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2010

National Peanut Board / Southeast Peanut Research Initiative

EXECUTIVE SUMMARY for 2010 NPB Project # 313, entitled:
"Implications of poor peanut stand establishment on weed control, TSWV, and overall agronomic performance" – Univ. of Georgia, by R. Scott Tubbs.

There are a number of factors that can affect plant stand in peanut, from soil temperature and moisture status, to presence of soilborne pathogens, to tillage / crop residue management, to mechanical adjustments on planting equipment such as row pattern and seed depth. When poor stands are present in the field, optimized production can be compromised and create additional management problems or concerns that would not otherwise be present with an adequate stand (such as weed control). Field experiments were implemented in 2010 to address some of the causes of poor plant stands from mechanical equipment settings and the resulting effect on production when plant stands are reduced, including supplementation of herbicide applications for weed control.

Air/vacuum planters are common in peanut planting, and variations in settings and procedures can influence how precise those planters work. On some planters, including the one used in this test, the vacuum is operated by the PTO, therefore any adjustments in RPM on the tractor will not only affect the suction pressure but will also affect tractor speed. The speed of the tractor can likewise be influential on the number of seed that settle onto the holes in the seeder plates, with faster operation permitting less time for a seed to settle into place. When a hole passes without a seed being in place, it results in plant stand skips in the field. Finally, the seed plates themselves are another factor for consideration, as the spacing between the holes can cause competition for space and knock an adjacent seed off of the hole when spaced too close together and using large seeded cultivars.

Results from our trials showed that plant stand was affected by the speed of travel of the tractor, with lower plant stands (more skips on the plate) with increasing tractor speed. Additionally, using a higher RPM/vacuum pressure (2000 RPM/24 PSI) caused greater plant stands regardless of the speed of the tractor. There was also an improvement in the initial plant stand when there was a larger spacing between holes in the seed plate. However, despite the differences noted in plant stand, there were no statistical differences in yield for any of the tested treatment variables.

Another experiment studied the performance of peanut based on the length of skips in the field. Plant stand differences were observed when a 12-inch skip occurred, and an even more drastic reduction in stand occurred with a 24-inch skip. The 24-inch skip caused a 17% yield loss compared to having a solid plant stand. There was also a 7% yield reduction when a 12-inch skip occurred compared to an optimum plant stand, although this was not at a statistically significant level. Multiple herbicide combinations were tested at the various plant stand / skip treatments, but none of the herbicide regimes that were tested offered any improvement in yield. Weed pressure was not heavy in this experiment, so even the plots with no supplemental weed control were not infested to the point of causing a yield loss.

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NATIONAL PEANUT BOARD / SOUTHEAST PEANUT RESEARCH INITIATIVE

FINAL REPORT for work done under project agreement entitled:
"Implications of poor peanut stand establishment on weed control, TSWV, and overall agronomic performance".

NPB Project # 313
GPC Budget # 4-949-653-5
UGA Account #25-21-RF328-847

INSTITUTION:	University of Georgia
Principle Investigator:	Dr. R. Scott Tubbs
EXPIRATION DATE:	30 June 2011
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FINAL REPORT:

Two separate field experiments were conducted to evaluate effect of poor stand establishment on peanut performance. A trial at the USDA-ARS Farm in Dawson, GA tested 3 levels of plant stands via planting at 6 seed/ft of row, reduced stand with 12 inch skips, and reduced stand with 24 inch skips. Each of these main plot levels had 6 levels of weed control for a factorial arrangement including all possible combinations of stand and weed control. Modified planter plates with plugged holes were used to generate skips in stand.

Forced Skipped Stand Test
Research site was located in Terrell Co. (GA) at the USDA-NPRL Bolton Research Farm. Soil series was a Redbay sand. Base fertilizer and lime applied in spring at UGA Ext. recommendations. Field preparation included multiple disking, moldboard plowing, and field cultivation for a level seedbed. Georgia-06G planted 7-May 2010. Soil moisture conditions at planting were best described as adequate. Supplemental irrigation used frequently due to dry weather for duration of field trial. Peanuts dug/inverted 8-Oct 2010 with harvest on 13-Oct 2010. Standard fungicide program of Tilt/Bravo and Abound used to control leaf spot and whitemold.
Treatments were a factorial arrangement of skip pattern (3) and herbicide program (6) with 4 replications. Skip patterns were: 1) No skip; 2) 12 inch skip; and 3) 24 inch skip. Herbicide treatments were: 1) None; 2) Weed-free; 3) Valor PRE fb Cadre POST fb 2,4-DB; 4) Valor PRE fb Gramoxone plus Basagran (POST) (2 X) fb 2,4-DB; 5) Cadre POST fb 2,4-DB; 6) Gramoxone plus Basagran (POST) (2 X) fb 2,4-DB.
Data collection included: stand counts at 14 and 32 days after planting (DAP), visual weed control ratings at 46 and 90 DAP, TSWV root assay at 90 DAP, yield, and grade.

Table 1. ANOVA.

Effect	Stand count 14 dap	Stand count 32 dap	Yield	TSMK
	----------*p* value----------			
Skip (S)	<.0001	<.0001	0.0153	0.7848
Herbicide (H)	0.2309	0.5111	0.8251	0.2428
S * H	0.3291	0.1616	0.5993	0.8111

Table 2. Effect of skip pattern on peanut stand counts and yield.

Skip pattern	Stand count 14 dap	Stand count 32 dap	Peanut yield
	plants/10 ft	*plants/10 ft*	*lb/acre*
None	30 a	26 a	4090 a
12 inch	28 b	21 b	3790 ab
24 inch	18 c	15 c	3400 b

Table 3. Incidence of *A. flavus* in graded samples.

Skip pattern	Seg 3 designated samples
	number[†]
None	6
12 inch	6
24 inch	11

[†] Number of samples out of 24 total within each skip pattern.

ANOVA indicated a strong response to skip pattern as expected for stand counts and yield, with no effect due to herbicide program (Table 1). Interactions between the 2 main effects not present. Peanut grade as represented by total sound mature kernels (TSMK) was not affected by skip pattern or herbicide program and averaged 72 (data not shown).

Stand counts 14 and 32 DAP showed a stepwise decrease with increasing skip distance (Table 2). The 12 inch skip pattern showed decreased stands of 5 and 20% at 14 and 32 DAP, respectively. At both measurement dates, 24 inch skip patterns had 40% fewer plants versus no skip plots. Yield followed a similar trend, with 24 inch skip pattern having 17% lower yield versus no skips. The 12 inch skip was not different in yield than the no skip treatment.

Incidence of *A. flavus* fungi on graded peanut samples from the 24 inch skip pattern was nearly double that found on no skip or 12 inch skip plots (Table 3). This is particularly interesting given that all plots were under irrigation, which generally minimizes the presence of *A. flavus*.

In summary, a skip pattern of 12 inches reduced plant stands but did not affect yield, while a 24 inch skip pattern reduced both stand and yield.

Speed x Pressure Test

Two additional experiments were established at the UGA Lang Farm in Tifton, GA and the Southwest GA Research and Education Center in Plains, GA to compare combinations of tractor speed and vacuum pressure at planting with a commercial planter. A McCormick C70 tractor was used, running in gears Low 2, Low 3, and Low 4, using RPM of either 1700 or 2000 for each of these gears. A Monosem precision vacuum planter was used. The reduction in RPM helps slow the tractor down, but simultaneously reduces suction pressure on the planter vacuum which could potentially lead to fewer seed sticking to the planter plate (1700 RPM resulted in approximately 20 PSI; 2000 RPM resulted in approximately 24 PSI). Faster speeds usually result in greater potential for skips in stand since the seed plate is rotating more rapidly and leaves less time for peanut seed to settle into position over the hole. In addition, two common seed plates used in commercial peanut planting were used – a 4060 and a 4860 plate. The 4060 plate corresponds to fewer holes along the perimeter, thus slightly more room between adjacent seed holes on the plate. The more holes there are, the greater potential for competition for space on the seed plate and peanuts being knocked off the plate, resulting in a skipped plant – especially with larger seeded cultivars. These planting combinations resulted in various tractor speeds at planting, as follows:

L2/1700 = 2.0 MPH
L2/2000 = 2.4 MPH
L3/1700 = 2.8 MPH
L3/2000 = 3.2 MPH
L4/1700 = 3.7 MPH
L4/2000 = 4.1 MPH

Plots were planted (Tifguard) in Tifton on June 9 and in Plains on June 3, 2010. Plants were dug in Tifton on October 27 and in Plains on October 22. Peanuts were harvested on November 8 in Tifton and November 1 in Plains.

Results – Tifton, GA

Table 4. Effect of tractor gear, RPM (vacuum pressure), and plate spacing on stand and yield of peanut, Tifton, GA 2010.

Gear	Stand count 24 DAP	Stand count Harvest	Peanut yield
	plants/10 ft	*plants/10 ft*	*lb/acre*
Low 2	30 a	40 a	2916 a
Low 3	28 b	37 a	2782 a
Low 4	24 c	33 b	2680 a

RPM / PSI	Stand count 24 DAP	Stand count Harvest	Peanut yield
	plants/10 ft	*plants/10 ft*	*lb/acre*
1700 / 20	25 b	34 b	2719 a
2000 / 24	29 a	39 a	2867 a

Plate	Stand count 24 DAP	Stand count Harvest	Peanut yield
	plants/10 ft	*plants/10 ft*	*lb/acre*
4060	28 a	36 a	2790 a
4860	26 b	37 a	2795 a

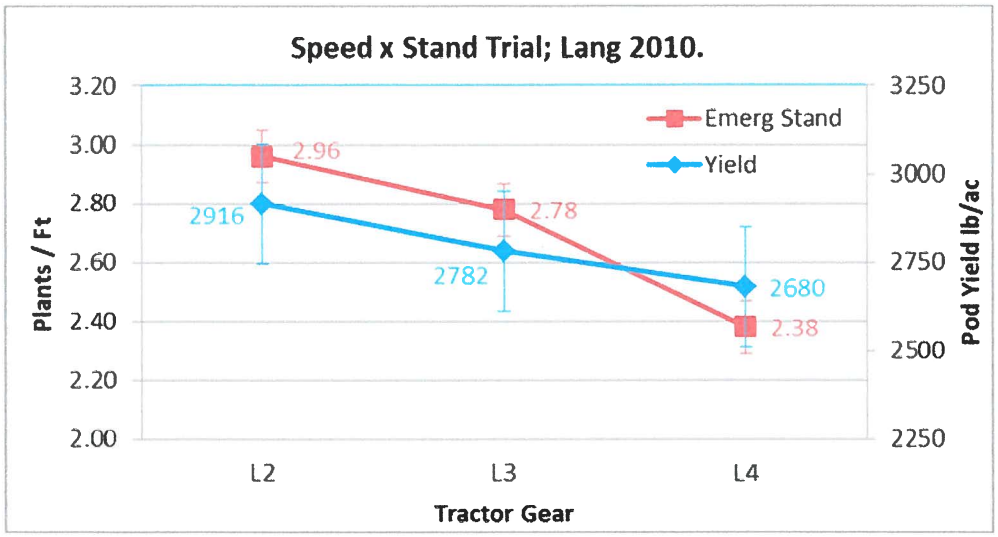

Figure 1. Effect of tractor gear (speed) on plant stand and yield of peanut at Tifton, GA 2010.

There were no interactions of the dependent variables tested (gear, pressure, or plate). However, each factor alone had a significant effect on certain analyses. Each of the factors independently resulted in significant differences in the 24 DAP plant stand (Table 4). These resulted in an expected trend that the faster the tractor was moving, the lower the pressure that was used, and the narrower the gap between holes in the seed plate, all resulted in lower plant stands achieved. The same trends were observed at the end of the season stand count for gear and pressure, but not for seed plate effect. There were similar trends in yield, but differences were not significant for yield (Table 4, Figure 1). Tomato spotted wilt virus (TSWV) was rated in all plots, but there were no differences for any factor (less than 6% incidence in all cases), as pressure for this disease was extremely low in 2010, plus the peanuts were planted in June when TSWV incidence is historically minimal, and a resistant cultivar was used in the trial.

Results – Plains, GA

Table 5. Effect of tractor gear, RPM (vacuum pressure), and plate spacing on stand and yield of peanut, Plains, GA 2010.

Gear	Stand count 20 DAP	Stand count Harvest	Peanut yield
	plants/10 ft	*plants/10 ft*	*lb/acre*
Low 2	36 a	40 a	3971 a
Low 3	32 b	37 b	3984 a
Low 4	28 c	33 c	3817 a

RPM / PSI	Stand count 20 DAP	Stand count Harvest	Peanut yield
	plants/10 ft	*plants/10 ft*	*lb/acre*
1700 / 20	31 b	35 b	3825 a
2000 / 24	33 a	38 a	4023 a

Plate	Stand count 20 DAP	Stand count Harvest	Peanut yield
	plants/10 ft	*plants/10 ft*	*lb/acre*
4060	32 a	38 a	3951 a
4860	32 a	36 b	3897 a

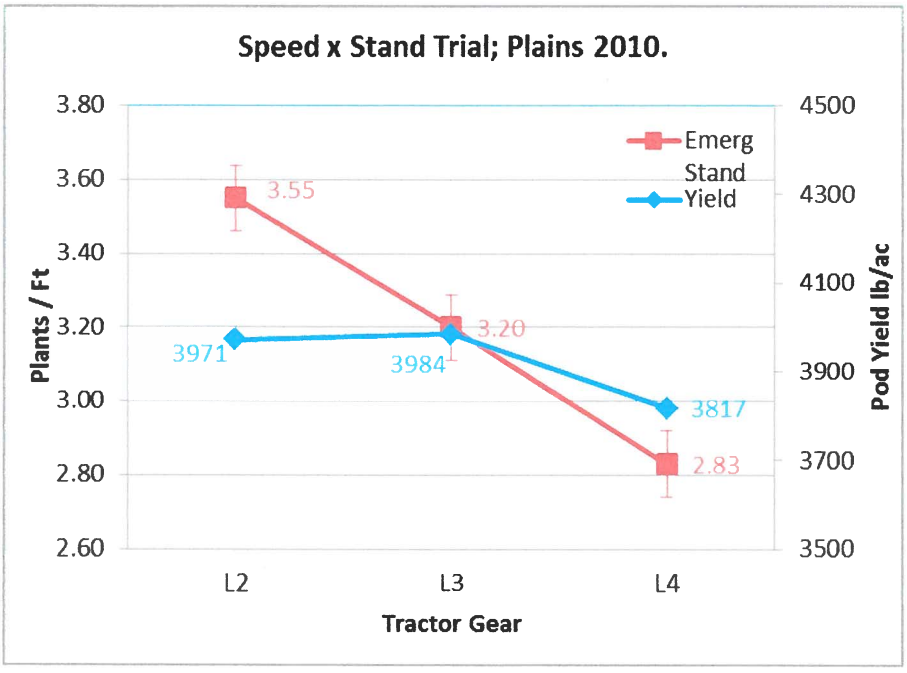

Figure 2. Effect of tractor gear (speed) on plant stand and yield of peanut at Plains, GA 2010.

There were again no interactions of the dependent variables tested (gear, pressure, or plate) for most variables, although a pressure x plate interaction was observed for stand counts. The stand interaction for 24 DAP stands and for harvest stands indicated that the

4860 seed plate influenced lower stands at the low pressure (1700 RPM/20 PSI) scenario, but not at the high pressure (2000 RPM/24 PSI) combination. When comparing tractor gears averaged over pressure and seed plates, a linear response was observed with approximately a 0.5 plant/ft reduction with every 1.0 mph increase in speed, which held true at both the emergent and harvest stand samplings. The yields were again unaffected statistically, though (Table 5, Figure 2). Likewise, TSWV was also rated in all plots at this location, but there was again no differences for any factor for similar reasons to above (less than 3% incidence overall).

Summary

According to these results, plant stand can be strongly affected by tractor settings and skips in the row. Plant stands did not lead to many yield differences in these experiments, but trends were observed that are associated with expected outcomes that have been confirmed in other research. Additional trials are needed to combine with these results, and to further explore the effects of plant stands on yield, diseases, etc.