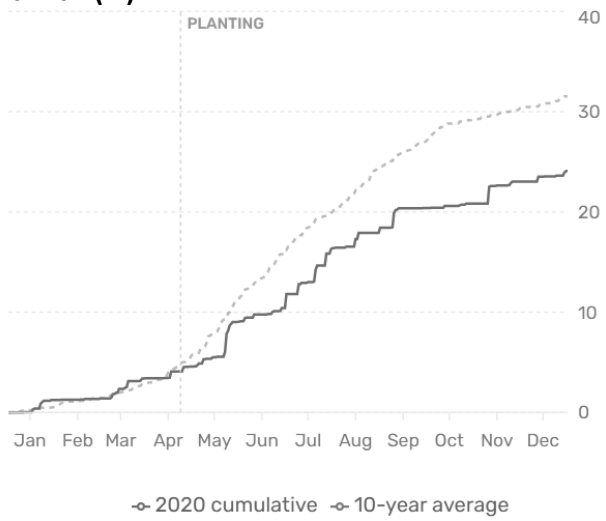
Impact of CENTURO™ Inhibitor with Fall and Spring Anhydrous Ammonia Application

Study ID: 0118185202001
County: York
Soil Type: Hastings silt loam 0-1% slope; Hastings silt loam 1-3% slope; Hastings silt loam 3-7% slopes
Planting Date: 4/23/20
Harvest Date: 10/19/20
Seeding Rate: 32,500
Row Spacing (in): 30
Hybrid: CROPLAN® 5335 VT2 PRO
Reps: 4
Previous Crop: Soybean
Tillage: No-Till
Herbicides: 3 qt/ac Lexar
Seed Treatment: None
Foliar Insecticides: None
Foliar Fungicides: None
Irrigation: Pivot, Total: 5.5"

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 purposes of this study were to evaluate the impact of CENTURO™ applied with anhydrous ammonia on crop yield and soil ammonium and nitrate. This study was conducted in silt loam soils. Anhydrous ammonia was applied at 150 lb/ac N at two different times; the fall application date was November 15, 2019, and the spring application date was March 7, 2020. The study compared both application timings with no inhibitor versus with CENTURO™ applied at 10 gal/ton of anhydrous ammonia. The field also received 5 gal/ac N from 10-34-0 at planting and 30 lb/ac N as 32% UAN through fertigation. The field was planted on April 23, 2020.

Soil samples were taken for ammonium-N and nitrate-N. The first set of samples was taken on May 12 to a 1' depth. A second set of soil samples was taken on June 5 to 1', 2', and 3' sample depths. Samples were collected 2" from the anhydrous band. Ear leaf tissue samples were collected at R2 on July 22, 2020, and analyzed for N%. Stand count, stalk quality, yield, and net return were evaluated.

Results:

	May 12 Soil Sample			June 5 Soil Sample								
	1'			1'			2'			3'		
	NH_4-N	NO_3-N	Total	NH_4-N	NO_3-N	Total	NH_4-N	NO_3-N	Total	NH_4-N	NO_3-N	Total
	lb/ac											
Fall, no inhibitor	2.3 A*	112.0 A	114.3 A	6.0 B	62.3 A	68.3 A	8.3 A	82.0 A	90.3 A	12.0 A	27.0 A	39.0 A
Fall, CENTURO™	5.0 A	111.0 A	116.0 A	4.7 B	49.0 A	53.7 A	7.7 A	66.3 A	74.0 A	7.3 AB	24.3 A	31.7 AB
Spring, no inhibitor	45.7 A	201.7 A	247.3 A	12.7 A	61.7 A	74.3 A	6.3 A	38.7 A	45.0 A	6.3 B	18.3 A	24.7 AB
Spring, CENTURO™	11.7 A	108.0 A	119.7 A	5.0 B	74.3 A	79.3 A	8.3 A	54.7 A	63.0 A	10.1 AB	10.7 A	20.8 B
P-Value	0.175	0.310	0.233	0.013	0.894	0.880	0.921	0.283	0.241	0.056	0.128	0.065

*Values with the same letter are not significantly different at a 90% confidence level.

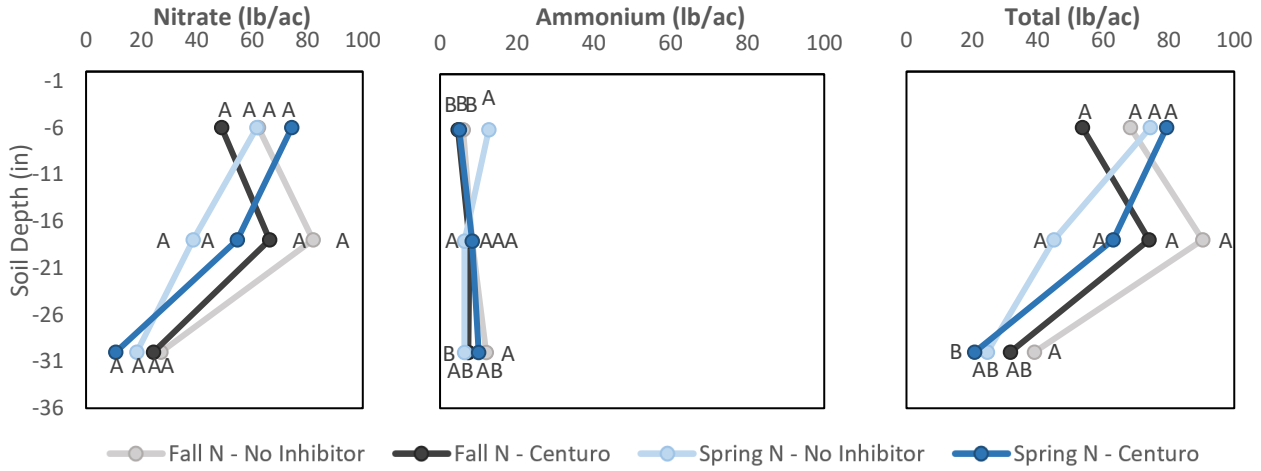


Figure 1. June 5 soil samples at 1', 2', and 3' depths for ammonium (lb/ac), nitrate (lb/ac), and total N (lb/ac) for the fall and spring anhydrous applications and with and without the CENTURO™ inhibitor.

	Stand Count (plants/ac)	Stalk Rot (%)	Green snap (%)	R2 Foliar N (%)†	Moisture (%)	Yield (bu/ac)††	Marginal Net Return‡ ($/ac)
Fall, no inhibitor	30,167 A*	10.00 A	5 A	2.71 A	16.3 A	269 A	902.61 A
Fall, CENTURO™	33,167 A	8.33 A	1 A	2.78 A	16.4 A	267 A	876.77 B
Spring, no inhibitor	31,500 A	7.50 A	1 A	2.74 A	16.4 A	269 A	903.49 A
Spring, CENTURO™	31,333 A	7.50 A	3 A	2.77 A	16.4 A	270 A	885.54 B
P-Value	0.151	0.892	0.191	0.151	0.560	0.269	0.0003

*Values with the same letter are not significantly different at a 90% confidence level.
†Midwest Laboratories sufficient level for in tissue sample is 3.4; Ward Laboratories sufficiency level is 2.71.
††Bushels per acre corrected to 15.5% moisture.
‡Marginal net return based on $3.51/bu corn, $445/ton anhydrous ammonia ($40.70/ac for the without inhibitor treatment), and $22.50/gal for CENTURO™ ($61.28/ac for the with inhibitor treatment).

Summary:

- The timing of anhydrous and the use of CENTURO™ did not impact soil nitrate or ammonium at the 1’ depth on the May 12 sampling dates. At the June 5 sampling date, in the top 1', the spring applied anhydrous with no inhibitor had higher ammonium concentrations. In the 3' depth, the fall applied anhydrous without inhibitor had higher ammonium than the spring anhydrous without CENTRO™.
- There were no differences in stand count, stalk rot, or green snap between the treatments evaluated.
- Yield was not different between the treatments. Due to the additional cost for the treatments with CENTURO™, there was a lower net return for the applications with inhibitor. There was no yield or net return difference between the fall and spring application timings.

This study is sponsored in part by the Upper Big Blue NRD.

Sponsored by: University of Nebraska Lincoln

In Partnership with: Nebraska Corn Board, Nebraska Soybean Checkoff, Nebraska Corn Growers Association, Nebraska Dry Bean Commission