

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

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Summary

Corn yield and yield components were affected by tillage and nitrogen (N) side-dress options in 2017. Corn yields were 14% greater with conventional tillage than with no-till. Yields were improved by either splitting N rate between pre-plant and side-dress or adding additional side-dress N as compared with applying 150 lb/a pre-plant. Side-dress applications of 50 lb N/a at V10 following 150 lb/a applied pre-plant resulted in greatest corn yield.

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. The N source for all treatments was liquid urea-ammonium nitrate (28% N) fertilizer. Pre-plant N fertilizer was applied on March 16, 2017, side-dress N at V6 on May 25, 2017, and side-dress N at V10 on June 12, 2017, to appropriate plots.

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All N was broadcast applied with 7-stream pattern fertilizer nozzles. Corn was planted on April 11 and harvested on September 11, 2017.

Results and Discussion

In 2017, corn yielded 18 bu/a more with conventional tillage than with no-tillage, likely because of 16% greater stand (Table 1). Adding N fertilizer, generally, more than doubled 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 V6 or V10 growth stages improved yields by more than 15 bu/a greater than all N applied pre-plant. Adding 50 lb N/a extra at the V6 growth stage 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. However, delaying the extra 50 lb N/a side-dress application to the V10 stage improved yield by nearly 20 bu/a. These effects of N timing on corn yield in 2017 appeared to be related to the combined responses in kernel weight, ears/plant and kernels/ear.

Table 1. Tillage and nitrogen (N) side-dress application effects on yield and yield components of corn in 2017

| Treatment | Yield bu/a | Stand number/a | Kernel weight mg | Ears/plant | Kernels/ear |
|---------------------------|---------------|-------------------|------------------------|------------|-------------|
| Tillage | | | | | |
| Conventional ¹ | 147.3 | 22300 | 225 | 0.93 | 789 |
| No-till | 129.0 | 19200 | 230 | 0.90 | 800 |
| LSD (0.10) | 16.6 | 1300 | NS | NS | NS |
| N timing ² | | | | | |
| No-N control | 56.1 | 20900 | 178 | 0.82 | 483 |
| 150 PP | 134.8 | 20900 | 220 | 0.92 | 814 |
| 100 PP/50 V6 | 152.0 | 20500 | 232 | 0.95 | 866 |
| 100 PP/50 V10 | 151.1 | 20600 | 240 | 0.92 | 850 |
| 150 PP/50 V6 | 157.8 | 20800 | 246 | 0.96 | 826 |
| 150 PP/50 V10 | 177.0 | 20900 | 250 | 0.94 | 929 |
| LSD (0.05) | 15.2 | NS | 19 | 0.08 | 80 |

¹Conventional tillage: chisel, disk, and field cultivate.

²Nitrogen 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; and 150 PP/50 V10, 150 lb N/a applied pre-plant with 50 lb N/a side-dress applied at V10 growth stage.