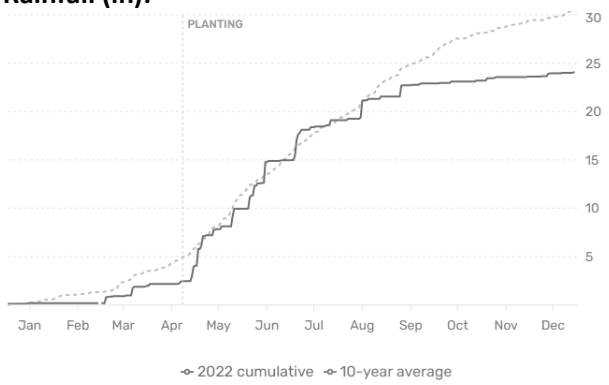
Impact of CENTURO® Inhibitor with Fall and Spring Anhydrous Ammonia Application

Study ID: 0118185202202
County: York
Soil Type: Hastings silt loam 0-1% slope; Hastings silt loam 1-3% slope
Planting Date: 4/22/22
Harvest Date: 9/21-22/22
Seeding Rate: 32,500
Row Spacing (in): 30
Hybrid: DEKALB® 59-82
Reps: 3
Previous Crop: Soybean
Tillage: No-till
Herbicides: ***Pre:*** Balance® Flexx and Degree Xtra®

Note: Severe hail damage on 6/14/22 at the 12 leaf stage. Field wasn't totaled by insurance. Many barren tassels, ears 1 foot off ground, and palmer amaranth in field.
Irrigation: Pivot, Total: 6.5"
Rainfall (in):



Soil Test, 0-8" (November 2021):

						Ammonium Acetate (ppm)					% Base Saturation				
Rep	pH	OM LOI %	Nitrate – N ppm N	Mehlich P-III ppm P	Sulfate-S ppm	K	Ca	Mg	Na	CEC me/100g	H	K	Ca	Mg	Na
1	**6.9**	3.7	12.6	16	9.6	225	2453	350	74	16.1	0	4	76	18	2
2	**6.9**	3.9	16.3	23	10.7	392	3127	450	66	20.7	0	5	76	18	1
3	**6.9**	3.6	11	16	8.4	385	2541	328	52	16.7	0	6	76	16	1

Introduction: CENTURO®, by Koch™ Agronomic Services LLC, contains a product with known efficacy for inhibiting nitrification. 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 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.

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 150 lb/ac N at two different times; the fall application date was November 6, 2021 and the spring application date was March 17, 2022. The study compared both application timings with no inhibitors versus with CENTURO® applied at 10 gal/ton anhydrous ammonia. The field was planted on April 22, 2022. Hail damage occurred on June 14 at the 12 leaf stage, but the field wasn't totaled by insurance.

Crop yield and soil ammonium and nitrate were measured. Soil samples were collected at 1' depth for ammonium-N and nitrate-N analysis on November 8, 2021, and March 21, 2022 (Figure 1). Soil samples were collected starting in the band and at 7" and 15" on either side of the band for a total of five soil cores for each treatment, replication, and sampling date. On September 8, 2022, end of the season, deep soil nitrate samples (1', 2', and 3' depths) were collected for one replication (Figure 1). Stand count, stalk quality, yield, and net return were evaluated.

Results:

	Harvest Stand Count (plants/ac)	Stalk Rot (%)	Moisture (%)	Yield (bu/ac)†	Marginal Net Return‡ ($/ac)
Fall, no inhibitor	22,000 A*	21.83 A	17.2 A	111 A	674 A
Fall, CENTURO®	23,667 A	15.00 A	17.6 A	122 A	723 A
Spring, no inhibitor	22,167 A	18.33 A	17.5 A	121 A	737 A
Spring, CENTURO®	22,167 A	26.00 A	17.1 A	122 A	723 A
P-Value	0.868	0.376	0.965	0.274	0.439

*Values with the same letter are not significantly different at a 90% confidence level.
†Bushels per acre corrected to 15.5% moisture.
‡Marginal net return based on $6.57/bu corn, $0.38/lb N, and $23/ac for CENTURO® .

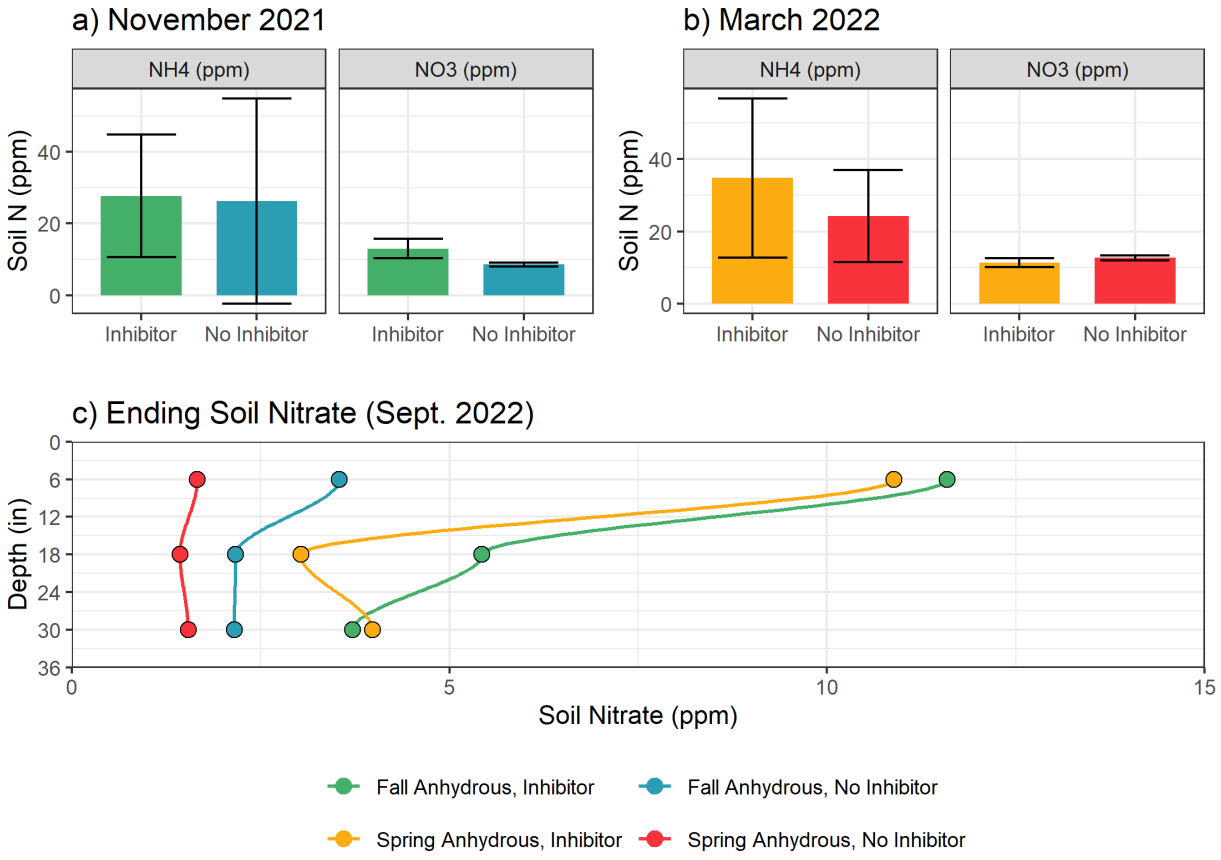


Figure 1. a) Soil ammonium (ppm) and nitrate (ppm) at one-foot depth for fall treatments in November 2021. **b)** Soil ammonium (ppm) and nitrate (ppm) at one-foot depth for spring treatments in March 2022. **c)** September 2022 end-of-season soil nitrate (ppm) at one, two, and three-foot depths for one replication.

Summary:

- There were no differences in stalk rot, stand count, grain moisture, yield, or net return for the nitrogen timings and inhibitors evaluated.
- This is the third year this producer has repeated this study. In years one and two, there were also no differences in yield for the nitrogen timings and inhibitors evaluated.

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