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REDUCED COVER CROP SEEDING RATES for NO-TILL COTTON

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INTRODUCTION

Today's agricultural producers are facing narrow profit margins. Every input is carefully evaluated for its return on investment. Many cotton farmers are implementing conservation tillage to reduce the number of seedbed preparation trips from as many as 12 to one or zero. Bloodworth and Johnson (1995) estimated that no-till cotton reduced total expenses by $17 per acre as compared to conventionally tilled cotton.

Legume cover crops such as crimson clover and hairy vetch may replace part or all of cotton's N requirement. Hutchinson et al. (1993) did not find a response for cotton following vetch when fertilized with up to 140 lb N/acre. As N fertilizer costs continue to increase, planting a cover crop may be more economical. Secondly, during dry years when cotton does not utilize all of the applied N, wheat may be planted to prevent this N from leaching into the ground water.

MATERIALS AND METHODS

Cover crops were broadcast seeded on 28 October 1993 after cotton stalks were shredded and plots disked once. In 1994, stalks were shredded and cover crops were drilled in 8-inch rows on 14 November. Seeding rates were 0.25X, 0.5X, 0.75X, and 1X the recommended rates (Funderburg, 1987). Phosphorus and K were broadcast applied prior to planting of the cover crops. Rates were based upon soil test results. Wheat received an additional 25 lb N/acre as ammonium nitrate at planting. Legume seeds were inoculated with the proper rhizobia at planting each year. Canopy cover was determined by visually estimating the percentage 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 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 paraquat at 0.62 lb ai/acre and cyanazine at 0.5 lb ai/acre on 15 April each year.

Cotton was no-till planted on 7 May 1994 and 8 May 1995. Varieties were 'HS-46' in 1994 and 'DPL-50' in 1995. Both fluometuron and metolachlor were applied preemergence at 1.5 lb ai/acre in 1994 and 1.75 lb ai/acre in 1995. Nitrogen was applied at 20, 30, 80, and 80 pounds/acre to cotton following hairy vetch, crimson clover, wheat, and native cover,

respectively, in 1994. All plots received 80 lb N/acre in 1995. Cotton was cultivated once in 1994. Postemergence applications consisted of cyanazine and MSMA at 1.0 and 2.0 lb ai/acre, respectively. Seedcotton yields were determined by hand harvesting one middle row in each plot.

Experimental design was a randomized complete block with four replications. Plots consisted of four rows (40-inch row spacing) 25 feet in length. Soil type was Grenada silt loam (Fine-silty, mixed, thermic Glossic Fragiudalfs). Analysis of variance was used to determine if significant differences occurred ($P \leq 0.05$). Percent canopy cover data were subjected to arcsine transformation before analyses, but non-transformed data are presented when transformation did not affect outcome. Duncan's Multiple Range Test (DMRT) was used to separate means that differed significantly (Steel and Torrie, 1960).

RESULTS AND DISCUSSION

Canopy cover from hairy vetch is low during the early to mid-stages of the growing season. This trend is shown in Table 1 where canopy cover from hairy vetch does not approach 50% until April. Typically hairy vetch can provide near complete canopy cover as was evident in 1994. Generally, reducing seeding rate by 25% did not decrease canopy cover at any date. Excessive soil moisture in 1995 was attributed to the low canopy cover. Native weeds provided >90% canopy cover by April of both years. This suggests that management systems should be adopted to promote the growth of cool season weeds thus not only reducing soil loss but also avoiding the costs of seeding a cover crop. However, some weeds like wild geranium (Geranium carolinianum L.) may serve as alternate hosts for insect pests.

Table 1. Seeding rate effects on cover crop canopy cover, 1994-1995.

Cover crop	Seeding rate	Canopy cover 2/01/94	3/11/94	4/08/94	3/09/95	4/05/95
	lb/acre			%		
Crimson clover	20	30b[1]	59ab	90abc	18b	77b
Crimson clover	15	18c	44abc	78bcd	10c	42cde
Crimson clover	10	13cd	54ab	80bcd	9cd	48cd
Crimson clover	5	6ef	18de	42f	4e	22ef
Hairy vetch	30	3f	38bcd	96a	4de	78b
Hairy vetch	23	4f	16de	82bcd	4e	50cd
Hairy vetch	15	3f	16de	66de	3e	42cde
Hairy vetch	8	3f	7e	42f	2e	12f
Wheat	90	42a	68a	75cd	20b	62bc
Wheat	69	42a	58ab	71d	15bc	46cd
Wheat	45	35ab	42abc	50ef	9cd	36de
Wheat	23	16c	27cd	44ef	12c	32de
Native_cover	--	10de	56ab	92ab	87a	95a

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

Dry matter yield data were pooled and analyzed over years. Treatments and the treatments x years were significant, thus, the interaction will be discussed. Growing conditions were excellent for cover crops in 1994 with an average DM yield of 7965 lb/acre

(Table 2). However, no significant differences were found. With the wet growing conditions in 1995 average DM yield was decreased by 92% as compared to 1994. Average DM yield of wheat in 1995 was lower than that of the legumes. This was attributed to the low N fertilizer rate, low residual level of cotton N fertilizer, and denitrification. Hairy vetch is more cold tolerant than crimson clover which has been reported to have been freeze killed when planted as a cotton cover crop (Bloodworth et al., 1994; Bloodworth and Johnson, 1995). For 1995, decreasing seeding rate by 50% did not decrease DM yield of the legumes while decreasing seeding rate by 75% did not decrease DM yield of wheat.

Pooled data for seedcotton yield indicated that only treatments were found to be significant. Decreasing cover crop seeding rate did not decrease seedcotton yield (Table 2). Cotton with hairy vetch planted at 30 or 23 pounds/acre significantly increased seedcotton yield over cotton following wheat planted at 45 pounds/acre. Comparable seedcotton yields when following crimson clover, hairy vetch, or wheat has been reported by Bloodworth et al. (1994) and Bloodworth and Johnson (1995). Even though cover crop DM yield and seedcotton yield were unaffected by decreasing cover crop seeding rate by 50 and 75%, the importance of canopy cover in reducing soil loss suggests that seeding rate should not be decreased by >25%.

Table 2. Seeding rate effects on cover crop dry matter yield and seedcotton yield, 1994-1995.

	Seeding	DM yield		Seedcotton yield
Cover crop	rate	1994	1995	1994-1995
			lb/acre	
Crimson clover	20	8527[1]	935ab	1422ab
Crimson clover	15	12509	1043a	1527ab
Crimson clover	10	8024	738abc	1593ab
Crimson clover	5	7412	372c	1495ab
Hairy vetch	30	6224	971ab	1714a
Hairy vetch	23	8371	612abc	1681a
Hairy vetch	15	6188	618abc	1644ab
Hairy vetch	8	7472	480c	1541ab
Wheat	90	7316	642abc	1564ab
Wheat	69	7604	570bc	1385ab
Wheat	45	8683	468c	1348b
Wheat	23	7927	384c	1494ab
Native_cover	--	6992	546bc	1492ab

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

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