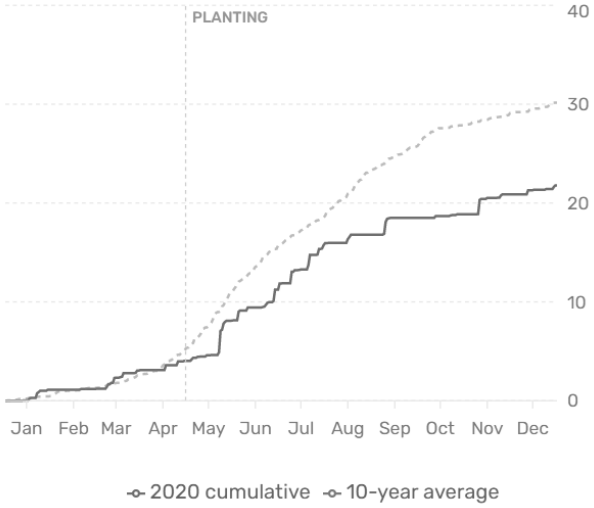
Evaluating Nitrogen Rate and Timing on Corn

Study ID: 1111081202001
County: Hamilton
Soil Type: Hord silt loam rarely flooded; Hord silt loam 3-6% slopes
Planting Date: 4/30/20
Harvest Date: 10/24/20
Seeding Rate: 27,500
Row Spacing (in): 36
Hybrid: Pioneer® P1639Q
Reps: 3
Previous Crop: Corn
Tillage: Stalk Chopping 4/20/20, Ridging 6/17/20
Herbicides: Post: Resicore®, Roundup®, atrazine, and crop oil on 5/2/20 as a post plant burndown
Seed Treatment: PPST, Maxim® Quattro, Lumiflex™, Lumiante™, L-20012R, Lumivia™ 250, Lumisure™, and Lumialza™
Foliar Insecticides: None
Foliar Fungicides: Delaro® late August

Note: There was 10% green snap on this field July 9. Lots of the standing plants pollinated and grew small ears late.
Irrigation: Pivot, Total: 6.25"
Rainfall (in):



Soil Tests (December 2019, 0-8" depth): Nitrate only also sampled 8-40" (<0.1 ppm) and 40-72" (<0.1 ppm)

			Nitrate –	Mehlich P-	Sulfate-S	B	Ammonium Acetate (ppm)				CEC	% Base Saturation				
Soil pH 1:1	BpH	OM LOI %	N ppm N	III ppm P	ppm S	(ppm)	K	Ca	Mg	Na	me/100g	H	K	Ca	Mg	Na
6.6		3.5	7.5	120	17.3	0.94	485	2331	332	20	15.8	0	8	73	18	1
6.6		3.4	3.0	84	11.5	0.75	535	2217	325	18	15.2	0	9	72	18	1

Introduction: This study evaluated various rates and timings of nitrogen application. The treatments were as follows:

Fall 205 lb/ac: 180 lb/ac N as fall anhydrous ammonia and 25 lb/ac N with herbicide
Fall 255 lb/ac: 230 lb/ac N as fall anhydrous ammonia and 25 lb/ac N with herbicide
Spring 205 lb/ac: 180 lb/ac N as spring anhydrous ammonia and 25 lb/ac N with herbicide
Spring 255 lb/ac: 230 lb/ac N as spring anhydrous ammonia and 25 lb/ac N with herbicide
Split 205 lb/ac: 120 lb/ac N as spring anhydrous ammonia, 25 lb/ac N with herbicide, and 60 lb/ac N sidedressed at V8
Split 255 lb/ac: 170 lb/ac N as spring anhydrous ammonia, 25 lb/ac N with herbicide, and 60 lb/ac N sidedressed at V8

Fall anhydrous application was in early November 2019. Spring anhydrous application was the last week of March 2020. The N with herbicide was applied on May 2, 2020. The sidedress application at V8 was the second week of June. For reference, with a yield goalof 225 bu/ac, with the UNL economical N recommendation for this field was 232 lb/ac N if applied in the fall, 190 lb/ac N if applied in the spring, and 156 lb/ac N if applied with a split application.

There was 10% green snap from on July 9. Many of the standing plants were damaged and pollinated late and grew small ears. Soil samples were collected from the same area of the field throughout the season. Two soil cores were pulled from the anhydrous band in three rows for a total of 6 cores. For the split application treatments, additional samples were taken from the furrow where liquid fertilizer was applied and the results were averaged with the samples from the anhydrous band. The soil samples were not replicated.

Results:

	Stand Count (plants/ac)	Stalk Rot (%)	Green snap (%)	lbs N/bu grain	Moisture (%)	Yield (bu/ac)†	Marginal Net Return‡ ($/ac)
Fall 205 lb/ac	26,667 A*	0.01 A	6 A	1.03 B	16.2 A	199 A	629.85 A
Fall 255 lb/ac	26,500 A	0.00 A	2 A	1.27 A	16.3 A	201 A	625.49 A
Spring 205 lb/ac	25,833 A	0.00 A	7 A	1.02 B	16.5 A	201 A	638.30 A
Spring 255 lb/ac	26,000 A	0.00 A	6 A	1.24 A	16.5 A	206 A	641.70 A
Split 205 lb/ac	26,833 A	0.00 A	3 A	1.00 B	16.6 A	205 A	645.69 A
Split 255 lb/ac	26,833 A	0.00 A	5 A	1.24 A	16.6 A	206 A	633.50 A
P-Value	0.920	0.465	0.588	<0.0001	0.669	0.238	0.564

*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 $3.51/bu corn, $0.28/lb N as anhydrous ammonia, $8.00/ac for anhydrous ammonia application, $0.35/lb for UAN applied with herbicide or as sidedress, and $3/ac for sidedress UAN application.

Soil Samples:

Treatment	6/30/20 Nitrate – N ppm N	6/30/20 Nitrate-N lb N/ac	7/17/20 Nitrate-N ppm N	7/17/20 Nitrate-N lb N/ac	10/19/20 Nitrate-N ppm N	10/19/20 Nitrate-N lb N/ac
			0-12”			
Fall 205 lb/ac	48.4	174	21.3	77	3	13
Fall 255 lb/ac	32.2	116	8	29	3.2	12
Spring 205 lb/ac	56.5	203	16.5	59	5.8	19
Spring 255 lb/ac	35.2	127	12.8	46	3.3	12
Split 205 lb/ac	24.9	90	27.7	100	2.3	8
Split 255 lb/ac	22.1	80	23.3	84	6.4	0
			12-24”			
Fall 205 lb/ac	19.1	69	5.3	19	0.7	3
Fall 255 lb/ac	16	58	4.6	17	0.6	2
Spring 205 lb/ac	18.7	67	4.6	17	0.7	2
Spring 255 lb/ac	11.1	40	4.8	17	1.8	7
Split 205 lb/ac	13.6	49	3.9	14	0.4	1
Split 255 lb/ac	8.8	32	15.5	2.85	0.6	0
			24-36”			
Fall 205 lb/ac	3.3	12	3.3	12	0.2	1
Fall 255 lb/ac	4.5	16	5.1	18	0.4	1
Spring 205 lb/ac	7.5	27	3.3	12	0.1	0
Spring 255 lb/ac	3.8	14	4.6	17	0.2	1
Split 205 lb/ac	4.4	16	1.9	7	0.1	0
Split 255 lb/ac	0.6	2	1	11	0	0
			36-72”			
Fall 255 lb/ac	-	-	2.8	30	0.1	2
Split 255 lb/ac	-	-	1	11	<0.1	0

Summary:

- There were no differences in stalk quality, yield, moisture, or net return for the nitrogen rates and timings evaluated. The 205 lb/ac N rate yielded as well as the higher N rate.
- The treatments with 205 lb/ac N resulted in better nitrogen use efficiency, using approximately 1 lb of N to produce a bushel of grain. In contrast, the treatments with 255 lb/ac N used approximately 1.2 lb of N to produce a bushel of grain.
- Across all treatments, in the mid-October soil sampling, the maximum amount of nitrate-N remaining in the soil was 19 lb/ac in the top 12” and 8 lb/ac from 12-72”.

Sponsored by: University of Nebraska Lincoln

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