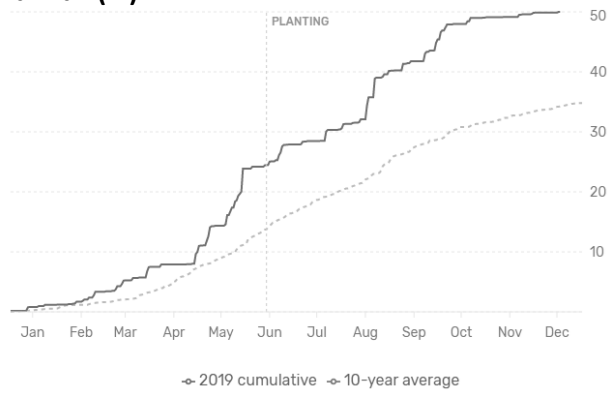
Impact of CENTURO™ Inhibitor with Anhydrous Ammonia Application

Study ID: 0416147201902
County: Richardson
Soil Type: Nodaway silty clay loam occasionally flooded; Zook silty clay loam occasionally flooded
Planting Date: 6/13/19
Harvest Date: 11/9/19
Seeding Rate: 32,000
Row Spacing (in): 30
Variety: Pioneer® P1197
Reps: 16
Previous Crop: Soybean
Tillage: Tilled following flooding and soil deposition in May
Herbicides: ***Pre:*** 28 oz/ac WeedMaster® and 29 oz/ac glyphosate on 4/15/19 ***Post:*** 2.25 qt/ac Keystone® NXT, 5.3 oz/ac Callisto®, 32 oz/gal glyphosate on 6/28/19
Seed Treatment: Poncho® 1250 + VOTiVO® and Raxil®
Foliar Insecticides: 2 oz/ac Province, 4 oz/ac Brigade® 2 EC on 8/23/19
Foliar Fungicides: 10 oz/ac Headline AMP® on 8/23/19
Fertilizer: 170 lb N/ac as anhydrous ammonia, 194 lb/ac 0-0-60, 183 lb/ac 11-52-0, and 91 lb/ac gypsum on 4/15/19
Irrigation: None
Rainfall (in):



Introduction: CENTURO™ by Koch Agronomic Services LLC contains a product with known efficacy for inhibiting nitrification (product information is provided below). The chemical compound pronitridine in CENTURO™ temporarily inhibits populations of the bacteria that convert ammonium to nitrite (*Nitrosomonas*) and nitrite to nitrate (*Nitrobacter*). These compounds protect against both denitrification and leaching by retaining fertilizer N in the ammonium form. Ammonium (NH_4^+) is a positively charged ion (cation) that can be held on negatively charged exchange sites in soils (such as in clays and organic matter); in comparison nitrate (NO_3^-), which is negatively charged, can be converted to N_2O or N_2 gases in waterlogged conditions, or can leach below the root zone with rain in well drained soils. You can learn more about nitrogen inhibitors at https://cropwatch.unl.edu/2019/nitrogen-inhibitors-improved-fertilizer-use-efficiency.

CENTURO™

Active Ingredients:	
Pronitridine (CAS RN 1373256-33-7)	14%
Other ingredients:	86%
Total:	100%

Contains 1.495 pounds of active ingredient per gallon

Product information from: https://kochagronomicservices.com/Solutions/agricultural-nutrient-efficiency/CENTURO/Documents/CENTURO-Specimen-Label.pdf?action=view

The purpose of this study was to evaluate the impact of CENTURO™ applied with anhydrous ammonia on crop yield and soil ammonium and nitrate. Anhydrous ammonia was applied at a rate of 170 lb N/ac on April 15, 2019 at 7” depth with strip-till following a previous crop of soybeans. The study compared 170 lb N/ac with no inhibitor versus 170 lb N/ac with CENTURO™ applied at 5 gal/ton anhydrous ammonia (recommended rate). The field was flooded twice in May and 2-6" of soil were deposited on the field. The field was tilled and planted on June 13.

Soil samples were taken on June 27, 10.5 weeks after anhydrous application, in V3 corn. Corn was planted on the anhydrous band and soil samples were collected across the inter-row area at 6" intervals (0", 6", 12", 18", 24", and 30" from the row). Samples were taken at 1' and 2' depths in both the CENTURO™ treatment and check in four replications of the study. Separate samples were taken from the south end of the field where soil is siltier and from the north end of the field where soil is sandier and closer to the Nemaha River. Soil samples were analyzed for ammonium-N and nitrate-N.

Results:

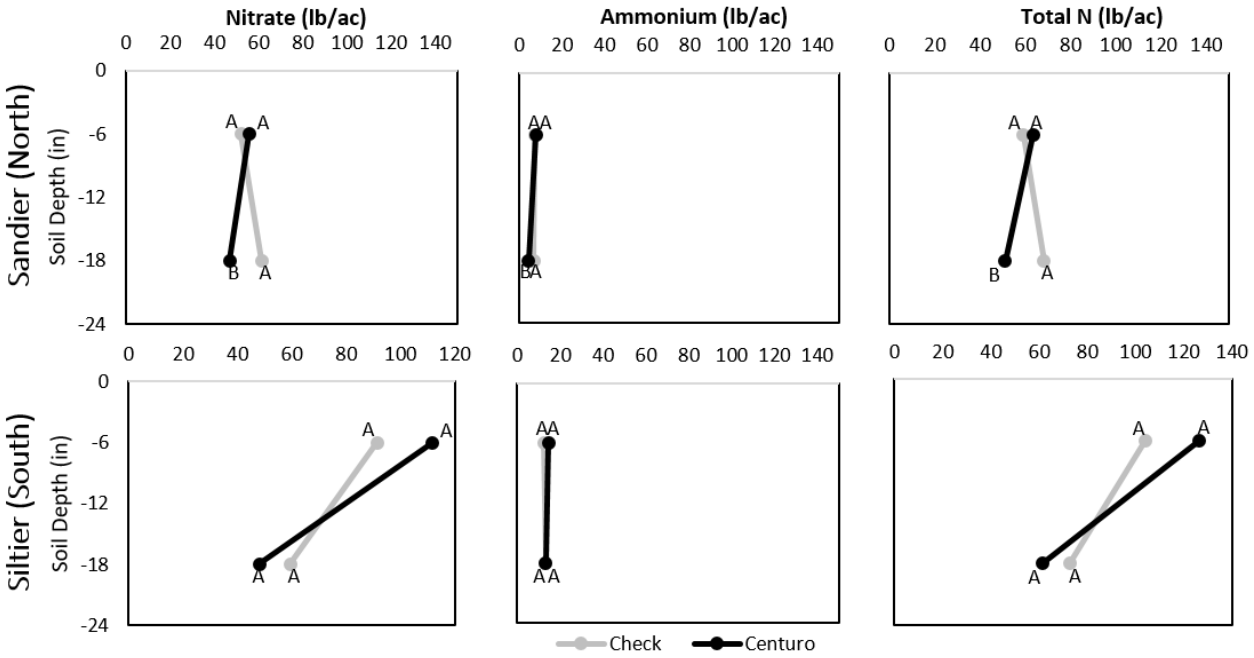


Figure 1. Soil ammonium-N and nitrate-N for check (170 lb N/ac anhydrous ammonia with no inhibitor) and CENTURO™ (170 lb N/ac anhydrous ammonia with CENTURO™ inhibitor) treatments on June 27 at 1' and 2' depths. Within a sampling depth, points with the same letter are not statistically different at the alpha=0.1 level.

	Stand Count (plants/ac)	Moisture (%)	Yield (bu/ac)†	Marginal Net Return‡ ($/ac)
Check	31,023 A*	18.5 A	209 A	798.81 A
CENTURO™	30,588 A	18.5 A	208 A	784.85 B
P-Value	0.645	0.547	0.478	0.004

*Values with the same letter are not significantly different at a 90% confidence level.
†Yield values are from cleaned yield monitor data. Bushels per acre adjusted to 15.5% moisture.
‡Marginal net return based on $3.83/bu corn and $10.95/ac CENTURO™ ($21.12/gal)

Summary:

- Because up to 6" of soil was deposited on the field surface, the soil sampled in the top foot represents some new soil depositions, whereas the second foot represents some of what was originally the top foot of soil on the field. Soil samples indicated that the siltier soils retained more nitrogen compared to the sandier soil at the time of sampling (Figure 1). There was no inhibitor effect on ammonium and nitrate content at both depths in the siltier soil. In the sandier soil no differences were found in the top soil; however, unexpected results were found in the second foot of soil where the CENTURO™ treatment had lower NH_4 and NO_3 than the untreated check. Only one soil sample time provided a limited view of the response to CENTURO™; multiple sampling dates in 2020 studies may help better explain the effect of CENTURO™.
- There were no differences in stand count, moisture, or yield. Net return was reduced for the CENTURO™ treatment as the additional product cost was not offset by increased yield.
- N rate blocks in the same field showed optimum nitrogen rates were around 95 lb N/ac, notably lower than the 170 lb N/ac applied; therefore, a yield response to the inhibitor would not be expected as available N was likely in excess of the optimum N rate even with N loss for the no inhibitor treatment.

Sponsored by: **In Partnership with:**

University of Nebraska Lincoln · Nebraska Corn Board · Nebraska Soybean Checkoff · Nebraska Corn Growers Association · Nebraska Dry Bean Commission