418/1321
2014

National Peanut Board / Southeast Peanut Research Initiative

EXECUTIVE SUMMARY for 2014 NPB Project # 418, entitled "Evaluation of Tillage, Cover Crop and Herbicide Effects on Weed Control in Peanut Production Systems" – Univ. of Georgia, by R. Scott Tubbs.

To ensure sustainability, multiple integrated weed management strategies must be developed in order to provide growers the most cost effective means for production, while achieving adequate management and long-term viability. With peanut being a staple economic crop in the southeastern U.S. and with the increased pressure of herbicide resistant weeds, development of integrated weed management practices is crucial to producers in this area. Presently, herbicides are used on approximately 97% of all crop acres in the U.S., which can contribute to increased selectivity for resistance. The peanut crop is known to have a relatively poor competitive ability with problematic weeds because of its low canopy and prostrate growth. The objective of this project was to evaluate the system effect on peanut production by integrating conservation tillage, a rye cover crop, and three herbicide input intensities to determine effective integrated weed management systems that might promote sustainable weed control practices.

A split-plot design was used with main plot effects of tillage and sub-plot effects of herbicide treatments. The three main plot treatments included conventional deep-tillage, strip-till into a rye cover crop (rye planted in November 2013), or strip-till into a winter fallow. Georgia-06G peanut was planted on May 14, 2014 and followed by the sub-plot effect of herbicide applications of Valor, Cadre, or Strongarm alone, or all possible combinations thereof (along with a non-treated control). There were no interactions between tillage and herbicide treatments for any variable analyzed. Tillage had a significant effect on yield, plant stand, and days to row middle overlap (lapping). When peanut was strip-tilled into a rye cover crop, yield was reduced, plant stand was lower, and it took nearly two additional weeks for row middles to overlap than when compared to the other treatments where there was no cover crop. Rye residue can interfere with planting and emergence in strip-till scenarios, even when planted with row cleaners (which were used in this trial). The remaining rye straw in row middles can also impede vine growth, taking longer for vines to overlap the row middles since the rye straw may force peanut vine growth upward/away from the soil instead of growing directly prostrate across the soil surface.

Herbicide treatments also resulted in significant differences for yield, grade, final plant stand, and amount of time to lapping. Treatments that included Strongarm herbicide (whether alone or in some combination with other herbicides) tended to have better yields than treatments that did not include the herbicide. Treatments with Valor alone, Cadre alone, or the combination of Valor + Cadre did not yield as well as treatments that included Strongarm.

Overall, these results suggest that inclusion of rye may hurt peanut development. While there wasn't an interaction with any of the herbicide treatments, the rye residue may have intercepted and reduced efficacy of herbicides compared to the conventional tillage and fallow strip-till scenarios where there was no residue to prevent the herbicide from reaching its target of the soil surface and small emerging weed seedlings. This data also supports the use of Strongarm herbicide in peanut for maximizing yield and improving canopy closure to combat weed escapes throughout the season.

418/1321
2014

NATIONAL PEANUT BOARD / SOUTHEAST PEANUT RESEARCH INITIATIVE

FINAL REPORT - 2014 funding cycle for work done under project agreement entitled: "Evaluation of Tillage, Cover Crop and Herbicide Effects on Weed Control in Peanut Production Systems".

NPB Project # 418
BID # 1321
SID # GA-168
UGA Account #25-21-RF328-059

INSTITUTION: University of Georgia

Principle Investigator: Dr. R. Scott Tubbs

EXPIRATION DATE: 30 June 2015

SPRI CONTACT: Joy Purvis
NPB CONTACT: Bob Parker

Final Report:

To ensure sustainability, multiple integrated weed management strategies must be developed in order to provide growers the most cost effective means for production, while achieving adequate management and long-term viability. With peanut being a staple economic crop in the southeastern U.S. and with the increased pressure of herbicide resistant weeds, development of integrated weed management practices is crucial to producers in this area. Presently, herbicides are used on approximately 97% of all crop acres in the U.S., which can contribute to increased selectivity for resistance. The peanut crop is known to have a relatively poor competitive ability with problematic weeds because of its low canopy and prostrate growth. The objective of this project was to evaluate the system effect on peanut production by integrating conservation tillage, a rye cover crop, and three herbicide input intensities to determine effective integrated weed management systems that might promote sustainable weed control practices.

A split-plot experiment was implemented at the UGA Ponder Farm under a half pivot to address herbicide efficacy in various tillage management and cover crop effects. Main plot effects included tillage/cover crop treatments, including conventional deep turn tillage (no cover crop in winter), a winter fallow (no cover crop) followed by strip-till, and strip-till into a winter cover crop of rye (rye planted November 14, 2013 and fertilized with 30 lb N/ac on December 16, 2013 and again on February 19, 2014). Sub-plot effects within each main plot tillage treatment included different herbicide regimes consisting of the following:

1) No herbicide
2) Cadre alone (4 oz/ac)
3) Strongarm alone (0.45 oz/a)
4) Strongarm + Cadre (0.45 oz/ac + 4 oz/ac)

5) Valor alone (3 oz/ac)
6) Valor + Cadre (3 oz/ac + 4 oz/ac)
7) Valor + Strongarm (3 oz/ac + 0.45 oz/ac)
8) Valor + Strongarm + Cadre (3 oz/ac + 0.45 oz/ac + 4 oz/ac)

All Valor applications were early pre-emergence; Strongarm was applied pre-emergence; Cadre was applied early post-emergence for all treatments involving each respective herbicide.

Peanut (Georgia-06G) was planted on May 14, 2014. Digging occurred on October 6 and harvest on October 16, 2014. Due to heavy weed pressure in the plots that received no herbicides, it was not possible to dig and obtain yield, grade, and plant stand data for that treatment at the end of the season.

Table 1. Peanut yield and grade (Total Sound Mature Kernels [TSMK]), plant stand at emergence, plant stand at harvest, and days to row overlap (lapping) for tillage and herbicide treatments at Tifton, GA in 2014. Means within a column not followed by the same letter are significantly different. Lowercase letters indicate significance at the P=0.10 level; Uppercase letters indicate significance at the P=0.05 level.

	Pod Yield	TSMK	Emerg. stand	Harvest stand	Lapping
Tillage[a]	lb/ac	%	plants/ft	plants/ft	d after plant
Conventional	6372 A	76.4 a	3.6 A	3.7 A	77.4 B
Fallow	5751 A	75.0 a	3.6 A	3.5 A	77.2 B
Strip-Till into rye	4690 B	75.5 a	3.1 B	3.2 B	91.0 A
Herbicide Treatment[b]					
None	x	x	3.6 a	x	x
Cadre	5344 bc	75.7 ab	3.4 a	3.4 AB	84.7 a
Strongarm	5878 ab	75.9 ab	3.4 a	3.6 A	78.8 b
Cadre + Strongarm	6303 a	75.3 b	3.5 a	3.7 A	80.4 ab
Valor	4886 c	75.5 ab	3.4 a	2.9 B	82.5 ab
Valor + Cadre	5530 bc	75.3 b	3.5 a	3.5 A	81.0 ab
Valor + Strongarm	5682 ab	76.5 a	3.2 a	3.5 A	82.5 ab
Valor + Cadre + Strongarm	5607 b	75.4 b	3.4 a	3.7 A	83.4 a

[a] Data pooled over rep and herbicide treatments.
[b] Data pooled over rep and tillage.

There were no interactions between tillage and herbicide treatments for any variable analyzed. Tillage had a significant effect on yield, plant stand, and days to row middle overlap (lapping) (Table 1). When peanut was strip-tilled into a rye cover crop, yield was reduced, plant stand was lower, and it took nearly two additional weeks for row middles to overlap than when compared to the other treatments where there was no cover crop. Rye residue can interfere with planting and emergence in strip-till scenarios, even when planted with row cleaners (which were used in this trial). The remaining rye straw in row middles can also impede vine growth, taking longer for vines to overlap the row middles since the rye straw may force peanut vine growth

upward/away from the soil instead of growing directly prostrate across the soil surface. This growth away from the soil surface can also lengthen the time for pegs to reach the soil and cause the plant to expend more energy in vegetative growth.

Herbicide treatments also resulted in significant differences for yield, grade, final plant stand, and amount of time to lapping. Treatments that included Strongarm herbicide (whether alone or in some combination with other herbicides) tended to have better yields than treatments that did not include the herbicide. Treatments with Valor alone, Cadre alone, or the combination of Valor + Cadre did not yield as well as treatments that included Strongarm. Differences in grade among herbicide treatments were few and there wasn't any noticeable trend. Plant stands were lowest where Valor alone was used, and the number of days to lapping was longest where Cadre or the full combination of Valor + Cadre + Strongarm was used, while plots with only Strongarm had the shortest interval until overlap. This might be an indication of plant injury by Cadre and possibly Valor and less potential injury by Strongarm. However, not all combinations of herbicides including Cadre or Valor resulted in slower lapping, so the data is not totally conclusive.

Overall, these results suggest that strip-till into a rye cover crop can be at a disadvantage in terms of yield compared to systems that do not include a cover crop. While there wasn't an interaction with any of the herbicide treatments, the rye residue may have intercepted and reduced efficacy of herbicides compared to the conventional tillage and fallow strip-till scenarios where there was no residue to prevent the herbicide from reaching its target of the soil surface and small emerging weed seedlings. This data also supports the use of Strongarm herbicide in peanut for maximizing yield and improving canopy closure to combat weed escapes throughout the season. It is a relatively expensive herbicide, but would have been worth the expense based on these results compared to where it was not used.