Jamie L. Whitten Plant Materials Center

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PROJECT REPORT

PEANUT RESPONSE TO COVER CROPS AND TILLAGE

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INTRODUCTION

Peanut (*Arachis hypogaea* L.) is planted on an average of 6.5 thousand acres in Mississippi. In 1991, total yield of all types was 14.5 million pounds with cash receipts totaling $4.7 million (USDA-ASCS, Jackson, MS).

Soil loss associated with peanut production may be as high as 22 tons/acre (USDA-NRCS, Jackson, MS). This is due to the amount of soil disturbance at planting and harvest and low amounts of crop residue after harvest. No-till (NT) studies in Mississippi with corn (*Zea mays* L.) (Mississippi Agric. Expt. Forestry Stn., 1988), cotton (*Gossypium hirsutum* L.) (Stevens et al., 1992), and sorghum [*Sorghum bicolor* (L.) Moench] (Reginelli et al., 1987) have shown that high yields can be maintained and soil erosion reduced especially when grown with a cover crop. This study was to determine the effects of a NT system with and without cover crops on peanut.

MATERIALS AND METHODS

This study was conducted at the Jamie L. Whitten Plant Materials Center near Coffeeville, MS from 1991 to 1994. Plots were four rows (40-inch row spacing) 25 feet in length. Soil type was Oaklimeter silt loam (Coarse-silty, mixed, thermic Fluvaquentic Dystrochrepts). Plots were rotated to a different section of the field each year. Experimental design was a randomized complete block with four replications. Analysis of variance was used to determine if significant differences occurred ($P \geq 0.05$). Duncan's Multiple Range Test (DMRT) was used to separate means that did differ significantly (Steel and Torrie, 1960).

Seedbeds for the cover crops were prepared by disking twice (2X), hipping 2X, and lightly harrowing. P and K were broadcast applied according to soil test results for peanut. Cover crops were broadcast planted on November 6, 1991 at 20, 30, 90, and 90 lb/acre for crimson clover (*Trifolium incarnatum* L. var. 'Tibbee'), hairy vetch (*Vicia villosa* L.), rye (*Secale cereale* L. var. 'Elbon'), and wheat (*Triticum aestivum* L.), respectively. Diclofop methyl (Hoelon-) was applied at 0.75 lb ai/acre on December 17, 1991 to all plots to control ryegrass (*Lolium multiflorum* Lam.). Subsequent planting dates were October 8, 1992 and October 28, 1993. Seeding rates

were reduced to 15, 20, 60, and 60 lb/acre for crimson clover, hairy vetch, rye, and wheat, respectively, in 1992 and 1993. Legume seeds were inoculated with the proper rhizobia prior to planting each year. Disking 2X, hipping, and harrowing in the spring served as a conventional tillage (CT) check. Canopy cover was determined by visually estimating the amount of cover in each plot. Dry matter (DM) yields were determined by hand harvesting four square feet in each plot prior to cover crop termination. Native cool season weeds varied from year to year, essentially none in 1991-1992, but mainly consisted of henbit (*Lamium amplexicaule* L.), chickweed [*Stellaria media* (L.) Cyrillo], and cutleaf eveningprimrose (*Oenothera laciniata* Hill). Cover crops were chemically killed using glyphosate (Roundup-) applied at 2.0 lb ai/acre on approximately April 15 of each year.

Spanish type peanut 'Florunner' was planted on May 12, 1992, May 20, 1993, and May 8, 1994 at 80 lb/acre. Plots were replanted June 15, 1994 due to birds pulling up the seedlings. Seed were planted using a no-till planter with a ripple coulter. Metolachlor (Dual,) at 2.0 lb ai/acre was applied preemergence with paraquat applied postemergence over-the-top at 0.13 lb ai/acre. Conventionally tilled plots were cultivated once. Seed yield (hulled) was determined by hand harvesting a middle row in each plot.

RESULTS AND DISCUSSION

Though planted after the last recommended planting date of October 15 (Kimbrough and Watson, 1988) in 1991 and 1993, the legumes emerged to satisfactory stands. Rye and wheat produced fair stands.

Crimson clover produced more canopy cover on all three dates in 1992 than did wheat (Table 1). In an earlier study at this location, canopy cover for rye and wheat during February and March was significantly higher than crimson clover (Bloodworth and Wolfe, 1992). In that study, crimson clover was affected more by cold temperatures than hairy vetch, rye, or wheat. Low canopy cover for native weeds on March 11, 1994 was attributed to water standing in the row middles covering plants that were still in the rosette stage. Hairy vetch, which has been shown to fix more N than crimson clover (Funderburg, 1987), did not produce >40% canopy cover until April of any year. Crimson clover produced a higher DM yield than wheat only in 1992 (Table 1). No significant differences were found between cover crops for DM yield in 1993 or 1994. Bloodworth and Johnson (1992) reported that when fertilized with 25 lb N/acre, wheat following cotton produced DM yields equal to or higher than crimson clover.

Soil moisture levels were low during mid-May 1992. To reach moisture seeds were planted at the 1-inch depth in NT plots and at the 1.5-inch depth in CT plots. Seedlings emerged to fair to excellent stands in the NT plots while the CT stands were sporadic.

No unusual problems occurred during the 1992 and 1993 peanut growing seasons. Plants were frequently checked for diseases but no major symptoms occurred in 1992 and 1993. In 1994, all plots were severely infested with fungus leaf spot (*Cercospora* spp.) and thus were not suitable for harvesting. Weed pressure in all plots was minimal during all years. In a Florida study, NT plots had significantly less broadleaf weeds than the CT plots but an equivalent number of grasses (Costello and Gallaher, 1983).

No significant differences were found between cover crops for peanut seed yields (Table 2). However, it is important to note their advantages: conserve soil moisture, reduce weed competition, and decrease soil erosion. With the stand failures in the CT plots in 1992, peanut

yields could not be obtained. In the major producing states in the southeastern United States, results have shown that comparable yields can be produced with NT peanut. In areas of Alabama and Georgia where a traffic pan occurred at the 8-10 inch depth, in-row subsoiling increased yield in NT plots (Reeves et al., 1986; Cheshire et al., 1985). In Florida, over a three year period, yields of NT and CT peanut were equal (Wright and Cobb, 1984).

CONCLUSIONS

This study supported earlier work that peanut can be successfully grown in a NT system. It also showed that cover crops benefited peanut plant growth by soil moisture conservation but did not influence yield. Use of a cover crop should not be based solely on its effect upon crop yield but upon its ability to improve the soil structure and fertility.

Future research should address if legume cover crops increase the incidence of peanut diseases and the effects of cover crops in a peanut crop rotation.

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Table 1. Cover crop canopy cover, 1992-1994.

	Canopycover								
	1992			1993			1994		
Cover crop	1/31	3/04	4/06	2/02	3/01	4/06	2/01	3/11	4/08
	%								
Crimsonc lover	21a[1]	59a	93a	25cd	11c	41b	14ab	15b	37b
Hairy vetch	4c	14d	84a	5d	7c	45b	8b	8bc	74a
Rye	17a	45b	70ab	40bc	21b	37b	31a	35a	78a
Wheat	12b	29c	41b	55ab	50a	50b	30a	40a	85a
Native cover	_--	_--	_--	76a	59a	92a	18ab	3c	21b

[1]Means within a column not followed by a common letter are significantly different as determined by DMRT ($P \geq 0.05$).

Table 2. Cover crop dry matter yield, 1992-1994.

	DM yield		
Cover crop	4/22/92	4/23/93	4/20/94
	lb/acre		
Crimson clover	4563a[1]	3328	2692
Hairy vetch	3586ab	4029	4396
Rye	4060ab	3915	4480
Wheat	2812b	3832	4581
Native cover	------	2866	3982

[1]Means within a column not followed by a common letter are significantly different as determined by DMRT ($P \geq 0.05$).

Table 3. Peanut seed yield (hulled) by covercrop/tillage system, 1992-1993.

Cover crop/	Seed yield	
tillage system	1992	1993
	lb/acre	
Crimson clover	2899	2287
Hairy vetch	3757	2662
Rye	2981	3211
Wheat	3838	3620
Native cover	3144	4113
Conventional tillage	----	2418

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