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Utilizing Strip Till in Continuous Corn Production in Central Iowa

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Utilizing Strip Till in Continuous Corn Production in Central Iowa

Abstract

Markets driven by the emerging bio-economy are creating renewed interest in planting more corn following corn in recent years. When corn following corn is a part of a producers cropping plan in central Iowa, fall tillage is deemed necessary to reduce crop residue and expose soil for warming in the spring. This leaves the soil vulnerable to wind and water erosion until the growing crop establishes a canopy.

Keywords

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Disciplines

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Utilizing Strip Till in Continuous Corn Production in Central Iowa

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Introduction

Markets driven by the emerging bio-economy are creating renewed interest in planting more corn following corn in recent years. When corn following corn is a part of a producers cropping plan in central Iowa, fall tillage is deemed necessary to reduce crop residue and expose soil for warming in the spring. This leaves the soil vulnerable to wind and water erosion until the growing crop establishes a canopy.

Anhydrous ammonia fertilizer is often applied in the fall to help reduce spring workload and also reduce potential compaction in soil that has mellowed over the winter. When anhydrous ammonia fertilizer is applied in the fall, it is exposed to losses over the next several months until the crop is actively growing. When applied in the fall, particularly following a tillage operation, loose soil may leave the nitrogen at higher risk for movement from the intended application zone, and a higher rate of N is sometimes applied to compensate for potential losses.

Applying anhydrous ammonia in the fall/spring into standing cornstalks following harvest with a strip till machine would: 1) minimize soil disturbance to protect the soil from wind and water erosion, 2) clear residue from a planting zone that would warm faster in the spring, and 3) reduce losses due to application into tilled soil.

Materials and Methods

The field site was located on an Iowa State University farm north of Ames. It had been planted to corn for two seasons. Two tillage treatments of disk chisel and disk rip were conducted in the fall of 2008 as standard field preparation for planned corn following corn. A third treatment of untilled stalks was left for the strip till. Treatments were 40 ft wide (16-30 in. rows) and 1,610 ft long. Treatments were replicated three times across the field. The middle 8 rows of each treatment were harvested to avoid border concerns from the tillage treatments. Due to a late harvest and unusually wet conditions following harvest, the strip till was not done in the fall, nor was any nitrogen applied to any of the treatments in the fall.

In spring of 2009, anhydrous ammonia was applied directly into standing cornstalks using a Blue Jet strip till unit donated by Brokaw Supply Company of Ft. Dodge, IA. Anhydrous ammonia was also spring applied to the fall tillage treatments using a standard ammonia unit. The target rate was between 180 and 200 lb/acre actual nitrogen. Tillage treatments were worked once with a field cultivator before planting (Figures 1 and 2). DKC61-69 VT3 was planted at 32,000 seeds/acre. The same herbicide program was applied to the entire trial. Weed control was very good with very little volunteer corn present.

Results and Discussion

The trial was scouted every two weeks from planting to harvest. Population counts were taken at V3 (Table 1). A slightly higher corn population was observed in the disk chisel vs. the strip till and disk rip treatments. Ammonia

burn was also noticed at V3 time in all of the treatments.

Eyespot developed in early August throughout the field. By mid September, the disease was rated greater than 10% coverage on the leaves above the ears. No fungicide was used, but the disease level was such that it may have affected yield.

Soil pits were dug in early August to observe rooting depth and proliferation within the treatments, one pit per treatment. Roots were observed to over 4 ft depths in all treatments. Both disk treatments exhibited a zone of horizontal root proliferation at the 4–6 in. depth before proceeding downward. This was not observed in the strip till treatment.

At harvest, yield and moisture were recorded (Table 2). Two (four row) strips were harvested from the center 8 rows of each treatment. This provided 6 data points from each rep, and a total of 18 data points for the trial. Each strip was weighed separately and moisture determined with a hand held moisture tester.

Although yields were not different statistically, there was an advantage to the strip till in this trial. One possibility for the difference was that the nitrogen was applied with two different units. In future trials, the nitrogen in all treatments will be applied with the strip till unit to eliminate possible inconsistencies due to application equipment. The lack of uniform drainage across the field may have also been a factor. In this exceptionally wet season, there were two areas of the field that showed signs of yield limiting wetness that were not distributed evenly across the treatments. No adjustments to yield were made for field variation.

Application of anhydrous ammonia in the fall is a generally accepted practice to secure lower cost nitrogen, reduce compaction, and distribute workload. However, the potential for leaching and run off is greater the longer the product remains in the soil before being used by the crop. Fall applied N with strip till may increase surface residue and reduce soil loosening, thus reducing risk of N loss. Spring applied N with strip till will also reduce risk of N loss by reducing time in the soil before the crop needs it. However, spring applied N with strip till may increase the risk of compaction in the soils of the Des Moines Lobe due to their nature of high in clay and poorly drained.

This trial was a single location in a single year. Multiple locations over several years and environments would be necessary to draw long term conclusions for the feasibility of using strip till in the Des Moines Lobe soils.

Table 1. Corn populations for various tillage systems.

Tillage	Plants/acre
Strip till	33,000
Disk chisel	34,000
Disk rip	33,000

Table 2. Corn yields for various tillage systems.

Tillage	Bu/acre	Moisture (%)
Strip till	184	22
Disk chisel	167	21
Disk rip	164	22
	*	*

*No significant difference.

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Figure 1. Disk chisel on left, strip till on right after planting.



Figure 2. Three treatments—far left strip till, middle left disk chisel, right deep rip.