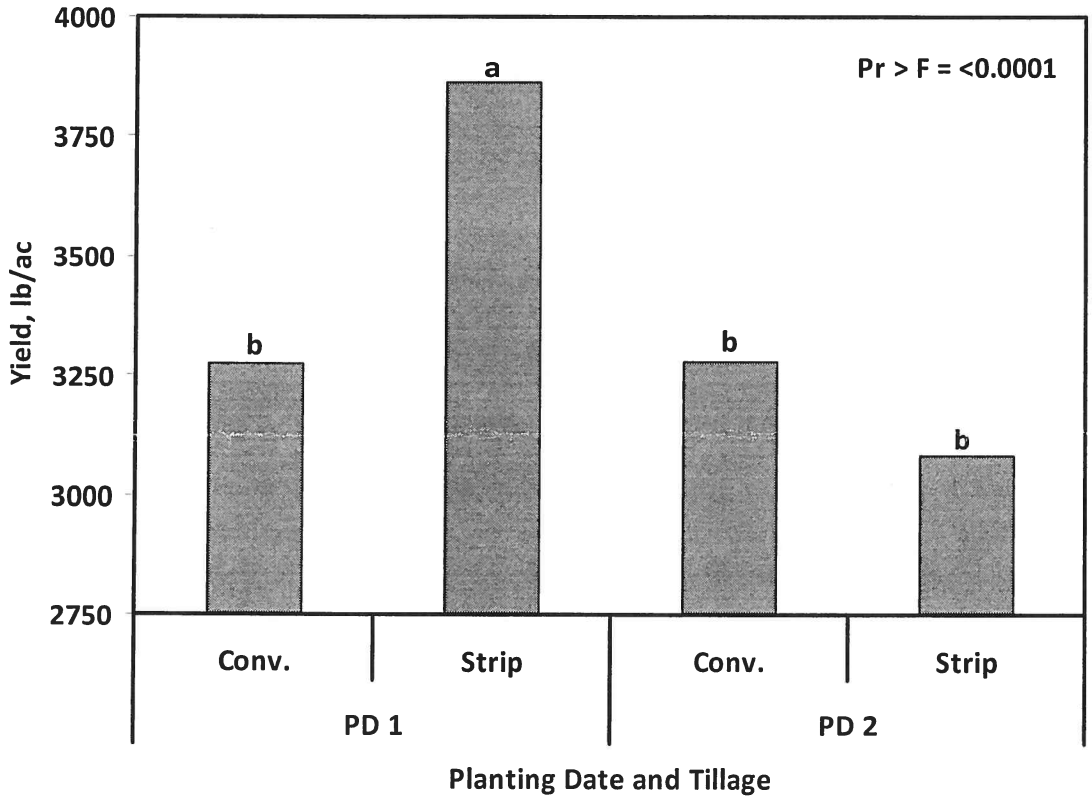
Peanut response to starter fertilizer across different tillage systems

254
AE 95
584-585
2008

Project Title: Starter Fertilizer
Fund No. 367347 302807 (APPA-RIA03-STARTER FERT)

Report of Progress: Research plots were established in 2008 at the Wiregrass Research and Extension Center as part of a multi-state project under the leadership of Kris Balkcom, Principal Investigator. Individual plots were 12 X 40 ft. wide in a strip split plot design with four replications. Treatments consisted of planting dates, tillage systems, and starter fertilizer application. The first planting date occurred on 4-17-08, while the second planting date was 5-19-08. Tillage was either conventional tillage or strip tillage with a rye cover crop. Starter fertilizer treatments consisted of no fertilizer, N alone, or N+P. All fertilizer was applied in a 2x2 band beside the row at planting or as a deep placement behind the subsoil shank. Early season plant samples for nutrient content were collected from all plots approximately one month after planting. Plots were monitored season long for insect, weed, and disease populations. The first planting date was harvested on 9-8-08. Disease counts were collected from all first planting date plots, prior to digging and immediately following digging. The second planting date was harvested on 10-6-2008. As with the first date, all disease counts were collected, prior to digging and immediately following digging. The only major finding in the first year results was an interaction between planting date and tillage systems for peanut yield. Strip tillage peanuts from the first planting date produced superior yields to all other planting date and tillage combinations. Although this information is only from one year, this data indicates that newer peanut cultivars, such as Georgia 03L, may have potential for earlier planting dates in a strip tillage system.



2008
254
585
annual update

NATIONAL PEANUT BOARD / SOUTHEAST PEANUT RESEARCH INITIATIVE

FINAL REPORT for work done under project agreement entitled:
"Peanut Response to Starter Fertilizer".

NPB Project # 254
GPC Budget # 4-908-653-5
UGA Account #25-21-RF328-805

INSTITUTION:	University of Georgia
Principle Investigator:	Dr. R. Scott Tubbs
EXPIRATION DATE:	30 June 2009
SPRI CONTACT:	Emory Murphy
NPB CONTACT:	Marie Fenn

FINAL REPORT:

Starter fertilizers have been successfully adopted in conservation systems across other crops. A starter application supplies a small amount of soluble fertilizer near the root zone of young plants, which strengthens young root systems, enhances early season growth, protects the plants from unfavorable environmental conditions, and potentially decreases the susceptibility of plants to various pests throughout the growing season. The benefits associated with starter applications could also permit earlier planting dates with increased yields in conservation systems compared to conventional peanut production. However, there can be some deleterious effects of adding starter fertilizers to peanuts including a reduction in nodulation and rhizobia activity resulting in minimized N-fixation. So, the objective of this research is to determine the interactive effects of various starter fertilizer combinations and placements for two planting dates across conventional and conservation tillage peanut production systems.

A cover crop ('Elbon' rye – 90 #/Ac) was planted on Dec. 10, 2007 and killed with glyphosate on April 1, 2008. Appropriate plots were turned and beds prepared in conventional tillage treatments, plus strip-till operation and fertilizer applications were made on April 23 prior to peanut planting. Peanuts were planted on April 23 and May 28 for the two planting date effects in this study.

Fertilizer treatments included 1) 30 # N/Ac, 2) 30 # N/Ac + 26 # P2O5/Ac, and 3) No Fertilizer applied. Fertilizer placement was another treatment effect including 1) behind the strip-till shank (12 inch depth) or 2) 2 x 2 placement (2 inches to the side and 2 inches below the seed furrow).

Cover crop samples were taken on April 23 for dry weight and nutrient analysis evaluations. Peanut plant samples were taken on May 28 for the first planting date peanuts, and July 1 for second planting date to determine dry weight and nutrient analyses. Stand counts were made approximately 30 days after planting.

Peanuts for the early planting date were evaluated for maturity based on mesocarp color (hull-scrape/pod-blast method) on September 5, and tomato spotted wilt *Tospovirus* (TSW) was evaluated on early planting date plots the same day. Peanuts for the early planting date were dug on September 11 and harvested on September 16. A stand count was made on September 16 prior to picking. Pods were weighed for yield determination and subsamples were taken to the Federal-State Inspection Lab for grade analyses. The second planting date plots were evaluated for TSW on Oct. 15 and dug on Oct. 17. Harvest stand counts were made and plots were harvested on Oct. 28 for the late planting. White mold (*Sclerotium rolfsii*) evaluations were made within 24 hours after each respective digging event.

Numerous data were collected over the course of the study including soil moisture with a TDR soil moisture probe, Greenseeker and Crop Circle instruments for Normalized Difference Vegetation Index (NDVI) values, SPAD for chlorophyll content, plant tissue for biomass and nutrient content, and row width measurements for canopy size. Because of four treatment factors and the large amount of data collected, the reporting of all of this information for this report would be excessive (some variables included three- and four-way interactions of the data). Therefore, some of the key findings will be reported with the knowledge that the additional data is available from the Principle Investigator and will be compiled with supplemental replicates for future publication submission to a peer reviewed scientific journal.

Table 1. Yield, harvest stand, and row width for two tillage systems – Starter Fertilizer for Peanut Trial; Tifton, GA 2008.

Tillage	Pod Yield (#/Ac) (7% moisture)		Harvest Stand (plants/ft)		Row Width (in.) – 7/7/08	
Conventional	4671	A	3.9	A	30.0	B
Strip-Till	4227	B	4.1	A	30.9	A

Differences between tillage management are indicated by alphabetical notation, where a different letter indicates a statistical difference at the P<0.05 level according to Fisher's Protected Least Significant Difference Test.

Table 2. Yield, harvest stand, and row width for two planting dates – Starter Fertilizer for Peanut Trial; Tifton, GA 2008.

Planting Date	Pod Yield (#/Ac) (7% moisture)		Harvest Stand (plants/ft)		Row Width (in.) – 7/7/08	
April 23	4723	A	4.0	A	37.8	A
May 28	4175	B	4.0	A	23.0	B

Differences between planting dates are indicated by alphabetical notation, where a different letter indicates a statistical difference at the P<0.05 level according to Fisher's Protected Least Significant Difference Test.

There were no interactions among treatment factors at the P<0.05 level of significance for pod yield, stand count, or row width. The only treatment effects displaying differences for any of these variables were tillage management (Table 1) and planting date (Table 2). Yields were greater in conventional tillage, however there were wider plants on July 7 (75 and 40 days after planting for the two respective planting dates) with the strip-till management. The early planted peanuts out-yielded the late planted peanuts in this trial. On July 7, the early planted peanuts had already lapped the row middle (36 inches apart), as indicated by the row width measurements and were much larger than the later planted peanuts.

Table 3. Peanut grade (% total sound mature kernels), an interaction between tillage management and planting dates – Starter Fertilizer for Peanut Trial; Tifton, GA 2008.

Tillage	April 23	May 28
Conventional	65.1	73.9
Strip-Till	65.1	73.1

LSD value = 0.48 (for comparing between planting dates within a tillage effect, or between tillage effects within a planting date) at the P<0.05 level according to Fisher's Protected Least Significant Difference Test.

Table 4. Peanut grade (% total sound mature kernels), an interaction among planting dates, fertilizer treatments, and fertilizer placement – Starter Fertilizer for Peanut Trial; Tifton, GA 2008.

Fertilizer	Place-ment	April 23	May 28
None	2x2*	64.7	73.4
N Only	2x2	63.8	74.1
N + P	2x2	67.5	73.2
None	BS**	63.6	74.1
N Only	BS	67.9	73.0
N + P	BS	63.2	73.2

LSD value = 0.84 (for comparing between planting dates within a fertilizer treatment and placement combination, among fertilizer treatments within a planting date and fertilizer placement combination, or between fertilizer placements within a planting date and fertilizer treatment combination) at the P<0.05 level according to Fisher's Protected Least Significant Difference Test.

* 2x2 = 2 inches below and 2 inches beside the seed furrow at planting

** BS = Behind subsoiler shank at 12 inch depth

Two interactions occurred with respect to peanut grade – a tillage x planting date interaction (Table 3) and a planting date x fertilizer treatment x fertilizer placement interaction (Table 4). The later planting date had higher grades than earlier planted peanuts in all comparisons. At the late planting date, conventional tillage management resulted in better grade than strip-till peanut (Table 3). There were no consistent trends in grade other than planting date effect in the three-way interaction (Table 4).

In regards to plant diseases, there was a tillage x planting date interaction related to % white mold (Table 5). More white mold was noted in strip-till for the early planting date, but there was more white mold in conventional tillage for the late planting date. Incidence of TSW had a four-way interaction of all treatment factors (Table 6). The most notable differences were significance occurred were that the late planting date had higher TSW than the early planting date (Conventional Till, No Fertilizer, 2x2 placement and Strip-Till, N Only, 2x2 placement). This is inconsistent with the majority of TSW data

comparing planting dates. Since the TSW ratings occurred on different days nearly 5 weeks apart, some error simply due to the gap in time may be associated with the planting date comparisons.

Table 5. White mold incidence (%), an interaction between tillage management and planting dates – Starter Fertilizer for Peanut Trial; Tifton, GA 2008.

Tillage	April 23	May 28
Conventional	6.6	10.2
Strip-Till	10.6	7.2

LSD value = 2.89 (for comparing between planting dates within a tillage effect, or between tillage effects within a planting date) at the P<0.05 level according to Fisher's Protected Least Significant Difference Test.

Table 6. Tomato spotted wilt incidence (%), an interaction among tillage management, planting dates, fertilizer treatments, and fertilizer placement – Starter Fertilizer for Peanut Trial; Tifton, GA 2008.

		Conventional		Strip-Till	
Fertilizer	Place-ment	April 23	May 28	April 23	May 28
None	2x2*	6.4	10.8	7.0	8.2
N Only	2x2	6.5	7.1	3.8	12.0
N + P	2x2	7.5	10.3	7.2	7.8
None	BS**	9.8	6.6	6.5	9.6
N Only	BS	8.1	10.7	7.4	8.7
N + P	BS	9.7	7.8	5.8	6.8

LSD value = 4.23 (for all treatment combination comparisons within a given effect) at the P<0.05 level according to Fisher's Protected Least Significant Difference Test.

* 2x2 = 2 inches below and 2 inches beside the seed furrow at planting

** BS = Behind subsoiler shank at 12 inch depth

Summary

There were very few differences in any measured variable when looking specifically at application of a starter fertilizer or with the placement of that fertilizer at planting. Based on these results, the application of a starter fertilizer would not be a worthwhile expense in peanuts. Tillage and planting date effects played much larger roles in determining most variables. Higher yields were observed in conventional tillage and at the early planting date. The most discernable and consistent difference in grade was that late planted peanuts did better than early planted peanuts and conventional tillage peanuts at the late planting date had higher grades than the strip-till peanuts. For rated diseases (white mold and TSW), there were no instances where pressure got above 12% infection, and most cases were less than 10%. The observations of greatest significance that will

warrant a closer investigation in subsequent replicates were that white mold was less severe in conventional tillage than strip-till at the early planting date, but the reverse occurred at the late planting date. Also, the TSW incidence was higher at the late planting date than at the early planting date, which is not typical.