The Effect of Nitrogen Rate (150-225 lbs/ac) on Corn Yield

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Objective

To determine the effects of total nitrogen rate on corn grain yield.

Background

Crop Year: 2014
Location: Wauseon, OH
County: Fulton
Soil Type: Hoytville loam
Drainage: Systematic
Previous Crop: Soybeans
Tillage: Conventional
Soil Test: pH 7.5, P 48 ppm*, K 203 ppm
Planting Date: May 8, 2014
Starter: dry 20 lbs N, 39 lbs P, 45 lbs K, 12 lbs S
Seeding Rate: 32,000 spa (30,700 harvest stand)
Harvest Date: October 23, 2014
Rainfall April-Sept: 14.64”
*Reported as Bray P1

Methods

This trial included four treatments replicated three times in a randomized complete block design. Treatments were made on May 31, 2014 at rates of 150, 175, 200 and 225 total units of nitrogen per acre with credits given for starter nitrogen. A pre-side dressed nitrogen test (PSNT) revealed that this field had 17 ppm of nitrate-nitrogen available at sidedress. Plots were approximately 2,500 feet long by 12 rows (30 feet) wide. Corn variety was Beck’s 6175. Normalized Digital Video Image (NDVI) readings were taken with Greenseeker handheld sensors approximately four weeks after nitrogen was applied, to better understand how to NDVI scores correlate with nitrogen rates and yield potential. Approximately 1-2 weeks after the corn reached black layer (physiological maturity), stalk nitrate samples were sent to A&L Labs to evaluate nitrate-nitrogen remaining in the plant at harvest. Plot centers were harvested with an 8 row head on a JD 9660 combine. Yield and moisture data was collected with a calibrated yield monitor and adjusted to 15% moisture. Weather data was obtained from weather.com.

Results

Table 1. Corn Yield (bu/ac) Response to Total Nitrogen

Treatment	Avg NDVI Reading	Stalk Nitrate	Dry Yield (bu/ac)
150 lbs/ac	.65	360 ppm	200.3 b
175 lbs/ac	.66	1,850 ppm	205.7 ab
200 lbs/ac	.65	1,410 ppm	211.0 a
225 lbs/ac	.67	490 ppm	213.0 a

LSD 7.3 (p<.05), CV 1.76

Summary

Total Nitrogen Rate, lbs/ac	Yield	Gross Revenue per acre	Nitrogen Cost per Acre	Net Return per acre
150	200.3	$801	$46	$755
175	205.7	$823	$69	$754
200	211.0	$844	$92	$752
225	213.0	$852	$115	$737

Economics: Gross income= yield x $4.00/bu;
Nitrogen cost= $0.46 per lb (source: 2014 Ohio State University AEDE Corn Budget).

Discussion:
There was a statistically significant difference in yield in those treatments where at least 175 units of total nitrogen were applied to corn. Based on one year of data, the 150 lbs total N rate had a slight economic advantage to those treatments where more nitrogen was applied. Stalk nitrate tests indicated an atypical nitrate nitrogen residual, but could have been affected by amount of time to ship and process samples. Additionally, more experience is needed to correlate NDVI readings with "N" rich strips, nitrogen response and yield response. Further data in the form of multi-year replications will add to the validity of these results.

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