The Effects of Reduced Tillage Practices and Rotation on Peanut Production and Pest Management

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- While certain trends appear to be evident from year to year that may relate to tillage effects on arthropods, weeds and diseases, no consistent differences have been observed. Yields and grades have been similar since 2004.
- Peanuts yield in 2010 indicate the importance of crop rotation. Rotation with a grass crop 2 out of 3 years provided a significant increase in peanut yield compared to continuous peanut.

Introduction

In 2009, the long-term tillage study at the Ft. Cobb Research Station was continued. The objectives were to assist Oklahoma growers in developing management strategies for conventional and conservation tillage practices in peanut production. Originally, plots were 76 feet wide by 130 feet long, to be representative of what growers would experience in adopting reduced tillage practices. Changes were made for the 2007 growing season. Large plots, which measured 76 feet wide by 130 feet long, were split to evaluate three different rotations, while maintaining the objectives of the original study. Each tillage plot was split into three sub-plots, which measured 40 feet wide by 50 feet long. Main plots were tillage and sub-plots became crop rotation. Crop rotations evaluated were a three-year corn, corn, then peanut rotation; and a three-year switchgrass, switchgrass, then peanut rotation. Including crop rotation as a variable in this study will provide beneficial data of how crop rotation affects weeds, diseases and insects in reduced and conventional tillage systems.

Materials and Methods

All plots were planted to peanut in 2009. An outline of field operations is presented in Table 1.

Arthropod monitoring

Once damage became apparent, thrips populations were monitored on three separate occasions. Ten quadrifoliate leaves were pulled from each plot and placed in 70 percent ethyl alcohol (ETOH) for transportation to the laboratory. Leaves were carefully separated and rinsed in an ETOH solution, then the liquid was strained for larvae and adults.

Table 1. Summary of field operations in 2009.

Date	Description
Land Preparation:	
April 22	Tilled Conventional Plots
May 21	Disc and Triple-K Conventional Plots
May 21	Strip-Tilled/ST Plots
May 21	Planted/Tamrun OL07
Herbicides:	
April 21	Glyphosate at 1 qt
May 22	Prowl® H_20 at 1 qt + Dual Magnum® at 1.33 pts + Glyphosate at 1 qt
June 12	Cobra® at 12.5 oz+ Blazer® at 1.5 pts + Butyrac® 200 at 1 pt + Induce® at 4 oz
June 18	Select® at 10 oz
July 7	Select® at 10 oz
August 13	Outlook® at 20 oz + Cobra® at 12.5 oz + Poast Plus® at 2 pts + Butyrac® 200 at 1.5 pts+Dynamic at 4 oz
Fungicides:	
July 13	Bravo® at 1.5 pts
July 28	Folicur® at 7.2 oz
July 31	Omega® at 1.5 pts
August 13	Headline® at 15 oz
August 31	Omega® at 1.5 pts
September 8	Bravo® at 1.5 pts
Fertilizer:	
May 18	100# 18-46-0
Harvest Information:	
Oct 20	Dug
Oct 27	Thrashed

Plot design and analysis

The plot design was a randomized, complete block with four replications of each treatment. An analysis of variance was conducted on the data and a least significant difference (LSD, P=0.05) test was generated to compare differences among the three tillage treatments in reference to insect and disease pressure, as well as yield and grade.

Results and Discussion

The information found in Table 2 presents results from monitoring insect populations encountered in the tillage test at Ft. Cobb. Thrips were the main problem noticed throughout the season. No insecticides were applied throughout this test. A significantly higher number of thrips larvae were found in conventional till plots. The higher larvae population in conventional till plots was observed only in the first sampling date (July 2). The high number of larvae resulted in the total number of thrips being higher in the conventional till plots compared to the no-till plots (Table 2). Over the duration of the study, thrips numbers have been similar in most years between the tillage treatments, but if differences were observed it was often the conventional till plots that had greater thrip populations. Rotation had no effect on the number of thrips (Table 3). In 2009, low numbers of potato leaf hopper, three-cornered alfalfa leaf hopper, wasps, grasshoppers and caterpillars were observed, but no treatment differences were detected (data not shown).

No significant interaction for tillage was detected, so effects were evaluated separately. No significant differences in peanut yields or grades were identified among tillage treatments (Table 4). This follows previous years' data. Tillage does not appear to have an effect on peanut yield or peanut grade after six years. Rotation had a significant effect on peanut yield (Table 5). The use of rotational crops, corn or switchgrass, significantly increased peanut yield compared to a continuous peanut system.

Table 2. Mean number of thrips/10 quadrifoliate leaves as a result of tillage practice.

	Sample Date 1 July 2, 2009			Sample Date 2 July 9, 2009		
Treatment	Larvae	Adult	Total	Larvae	Adult	Total
Strip-Till	5.0 b*	9.0 a	14.0 ab	7.5 a	3.6 a	11.1 a
No-Till	2.2 b	5.9 ab	8.1 b	3.6 a	3.0 a	6.8 a
Conventional Till	9.7 a	5.7 b	15.5 a	6.9 a	3.4 a	10.3 a

*Means, within columns, followed by the same letter are not significantly different (ANOVA, LSD *P*=0.05).

Table 3. Mean number of thrips/10 quadrifoliate leaves as a result of crop rotation.

Treatment Sub-Samples	Sample Date 1 July 2, 2009			Sample Date 2 July 9, 2009		
	Larvae	Adult	Total	Larvae	Adult	Total
Peanut Only	6.7 a[1]	5.8 b	12.3 a	5.6 a	3.3 a	8.8 a
Peanut/Corn	6.8 a	7.1 ab	13.8 a	6.2 a	2.8 a	9.0 a
Peanut/Switchgrass	3.6 a	8.9 a	12.5 a	6.3 a	4.0 a	10.3 a

[1] Means, within columns, followed by the same letter are not significantly different (ANOVA, LSD *P*=0.05).

While certain trends appear to be evident from year to year that may relate to tillage effects on arthropods, weeds and diseases, no consistent differences seem to indicate minor impacts from reduced tillage practices in peanuts. Also, the importance of a good rotation is evident from this study.

Table 4. Effect of tillage on peanut yield and grade from the Long-term tillage study, Ft. Cobb, 2009.

Tillage	Yield (lbs/A)	Grade (% TSMK[1])
No-Till	4,751 a*	57
Strip-Till	4,605 a	58
Conventional Till	5,332 a	61

[1] % TSMK = Percent total sound mature kernels.
*Means, within columns, followed by the same letter are not significantly different (ANOVA, LSD *P*=0.05).

Table 5. Effect of rotation on peanut yield and grade from the Long-term tillage study, Ft. Cobb, 2009.

Rotation	Yield (lbs/A)	Grade (% TSMK[1])
Peanut-Corn-Corn	5,566 a*	58
Peanut-Swithgrass-Swichgrass	5,325 a	64
Continous Peanut	4,308 b	59

[1] % TSMK = Percent total sound mature kernels.
*Means, within columns, followed by the same letter are not significantly different (ANOVA, LSD *P*=0.05).