

Pre-Plant Nitrogen Rate and Application Method and Side-Dress Nitrogen Rate Effects on Corn Grown No-Till on a Claypan Soil

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Summary

Corn yield in 2018 was increased by about 5 bu/a with knife application of pre-plant nitrogen (N) fertilizer compared with broadcast application. Fertilizing with increasing rates of N applied pre-plant, at side-dress, or both had little effect on yield or yield components of corn in 2018.

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. Pre-plant N application method, pre-plant N rate, and side-dress N rate selection 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 pre-plant and side-dress N fertilization options on corn grown on a claypan soil.

Experimental Procedures

The experiment was established in spring 2018 on a Parsons silt loam soil at the Parsons Unit of the Kansas State University Southeast Research and Extension Center that had been in continuous no-till for more than 10 years. The experiment was a factorial arrangement of a randomized complete block design with four blocks (replications). The two factors were pre-plant N fertilizer placement of broadcast and knife (subsurface band at 4 inches deep) and pre-plant/side-dress N rates of 0-0, 0-150, 100-0, 100-50, 100-100, 150-0, 150-50, 150-100, and 200-0 lb/a. Side-dress applications were broadcast at the V10 growth stage using 7-stream pattern fertilizer nozzles. The N source for all treatments was liquid urea-ammonium nitrate (UAN; 28% N) fertilizer. Pre-plant N fertilizer was applied on March 12, 2018, and side-dress N was applied at V10 on June 4, 2018, to appropriate plots. Corn was planted on April 10 and harvested on August 28, 2018.

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Results and Discussion

Even though individual yield components were not significantly affected by pre-plant N application method, general trends resulted in more than 5 bu/a greater corn yields when N was knife applied rather than broadcast prior to planting (Table 1). In general, applying N at any rate and time resulted in approximately 50% greater corn yield in 2018 than the 75.6 bu/a in the no-N control. However, there were few differences in yield among the eight treatments receiving N fertilizer. For example, general increases in total N applied, as well as applying no N until the V10 growth stage (0-150 lb/a pre-plant/side-dress N rate), had little effect on yield in 2018. Stand was not affected by pre-plant/side-dress N rates, but fertilizing with N increased kernel weight, the number of ears/plant, and the number of kernels/ear compared with corn grown in the no-N control.

Table 1. Pre-plant application method and pre-plant/side-dress nitrogen (N) rates effects on yield and yield components of corn planted no-till on a claypan soil in 2018

Treatment	Yield bu/a	Stand plants/a	Kernel weight mg	Ears/plant	Kernels/ear
Pre-plant N method					
Broadcast	101.1	16600	253	1.07	622
Knife ¹	115.6	17200	249	1.10	634
LSD (0.10)	4.4	NS	NS	NS	NS
Pre-plant/side-dress ²					
N rates (lb/a)					
0-0 (No-N control)	75.6	16700	227	1.00	521
0-150	113.2	16000	263	1.05	675
100-0	110.8	16600	249	1.11	625
100-50	116.8	17500	259	1.06	637
100-100	115.3	17300	256	1.13	638
150-0	114.5	16600	251	1.12	643
150-50	114.3	16800	257	1.14	641
150-100	121.2	16600	254	1.13	665
200-0	111.3	17800	243	1.06	609
LSD (0.05)	9.5	NS	15	0.11	70

¹Knife: subsurface band at 4 inch depth.

²Side-dress applications were made at the V10 growth stage.