EXPERIENCES FROM PLANTING COTTON IN VARIOUS COVER CROPS

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Introduction

Influence of three cover crops (wheat, vetch, and crimson clover) and no-cover conditions combined with three planting techniques and two cover kill schemes on cotton performance was investigated over a three-year period. Cotton population, plant height and spacing, yield, and soil temperature and moisture data are discussed. The influence of these factors is examined and some observations concerning cultural practices are made.

Experimental Procedure

Cotton was planted with three tillage-planter systems in four cover conditions: wheat, crimson clover, cahaba white vetch, and no cover (check plot). The first tillage-planter system consisted of a modified John Deere max-emerge planter which had a coulter and clearing disks preceding the planter units. The clearing disks were adjusted to operate about 1/2 inch deep to remove heavy cover residue from the row (approximately 6 inches wide). The second system included the first but was preceded by a subsoiler that passed about 14 to 15 inches deep through the soil under the row. The third was a Kelley subsoil-planter implement.

A field of Norfolk sandy loam soil near Marvyn, AL, was separated into four blocks of wheat, vetch, clover, and bare soil conditions. These blocks were approximately an acre in size. Four rows for each tillage-planter system were planted and the three systems were randomized into four replicate subplots. Then the field was divided, with one-half being planted within the first week of May (early) while the other section was planted within the first week of June (late). About 10 to 14 day days preceding the early planting, the cover was killed with paraquat in strips (about 14 inches wide) over the intended row location. This design outlay was used in 1981, 1982, and 1983 except for new randomization within subplots. In 1983 an additional section of only two replications was added to the early planted section to study the influence of the time of cover kill. In the additional section the cover was strip killed twice; once about 4 weeks and then 2 weeks prior to planting. The cotton was seeded in 40-inch rows with 3-way treated DPL-41 at a seed rate of 8 seeds/foot of row. Two hundred and fifty pounds per acre of 8-24-24 was banded beside the row for all

plots. The no-cover and wheat plots received an additional 200 pounds per ammonia nitrate (34-0-0). All plots were mechanically rototilled and chemically cultivated as needed.

The stand count, plant height, plant spacing, and handpicked yields were observed from a single 20-foot-length row within the four-row subplots. Four 65-foot-long (1/50 acre) rows were mechanically harvested with a John Deere two-row cotton picker from each subplot to determine cotton yields. In addition to observing cotton performance, the following environmental factors were measured: daily maximum and minimum temperatures, moisture contents of the soil beneath the cover conditions, daily air temperatures, and rainfall.

Results and Discussion

Over the last three years the wheat cover has equaled or significantly exceeded cotton yields of the no-cover condition (Table 1). Usually, the vetch cover out-yielded the clover. However, it has been a problem with both legume covers to obtain and retain a cotton stand. As shown in Tables 2 and 3, the percent stand reduction in the legume covers may be the primary reason for poor yields. The cotton height performance data showed that the legume covers appear to retard growth of the cotton which may also decrease yields. The date of planting had no consistent influence on the yields of cotton but may indirectly affect yield from available moisture during critical stages of cotton growth.

The soil moisture data indicate that the average moisture content with the cover crops was usually lower than no-cover but only by less than 1/2 percent (dry basis); thus it was not considered influential. However, in a period of severe drought, especially soon after stand establishment, the moisture lost from uptake of the cover may depress cotton yields in the vegetative cover conditions. The average daily soil temperatures under the vegetative covers were usually lower than bare soil, but as the soil warmed during the spring the covers tended to act as an insulation barrier if a short cold period occurred. The bare soil had larger fluctuations of soil temperature.

If the tillage-planter systems gave uniform stands, little difference occurred between the systems; however, it appeared more difficult to obtain a uniform stand with the Kelley subsoil-planter. The difference in yield between the subsoil and no subsoil treatments was smaller than expected (Table 4). The no subsoil plots (which were kept at the same location over the three-year period) had higher plant stands than the subsoil plots. It is suspected that this may have been due to poorer seeding depth control in the subsoil plots resulting in poorer emergence.

The wheat yields were 3306, 1481, and 1240 pounds per acre for 1981, 1982, and 1983, respectively. This gives some indication of the benefit of a double-crop system. The reduction in wheat yields due to strip killing and traffic may be substantial if early planting is used unless specialized equipment and techniques are developed. The legume crops are not utilized as a double-crop but would add beneficial nitrogen to the soil for primary

crop uptake. Thus lower rates of nitrogen fertilizer were assumed needed for cotton production. The crimson clover aggressively reseeded itself; after the third year the clover had started moving into the two adjacent cover plots. The vetch was not as successful in reseeding and would need to be replanted after the second or third year of use.

Conclusions

1. Stand reductions were severe in the clover and vetch cover crops resulting in poor yields of cotton.

2. The wheat cover plots produced cotton yields equal to or higher than bare soil conditiosn.

3. Wheat yields were acceptable when the wheat was harvested prior to planting cotton in the stubble.

Table 1. Three-year average yields from mechanically picked cotton.

	Early --lb/ac--			Late --lb/ac--		
	1982	1983		1981	1982	1983
No Cover	1621ba@	1251b*	1364ab†	1402a	1618b	1473b
Wheat	2228a	1726a	1550a	1044ab	2015a	1727a
Vetch	1724b	1217b	1134c	808b	1607b	1312b
Clover	1505c	873c	1291bc	793b	959c	1040c

@ Means followed by the same letter in a column do not differ significantly at the 0.05 level.
* The cover was strip killed about 2 weeks before planting for all means in this column.
t The cover was strip killed twice, at 4 and 2 weeks before planting for all means in this column.

	Emergence			Final Stand			Percent Reduction		
	1982	1983		1982	1983		1982	1983	
	plants/foot			plants/foot			%-Emergence Base		
No Cover	2.96	4.66*	5.02t	2.81	3.99*	4.41t	5.0	14.3*	12.lt
Wheat	2.95	4.39	4.71	2.21	3.72	4.02	24.9	15.3	14.6
Vetch	2.17	4.10	3.77	1.47	3.12	3.05	32.4	24.0	19.1
Clover	2.28	3.55	3.71	1.23	1.77	2.03	46.1	50.1	45.3

of the late planted plots - 20 feet long

	Emergence			Final Stand			Percent Reduction		
	1981	1982	1983	1981	1982	1983	1981	1982	1983
	plants/foot			plants/foot			%-Emergence Base		
No Cover	5.07	3.14	4.07	2.97	3.03	3.67	41.4	3.7	9.8
Wheat	3.77	3.37	2.68	2.14	3.24	2.44	43.2	3.8	9.0
Vetch	3.80	2.42	3.73	1,08	2.01	3.30	71.6	16.6	11.5
Clover	3.86	3.32	3.45	1.16	2.63	2.53	70.0	20.8	26.7

Table 4. Three-year average yields from mechanically picked cotton.

	Early			Late		
	-- lb/ac--			-- lb/ac--		
	1982	1983		1981	1982	1983
JD Max-Emerge	1686b@	1223a*	1414at	957	1487a	1224b
JD Max E + Sub	1991a	1316a	1441a	1045	1548a	1498a
Kelley + Sub	1632b	1273a	1149a	1034	1614a	1455a

@ Means followed by the same letter in a column do not differ significantly at the 0.05 level.

* The cover was strip killed about 2 weeks before planting for all means in this column.

t The cover was strip killed twice, at 4 and 2 weeks before planting for all means in this column.