	11.6	4.2	8.1	1.1	22.3	2.6	
LSD (.05)	891	4.4	NS	1.5	NS	ns	
Virginia[1]							
Florida Fancy	7272a	67b	5889ab	67bc	6580	67	846
ARSOK-V31	5783b	72a	6227ab	69bc	6005	71	819
VENUS	4936b	69b	5582b	65c	5259	67	677
Mean	6228	69	6124	68	5948	68	
CV	9.5	2.7	7.1	3.6	13.2	2.1	
LSD (0.05)	949	3.0	758	4.3	NS	NS	

[1] Market Type.
[2] % TSMK = Percent total sound mature kernels.
[3] Calculated based on peanut market-type price December 2016 (USDA-FSA).
[4] Data not shown for all varieties tested in 2013-2016 and used to calculate mean, CV, and LSD.
[5] Values within the same column followed by the same letter are not significantly different at P = 0.05; NS = not significantly different.

Table 7. Yields and grades from peanut variety trials at all locations in 2013, 2014 and 2016, along with three-year averages and estimated revenue.

Variety or line	*Yield (lbs/A)*	*Percent of trial average*	*Grade[2] (% TSMK)*	*Revenue[3] ($/A)*
Runner[1]				
TamrunOL11	6,186a	111	72a	856
Red River Runner	6,168a	110	71ab	842
ARSOK-R47A	6,142ab	110	72a	851
ARSOK-R37	5,878a-c	105	71ab	803
Lariat	5,781a-c	104	70a-c	779
ARSOK-R92-13	5,574b-d	100	70a-c	751
ARSOK-R60A	5,565b-d	100	66de	707
Webb	5,504cd	98	67cd	709
ARSOK-R94-4	5,165de	93	68cd	676
ARSOK-90-12	5,086de	91	70a-c	685
Flavor Runner 458	5,082de	91	69bc	675
ARSOK-R93-10	4,822e	86	65e	603
Mean	5,579		69	
CV	12.3		4.6	
LSD (0.05)	582		2.7	
Spanish[1]				
AT98-99	5,306a	104	68a	669
OLé	5,108ab	101	66b	626
ARSOK-S88-1	4,958b	98	68a	627
Tamnut OL06	4,954b	97	65b	598
Mean	5,082		67	
CV	6.4		2.9	
LSD (.05)	287		1.7	
Virginia[1]				
ARSOK-V377	6,071a	110	68bc	792
Florida Fancy	5,815ab	105	66de	737
ARSOK-V86	5,495bc	99	67b-d	707
VENUS	5,442bc	98	65e	679
Wynne	5,381bc	97	67c-e	692
Jupiter	5,372c	97	66de	680
ARSOK-V31	5,328c	96	69b	706
ARSOK-V85-7	5,297c	96	73a	742
Mean	5,525		68	
CV	9.2		3.3	
LSD (0.05)	435		1.9	

[1] Market Type.
[2] % TSMK = Percent total sound mature kernels.
[3] Calculated based on peanut market-type price December 2016 (USDA-FSA).
[4] Values within the same column followed by the same letter are not significantly different at P = 0.05.

Table 8. Peanut yields and grades averaged over years (2013-2016) and across all locations (Caddo, Custer/Blaine, Beckham and Tillman counties) along with estimated revenue.[4, 5]

Variety or line	*Yield (lbs/A)*	*Grade[2] (% TSMK)*	*Revenue[3] ($/A)*
	-------4-yr average------		
Runner[1]			
ARSOK-R47A	5,993a	73a	842
ARSOK-R37	5,978a	72a	828
Tamrun OL11	5,678a	73a	797
Lariat	5,593a	72a	775
Red River Runner	5,492a	73a	771
ARSOK-R60A	5,474a	68b	716
Flavor Runner 458	4,817b	70ab	648
Mean	5,575	71	
CV	11.5	4.9	
LSD (0.05)	577	3.1	
Spanish[1]			
AT-98-99	4,889a	69a	626
Tamnut OL06	4,344ab	67b	540
OLé	4,334b	68ab	567
Mean	4,522	69	
CV	12.9	2.5	
LSD (.05)	549	1.6	
Virginia[1]			
Florida Fancy	6,580	67	846
ARSOK-V31	6,005	71	818
VENUS	5,259	67	676
Mean	5,948	68	
CV	13.2	2.1	
LSD (0.05)	NS	NS	

[1] Market Type.
[2] % TSMK = Percent total sound mature kernels.
[3] Calculated based on peanut market-type price December 2016 (USDA-FSA).
[4] Values within the same column followed by the same letter are not significantly different at P = 0.05.
[5] Data not shown for all varieties tested in 2013-2016 and used to calculate mean, CV and LSD.

Table 9. Peanut pod rot in Virginia market-type entries in the Caddo County peanut variety test in 2016.

Variety or line	*Percent pod rot*[1]
Wynne	20.0a
Florida Fancy	16.3a
ARSOK-V86	13.3a
Jupiter	12.5a
ARSOK-V377	10.0a
VENUS	9.3a
ARSOK-V85-7	2.8a
ARSOK-V31	2.5a

[1] Pod rot ratings taken immediately after digging. Numbers with the same lowercase letter within each market-type are not significantly different.

Table 10. Pod brightness and % super jumbo, jumbo and fancy pods for Virginia genotypes included in the 2016 Oklahoma peanut variety trials. Values are averaged across locations.[1]

Variety or line	*Brightness (Hunter L score)*	*Super jumbo pods %*	*Jumbo pods %*	*Fancy pods %*
Jupiter	50.0a	16b	36a	90a
ARSOK-V377	49.6a	17b	26b	88ab
Wynne	49.4a	29a	35a	93a
ARSOK-V85-7	49.2ab	10bc	28a	84b
ARSOK-V31	48.9ab	10bc	29a	87ab
VENUS	48.6ab	15b	33a	89ab
ARSOK-V86	46.7b	5c	10c	64c
Florida Fancy	46.6b	17b	33a	91a
Mean	48.6	15	25	86
CV	3.7	1.2	9.1	2.3
LSD (0.05)	2.7	9.7	10.2	5.0

[1] Values within the same column followed by the same letter are not significantly different at P = 0.05.

Disease Evaluations and Agronomic Traits of Advanced Peanut Breeding Lines in 2016

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2016 progress made possible through OPC and NPB support

- **A total of 21 breeding lines and reference cultivars (12 runner, two Spanish, and seven Virginia market types) were evaluated in fields infested with *Sclerotinia minor*, the fungus causing Sclerotinia blight. All advanced breeding lines were high oleic.**
- **Environmental conditions in 2016 were moderately favorable for Sclerotinia blight. Little southern blight and pod rot were observed.**
- **The top four runner entries for revenue were ARSOK-R47A ($716 per acre), ARSOK-R37 ($712 per acre), Lariat ($688 per acre) and ARSOK-R58B ($687 per acre). The highest-yielding entries were ARSOK-R37, ARSOK-R47A and Lariat, which produced 5,941, 5,858 and 5,797 pounds per acre, respectively. Tamrun OL11 was the highest-grading entry at 70 percent TSMK, followed by ARSOK-47A at 69 percent, Red River Runner at 68 percent and ARSOK-R37 at 68 percent. The most Sclerotinia-resistant entries were ARSOK breeding lines R60A, R58B and R58C, with less than 10 percent disease incidence. Florida 07 was the most susceptible entry at 55 percent.**
- **No significant differences were observed between the two Spanish entries, OLé and ARSOK-S88-1, in crop value, yield, shelling characteristics or resistance to Sclerotinia blight. Mean yield and grade for OLé were 5,048 pounds per acre and 65 percent TSMK, respectively. ARSOK-S88-1 produced 4,852 pounds per acre and an average grade of 65 percent TSMK.**
- **The breeding line ARSOK-V85-7 ($699 per acre) had the highest numerical crop value, and Wynne ($472 per acre) had the lowest crop value. All entries were statistically similar in yield except Wynne, which had the lowest yield at 4,175 pounds per acre. Numerically, ARSOK-V85-7 at 74 percent TSMK percent had the highest grade. Florida Fancy and VENUS (62 and 61 percent TSMK, respectively) had the lowest grades. Less Sclerotinia blight was found in ARSOK-V31 and VENUS at 13 and 14 percent, respectively than ARSOK-V41 at 52 percent.**

A major goal of the ARS peanut research program in Stillwater is to develop and release high-oleic peanut cultivars for the Southwest with improved yield, disease resistance and seed characteristics. In 2016, we evaluated commercial and advanced breeding lines of runner, Spanish and Virginia peanuts in small plots at the Oklahoma State University's Caddo Research Station in Fort Cobb. The objectives of the field study were to compare advanced or newly released lines to commercially available cultivars in agronomic quality and disease resistance to Sclerotinia blight in plots with substantial soilborne inoculum.

Methods and field conditions

A total of 21 breeding lines and reference cultivars (12 runner, two Spanish and seven Virginia market types) were evaluated. The three peanut market types were grown and evaluated separately, and all advanced breeding lines were high oleic. Each breeding line or cultivar was planted at a density of five seeds per foot in plots consisting of two 15-foot-long rows with 36-inch beds. A randomized complete block design was used by dividing the field into four sections to account for potential disease gradients and environmental variables. Each breeding line or cultivar was planted once in each section, except for an additional replication of ARSOK-V85-7 in each section of the Virginia study. Plots were planted on May 13. Plots in two of the four sections were inoculated with pure sclerotia of *Sclerotinia minor* at a rate of 0.25 grams per 15-foot-row on Sept. 9. All plots were managed for weeds, foliar diseases, and Southern blight but plots were not managed for Sclerotinia blight, pod rot or nematodes.

Environmental conditions were somewhat conducive for Sclerotinia blight from August to October, the months during which this disease is usually occurs. Daily records are especially incomplete for August and September, so departures from 15-year averages for these two months are not available. Daily average temperatures in August, September and October were 79.6, 72.5 and 67.1, respectively. October's daily mean temperature was 5 degrees warmer than the 15-year average. Rainfall was greater than the 15-year average in June (+2.41 inches), July (0.54 inch) and September (4.19 inches). Additional water (0.75 to 1 inch) was applied to the plots 16 times between June 11 and October 9 using a pivot system.

Disease evaluations for Sclerotinia and southern blights were conducted on Sept. 14 and Oct. 7. Disease incidence was measured by counting the number of 6-inch sections within each plot that had symptoms of Sclerotinia blight, caused by *Sclerotinia minor*, and southern blight, caused by *Sclerotium rolfsii*. Little Southern blight was observed. Only the results from the last Sclerotinia blight evaluation were analyzed because the disease was most severe at that date. In addition, the area lost to the center pivot's irrigation tracks was estimated in affected plots on Oct. 7. All plots were dug on Oct. 18 and

Table 11. Monthly air temperature and rainfall for 2016 field season at the Caddo Research Station.[1]

Month	Air temperature (F)		Rainfall (inches)	
	Daily mean	Departure from 15-year average	Total	Departure from 15-year average
May[2]	68.2	-2	2.56	-2.01
June	78.5	0	6.38	+2.41
July[3]	82.5	+1	3.04	+0.54
August[3]	79.6	-[3]	1.41	-1.75
September[3]	72.5	-[3]	5.88	+4.19
October[2]	67.1	+5	0.23	-2.61

[1] Data from Mesonet.
[2] Mean temperature and rainfall are for May 12 (planting date) to May 31 and Oct. 1 to 18 (digging date). Departure from 15-year average includes all days in May and October.
[3] Incomplete records or data unavailable.

threshed on Oct. 20. Pod rot ratings were taken within five hours of digging by estimating the percentage of discolored pods. Pod rot damage was minimal and no greater than 5 percent in the most affected plots, so statistical analyses were not conducted. Peanut grades were determined following USDA-Agricultural Marketing Service guidelines using a 200-gram sample from each plot. Pods were presorted prior to shelling, and all sound mature kernels from grade samples were assessed for visible damage. The center pivot wheels affected only certain runner plots, so yield was adjusted in these plots by factoring in the percent of the plot area lost.

Data were analyzed using one-way ANOVA with block as a random factor in PROC GLIMMIX of SAS (ver. 9.3). Proportion data including grade, extra large kernels, hull, damaged kernels, and fancy pods were analyzed using the LOGIT function, but means of untransformed data are presented (Tables 12 and 13). Mean disease from the two rows were used to analyze Sclerotinia blight incidence using PROC GLIMMIX. The Type I error rate for pairwise comparisons of breeding lines and cultivars was controlled at $\alpha = 0.05$ using the ADJUST=TUKEY option.

Performance of the advanced runner-type breeding lines and cultivars in 2016

Twelve runner peanut entries, including the high-oleic cultivars Flavor Runner 458, Florida 07, Lariat, Red River Runner, Tamrun OL11 and Webb were evaluated (Table 12). Statistical differences among entries were found for crop value, yield, Sclerotinia blight incidence and all shelling characteristics except 100-seed weight and visibly damaged kernels. Numerically, the top four runner entries for revenue were ARSOK-R47A ($716 per acre), ARSOK-R37 ($712 per acre), Lariat ($688 per acre) and ARSOK-R58B ($687 per acre). The entries with the lowest crop value and yield were Flavor Runner 458 ($490 per acre; 4,247 pounds per acre) and Webb ($517 per acre; 4,538 pounds per acre). The highest-yielding entries were ARSOK-R37, ARSOK-R47A and Lariat, which produced 5,941, 5,858 and 5,797 pounds per acre, respectively. Tamrun OL11 at 70 percent TSMK, had the highest grade, followed by ARSOK-47A at 69 percent TSMK, Red River Runner at 68 percent TSMK and ARSOK-R37 at 68 percent TSMK. Entries with the largest seeds included Webb, Red River Runner, and ARSOK-R47A at 36 seeds per ounce and ARSOK-R37 at 37 seeds per ounce. The greatest percentage of extra-large kernels was found in Red River Runner, ARSOK-R58B and ARSOK-R58C (40 percent, 40 percent and 39 percent, respectively). ARSOK-R60A and Flavor Runner 458 had the fewest ELK (24 and 25 percent, respectively). The hull percentage for Tamrun OL11 was the lowest at 25 percent, and ARSOK-R60A and Webb had greatest percentage of hulls (each 31 percent). The most Sclerotinia-resistant entries were ARSOK breeding lines R60A, R58B and R58C, with less than 10 percent disease incidence. Florida 07 was the most susceptible entry at 55 percent.

Performance of Spanish market types in 2016

No significant differences were observed between the two Spanish entries, OLé and ARSOK-S88-1, in crop value, yield, shelling characteristics or resistance to Sclerotinia blight. Mean yield and grade for OLé were 5,048 pounds per acre and 65 percent TSMK. ARSOK-S88-1 produced 4,852 pounds per acre and an average grade of 65 percent TSMK.

Performance of the advanced Virginia-type breeding lines and cultivars in 2016

Six Virginia peanut entries, including Jupiter, high-oleic Florida Fancy, VENUS and Wynne were evaluated (Table 13). The entries differed statistically in all measured qualities except visibly damaged kernels. The breeding line ARSOK-V85-7 ($699 per acre) had the highest numerical crop value, and Wynne ($472 per acre) had the lowest crop value. All entries were statistically similar in yield except Wynne, which had the lowest yield at 4,175 pounds per acre. Numerically, ARSOK-V85-7 at 74 percent TSMK had the highest grade, while Florida Fancy and VENUS at 62 and 61 percent TSMK, respectively had the lowest grades. The percentage of fancy pods was highest in Wynne at 96 percent and lowest in ARSOK-V41 and Florida Fancy both at 87 percent and VENUS at 88 percent. ARSOK-V85-7 had the greatest 100-seed weight at 95.4 grams, percent extra large kernels at 59 percent, and lowest hull percentage at 24 percent. Less Sclerotinia blight was found in ARSOK-V31, VENUS, and Jupiter at 13, 14, and 20 percent, respectively than ARSOK-V41 at 52 percent.

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Table 12. Yield, grade, shelling characteristics and disease incidence (Sclerotinia blight, SM) in advanced runner breeding lines at the Caddo Research Station in 2016.[1]

Variety or line	*Revenue ($/A)[1]*	*Yield (lbs/A)*	*Grade % TSMK*	*100-seed weight (g)*	*No. seeds per oz*	*ELK (%)[3]*	*Hull (%)*	*VDK (%)[2]*	*SM (%)*
Runner									
ARSOK-R47A	716a	5858a	69ab	71.3	36.4f	36.6ab	26.1bc	0.6	15.4dc
ARSOK-R37	712a	5941a	68ab	51.9	36.8f	33.2a-c	26.3bc	0.7	21.7b-d
Lariat	688a	5797a	67a-c	66.8	37.4ef	33.1a-c	28.5a-c	0.6	11.7dc
ARSOK-R58B	687a	5758ab	67a-c	56.7	43.2a	39.7a	27.8a-c	0.5	5.8d
Tamrun OL11	670ab	5370a-c	70a	62.1	37.7d-f	33.2a-c	25.1c	0.3	23.8b-d
Red River Runner	646a-c	5371a-c	68ab	67.3	36.3f	40.4a	26.4bc	1.2	19.2b-d
ARSOK-R58C	637a-c	5483ab	66a-c	60.0	42.3a-c	39.4a	27.9a-c	0.6	5.8d
ARSOK-R60A	633a-c	5769ab	62c	58.7	42.7ab	24.3c	30.7a	1.1	4.2d
ARSOK-R58A	604a-c	5226a-c	65a-c	55.9	44.2a	28.1bc	28.5a-c	0.4	14.6cd
Florida 07	565a-c	5033a-c	63bc	62.5	39.9c-e	26.0bc	29.1ab	0.5	54.6a
Webb	517bc	4538bc	64bc	64.5	35.9f	30.9a-c	30.8a	0.5	33.8a-c
Flavor Runner 458	490c	4247c	65bc	60.4	40.1b-d	24.9c	28.8ab	0.6	42.5ab

[1] Market types were analyzed separately. Numbers with the same lowercase letter within columns for each market type are not significantly different (P = 0.05). No southern blight was observed and incidence of pod rot was too low for analyses.

[2] Based on the 2016 USDA peanut loan rate of $354.43/ton. Calculations do not include deductions for excess splits or damaged and other kernels.

[3] ELK = percentage of seeds riding largest screen riding 21/64 screen. VDK = kernels with visible damage.

Table 13. Yield, grade, shelling characteristics and disease incidence (Sclerotinia blight, SM) in advanced Spanish and Virginia breeding lines at the Caddo Research Station in 2016.[1]

Variety or line	*Revenue ($/A)[2]*	*Yield (lbs/A)*	*Grade % TSMK*	*Fancy pods (%)[3]*	*100-seed weight(g)*	*No. seeds per oz*	*ELK (%)[4]*	*Hull (%)*	*VDK (%)[4]*	*SM (%)*
Spanish										
OLé	561	5,058	65	-	50.0	51.1	39.7	30.3	1.9	0.8
ARSOK-S88-1	536	4,852	65	-	49.6	52.3	41.1	30.4	1.1	1.7
Virginia										
ARSOK-V85-7	699a	5,239a	74a	91.4ab	95.4a	27.2b	59.2a	24.2c	0.8	38.3a-c
ARSOK-V41	680a	5,409a	70ab	86.7b	86.8a-c	29.0a	51.9ab	28.1bc	0.6	51.7a
ARSOK-V31	671a	5,360a	70a-c	89.2ab	93.3a-c	27.4ab	51.8ab	28.0bc	1.2	12.5c
Florida Fancy	607a	5,433a	62d	87.4b	82.4c	28.4ab	38.8c	34.0ab	0.9	43.8ab
Jupiter	592ab	5,082a	65b-d	94.9ab	89.2a-c	27.3b	45.6bc	32.1ab	1.8	20.6c
VENUS	587ab	5,372a	61d	87.5b	85.8bc	28.4ab	40.4c	36.4a	0.6	13.8c
Wynne	472b	4,175b	63cd	96.4a	93.5ab	25.5c	42.2c	32.8ab	1.0	24.6bc

[1] Market types were analyzed separately. Numbers with the same lowercase letter within columns for each market type are not significantly different (P = 0.05). No southern blight was observed and incidence of pod rot was too low for analyses.

[2] Based on the 2016 USDA peanut loan rate per ton: Spanish, $399.00; Virginia, $359.97. Calculations do not include deductions for excess splits or damaged and other kernels.

[3] Percentage of Virginia pods that ride the 34/64-inch spacing on presizer.

[4] ELK = percentage of seeds riding largest screen: Spanish, 19/64; Virginia, 21.5/64. VDK = kernels with visible damage.

Developing Genomic E-Probes for Monitoring the Mycotoxin-Producing Fungus *Aspergillus Flavus*

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2016 progress made possible through OPC and NPB support

- **Maize, peanut, tree nuts and cotton are crops that can be infected during the preharvest, postharvest and/or storage period with *Aspergillus flavus*.**
- **E-probe Diagnostic Nucleic acid Analysis (EDNA) is a bioinformatic tool originally developed to detect plant pathogens in metagenomic (genetic material recovered directly from environmental samples) databases.**
- **Enhancements made to EDNA permitted to increase its capability to detecting specific gene targets present in metatranscriptomic databases (genes expressed in infected plants, including Messenger RNA of plant and micro organisms. To target specific pathogenicity factors used by the pathogen to infect its host or other targets of interest, e-probes need to be developed in transcripts related to that function.**
- **EDNAtran was used to semi quantitatively detect the expression of genes related to aflatoxin production in *A. flavus*.**
- **E-probes were designed from up-regulated genes (turned on genes responsible for toxin synthesis) during *A. flavus* aflatoxin production.**
- **A total of 231 highly specific e-probes were generated to detect the production of aflatoxin specifically for AF70 (aflatoxin producing strain) of *A. Flavus*.**
- **EDNAtran successfully inferred aflatoxin production using e-probes that targeted the aflatoxin gene cluster of the metabolic pathway.**
- **EDNAtran was able to find statistically significant differences between the transcriptomic data set of the highly toxigenic sample and the non-toxigenic samples and was able to transcriptomically evaluate the production of aflatoxin.**

Introduction

Maize, peanut, tree nuts, and cotton are crops that can be infected during the preharvest, postharvest and/or storage period with *Aspergillus flavus*. This fungus produces polyketide secondary metabolites named aflatoxins. Among the four known aflatoxins, B1, B2, G1 and G2, B1 has been of special interest to food biosecurity due to its toxicity and potent carcinogenic properties (Squire, 1981). *A.*

flavus is a ubiquitous saprophyte fungus. Species containing aflatoxin-producing strains include *A. flavus, A. parasiticus* and *A. nomius.*

Aflatoxin contamination in food is highly regulated in many countries, consequently increasing management costs and final product price. In the United States, the maximum allowed concentration of aflatoxin in food for human consumption is 20 parts per billion, as dictated by the U.S. Food and Drug Administration. Appropriate and accurate aflatoxin testing is necessary to opportunely control *A. flavus*-infected crops. Among the most used techniques for aflatoxin detection and quantification are chromatography, Enzyme-linked-immunosorbent assay, ELISA and fluorometry (Van Egmond, Schothorst & Jonker, 2007). Industry costs for testing crops for aflatoxins in the United States range from $30 to $50 million per year at $10 to $20 per sample tested. Aflatoxin is produced through a polyketide metabolic pathway with the interaction of approximately 25 genes encoded by the aflatoxin gene cluster.

Although host resistance to *A. flavus* has not been developed, promising studies have found genetic factors suitable to confer resistance in maize (Chen et al., 2011). Another promising management strategy for aflatoxin reduction includes biocontrol using atoxigenic strains on nonproducing strains of *A. flavus* (Aflaguard® & AF36) (Garber & Cotty, 1997). Appropriate management of using indigenous atoxigenic strains is recommended to avoid potential adaptation problems arising from the development of new toxigenic strains. The indigenous isolates of atoxigenic strains can be mass-produced and applied to crops in fields with the purpose of excluding toxigenic strains through competition, since they occupy the same niche or infection sites. Screening after application of the atoxigenic strain is performed on a regular basis for both the production of aflatoxin and in some cases, strain viability ratio of atoxigenic to toxigenic. The viability of the atoxigenic strain can be inferred by testing for the presence of aflatoxin. If higher concentrations of toxin are found, inoculation of the field with additional atoxigenic is recommended (Mauro, Battilani & Cotty, 2015). Both the identification of newly infecting toxigenic *A. flavus* strains and biocontrol screening require sensitive testing for their identification.

While there have been multiple attempts to use genetic features to discriminate toxigenic and atoxigenic strains, the rapidness of some quantitative kits like ELISA make them more practical than nucleic acid based methods in spite of the power of such tools. However, aflatoxin using immunoassay detection might be useful for *A. flavus* strain screening only when a substantial growth of the fungus and relevant amounts of the toxin are present. This limits their sensitivity for potential detection of asymptomatic infections with toxin levels under the detection limit of the assays. Hence, their use is not feasible as preventative approaches, but aims to serve as an assessment approach followed by therapeutic methods. On the contrary, genetic-based tools have the flexibility of being used as early infection detection tools for most organisms, due to their sensitivity and specificity. Nevertheless, the large amount of genes that need to be targeted for proper discrimination of aflatoxin-producing strains has limited the development of such tools. Currently, RT-PCR tests targeting coding regions in the aflatoxin gene cluster have been suggested to replace microbiological and chemical methods for the identification of aflatoxin-producing strains of *A. flavus.* (Niessen, 2008). Furthermore, newly developed monitoring techniques focus mainly on genetic characterization of the aflatoxin gene cluster (Chang, Horn &

Dorner, 2005; Donner et al., 2010). The most recent is a DNA-based monitoring technique with 32 markers amplified in four multiplex PCR. The protocol relies on deletions occurring in the aflatoxin gene cluster of atoxigenic strains (Callicott & Cotty, 2015).

A fast and tentatively less expensive screening tool for toxigenic *A. flavus* strains might be sequencing the whole nucleic acid of the pathogen niche and determining the presence of potential toxigenic inoculum. In this study, *A. flavus* was used as a model system for the development of e-probes that target genes in the aflatoxin gene cluster. This EDNAtran protocol aimed to discriminate metagenomics databases from samples infected by either toxigenic or atoxigenic *A. flavus* strains, which will permit the screening of fields that could be potentially infected with toxigenic strains of *A. flavus*.

Discrimination with e-probes can be performed at both, genome DNA and transcriptome levels. A previous study with Sclerotinia minor used e-probes targeting exonic regions of CAZyme (cell wall degrading) genes to detect physiologically active mycelium. EDNAtran has not been used for detection of expression of gene clusters of a fungus genome. The purpose of the study was to detect *A. flavus* in metatranscriptomic samples (infected plants) by using e-probes designed in coding regions of the aflatoxin gene cluster, and compare the differential transcription of the aflatoxin gene cluster without the hassle of assembling (building) the metatranscriptome.

Experimental procedures

Atoxigenic strains of the fungus *Aspergillus flavus* were grown on a corn medium as well as potato dextrose broth, PDB, media under conditions favorable to fungal growth. RNA was extracted from mycelia of two strains of Aspergillus flavus, each grown on PDB and corn, using the RNeasy Plant Mini Kit from Qiagen®. After quality control RNA was submitted to be sequenced using the Illumina HiSeq 2500 sequencer at the Core Facility of the University of Illinois at Urbana-Champaign. The mRNA sequencing library was performed with poly(A) capture method per manufacturer's protocol and the metatranscriptome was sequenced as single-end. RNA sequencing reads were mapped to the *A. flavus* AF70 genome with STAR and bam binary files were created with SAMtools. Gene expression analysis was performed by using DeSeq2 in R (Anders & Huber, 2010). Up-regulated genes were retrieved by an in house linux bash script. Aflatoxin detection by using transcriptomic approaches was achieved by selecting appropriate genetic signatures targeting genes that are up-regulated when aflatoxin is produced in AF70. The identification of up-regulated genes was achieved by challenging toxigenic *A. flavus* strains with environmental conditions that favor the production of aflatoxin and comparing them with environmental conditions that are not conducive for the production of aflatoxin. Up-regulated genes were retrieved and e-probes were generated targeting loci containing single nucleotide polymorphisms, SNPs, by comparative genetics using a local alignment search against the transcriptome of the atoxigenic *A. flavus* strain on both conducive and nonconducive growing substrates. E-probes specificity and sensitivity was assessed comparing metatranscriptomic databases of *A. flavus* strains subjected to a variety of environmental conditions.

The genomes from *A. flavus* AF70 (Accession: JZDT00000000.1) and NRRL3357 (Accession: AAIH00000000.2) were obtained from GenBank. In addition, the sequences for the aflatoxin

gene cluster of AF70 (AY510453) and AF36 (AY510455) were also retrieved from GenBank (Ehrlich, Yu & Cotty, 2005). E-probes were generated using the e-probe generation pipeline for EDNA (Espindola et al., 2015; Stobbe et al., 2013). The target sequence for e-probe design was the aflatoxin gene cluster of both AF70 and AF36 *A. flavus* strains. Their specificity was verified by aligning the developed e-probes with the intended target and nontarget sequences using a stringency of 100 percent identity and 100 percent query coverage. Only AF70 e-probes were utilized for the analysis because the main objective of the study was to discriminate between aflatoxin active producer and nonaflatoxin producers. It was expected that the AF70 strain grown on PDB would produce little or no aflatoxin when compared with AF70 grown on the corn medium. Therefore, hit frequencies in the corn grown AF70 should be higher than hit frequencies in PDB grown AF70-PDB. Differences in hit frequencies were evaluated using central tendency statistics. When only two samples were used, the T-test was utilized; however, whenever more than two samples were an ANOVA was used to determine any differences on hit frequencies with a confidence of 95 percent. In the event of detectable differences, a Tukey honest significance difference test was performed to identify which samples were different from either the positive or negative controls.

Results and discussion

A total of 231 highly specific e-probes were generated to detect the production of aflatoxin specifically for AF70 of *A. flavus*. Multiple genes are involved in specific metabolic pathways in living organisms. Such genes tend to be found in gene clusters, and therefore, selecting up-regulated genes is crucial in EDNAtran since the likelihood of detecting the pathogen is higher than when e-probes are designed randomly throughout the genome. Although previous RNA sequencing analyses were performed to detect the up-regulated genes of interest in *A. flavus*, literature can also be used asa source of information to design the e-probes in up-regulated genomic regions when RNA sequencing does not provide enough information. EDNAtran takes advantage of e-probes designed in key genes that are up-regulated during particular metabolic stages of the pathogen. EDNAtran capacity to detect plant pathogens in RNA sequencing databases was previously evaluated using the fungal plant pathogen Sclerotinia minor, the causal agent of Sclerotinia blight, in peanut.

As expected, the 231 e-probes had more than 200 hits creating High Quality Matches, HQMs, in AF70-corn transcriptome, mRNA, data sets, meanwhile, AF70-PDB had only 39 HQMs, AF36-corn had only 2 HQMs and AF36-PDB had 12 HQMs. EDNAtran was able to differentiate between the transcriptomic databases with abundant aflatoxin production and the non-toxigenic transcriptomes based on EDNA eukaryotic metrics. However, to indirectly assess the presence of aflatoxin frequencies of hits are used as measuring values. In this case, the number of times a read was mapped to an e-probe was recorded and counted without any limits. An easy way of visualizing e-probe hit frequencies is by plotting a dot plot of alignment length against percent identity with marginal hit frequencies. Specifically for *A. flavus* AF70 in corn, it was observable that the hit frequencies were very high — around 9,000 hits per e-probe — when the alignments are above 90 percent identity and the alignment length was approaching to the total length of the e-probe. Conversely, for AF70 grown on PDB medium and AF36, the marginal plots show a low

frequency of hits when alignment lengths and percent identities were above the threshold of 35th and 90 percent, respectively, (see Figure 1).

In *A. flavus,* it was shown that e-probes hitting on RNA sequencing databases obtained from *A. flavus* AF70 growing on a ground corn medium were different from those of AF70 growing on PDB medium, and AF36 on corn and PDB medium. In conclusion, EDNAtran was able to find statistically significant differences between the transcriptomic data set of the highly toxigenic sample, from the nontoxigenic samples, using 231 e-probes generated in this study and was able to transcriptomically evaluate the production of aflatoxin by solely using EDNAtran.

Future studies need to include multiple blind samples to evaluate the usefulness of the new EDNAtran procedure to identify aflatoxin producing *A. flavus* strains. This study shows that in a known positive transcriptomic database, EDNAtran is capable of discriminating between production and nonproduction of aflatoxin. However, blind samples will provide a more realistic evaluation of the newly developed tool.

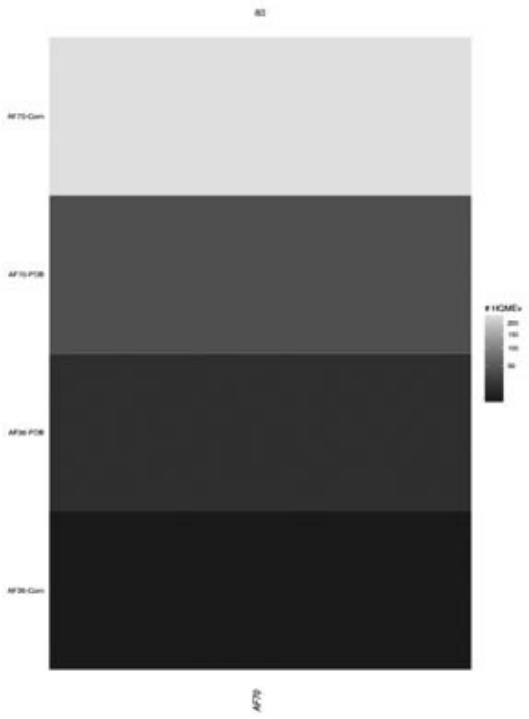

Figure 1. Hierarchal-clustered heat map depicting the number of High Quality Matches (HQMs) of e-probes designed on the aflatoxin gene cluster hitting on RNA sequencing runs containing *Aspergillus flavus* AF70 (toxigenic) and AF36 (atoxigenic) growing on Potato Dextrose Agar (PDB) and ground corn. Higher number of HQMs are colored yellow and lower number of HQMs are colored blue.

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Integrated Management of Peanut Diseases

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2016 progress made possible through OPC and NPB support

- **Levels of soilborne diseases such as Sclerotinia blight, southern blight and pod rot were low in 2016.**
- **Fungicide seed treatments increased stand establishment and yields by about 3,000 pounds per acre.**
- **Early leaf spot was severe and control of early leaf spot resulted in yield responses of 1,000 to 1,500 pounds per acre.**
- **Of the available high O/L peanut varieties, Lariat, OLé and Red River Runner were the most resistant to Sclerotinia blight, while Georgia 09B and Flavor Runner 458 were the most susceptible.**
- **While disease pressure was low, the breeding lines ARSOK-V31, ARSOK-R35, and ARSOK-S88-2 had low levels of Sclerotinia blight in both treated and untreated plots.**

Field trials that addressed the management of important peanut diseases in Oklahoma were completed in 2016. The management strategies that were evaluated included chemical control and disease-resistant varieties. Efforts were made to develop and demonstrate a range of input levels for the fungicide programs. The diseases studied included seedling disease, early leaf spot, southern blight and Sclerotinia blight. The excellent cooperation of Bobby Weidenmaier and the farm crew at the Caddo Research Station continues to be greatly appreciated. Additional funding for the trials was provided by Arysta, BASF, Bayer, DuPont and Syngenta.

Results from 2016 are summarized in this report. In interpreting the results, small differences in treatment values should not be overemphasized. Statistical analysis at the 95 percent confidence level is applied to all the trial data. Unless values are statistically different (followed by different letters), little confidence can be placed in the superiority of one treatment or variety over another.

Conditions were generally favorable for development of the peanut crop and diseases. Most of the trials at the Caddo Research Station were planted on May 13. Rainfall during the cropping period May 13 to Oct. 28 totaled 2.54 inches for May, 6.38 inches for June, 3.04 inches for July, 1.41 inches for August, 5.88 inches for September and 0.23 inches for October. Plots received 16 applications of sprinkler irrigation at 0.5 to 1 inch per application that totaled 11.75 inches of water. Compared to the 30-year average, rainfall was nearly normal during the cropping season. Monthly rainfall totals were above normal in June, July and September and below normal for the remaining months. Average daily temperatures were below normal except for June and October. The above normal rainfall in June and July favored

foliar disease development, which was severe in 2016. However, pressure from soilborne diseases such as Sclerotinia blight, southern blight and pod rot was low; probably due to drier-than-normal conditions in August.

Seedling diseases

Evaluation of seed treatments - Seedling disease is an important factor limiting stand establishment. Seedling disease is effectively controlled by fungicide seed treatments routinely applied to seed peanuts. The objective of this trial was to evaluate a new seed treatment, Rancona V, compared to the industry standard Dynasty PD. Seed treatments were applied in a rotary drum prior to planting May 13. Plots received 2.54 inches of rain within 10 days of planting. The cool wet conditions favored seedling disease and untreated plots had very low stand establishment (Table 14). Seed treatments increased stand establishment, yields, and crop value compared to untreated check plots. Stands, yields, and crop values for Rancona® treatments were numerically greater than for Dynasty®, but the differences were not statistically significant.

Foliar diseases

Evaluations of fungicide programs - The objective of this trial was to compare various registered fungicides applied on a full-season, 14-day schedule that totaled six sprays, on a 3-spray reduced calendar program, and according to the weather-based, Peanut Leaf Spot Advisor program on the Oklahoma MESONET (http://www.mesonet.org). The trial was planted on May 5 using strip till techniques and dug on October 13.

Early leaf spot appeared in July and reached severe levels compared to previous trials at this site. All treatments reduced the final level of defoliation compared to the untreated check (Table 15). Leaf spot increased rapidly late in the season and final levels of leaf spot were reduced compared to the untreated check only for the full-season program with the Alto®/Headline® and Priaxor®/Elatus®/Bravo® treatments. The full-season programs with Headline® and Priaxor® generally provided the best control. Full-season programs with Approach® and Approach Prima® also had low levels of defoliation. Reduced fungicide programs with Bravo®/Folicur® and Alto®/Headline®were generally less effective that respective full-season programs. All

Table 14. Effect of fungicide seed treatments on control of seedling diseases of 'Red River Runner' peanuts at the Caddo Research Station, 2016.

Treatment and rate/cwt seed	*Stand (no. plants/ft)*	*Yield (lbs/A)*	*Value ($/a)*[1]
Untreated check	0.13b[2]	1,216b	198b
Rancona® V PD 4 oz	1.24a	4,429a	720a
Dynasty® PD 4 oz	1.01a	4,156a	676a
Rancona® V PD 4 oz + ALS 1603 8.3 g	1.13a	4,329a	704a
LSD (0.05)[3]	0.26	796	129

[1] Loan rate value based on an average grade of 65% TSMK.
[2] Values in a column followed by the same letter are not statistically different according to Fisher's Least Significant Difference test.
[3] Least significant difference P = 0.05.

Table 15. Evaluation of fungicide programs for control of early leaf spot on 'OLé' Spanish peanuts at the Caddo Research Station, 2016.

Treatment and rate/A (timing)[1]	*Early leaf spot (%) Oct. 14*	*Defoliation (%) Oct. 14*	*Yield (lbs/A)*	*Value ($/A)*[2]
Bravo® 6F 1.5 pt (1,6)				
Folicur® 3.6F 7.2 fl oz (2-5)	83.3a[3]	13.7de	4,385ab	712ab
Bravo® 6F 1 pt +				
Folicur® 3.6F 7.2 fl oz (A1-A4)	90.0a	26.2cd	4,341abc	705abc
Bravo® 6F 1 pt +				
Folicur® 3.6F 7.2 fl oz (3-5)	87.5a	53.3b	4,095c	665c
Alto® 100SL 5.5 fl oz (1,3,5)				
Headline® 2.09E 6 fl oz (2,4,6)	9.2c	0.0f	4,283abc	696abc
Alto® 100SL 5.5 fl oz (A1,A3)				
Headline® 2.09E 6 fl oz (A2,A4)	90.8a	52.5b	4,131bc	671bc
Alto® 100SL 5.5 fl oz (3,5)				
Headline® 2.09E 6 fl oz (4)	60.0b	35.8b	4,320abc	702abc
Approach® 2.08F 5.5 fl oz +				
Alto® 100SL 5.5 fl oz (1,2)				
Fontelis® 1.67F 1 pt (3-5)				
Bravo® 6F 1.5 pt (6)	86.7a	10.0ef	4,247abc	690abc
Approach Prima® 2.3F 6.8 fl oz (1,2)				
Fontelis® 1.67F 1 pt (3-5)				
Bravo® 6F 1.5 pt (6)	81.7a	7.1c	4,080c	663c
Priaxor® 4.17F 4 fl oz (1,2)				
Elatus® 45WDG 8 oz (3-5)				
Bravo® 6F 1.5 pt (6)	16.2c	0.4f	4,472a	726a
Untreated check	100.0a	97.5a	2,512d	408d
LSD (0.05)[4]	19.4	13.0	280	45

1 1 to 6 correspond to the spray dates of 1 = July 13, 2 = July 23, 3 = Aug. 8, 4 = Aug. 22, 5 = Sept. 9 and 6 = Sept. 22; A1 to A4 correspond to the spray dates of A1 = July 13, A2 = Aug. 8, A3 = Aug. 31, and A4 = Sept. 22 made according to the weather-based Leaf Spot Advisor.

2 Loan rate value based on an average grade of 67 percent TSMK.

3 Values in a column followed by the same letter are not significantly according to Fisher's Least Significant Difference test.

4 Least significant difference P = 0.05.

treatments increased yield compared to the untreated check by over 1,500 pounds per acre and crop value by over $250 per acre.

Foliar diseases and southern blight

Evaluations of fungicide programs - The objective of this trial was to evaluate the experimental fungicide A19649, the newly registered fungicide Elatus and several registered fungicides for control of early leaf spot and southern blight. Bravo® was included as a reference for control of only leaf spot. Fungicides were applied on a five-spray, 14-day program. The trial was planted May 5 and dug Oct. 13.

Early leaf spot appeared in July and reached severe levels compared to previous trials at this site. Southern blight levels were low, 1 percent or less, and did not differ between treatments. All treatments reduced, final levels of leaf spot and defoliation compared to the untreated check (Table 16). All treatments increased yield and crop value compared to the untreated check.

Table 16. Evaluation of fungicide programs for control of early leaf spot and southern blight on 'OLé' Spanish peanuts at the Caddo Research Station, 2016.

Treatment and rate/A (timing)[1]	*Leaf spot (%)*	*Defoliation (%)*	*Southern blight (%)*	*Yield (lbs/A)*	*Value ($/A)*[2]
Alto® 0.83 SL 5.5 fl oz + Bravo® 6F 1.0 pt (1) Elatus® 45WG 7.3 oz (2,4) Bravo® 6F 1.5 pt (3,5)	17.1cd[3]	0.0c	0.7a	4,697ab	729ab
Elatus® 45WG 7.3 oz (1,3) Bravo® 6F 1.5 pt (2,4,5)	15.0de	0.4c	1.5a	5,126a	796a
Alto® 0.83 SL 5.5 fl oz + Bravo® 6F 1.0 pt (1) Elatus® 45WG 7.3 oz (2,4) Omega® 4F 1.5 pt + Bravo® 6F 1.5 pt (3) Bravo® 6F 1.5 pt (5)	15.8cd	0.0c	0.0a	4,755ab	738ab
Bravo® 6F 1.5 pt (1,5) Provost® 3.6F 8 fl oz (2,3,4)	10.4e	0.0c	0.5a	4,421b	686b
Elatus® 45WG 7.3 oz + A19649 1.67F 3.42 fl oz (1,3) Bravo® 6F 1.5 pt (2,4,5)	2.5f	0.0c	0.0a	4,777ab	742ab
Bravo® 6F 1 pt (1) Alto® 0.83 SL 5.5 fl oz + Bravo® 6F 1.0 pt (2) Elatus® 45WG 7.3 oz + A19649 1.67F 3.42 fl oz (3) Bravo® 6F 1.5 pt	4.2f	0.0c	0.2a	4,763ab	739ab
Bravo® 6F 1.5 pt (1,5) Priaxor® 4.17F 6 fl oz (2,4) Folicur® 3.6F 7.2 fl oz (3)	2.2f	0.0c	0.0a	4,588ab	712ab
Bravo® 6F 1.5 pt (1,5) Folicur® 3.6F 7.2 fl oz (2,3,4)	47.1b	12.5b	0.0a	4,530b	703b
Bravo® 6F 1.5 pt (1-5)	20.4c	2.1c	1.5a	4,421b	686b
Untreated check	100.0a	85.0a	0.5a	3,666c	569c
LSD (0.05)[4]	4.9	3.6	NS	359	56

[1] 1 to 5 correspond to the spray dates of 1 = July 13, 2 = 26 July 26, 3 = Aug. 8, 4 = Aug. 22 and 5 = Sept. 6.
[2] Loan rate value based on an average grade of 64 percent TSMK.
[3] Values in a column followed by the same letter are not significantly different at P = 0.05 according to Fisher's Least Significant Difference test.
[4] Least significant difference, NS = treatment effect not significant P = 0.05.

Sclerotinia blight

Variety response to fungicide programs -

The objective of this study was to evaluate the disease and yield responses of the high O/L varieties Lariat, Red River Runner, OLé, Georgia 09B and Flavor Runner 458 to various levels of fungicide input for control of Sclerotinia blight. The high-input treatment consisted of two preventive applications. The low-input treatment was a single application made at the first appearance of disease. The trial was planted on May 13 and dug on Oct. 28.

Sclerotinia blight appeared in early September, but only reached low levels compared to previous trials at this site. Fungicides reduced levels of Sclerotinia blight in the susceptible variety Flavor Runner 458 and in Georgia 09B, but generally

Table 17. Disease and yield responses of high O/L peanut varieties to fungicide programs for Sclerotinia blight at the Caddo Research Station, 2016.

Treatment and rate/A (timing)[1]	Lariat	Red River Runner	Georgia 09B	Flavor Runner OLé	Flavor Runner 458	Average[2]
			Sclerotinia blight (%)			
Omega® 4F 1.0 pt (P1, P2)	0.0b[3]	1.7a	1.2b	0.0a	4.2bc	1.4
Omega® 1.5 pt (D)	0.7ab	2.5a	4.5ab	0.5a	5.5bc	2.7
Endura® 70WG 8 oz (P1, P2)	0.0b	0.2a	0.7b	0.0a	1.0c	0.4
Endura® 70WG 10 oz (D)	0.0b	5.7a	3.2b	0.2a	12.0ab	4.2
Untreated check	1.5a	9.0a	9.0a	0.2a	16.5a	7.2
Average[4]	0.4	3.8	3.7	0.2	9.8	
LSD (P=0.05)[5]	0.9	NS	4.8	NS	7.8	
			Yield (lbs/A)			
Omega® 4F 1.0 pt (P1, P2)	5,082c	5,989a	5,554a	5,009a	5,245ab	5,376
Omega® 1.5 pt (D)	5,291bc	5,554a	5,000c	4,991a	4,846b	5,136
Endura® 70WG 8 oz (P1, P2)	5,672a	6,625a	5,926a	4,937a	5,790a	5,790
Endura® 70WG 10 oz (D)	5,381abc	5,681a	5,717ab	5,118a	5,091b	5,398
Untreated check	5,481ab	5,708a	5,273bc	5,118a	5,046	5,325
Average[4]	5,381	5,911a	5,494	5,035	5,203	
LSD (P=0.05)[5]	371	NS	450	NS	574	
			Value ($/A)[6]			
Omega® 4F 1.0 pt (P1, P2)	877c	1,093a	996a	846a	923ab	947
Omega® 1.5 pt (D)	913bc	1,013a	897c	843a	853b	904
Endura® 70WG 8 oz (P1, P2)	979a	1,209a	1,063a	834a	1,019a	1,021
Endura® 70WG 10 oz (D)	928abc	1,037a	1,025ab	864a	896b	950
Untreated check	946ab	1,042a	946bc	864a	888b	937
Average[4]	928	1,079	985	850	915	
LSD (P=0.05)[5]	64	NS	81	NS	101	

1 P1 and P2 are preventive applications on Aug. 8 and Sept. 8 respectively; D is the demand application on Sept. 31.
2 Averaged over variety.
3 Values in a column followed by the same letter are not statistically different.
4 Averaged over fungicide treatment.
5 Least significant difference. NS = treatment effect not statistically significant P = 0.05.
6 Loan rate value based on an average grade (% TSMK) of 70 for Lariat, 75 for Red River Runner, 74 for Georgia 09B, 70 for OLé and 72 for Flavor Runner 458.

not in the other varieties (Table 17). Fungicides increased yield and crop value compared to the untreated check only for Georgia 09B and Flavor Runner 458. The preventive program with Endura® generally provided the best control. Yield and crop value were highest for Red River Runner compared to the other varieties. Except for the preventive program with Endura® applied to Flavor Runner 458 and Georgia 09B, crop value responses were below those observed in the past and generally not sufficient to offset treatment costs.

Breeding line responses to fungicide programs -
The objective of this trial was to measure the disease and yield responses of runner and Virginia-type breeding lines to a maximum rate of the fungicide Omega® for control of Sclerotinia blight. Because Omega® is fairly specific for Sclerotinia blight, the lack of a yield response to Omega® suggests a high level of resistance. Lariat and Flavor Runner 458 were reference varieties for resistant and susceptible entries, respectively. The trial was planted May 13 and dug Oct. 28.

Sclerotinia blight appeared in early September, but only reached low levels compared to previous trials at this site. Fungicide effects on levels of Sclerotinia blight were statistically significant for ARSOK-V41, ARSOK-V85-7 and Flavor Runner 458, but not the other entries (Table 18). However, the fungicide effects on Sclerotinia blight, as well as yield and value, were not meaningful due to the low disease pressure. The breeding lines ARSOK-V41 and ARSOK-V85-7 were the highest yielding entries. Averaged over entries, the effect of fungicide was significant on yield, but the increase in yield was not sufficient to offset the cost of the fungicide program.

Evaluation of fungicides -
The objective of this trial was to compare registered fungicides for control of Sclerotinia blight. Fungicides were applied preventively at high and low labeled rates. The trial was planted on May 13 and dug Oct. 28.

Sclerotinia blight appeared in early September, but only reached low levels compared to previous trials at this site. The low disease incidence was attributed to reduced canopy development that resulted in the vines not covering the ground in between rows. All treatments reduced final disease incidence compared to the untreated check (Table 19). Because of the low disease pressure, yields were high and did not differ among treatments.

Evaluation of fungicides and application timing -
The objective of this trial was to evaluate application timing and rate of registered fungicides; Omega®, Propulse®, Priaxor®, Endura® and Fontelis®; new fungicides Elatus® and an experimental fungicide, A19649s, for control of Sclerotinia blight. Applications were made twice preventively or three times on 14-day intervals. The trial was planted May 13 and dug Oct. 28.

Sclerotinia blight appeared in early September, but only reached low levels compared to previous trials at this site. The low disease incidence was attributed to reduced canopy development that resulted in the vines not covering the ground in between rows. All treatments reduced final levels of Sclerotinia blight

Table 18. Disease and yield responses of peanut breeding lines to fungicide programs for Sclerotinia blight at the Caddo Research Station, 2016.

Variety or line	*Omega® 4F 1.5 pt (2)[1]*	*Check*	*Average[2]*	*Omeg®a 4F 1.5 pt (2)[1]*	*Check*	*Average[2]*
	Sclerotinia blight (%)			***Yield (lbs/A)***		
Lariat	0.3a[3]	0.6a	0.5	5,009	5,200	5,104c[3]
ARSOK-V41	2.5b	15.9a	9.2	5,817	5,363	5,590ab
ARSOK-V31	0.3a	2.2a	1.2	5,518	5,200	5,359bc
VENUS	1.9a	3.1a	2.5	5,273	4,973	5,123c
ARSOK-R60A	0.6a	1.9a	1.2	4,855	4,601	4,728d
ARSOK-V85-7	1.2b	12.8a	7.0	5,908	5,527	5,717a
ARSOK-S88-2	0.0a	0.6a	0.3	4,792	4,692	4,742d
Flavor Runner 458	3.1b	21.6a	12.3	4,928	4,519	4,723d
Average[4]	1.2	7.3		5,262a	5,009b	

1 Two preventive applications Aug. 8 and Sept. 6.
2 Averaged over treatment.
3 Values in a column or row followed by the same letter are not statistically different at P = 0.05.
4 Averaged over entry.
5 Values in a row followed by the same letter are not statistically different at P = 0.05

compared to the untreated check (Table 20). All treatments except Omega® at 1 pint per acre increased yields compared to the untreated check. Yields were high and the yield responses ranged from 350 to 675 pounds per acre.

Table 19. Effects of fungicide and application rate on control of Sclerotinia blight of FloRun 107 peanuts at the Caddo Research Station, 2016.

Treatment and rate/A (timing)[1]	*Sclerotinia blight (%)*	*Yield (lbs/A)*	*Value ($/A)*[2]
Omega® 4F 1.5 pt (1,2)	0.5cd[3]	5,220a	897a
Omega® 4F 1.0 pt (1,2)	1.3bcd	5,191a	892a
Endura® 70WG 10 oz (1,2)	0.5cd	5,126a	881a
Endura® 70WG 8 oz (1,2)	0.0d	5,351a	920a
Propulse® 3.3F 10 fl oz (1,2)	4.6b	5,278a	907a
Propulse® 3.3F 13.7 fl oz (1,2)	4.8b	5,641a	969a
Fontelis® 1.67F 1 pt (1,2)	4.2bc	5,009a	861a
Fontelis® 1.67F 1.5 pt (1,2)	4.2bc	5,176a	889a
Priaxor® 4.17F 8 fl oz (1,2)	1.5bcd	5,554a	954a
Untreated check	10.0a	5,336a	917a
LSD (0.05)[4]	3.8	NS	NS

1 Timings 1 and 2 refer to preventive applications made on Aug. 8 and Sept. 6, respectively.
2 Loan rate value based on an average grade of 70 percent TSMK.
3 Values in a column followed by the same letter are not significantly according to Fisher's Least Significant Difference test.
4 Least significant difference. NS = treatment effect not statistically significant P=0.05.

Table 20. Effects of fungicide and application timing on control of Sclerotinia blight of FloRun 107 peanuts at the Caddo Research Station, 2016.

Treatment and rate/A (timing)[1]	*Sclerotinia blight (%)*	*Yield (lbs/A)*	*Value ($/A)*[2]
Omega® 4F 1.5 pt (1,3)	1.5c[3]	5,706ab	994ab
Omega® 4F 1.0 pt (1, 3)	3.0bc	5,525bc	963bc
Elatus® 45WG 7.3 fl oz (1,3)	4.8ab	5,626ab	980ab
Elatus® 45WG 7.3 fl oz (1,3) Omega® 4F 1.5 pt (2)	3.0bc	5,830ab	1,016ab
Elatus® 45WG 7.3 fl oz + A19649 1.67F 3.42 fl oz (1,3)	1.5c	5,895a	1,027a
Propulse® 3.3F 13.7 fl oz (1,3)	3.0bc	5,822ab	1,014ab
Priaxor® 4.17F 8 fl oz (1,3)	2.2bc	5,953a	1,037a
Endura® 70WG 8 oz (1,3)	1.3c	5,626ab	980ab
Fontelis® 1.67F 1.5 pt (1,3)	3.5bc	5,699ab	993ab
Untreated check	7.0a	5,278c	920c
LSD (0.05)[4]	3.0	336	58

1 Timing numbers 1 to 3 correspond to applications on 1 = Aug. 8, 2 = Aug. 22, and 3 = Sept. 6.
2 Loan rate value based on an average grade of 71 percent TSMK.
3 Values in a column followed by the same letter are not statistically significantly according to Fisher's Least Significant Difference test.
4 Least significant difference P = 0.05.

2016 Weed Management in Peanuts

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Peanut weed management trials were conducted at the Oklahoma Agricultural Experiment Station's Caddo Research Station near Fort Cobb in 2016. Peanuts were planted in early May and did not experience the heavy rainfall immediately after planting that occurred in 2015. While peanuts were planted in early May, cool, wet conditions did delay crop maturity and peanuts were not harvested until late October. Even with this delay in maturity, peanut yields were excellent in 2016.

Trial (PFCS16-01) evaluated various weed management programs with Zidua®. Peanut stand reduction and injury was 5 percent or less season long with all treatment combinations. The only treatments that controlled Texas panicum, PANTE, at least 85 percent prior to the POST applications were those that included Prowl H2O® applied PRE followed by an At Crack® application of Gramoxone® followed by either Zidua® or Outlook®. The only treatment controlling PANTE 90 percent in August was Prowl H2O® PRE followed by an At Crack application of Gramoxone® + Outlook® followed by a POST application of Cadre®. The only treatment controlling Palmer amaranth, AMAPA, over 85 percent was Prowl H2O® PRE followed by an At Crack application of Gramoxone® + Zidua® followed by a POST application of Cadre®. Only treatments including Prowl H2O® PRE followed by both an At Crack and POST herbicide combination adequately controlled ivyleaf morninglory, IPOHE,

Trial PFCS15-02 evaluated the potential for the use of fluridone, SP1171, preemergence in peanut. This trial was maintained weed free. Unlike trials in 2015 stand reductions were less than 10 percent with all fluridone treatments in 2016. Peanut injury was much lower in 2016 with only fluridone applied at the 2X rate alone or in combination with Dual Magnum® or Valor® injuring peanuts 10 percent or more mid-season. Late season injury was 5 percent or less with all treatments. While a yield reduction was observed with fluridone in 2015, no treatment effected yield in 2016.

Trial PFCS15-03 evaluated the effects of 2,4-D + glyphosate on peanut. This trial was established to simulate drift and misapplication or tank-contamination. The trial was maintained weed free. Rates were applied from 1X, 1/2X, 1/4X, 1/8X and 1/16X. All of these rates were applied at 30, 60 and 90 days after planting, DAP. Peanut stand reduction season long was less than 10 percent with all rates and application timings. Significant visual peanut injury was observed with the 1/2X and 1X rates regradless of application timing. Visual peanut injury was greater than 10 percent season long with the 1/4X rate applied at 30 and 60 DAP. Yield reductions occurred with 1/4X, 1/2X and 1X applications at all timings. Yield reducations also occurred with 1/8X rate applied at 60 DAP. Care must be taken to minimize peanut to exposures of 2,4-D + glyphosate.

Trial PFCS15-04 evaluated Anthem Flex® for weed control in peanut. Peanut

stand reduction and injury was 6 percent or less season long with all treatments applied. Initial PANTE control was 73 to 80 percent with Anthem Flex® applied PRE. Valor® + Prowl H2O® was the only treatment that controlled Texas panicum 90 percent two weeks after planting. Select was applied POST2 after all treatments were applied to assist in controlling PANTE. After this application the only treatment that did not control Texas panicum at least 85 percent was Anthem Flex® applied POST alone at any of the three rates. The only treatment that controlled AMAPA at least 90 percent late season was Anthem Flex PRE® at 3 fluid ounces per acre. Valor® + Prowl H2O Pre® followed by Gramoxone® + Outlook® At Crack® followed by Cadre® was the only treatment that controlled IPOHE over 95 percent late season.

Appreciation is expressed to the Oklahoma Peanut Commission and the National Peanut Board for support of this project. Without the support of the OPC and the peanut producers of Oklahoma who contribute to the board through their checkoff dollars much of this research would not be possible. Thanks to Robert Weidenmaier and the farm crew at the Caddo Research Station for their assistance in conducting these trials. Support from BASF Crop Protection, FMC Corporation and SePro Corporation for their support of these projects is appreciated.

Effectiveness of Zidua® in a Peanut Weed Control Program

Project Code	PFCS16-01			
Cooperator/Location	OSU Caddo Research Station - Fort Cobb, OK			
Exp. Des/Rep#/Plot Size [#Row, Width]	RCB/4/4-30"x30'			
Soil Type	Sandy Loam			
Sand/Silt/Clay [%]	72.5/17.5/10			
OM/pH/CEC	0.9/7.4/7			
Planting/Harvest Date	5/3/16			
Crop/Variety	Peanut/Virginia Florida Fancy			
Uniform Standard Treatment	N/A			
Application Timing	PRE	At Crack	POST	
Application Date	5/3/16	5/18/16	6/6/16	
Time of Day	10:00-10:20		11:30-11:55	8:30-8:45
Air/Soil/R.H. [F, %]	63/62/57.2		56/68/74	76/70/50
Wind [mph/direction]	2-7/SSW	6-8/NNE	3-4/NW	
Soil/Leaf Moisture	Med/ N/A	MED/DRY		MED/DRY
Crop Stage/Ht-Diam	N/A	2-3LF/2-3"		5-6LF/6-10"
Sprayer Type/MPH/Nozzle	CO2BPK/3.0/110015XRAI			
Boom Ht/# Noz/Spacing [in]	16"/4/18"	16"/4/18"	16"/4/18"	
GPA/PSI	10/19	10/19	10/19	
Weed Species [population]	growth stage/ht-diam			
Texas Panicum - PANTE [3-20/FT2]	N/A	1lf-2til/1-3"		2lf-4til/1-8"
Palmer Amaranth - AMAPA [1/YD2]	N/A	coty-10lf/1-2"		5->25lf/2-12"
Ivyleaf Morningglory - IPOHE [1/YD2]	N/A	coty-3lf/1-2"		coty-6lf/1-3"

Effectiveness of Zidua® in a Peanut Weed Control Program

Trial ID: PFCS 16-01 Location: Ft. Cobb Investigator: Todd A. Baughman

Crop/Pest Code *Description* *Rating Date* *Rating Unit*					*Peanut StdRed 5/18 %*	*Peanut StdRed 6/6 %*	*Peanut Injury 5/18 %*	*Peanut Injury 6/6 %*	*Peanut Injury 6/21 %*	*Peanut Injury 7/5 %*	*Peanut Injury 8/11 %*
Trt No.	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1	Untreated				0	0	0	0	0	0	0
2	Prowl H2O®	32	fl oz/A	A	3	5	4	1	1	0	0
3	Outlook®	16	fl oz/A	A	0	1	1	0	0	0	0
	Gramoxone®	12	fl oz/A	A							
	Induce®	0.25	% v/v	A							
4	Warrant®	48	fl oz/A	A	0	5	5	0	0	0	0
	Gramoxone®	12	fl oz/A	A							
	Induce®	0.25	% v/v	A							
5	Outlook®	16	fl oz/A	B	0	0	1	1	1	0	0
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
6	Zidua®	1.5	oz/A	B	0	0	1	1	0	0	0
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
7	Zidua SC®	2.5	fl oz/A	B	0	0	0	3	0	0	0
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
8	Warrant®	48	fl oz/A	B	0	0	0	3	0	0	0
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
9	Outlook®	16	fl oz/A	B	0	0	0	0	0	0	0
	Zidua SC®	2.5	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
10	Prowl H2O®	32	fl oz/A	A	3	3	1	1	0	0	0
	Outlook®	16	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
11	Prowl H2O®	32	fl oz/A	A	4	5	3	1	1	0	0
	Zidua SC®	2.5	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							

(continued on next page)

Effectiveness of Zidua® in a Peanut Weed Control Program (continued)

Trial ID: PFCS 16-01 Location: Ft. Cobb Investigator: Todd A. Baughman

Crop/Pest Code					*Peanut*	*Peanut*	*Peanut*	*Peanut*	*Peanut*	*Peanut*	*Peanut*
Description					*StdRed*	*StdRed*	*Injury*	*Injury*	*Injury*	*Injury*	*Injury*
Rating Date					*5/18*	*6/6*	*5/18*	*6/6*	*6/21*	*7/5*	*8/11*
Rating Unit					*%*	*%*	*%*	*%*	*%*	*%*	*%*
Trt No.	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
12	Prowl H2O®	32	fl oz/A	A	4	4	3	4	4	4	0
	Zidua SC®	2.5	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
	Cadre®	4	fl oz/A	C							
	Agridex®	1	% v/v	C							
13	Prowl H2O®	32	fl oz/A	A	0	1	1	0	0	0	0
	Outlook®	16	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
	Cadre®	4	fl oz/A	C							
	Agridex®	1	% v/v	C							
14	Prowl H2O®	32	fl oz/A	A	3	3	3	0	0	0	0
	Zidua SC®	2.5	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
	Outlook®	16	fl oz/A	C							
	Cadre®	4	fl oz/A	C							
	Agridex®	1	% v/v	C							
LSD P = 0.10					NS	3	2	NS	NS	2	NS
Standard Deviation					3	2	2	2	2	1	0
CV					237	129	128	209	327	478	0

Pest Code
PANTE = Texas panicum (Brachiaria texana)
AMAPA = Palmer amaranth, (Amaranthus palmeri)
IPOHE = Ivyleaf morningglory (Ipomoea hederacea)

Application Code: A = PRE, B = At Crack, C = POST

Effectiveness of Zidua® in a Peanut Weed Control Program

Trial ID: PFCS 16-01 Location: Ft. Cobb Investigator: Todd A. Baughman

Pest Code *Description* *Rating Date* *Rating Unit*					*PANTE* *Control* *5/18* *%*	*PANTE* *Control* *6/6* *%*	*PANTE* *Control* *6/21* *%*	*PANTE* *Control* *7/5* *%*	*PANTE* *Control* *8/11* *%*	*AMAPA* *Control* *5/18* *%*	*AMAPA* *Control* *6/6* *%*
Trt No.	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
1	Untreated				0	0	0	0	0	0	0
2	Prowl H2O®	32	fl oz/A	A	60	58	46	18	0	93	69
3	Outlook®	16	fl oz/A	A	66	63	18	23	0	98	54
	Gramoxone®	12	fl oz/A	A							
	Induce®	0.25	% v/v	A							
4	Warrant®	48	fl oz/A	A	55	41	18	18	0	100	68
	Gramoxone®	12	fl oz/A	A							
	Induce®	0.25	% v/v	A							
5	Outlook®	16	fl oz/A	B	0	70	35	21	0	0	64
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
6	Zidua®	1.5	oz/A	B	0	76	53	29	0	0	88
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
7	Zidua SC®	2.5	fl oz/A	B	0	70	48	29	0	0	96
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
8	Warrant®	48	fl oz/A	B	0	44	18	21	0	0	70
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
9	Outlook®	16	fl oz/A	B	0	81	51	31	0	0	100
	Zidua SC®	2.5	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
10	Prowl H2O®	32	fl oz/A	A	59	93	68	41	0	100	100
	Outlook®	16	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
11	Prowl H2O®	32	fl oz/A	A	58	91	71	43	0	95	94
	Zidua SC®	2.5	fl oz/A	B							
	Gramoxone®	12	fl ozA	B							
	Induce®	0.25	% v/v	B							

(continued on next page)

Effectiveness of Zidua® in a Peanut Weed Control Program (continued)

Trial ID: PFCS 16-01 Location: Ft. Cobb Investigator: Todd A. Baughman

Pest Code *Description* *Rating Date* *Rating Unit*					*PANTE* *Control* *5/18* *%*	*PANTE* *Control* *6/6* *%*	*PANTE* *Control* *6/21* *%*	*PANTE* *Control* *7/5* *%*	*PANTE* *Control* *8/11* *%*	*AMAPA* *Control* *5/18* *%*	*AMAPA* *Control* *6/6* *%*
Trt No.	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
12	Prowl H2O®	32	fl oz/A	A	45	86	95	97	74	100	99
	Zidua SC®	2.5	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
	Cadre®	4	fl oz/A	C							
	Agridex®	1	% v/v	C							
13	Prowl H2O®	32	fl oz/A	A	55	89	97	97	90	95	89
	Outlook®	16	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
	Cadre®	4	fl oz/A	C							
	Agridex®	1	% v/v	C							
14	Prowl H2O®	32	fl oz/A	A	50	93	97	98	88	98	96
	Zidua SC®	2.5	fl oz/A	B							
	Gramoxone®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
	Outlook®	16	fl oz/A	C							
	Cadre®	4	fl oz/A	C							
	Agridex®	1	% v/v	C							
LSD P = 0.10					11	13	12	12	4	4	17
Standard Deviation					9	11	10	10	3	3	14
CV					28	16	20	25	17	6	18

Pest Code
PANTE = Texas Panicum (Brachiaria texana)
AMAPA = Palmer Amaranth, (Amaranthus palmeri)
IPOHE = Ivyleaf Morningglory (Ipomoea hederacea)

Application Code: A = PRE, B = At Crack, C = POST

Effectiveness of Zidua® in a Peanut Weed Control Program

Trial ID: PFCS 16-01 Location: Ft. Cobb Investigator: Todd A. Baughman

Pest Code *Description* *Rating Date* *Rating Unit*					*AMAPA Control 6/21 %*	*AMAPA Control 7/5 %*	*AMAPA Control 8/11 %*	*IPOHE Control 5/18 %*	*IPOHE Control 6/6 %*	*IPOHE Control 6/21 %*	*IPOHE Control 7/5 %*	*IPOHE Control 8/11 %*
Trt No.	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*
1	Untreated				0	0	0	0	0	0	0	0
2	Prowl H2O®	32	fl oz/A	A	44	30	20	73	65	40	28	0
3	Outlook®	16	fl oz/A	A	33	34	20	55	36	30	30	0
	Gramoxone®	12	fl oz/A	A								
	Induce®	0.25	% v/v	A								
4	Warrant®	48	fl oz/A	A	63	50	33	55	30	24	24	0
	Gramoxone®	12	fl oz/A	A								
	Induce®	0.25	% v/v	A								
5	Outlook®	16	fl oz/A	B	31	31	18	0	55	44	44	0
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
6	Zidua®	1.5	oz/A	B	46	46	46	0	76	48	39	0
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
7	Zidua SC®	2.5	fl oz/A	B	59	55	55	0	75	59	55	0
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
8	Warrant®	48	fl oz/A	B	44	43	30	0	54	38	36	3
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
9	Outlook®	16	fl oz/A	B	74	74	55	0	68	50	41	0
	Zidua SC®	2.5	fl oz/A	B								
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
10	Prowl H2O®	32	fl oz/A	A	100	99	85	55	75	38	28	0
	Outlook®	16	fl oz/A	B								
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
11	Prowl H2O®	32	fl oz/A	A	71	69	60	60	86	69	46	0
	Zidua SC®	2.5	fl oz/A	B								
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								

(continued on next page)

Effectiveness of Zidua® in a Peanut Weed Control Program (continued)

Trial ID: PFCS 16-01 Location: Ft. Cobb Investigator: Todd A. Baughman

Pest Code *Description* *Rating Date* *Rating Unit*					*AMAPA* *Control* *6/21* *%*	*AMAPA* *Control* *7/5* *%*	*AMAPA* *Control* *8/11* *%*	*IPOHE* *Control* *5/18* *%*	*IPOHE* *Control* *6/6* *%*	*IPOHE* *Control* *6/21* *%*	*IPOHE* *Control* *7/5* *%*	*IPOHE* *Control* *8/11* *%*
Trt No.	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*
12	Prowl H2O®	32	fl oz/A	A	100	99	88	65	93	98	98	94
	Zidua SC®	2.5	fl oz/A	B								
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
	Cadre®	4	fl oz/A	C								
	Agridex®	1	% v/v	C								
13	Prowl H2O®	32	fl oz/A	A	93	88	73	60	84	90	96	97
	Outlook®	16	fl oz/A	B								
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
	Cadre®	4	fl oz/A	C								
	Agridex®	1	% v/v	C								
14	Prowl H2O®	32	fl oz/A	A	96	94	74	60	81	97	97	96
	Zidua SC®	2.5	fl oz/A	B								
	Gramoxone®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
	Outlook®	16	fl oz/A	C								
	Cadre®	4	fl oz/A	C								
	Agridex®	1	% v/v	C								
LSD P = 0.10					25	26	29	12	23	22	22	5
Standard Deviation					21	22	24	10	19	19	18	4
CV					35	38	52	29	31	36	39	20

Pest Code
PANTE = Texas Panicum (Brachiaria texana)
AMAPA = Palmer Amaranth, (Amaranthus palmeri)
IPOHE = Ivyleaf Morningglory (Ipomoea hederacea)

Application Code: A = PRE, B = At Crack, C = POST

Peanut Tolerance to Fluridon Applied Preemergence

Project Code	PFCS16-02
Cooperator/Location	OSU Caddo Research Station - Fort Cobb, OK
Exp. Des/Rep#/Plot Size [#Row, Width]	RCB/4/4-30"x30'
Soil Type	Sandy Loam
Sand/Silt/Clay [%]	72.5/17.5/10
OM/pH/CEC	0.9/7.4/7
Planting/Harvest Date	5/3/16
Crop/Variety	Peanut/Florida Fancy
Uniform Standard Treatment	Cadre 4 fl oz/A f/by Select 16 fl oz/A
Application Timing	PRE
Application Date	5/3/16
Time of Day	10:25-10:35
Air/Soil/R.H. [F, %]	64/62/57
Wind [mph/direction]	2-7/SSW
Soil/Leaf Moisture	Med/ N/A
Crop Stage/Ht-Diam	N/A
Sprayer Type/MPH/Nozzle	CO2BPK/3.0/110015XRAI
Boom Ht/# Noz/Spacing [in]	16"/4/18"
GPA/PSI	10/19

Weed Species [population]	growth stage/ht-diam
N/A	N/A

Peanut Tolerance to Fluridon Applied Preemergence

Trial ID: PFCS 16-02 Location: Ft. Cobb Investigator: Todd A. Baughman

Crop Code *Description* *Rating Date* *Rating Unit*					*Peanut StdRed* *5/18* *%*	*Peanut StdRed* *6/6* *%*	*Peanut StdRed* *6/21* *%*	*Peanut StdRed* *7/5* *%*
Trt No.	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*				
1	No Furidone No Tank Mix				0	0	0	0
2	No Fluridone Valor®	 3	 oz/A	 A	3	3	3	3
3	No Fluridone Dual Magnum®	 1.33	 pt/A	 A	1	0	0	0
4	SP1171 1X No Tank Mix	0.15	lb ai/A	A	0	1	0	0
5	SP1171 1X Valor®	0.15 3	lb ai/A oz/A	A A	3	3	1	1
6	SP1171 1X Dual Magnum®	0.15 1.33	lb ai/A pt/A	A A	6	6	5	5
7	SP1171 2X No Tank Mix	0.3	lb ai/A	A	1	1	1	1
8	SP1171 2X Valor®	0.3 3	lb ai/A oz/A	A A	1	1	0	0
9	SP1171 2X Dual Magnum®	0.3 1.33	lb ai/A pt/A	A A	6	6	5	5
LSD P = 0.10					3	3	3	3
Standard Deviation					2	2	2	2
CV					94	88	127	127

Application Code: A = PRE

Peanut Tolerance to Fluridon Applied Preemergence

Trial ID: PFCS 16-02 Location: Ft. Cobb Investigator: Todd A. Baughman

Pest Code *Description* *Rating Date* *Rating Unit*					*Peanut Injury 5/18* %	*Peanut Injury 6/6* %	*Peanut Injury 6/21* %	*Peanut Injury 7/5* %	*Peanut Injury 10/11* %	*Peanut Yield 10/27* lb/a
Trt No.	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*						
1	No Furidone No Tank Mix				0	0	0	0	0	6,135
2	No Fluridone Valor®	3	oz/A	A	3	8	6	1	1	6,546
3	No Fluridone Dual Magnum®	1.33	pt/A	A	5	3	3	1	0	6,165
4	SP1171 1X No Tank Mix	0.15	lb ai/A	A	4	4	3	3	1	6,340
5	SP1171 1X Valor®	0.15 3	lb ai/A oz/A	A A	3	8	8	5	1	6,579
6	SP1171 1X Dual Magnum®	0.15 1.33	lb ai/A pt/A	A A	5	8	5	1	1	6,380
7	SP1171 2X No Tank Mix	0.3	lb ai/A	A	3	13	6	3	1	6,304
8	SP1171 2X Valor®	0.3 3	lb ai/A oz/A	A A	4	10	5	3	3	6,431
9	SP1171 2X Dual Magnum®	0.3 1.33	lb ai/A pt/A	A A	5	10	8	6	5	6,032
LSD P = 0.10					NS	4	NS	NS	NS	NS
Standard Deviation					3	3	4	4	3	792
CV					77	50	79	157	207	13

Application Code: A = PRE

Peanut Response to Roundup + 2,4-D Simulated Drift

Partners in Progress PEANUTS

Project Code	PFCS16-03		
Cooperator/Location	OSU Caddo Research Station - Fort Cobb, OK		
Exp. Des/Rep#/Plot Size [#Row, Width]	RCB/4/4-30"x30'		
Soil Type	Sandy Loam		
Sand/Silt/Clay [%]	72.5/17.5/10		
OM/pH/CEC	0.9/7.4/7		
Planting/Harvest Date	5/3/16		
Crop/Variety	Peanut/Florida Fancy		
Uniform Standard Treatment	N/A		
Application Timing	POST1	POST 2	POST3
Application Date	6/6/16	7/5/16	8/11/16
Time of Day	9:05-9:15	10:55-11:00	10:45-11:00
Air/Soil/R.H. [F, %]	76/70/50	89/80/59	94/80/48.4
Wind [mph/direction]	3-4/NW	2-7/SE	3-6/S
Soil/Leaf Moisture	MED/DRY	Med/ N/A	Med/Dry
Crop Stage/Ht-Diam	5-6LF/6-10"	Peg/20-24"	Pod Set/30-36"
Sprayer Type/MPH/Nozzle	CO2BPK/3.0/110015XRAI		
Boom Ht/# Noz/Spacing [in]	16"/4/18"	16"/4/18"	16"/4/18"
GPA/PSI	10/19	10/19	10/19
Weed Species [population]	growth stage/ht-diam		
N/A	N/A	N/A	N/A

Peanut Response to Roundup + 2,4-D Simulated Drift

Trial ID: PFCS 16-03 Location: Ft. Cobb, OK Investigator: Todd A Baughman

Pest Code *Description* *Rating Date* *Rating Unit* *Trt No.*	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*	*Peanut StdRed 6/6 %*	*Peanut StdRed 6/21 %*	*Peanut StdRed 7/5 %*	*Peanut StdRed 7/15 %*	*Peanut StdRed 8/11 %*	*Peanut StdRed 8/24 %*
1	Untreated				0	0	0	0	0	0
2	Glyphosate	1.83	fl oz/A	A	0	1	0	0	0	0
	2,4-D Amine	2.04	fl oz/A	A						
3	Glyphosate	3.66	fl oz/A	A	0	1	0	0	0	0
	2,4-D Amine	4.1	fl oz/A	A						
4	Glyphosate	7.3	fl oz/A	A	0	5	4	1	0	0
	2,4-D Amine	8.2	fl oz/A	A						
5	Glyphosate	14.6	fl oz/A	A	0	9	6	8	4	0
	2,4-D Amine	16.3	fl oz/A	A						
6	Glyphosate	29.3	fl oz/A	A	0	8	9	8	5	0
	2,4-D Amine	32.7	fl oz/A	A						
7	Untreated				0	0	0	0	0	0
8	Glyphosate	1.83	fl oz/A	B	0	0	0	0	0	0
	2,4-D Amine	2.04	fl oz/A	B						
9	Glyphosate	3.66	fl oz/A	B	0	0	0	0	1	0
	2,4-D Amine	4.1	fl oz/A	B						
10	Glyphosate	7.3	fl oz/A	B	0	0	0	1	1	0
	2,4-D Amine	8.2	fl oz/A	B						
11	Glyphosate	14.6	fl oz/A	B	0	0	0	3	1	0
	2,4-D Amine	16.3	fl oz/A	B						
12	Glyphosate	29.3	fl oz/A	B	0	0	0	4	1	0
	2,4-D Amine	32.7	fl oz/A	B						
13	Untreated				0	0	0	0	0	0
14	Glyphosate	1.83	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	2.04	fl oz/A	C						
15	Glyphosate	3.66	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	4.1	fl oz/A	C						
16	Glyphosate	7.3	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	8.2	fl oz/A	C						
17	Glyphosate	14.6	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	16.3	fl oz/A	C						
18	Glyphosate	29.3	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	32.7	fl oz/A	C						
LSD P = 0.10					NS	3	1	2	2	NS
Standard Deviation					0	2	1	2	1	0
CV					0	170	97	141	168	0

Application Code: A = POST1, B = POST2, C = POST3

Peanut Response to Roundup + 2,4-D Simulated Drift

Trial ID: PFCS 16-03 Location: Ft. Cobb, OK Investigator: Todd A Baughman

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	Peanut StdRed 9/8 %	Peanut StdRed 10/11 %	Peanut Injury 6/6 %	Peanut Injury 6/21 %	Peanut Injury 7/5 %	Peanut Injury 7/15 %
1	Untreated				0	0	0	0	0	0
2	Glyphosate	1.83	fl oz/A	A	0	0	0	4	1	1
	2,4-D Amine	2.04	fl oz/A	A						
3	Glyphosate	3.66	fl oz/A	A	0	0	0	6	3	3
	2,4-D Amine	4.1	fl oz/A	A						
4	Glyphosate	7.3	fl oz/A	A	0	0	0	40	18	10
	2,4-D Amine	8.2	fl oz/A	A						
5	Glyphosate	14.6	fl oz/A	A	0	0	0	55	50	34
	2,4-D Amine	16.3	fl oz/A	A						
6	Glyphosate	29.3	fl oz/A	A	0	0	0	79	80	70
	2,4-D Amine	32.7	fl oz/A	A						
7	Untreated				0	0	0	0	0	0
8	Glyphosate	1.83	fl oz/A	B	0	0	0	0	0	0
	2,4-D Amine	2.04	fl oz/A	B						
9	Glyphosate	3.66	fl oz/A	B	0	0	0	0	0	8
	2,4-D Amine	4.1	fl oz/A	B						
10	Glyphosate	7.3	fl oz/A	B	0	0	0	0	0	14
	2,4-D Amine	8.2	fl oz/A	B						
11	Glyphosate	14.6	fl oz/A	B	0	0	0	0	0	20
	2,4-D Amine	16.3	fl oz/A	B						
12	Glyphosate	29.3	fl oz/A	B	0	0	0	0	0	35
	2,4-D Amine	32.7	fl oz/A	B						
13	Untreated				0	0	0	0	0	0
14	Glyphosate	1.83	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	2.04	fl oz/A	C						
15	Glyphosate	3.66	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	4.1	fl oz/A	C						
16	Glyphosate	7.3	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	8.2	fl oz/A	C						
17	Glyphosate	14.6	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	16.3	fl oz/A	C						
18	Glyphosate	29.3	fl oz/A	C	0	0	0	0	0	0
	2,4-D Amine	32.7	fl oz/A	C						
LSD P = 0.10					NS	NS	NS	3	3	5
Standard Deviation					0	0	0	3	2	5
CV					0	0	0	25	28	42

Application Code: A = POST1, B = POST2, C = POST3

Peanut Response to Roundup + 2,4-D Simulated Drift

Trial ID: PFCS 16-03 Location: Ft. Cobb, OK Investigator: Todd A Baughman

Pest Code *Description* *Rating Date* *Rating Unit* *Trt No.*	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*	*Peanut Injury 8/11 %*	*Peanut Injury 8/24 %*	*Peanut Injury 9/8 %*	*Peanut Injury 10/11 %*	*Peanut Yield 10/27 lb/A*
1	Untreated				0	0	0	0	6,038
2	Glyphosate	1.83	fl oz/A	A	1	1	1	0	5,406
	2,4-D Amine	2.04	fl oz/A	A					
3	Glyphosate	3.66	fl oz/A	A	1	1	0	0	5,484
	2,4-D Amine	4.1	fl oz/A	A					
4	Glyphosate	7.3	fl oz/A	A	6	6	4	1	5,118
	2,4-D Amine	8.2	fl oz/A	A					
5	Glyphosate	14.6	fl oz/A	A	16	15	14	11	3,467
	2,4-D Amine	16.3	fl oz/A	A					
6	Glyphosate	29.3	fl oz/A	A	39	34	25	15	2,992
	2,4-D Amine	32.7	fl oz/a	A					
7	Untreated				0	0	0	0	5,935
8	Glyphosate	1.83	fl oz/A	B	0	0	0	0	6,011
	2,4-D Amine	2.04	fl oz/A	B					
9	Glyphosate	3.66	fl oz/A	B	6	5	5	5	4,610
	2,4-D Amine	4.1	fl oz/A	B					
10	Glyphosate	7.3	fl oz/A	B	19	18	14	11	4,604
	2,4-D Amine	8.2	fl oz/A	B					
11	Glyphosate	14.6	fl oz/A	B	25	23	21	25	3,606
	2,4-D Amine	16.3	fl oz/A	B					
12	Glyphosate	29.3	fl oz/A	B	36	35	35	43	2,562
	2,4-D Amine	32.7	fl oz/A	B					
13	Untreated				0	0	0	0	6,147
14	Glyphosate	1.83	fl oz/A	C	0	3	1	0	5,778
	2,4-D Amine	2.04	fl oz/A	C					
15	Glyphosate	3.66	fl oz/A	C	0	3	3	3	5,681
	2,4-D Amine	4.1	fl oz/A	C					
16	Glyphosate	7.3	fl oz/A	C	0	9	4	3	4,976
	2,4-D Amine	8.2	fl oz/A	C					
17	Glyphosate	14.6	fl oz/A	C	0	24	26	39	3,116
	2,4-D Amine	16.3	fl oz/A	C					
18	Glyphosate	29.3	fl oz/A	C	0	33	41	59	1,897
	2,4-D Amine	32.7	fl oz/A	C					
LSD P = 0.10					10	10	9	8	696
Standard Deviation					9	8	8	7	587
CV					103	69	73	56	13

Application Code: A = POST1, B = POST2, C = POST3

Crop Response & Weed Control in Peanuts with Anthem Flex

Partners in Progress PEANUTS

Project Code	PFCS16-05		
Cooperator/Location	OSU Caddo Research Station - Fort Cobb, OK		
Exp. Des/Rep#/Plot Size [#Row, Width]	RCB/4/4-30"x30'		
Soil Type	Sandy Loam		
Sand/Silt/Clay [%]	72.5/17.5/10		
OM/pH/CEC	0.9/7.4/7		
Planting/Harvest Date	5/3/16		
Crop/Variety	Peanut/Florida Fancy		
Uniform Standard Treatment	Select @ 16 fl oz/A + 1% COC POST2		
Application Timing	PRE	At-Crack	POST
Application Date	5/3/16	5/18/16	6/6/16
Time of Day	10:55-11:10	12:00-12:15	8:50-9:00
Air/Soil/R.H. [F, %]	65/62/56	56/68/74	76/70/50
Wind [mph/direction]	2-7/SSW	6-8/NNE	3-4/NW
Soil/Leaf Moisture	Med/ N/A	MED/DRY	MED/DRY
Crop Stage/Ht-Diam	N/A	2-3lf/2-3"	5-6lf/6-10"
Sprayer Type/MPH/Nozzle	CO2BPK/3.0/110015XRAI		
Boom Ht/# Noz/Spacing [in]	16"/4/18"	16"/4/18"	16"/4/18"
GPA/PSI	10/19	10/19	10/19
Weed Species [population]	growth stage/ht-diam		
PANTE [10-20/FT2] [3-10/FT2]	N/A	1lf-2til/0.5-3"	2lf-4til/0.5-8"
AMAPA [1/YD2]	N/A	coty-10fl/0.5-1"	5->25lf/2-12"
IPOHE [1/YD2]	N/A	coty-3lf/0.5-1.5"	coty-6lf/1-3"

Crop Response & Weed Control in Peanuts with Anthem Flex

Trial ID: PFCS 15-05 Location: Ft. Cobb, OK Investigator: Todd A Baughman

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	Peanut StdRed 5/18 %	Peanut StdRed 6/6 %	Peanut Injury 5/18 %	Peanut Injury 6/6 %	Peanut Injury 6/21 %	Peanut Injury 7/5 %	Peanut Injury 8/11 %
1	Untreated				0	0	0	0	0	0	0
2	Anthem Flex®	1.5	oz/A	A	0	0	1	1	1	0	0
3	Anthem Flex®	2	oz/A	A	1	0	4	3	1	0	0
4	Anthem Flex®	3	oz/A	A	3	1	6	3	3	3	0
5	Anthem Flex®	1.5	oz/A	B	0	0	0	1	0	0	0
	Induce®	0.25	% v/v	B							
6	Anthem Flex®	2	oz/A	B	0	0	0	0	0	0	0
	Induce®	0.25	% v/v	B							
7	Anthem Flex®	3	oz/A	B	0	0	0	4	0	0	0
	Induce®	0.25	% v/v	B							
8	Anthem Flex®	2	oz/A	C	0	0	0	0	0	0	0
	Induce®	0.25	% v/v	C							
9	Anthem Flex®	4	oz/A	C	0	0	0	0	0	0	0
	Induce®	0.25	% v/v	C							
10	Anthem Flex®	6	oz/A	C	1	0	0	0	1	1	0
	Induce®	0.25	% v/v	C							
11	Valor®	2	oz/A	A	1	0	3	6	6	3	0
	Prowl H2O®	32	fl oz/A	A							
	Gramoxone®	16	fl oz/A	B							
	Outlook®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
	Cadre®	4	fl oz/A	C							
	Agridex®	1	% v/v	C							
LSD P = 0.10					NS	NS	2	3	2	NS	NS
Standard Deviation					2	1	2	2	2	2	0
CV					346	663	148	134	180	348	0

Pest Code
PANTE = Texas Panicum (Brachiaria texana)
AMAPA = Palmer Amaranth, (Amaranthus palmeri)
IPOHE = Ivyleaf Morningglory (Ipomoea hederacea)

Application Code: A = PRE, B = At Crack, C = POST

Crop Response & Weed Control in Peanuts with Anthem Flex

Trial ID: PFCS 15-05 Location: Ft. Cobb, OK Investigator: Todd A Baughman

Pest Code					*PANTE*	*PANTE*	*PANTE*	*PANTE*	*PANTE*	*AMAPA*	*AMAPA*	*AMAPA*
Description					*Control*	*Control*	*Control*	*Control*	*Control*	*Control*	*Control*	*Control*
Rating Date					*5/18*	*6/6*	*6/21*	*7/5*	*8/11*	*5/18*	*6/6*	*6/21*
Rating Unit					*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*
Trt No.	*Treatment Name*	*Rate*	*Rate Unit*	*Appl Code*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
1	Untreated				0	0	0	0	0	0	0	0
2	Anthem Flex®	1.5	oz/A	A	80	79	48	43	93	100	99	85
3	Anthem Flex®	2	oz/A	A	73	73	46	41	89	88	85	79
4	Anthem Flex®	3	oz/A	A	79	79	40	38	93	100	100	93
5	Anthem Flex®	1.5	oz/A	B	0	51	28	25	84	0	31	40
	Induce®	0.25	% v/v	B								
6	Anthem Flex®	2	oz/A	B	0	53	26	26	88	0	61	56
	Induce®	0.25	% v/v	B								
7	Anthem Flex®	3	oz/A	B	0	70	50	48	89	0	71	70
	Induce®	0.25	% v/v	B								
8	Anthem Flex®	2	oz/A	C	0	0	31	31	75	0	0	40
	Induce®	0.25	% v/v	C								
9	Anthem Flex®	4	oz/A	C	0	0	44	38	76	0	0	40
	Induce®	0.25	% v/v	C								
10	Anthem Flex®	6	oz/A	C	0	0	29	29	83	0	0	58
	Induce®	0.25	% v/v	C								
11	Valor®	2	oz/A	A	90	97	80	98	91	100	100	100
	Prowl H2O®	32	fl oz/A	A								
	Gramoxone®	16	fl oz/A	B								
	Outlook®	12	fl oz/A	B								
	Induce®	0.25	% v/v	B								
	Cadre®	4	fl oz/A	C								
	Agridex®	1	% v/v	C								
LSD P = 0.10					8	14	23	17	8	9	19	29
Standard Deviation					6	11	19	14	7	8	16	24
CV					22	25	51	38	9	21	31	40

Pest Code
PANTE = Texas Panicum (Brachiaria texana)
AMAPA = Palmer Amaranth, (Amaranthus palmeri)
IPOHE = Ivyleaf Morningglory (Ipomoea hederacea)

Application Code: A = PRE, B = At Crack, C = POST

Crop Response & Weed Control in Peanuts with Anthem Flex

Trial ID: PFCS 15-05 Location: Ft. Cobb, OK Investigator: Todd A Baughman

Pest Code					*AMAPA*	*AMAPA*	*IPOHE*	*IPOHE*	*IPOHE*	*IPOHE*	*IPOHE*
Description					*Control*	*Control*	*Control*	*Control*	*Control*	*Control*	*Control*
Rating Date					*7/5*	*8/11*	*5/18*	*6/6*	*6/21*	*7/5*	*8/11*
Rating Unit					*%*	*%*	*%*	*%*	*%*	*%*	*%*
Trt No.	*Treatment* Name	Rate	*Rate* Unit	*Appl* Code	16	17	18	19	20	21	22
1	Untreated				0	0	0	0	0	0	0
2	Anthem Flex®	1.5	oz/a	A	85	82	25	71	51	50	46
3	Anthem Flex®	2	oz/A	A	80	78	25	66	55	44	30
4	Anthem Flex®	3	oz/A	A	96	92	25	80	60	38	35
5	Anthem Flex®	1.5	oz/A	B	24	24	0	48	44	31	29
	Induce®	0.25	% v/v	B							
6	Anthem Flex®	2	oz/A	B	48	46	0	83	73	54	43
	Induce®	0.25	% v/v	B							
7	Anthem Flex®	3	oz/A	B	70	70	0	89	55	44	33
	Induce®	0.25	% v/v	B							
8	Anthem Flex®	2	oz/A	C	41	41	0	0	44	44	33
	Induce®	0.25	% v/v	C							
9	Anthem Flex®	4	oz/A	C	51	51	0	0	68	70	40
	Induce®	0.25	% v/v	C							
10	Anthem Flex®	6	oz/A	C	68	64	0	0	60	63	30
	Induce®	0.25	% v/v	C							
11	Valor®	2	oz/A	A	98	88	98	99	87	100	96
	Prowl H2O®	32	fl oz/A	A							
	Gramoxone®	16	fl oz/A	B							
	Outlook®	12	fl oz/A	B							
	Induce®	0.25	% v/v	B							
	Cadre®	4	fl oz/A	C							
	Agridex®	1	% v/v	C							
LSD P = 0.10					25	25	31	19	26	23	26
Standard Deviation					21	21	26	15	21	19	22
CV					35	36	164	32	40	39	58

Pest Code
PANTE = Texas Panicum (Brachiaria texana)
AMAPA = Palmer Amaranth, (Amaranthus palmeri)
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