

CORN AND SOYBEAN RESPONSE TO ROTATION AND TILLAGE ON A PRAIRIE CLAY SOIL

N.W. Buehring¹ M.P. Harrison¹, and R.R. Dobbs¹

¹Northeast Branch Experiment Station, North Mississippi Research and Extension Center, Mississippi State University, Mississippi State, MS 39762

ABSTRACT: A study, initiated in the fall of 1999 to evaluate corn and soybean response to a corn-soybean rotation and selected tillage system on a Prairie clay soil (Catalpa silty clay loam), was continued in 2001. The environmental growing conditions were very favorable for corn and less than optimum for soybean which experienced a three week dry period from mid July through early August. All rotation/tillage treatments following soybean produced higher corn yield than continuous no-till corn. Both corn hybrid and rotation/tillage system had an effect on yield and there was no hybrid by rotation tillage interaction for yield. Averaged over hybrid, the continuous no-till corn had lower yield than rotation/tillage treatments. Pioneer 3223 (116 day maturity), averaged over rotation/tillage system, produced 26 bu/ac more than Pioneer 34B23 (110 day maturity). The soybean yield results indicated a variety by tillage/rotation interaction. The MG V DP 5915RR averaged over treatments produced 12 bu/ac more than MG IV AG 4702. DP 5915RR produced higher yields than AG 4702 in all treatments except the fall colter-chisel-harrow (one-pass tillage operation) in continuous soybean. With AG 4702, the fall colter-chisel-harrow system in continuous soybean showed similar yield to no-till soybean following no-till corn and the fall colter-chisel-harrow soybean following no-till corn. These yields were greater than continuous no-till soybean or no-till soybean following no-till corn with a winter cover crop (Balsam clover). With DP 5915R the fall colter-chisel-harrow following no-till corn produced at least 6.5 bu/ac more than continuous no-till soybean or no-till soybean following no-till corn. The fall colter-chisel-harrow system rotation showed about 10% higher yields than continuous soybean.

CITATION: Buehring, N.W., M.P. Harrison, and R.R. Dobbs. 2002. Corn and soybean response to rotation and tillage on a Prairie clay soil. Annual Report of the North Mississippi Research & Extension Center, Miss. Agric. & For. Expt. Sta. Info. Bull. 386. pp. 53-55.

MATERIALS AND METHODS: A field study initiated in the fall of 1999 to evaluate corn and soybean response to a corn-soybean rotation with selected tillage systems was continued in 2001. The study was conducted as a split plot with variety or hybrid as main plot and tillage system as subplots with 4 replications. Subplot size was 4 (30 inch) rows x 60 ft. No P and K fertilizer was applied in the fall of 2000, since soil test results indicated high P and K levels. Nitrogen fertilizer solution (32% UAN) at 160 lb N/A was applied as a sidedress application to all corn plots on 5/07/01.

The fall colter-chisel-harrow treatments were applied 11/22/00 (Table 1). All treatments were planted with a no-till planter equipped with residue removers and colters. Gramoxone (paraquat) + surfactant at 1.0 lb ai/ac + 0.8 pt/ac in 40 gpa was applied 3/28/01 as a burndown to the winter cover crop (Balsam clover). Pioneer 3223 and Pioneer 34B23 corn hybrid were seeded at 28,000 seed/ac in 30-inch rows on 4/11/01. Gramoxone + atrazine + surfactant at 0.47 + 2 lb ai + 0.2 pt/ac was applied preemergence to all corn plots after planting. Lorsban (chlorpyrifos) at 1.3 lb ai/ac was applied in-furrow at planting. Accent (nicosulfuron) + crop oil at 0.5 oz ai/ac + 2 pt/ac was applied post-directed to all corn plots for broadleaf signalgrass control on 5/23/01. Evik (ametryn) + surfactant at 1.8 lb ai/ac + 1 pt/ac was applied 5/22/01 with a hooded shield sprayer to corn 12 to 24 inches tall.

All soybean plots received a burndown application of Glyphos (glyphosate) at 1.2 lb ai/ac on 4/19/01. Deltapine DP 5915RR and Asgrow AG 4702 soybean were planted no-till in 30 inch rows on all treatments on 5/01/01. Gramoxone + surfactant at 0.5 lb ai/ac + 0.5 pt/ac was applied after planting soybeans on 5/01/01. Roundup Ultra (glyphosate) at 1.0 lb ai/ac was applied to all soybean plots on 5/17/01 and repeated 6/12/01 and 6/21/01. Orthene (acephate) at 0.135 lb ai/ac was applied to soybean for grasshopper control on 6/04/01 and 6/18/01.

The center 2 rows in each corn plot was harvested with a plot combine for grain yield 9/11/01. The center 2 rows of AG 4702 and DP 5915RR soybean plots were harvested for grain yield 9/25/01 and 10/25/01, respectively. All

grain samples were weighed, and seed moisture and test weight was determined with Dickey John GAC® II grain analyzer. Corn and soybean grain yields were adjusted to 15 and 13% seed moisture, respectively. All data was subjected to statistical analysis and means were separated using Fisher Protected LSD at the 5% probability level.

RESULTS AND DISCUSSION: The environmental growing conditions were very favorable for corn and less than optimum for soybean which experienced a three-week dry period from mid-July through early August. All rotation/tillage treatments following soybean produced higher corn yield than continuous no-till corn (Table 1.) Both corn hybrid and rotation/tillage system had an effect on yield and there was no hybrid by rotation tillage interaction for yield. Averaged over hybrid, the continuous no-till corn had lower yield than all other rotation/tillage treatments. Pioneer 3223 (116 day maturity), averaged over rotation/tillage system, produced 26 bu/ac more than Pioneer 34B23 (110 day maturity). The soybean yield results indicated a variety by tillage/rotation interaction (Table 2.) The MG V DP 5915RR averaged over treatments produced 12 bu/ac more than MG IV AG 4702. DP 5915RR produced higher yields than AG 4702 in all treatments except the fall colter-chisel-harrow (one-pass tillage operation) in continuous soybean. With AG 4702, the fall colter-chisel-harrow system in continuous soybean showed similar yield to both no-till soybean following no-till corn and the fall colter-chisel-harrow soybean following no-till corn. These yields were greater than continuous no-till soybean or no-till soybean following no-till corn with a winter cover crop (Balsam clover.) With DP 5915RR, the fall colter-chisel-harrow following no-till corn produced at least 6.5 more than continuous no-till soybean or no-till soybean following no-till corn. The fall colter-chisel-harrow continuous soybean produced yield equal to colter-chisel-harrow following no-till corn.

Table 1. Corn hybrid population and yield response to tillage and rotation in 2001, Verona, MS.

Rotation/tillage	-----Corn hybrid-----		
	Pioneer 3223	Pioneer 34B23	Mean
	-----Yield bu/ac-----		
1) No-till (NT) continuous corn	105.3	82.3	93.8
2) Cover crop + NT soybean (Bn) followed by (Fb) NT corn	147.6	119.2	133.4
3) NT Bn Fb NT corn	148.2	129.0	138.6
4) Fall colter-chisel-harrow Bn Fb NT corn	<u>153.9</u>	<u>118.5</u>	136.2
	Mean	138.8	112.3
Hybrid LSD (.05): 17.2			
Tillage LSD (.05): 12.2			
VAR x Tillage LSD (.05): NS			
% CV: 9.2			
	-----Plants/ac x 1000 (9/07/01)-----		
1) No-till (NT) continuous corn	17.2	17.2	17.2
2) Cover crop + NT Bn Fb NT corn	18.9	19.4	19.2
3) NT Bn Fb NT corn	21.5	20.8	21.2
4) Fall colter-chisel-harrow Bn Fb NT corn	<u>21.5</u>	<u>19.1</u>	20.3
	Mean	19.8	19.1
Hybrid LSD (.05): NS			
Tillage LSD (.05): NS			
VAR x Tillage LSD (.05): NS			

Table 2. Soybean variety population, plant height at maturity, and yield response to tillage and rotation in 2001, Verona, MS.

Rotation/tillage	LSD (.05) ¹	-----Variety-----	
		AG 4702	DP5915R
		-----Yield bu/ac-----	
1) No-till (NT) continuous soybean (Bn)	4.8	23.9	38.1
2) Cover crop + NT corn followed by (Fb) NT Bn	8.2	22.8	38.9
3) NT corn Fb NT Bn	7.3	29.6	37.2
4) NT corn Fb Fall colter-chisel-harrow Bn	1.7	31.0	45.5
5) Fall colter-chisel-harrow continuous Bn	NS	<u>35.2</u>	<u>41.0</u>
	Mean	28.5	40.2
	LSD (.05)	6.1	5.2
	% CV	13.9	8.4
		-----Plants/ac x 1000 (9/17/01)-----	
1) No-till (NT) continuous Bn		77.1	93.9
2) Cover crop + NT corn Fb NT Bn		73.3	86.4
3) NT corn Fb NT Bn		75.1	92.2
4) NT corn Fb Fall colter-chisel-harrow continuous Bn		77.7	85.7
5) Fall colter-chisel-harrow continuous Bn		<u>79.6</u>	<u>83.5</u>
	Mean	76.6	88.3
	Variety LSD (.05): NS		
	Tillage LSD (.05): NS		
	VAR x Tillage LSD (.05): NS		
		-----Height at maturity (inches)-----	
1) No-till (NT) continuous Bn		25.7	27.0
2) Cover crop + NT corn Fb NT Bn		26.7	28.4
3) NT corn Fb NT Bn		27.7	26.9
4) NT corn Fb Fall colter-chisel-harrow continuous Bn		29.0	30.4
5) Fall colter-chisel-harrow continuous Bn		<u>28.9</u>	<u>28.3</u>
	Mean	27.6	28.2
	Variety LSD (.05): NS		
	Tillage LSD (.05): NS		
	VAR x Tillage LSD (.05): NS		

¹ LSD.05 comparison across columns.