Late Season 28% Nitrogen Application for Corn Yield - V5 vs. V10

Eric Richer, Ohio State University Extension Educator, Fulton County, Ohio

Objective

To determine the effects of nitrogen timing on corn grain yield and profitability.

Background

Crop Year: 2017
County: Fulton
Location: Fayette, Ohio
Drainage: 30' centers, Lateral
Previous Crop: Soybeans
Plant Date: May 17
Harvest Date: October 16
Herbicide: Triple Flex, Atrazine, Round up

Soil Type: Lenawee SCL, Fulton SCL
Soil Test (grid avg):
pH 6.5
P 20 ppm (Bray-p1)
K 159 ppm
O.M. 2.1%
CEC 11.4 meq/100g

Tillage: Fall chisel plow, Spring finisher
Starter Fertilizer: 92-52-90/acre
Pre-Sidedress Nitrogen Test: 18 ppm NO_3-N
Rainfall (May – August): 18.7"

Methods

Four corn nitrogen timing systems were replicated four times in a randomized complete block design. Plots were 24 rows wide (60 feet) by 1,000 feet long. The trial was planted, sprayed and harvested with commercial farm equipment. The sidedress treatments were made with commercial urea ammonium nitrate (UAN) 28% nitrogen knife application equipment and late season nitrogen treatments were made with a high boy sprayer with drop tubes at each row. The total nitrogen budget for this farm was 212 pounds of nitrogen per acre with a yield goal of 220 bushels per acre. All treatments received 92 pounds of nitrogen per acre at plant (planter applied + pre-emerge). In this trial the sidedress treatments were made on June 5th when corn had five leaf collars present (V5) and the late season treatment was applied on July 17th when corn had ten leaf collars present (V10). The first significant rain (1.0") fell 5 days after late season application. A corn stalk nitrate test (CSNT) was taken by averaging 1 test of 10 stalks for every treatment replication (4 tests for each treatment) at black layer. Yields and moistures were measured using a calibrated yield monitor and shrunk to 15% moisture. Rainfall data was collected from the nearest CoCoRaHS station OH-FL-9 in Fayette.

Treatments:
1. Sidedress UAN 28% (V5) 120 lbs N/acre
2. Late Season UAN 28% (V10) 120 lbs N/acre
3. Split: Sidedress UAN 28% (V5) 60 lbs N/ac and Late Season UAN 28% (V11) 60 lbs N/ac
4. Late Season UAN 28% reduced (V10) 76 lbs N/acre

Results

Table 1: N Application Timing in Corn (28%)

Nitrogen Application and Source**	Placement	Rate (total N/ac)	Yield (bu/ac)		CSNT (ppm NO_3-N)	NUE (lbs N/ac)	System Application Cost ($/ac)*	Return Minus Application Cost ($/ac)*
28% Check (V5)	Coulter/Knife	210	232.7	a	58	0.90	$50.05	$764
Late Season (V10)	Y-Drops ®	210	234.7	a	449	0.89	$50.80	$771
Split (V5 & V10)	Both	210	239.0	a	1,375	0.88	$60.05	$776
Late Season (V10) (reduced)	Y-Drops ®	168	219.7	b	173	0.76	$35.84	$733
LSD (P<.05, CV 2.7)			12.3					

*Based on $9.25 28% application, $10.00 highboy application, $.24/lb N and $3.50/bu corn (2016 Ohio Custom Farm Rates)

**All Systems used 28% UAN

Discussion

There was no statistical significant difference for yield among treatments 1, 2 and 3 (Table 1). However, there was statistically significant yield loss in treatment 4 (reduced rate). CSNTs indicate that nitrogen could have been a yield-limiting factor in treatments 1 and 4 (Based on Purdue optimal levels of 250-2,000 ppm).

A standard economics calculation shows that each of the systems have a very similar economic return except treatment 4 (reduced rate) showing a slight economic disadvantage in this trial. These returns will also vary depending on each producer's equipment and nitrogen cost.

With the development and use of in-season nitrogen application equipment, the risk of nitrogen loss can be minimized by applying it later in season when needed by the corn crop. Further research in the form of multi-year replication will add to the validity of these results.

Acknowledgement

The authors express appreciation to on-farm collaborator Jack Rupp for conducting this trial and thanks to Von Seggern Family Farms for applying the late season nitrogen treatments. Thanks to Ross Andre and Kaitlin Ruetz for helping with data collection, the Culman Lab at OARDC for processing CSNT tests and to the Ohio Corn Checkoff Board for supporting this research.

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For more information, contact:
Eric Richer
OSU Extension –Fulton County
8770 State Route 108
Wauseon, Ohio 43567
Richer.5@osu.edu