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Timing of Side-Dress Applications of Nitrogen for Corn in Conventional and No-Till Systems

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Cover Page Footnote

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K-STATE Research and Extension

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Summary

Corn yield and yield components were affected by tillage and nitrogen (N) side-dress application options in 2019. Average corn yields were 15% greater with conventional tillage than with no-till. Yields were improved by either splitting N rate between pre-plant and side-dress at the V10 growth stage or adding additional side-dress N as compared with applying 150 lb/a pre-plant.

Introduction

Environmental conditions vary widely in the spring in southeastern Kansas. As a result, much of the N applied prior to corn planting may be lost before the time of maximum plant N uptake. Side-dress or split applications to provide N during rapid growth periods may improve N use efficiency while reducing potential losses to the environment. The objective of this study was to determine the effect of timing of side-dress N fertilization compared with pre-plant N applications for corn grown on a claypan soil.

Experimental Procedures

The experiment was established in spring 2015 on a Parsons silt loam soil at the Parsons Unit of the Kansas State University Southeast Agricultural Research Center. The experiment was a split-plot arrangement of a randomized complete block design with four blocks (replications). Whole plot tillage treatments were conventional tillage (chisel, disk, and field cultivate) and no tillage. Sub-plot nitrogen treatments were six pre-plant/side-dress N application combinations that include:

1. A no-N control;
2. 150 lb N/a applied pre-plant;
3. 100 lb N/a applied pre-plant with 50 lb N/a applied at the V6 (six-leaf) growth stage;
4. 100 lb N/a applied pre-plant with 50 lb N/a applied at the V10 (ten-leaf) growth stage;
5. 150 lb N/a applied pre-plant with 50 lb N/a applied at the V6 growth stage; and
6. 150 lb N/a applied pre-plant with 50 lb N/a applied at the V10 growth stage.

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The N source for all treatments was liquid urea-ammonium nitrate (28% N) fertilizer. Pre-plant N fertilizer was applied on March 13, 2019, side-dress N at V6 on June 3, 2019, and side-dress N at V10 on June 13, 2019, to appropriate plots. All N was broadcast applied with 7-stream pattern fertilizer nozzles. Corn was planted on April 11 and harvested on September 5, 2019.

Results and Discussion

In 2019, average corn yielded 22 bu/a more with conventional tillage than with no-tillage, partially due to having a 9% greater established stand (Table 1). Adding N fertilizer more than tripled yields obtained in the no-N control. Splitting the N fertilizer to apply 100 lb N/a preplant followed by 50 lb N/a at the V10 growth stage improved yields by 15 bu/a more than all N applied pre-plant. Adding 50 lb N/a extra at the V6 or V10 growth stages to a 150 lb N/a preplant application did not improve yields more than that obtained with 150 lb N/a applied split pre-plant and side-dress at V10. These effects of N application timing on corn yield in 2019 appeared to be related to the combined responses in kernel weight, ears/plant, and kernels/ear.

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Table 1. Tillage and nitrogen (N) side-dress application effects on yield and yield components of corn in 2019

Treatment	Yield	Stand	Kernel weight	Ears/plant	Kernels/ear
	bu/a	plants/a	mg		
Tillage					
Conventional[1]	167	22,300	271	0.95	709
No-till	145	20,400	258	0.97	689
LSD (0.10)	15	800	NS	NS	NS
N timing[2]					
No-N control	54	21,900	205	0.84	371
150 PP	164	21,600	260	0.99	752
100 PP/50 V6	166	21,600	273	0.99	724
100 PP/50 V10	179	22,200	273	0.98	768
150 PP/50 V6	187	21,000	287	0.99	801
150 PP/50 V10	186	21,000	289	1.00	778
LSD (0.05)	9	NS	15	0.05	52

[1]Conventional tillage: chisel, disk, and field cultivate.
[2]Nitrogen treatments:
Control = no N fertilizer.
150 PP = 150 lb N/a applied pre-plant with no side-dress N.
100 PP/50 V6 = 100 lb N/a applied pre-plant with 50 lb N/a side-dress applied at V6 (six-leaf) growth stage.
100 PP/50 V10 = 100 lb N/a applied pre-plant with 50 lb N/a side-dress applied at V10 (ten-leaf) growth stage.
150 PP/50 V6 = 150 lb N/a applied pre-plant with 50 lb N/a side-dress applied at V6 growth stage.
150 PP/50 V10 = 150 lb N/a applied pre-plant with 50 lb N/a side-dress applied at V10 growth stage.