

Corn Response to Nitrogen and Timing of Weed Control, Carrington

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The trial objective was to determine the combination of soil N levels and initial timing of weed control to economically increase corn yield. The dryland field trial was established at the NDSU Carrington Research Extension Center on a conventionally-tilled Heimdal-Emrick loam soil. Experimental design was split plot [main plot = N (three treatments targeted at 50, 100, 150 lbs soil N/acre) and subplots = initial timing of weed control (four treatments targeted at PPI, early POST = 2- to 4-inch weed height, late POST = 8- to 12-inch weed height, and untreated check)] with four replications. Spring soil analysis indicated 41 lbs nitrate-N/A, 5 ppm phosphorus, 174 ppm potassium, 0.61 ppm zinc, 3.1 percent organic matter, and 6.4 pH. Urea (46-0-0) was applied and mechanically incorporated on April 25 to reach targeted N rates. SureStart (acetochlor&clopyralid&flumetsulam&dichlormid safener) herbicide at 28 fl oz/A was PP applied on April 25 using a CO₂ hand-boom sprayer with 80015 flat-fan nozzles delivering 14 gal/A at 35 PSI and incorporated twice at 1- to 2-inch depth with a field cultivator plus harrow. DeKalb Roundup Ready 'DKC33-53' (83-day relative maturity) was planted at 36,000 seeds/A in 30-inch row spacing on April 25. Starter liquid fertilizer 10-34-0 was in-furrow applied at 10 gal/A. POST glyphosate (Roundup PowerMax) at 22 fl oz/A plus Class Act NG at 2.5% v/v was applied with 8001 flat-fan nozzles delivering 12 gal/A at 35 psi. POST1 was applied to the PPI and early POST plots on May 31 with 66° F, 32 percent RH, and 8 mph wind to 2- to 3-collar stage corn. POST2 was applied to the late POST plots on June 13 with 77° F, 34 percent RH, and 3 mph wind to 5-collar corn. Table 1 lists weed species, size, and density during application of POST1 and POST2 treatments. A second POST application was applied to the early POST plots on June 22 with 68° F, 61 percent RH, and 5 mph wind to 5-collar corn. A second POST application was applied to the PPI plots on June 29 with 68° F, 66 percent RH, and 6 mph wind to 6- to 7-collar corn. The trial was harvested with a plot combine on October 5.

Table 1. Corn response to N and timing of weed control.

Species ¹	Weed			
	POST1 (May 31)		POST2 (June 13)	
	Size (inches in height)	Density (plt/ft ²)	Size (inches in height)	Density (plt/ft ²)
Grass	1 to 3	35	8 (average)	29
Broadleaf	1 to 3	25		23

¹Grass = green and yellow foxtail; Broadleaf = common lambsquarters, prostrate and redroot pigweed, volunteer canola, and wild buckwheat.

Among soil N levels, plant chlorosis score was higher with low N and grain yield was reduced compared to 100 and 150 lbs/acre of soil N (Table 2). Corn plants with PPI or early-POST weed control were generally taller and greener compared to the late-POST (POST2) weed control or untreated check. Silk dates were delayed as initial weed control was delayed. PPI and early-POST weed control resulted in greater seed yield and test weight compared to the late-POST weed control or untreated check. Basal stalk nitrate samples were collected on October 1 in three replications and analysis indicated nitrate-N levels were marginal (possible that N deficiency limited yield) among N and weed control treatments. However, stalk nitrate levels were higher at 150 lbs N/acre compared to lower N levels and stalk nitrate levels were higher with PPI and early-POST compared to late-POST weed control. Statistically significant interactions among N levels and initial timing for control of weeds occurred with stalk nitrate and seed moisture. Treatments where yield was not limited by N, based on the stalk nitrate test results, were with 150 lbs N/acre and PPI or early-POST weed control.

Table 2. Corn response to N and timing of weed control, Carrington, 2012.

Treatment		Plant ¹				Seed			
Factor	Height	Chlorosis	Silk	Basal	Yield	Test	Moisture	Protein	Starch
	(cm)	(0-9)	Date	Stalk					
	(cm)	(0-9)	Date	Nitrate-N					
	2-Jul	2-Jul	Jday	ppm	bu/A	lb/bu	%	%	(dry matter)
Soil N level (lb/A)									
50	78	3	202	242	83.6	57.2	15.3	7.3	73.2
100	82	2	201	306	102.8	57.6	15.0	8.2	72.6
150	83	2	201	602	97.1	57.6	15.1	8.7	72.0
LSD (0.05)									
	NS	1	NS	88	12.6	NS	NS	NS	NS
Weed control ²									
untreated check	72	4	NA	NA	0.0	55.7	16.5	8.1	72.4
PPI/POST1/POST4	93	1	200	448	134.9	58.3	14.4	8.4	72.5
POST1/POST3	87	2	201	447	132.1	58.6	14.6	8.3	72.6
POST2	71	3	203	254	111.1	57.3	15.0	7.6	72.8
LSD (0.05)									
	7	1	1	102	14.5	0.6	0.9	NS	NS
Mean	81	2	201	383	94.5	57.5	15.1	8.1	72.6
C.V. (%)	11.5	45.1	0.6	31.2	18.7	1.4	3.1	7.3	1.2

¹Chlorosis: 0 = dark green, 9 = yellow; Basal stalk nitrate-N samples taken on October 1.

²PPI = April 25; POST1 = May 31; POST2 = June 13; POST3 = June 22; POST4 = June 29.



Corn response to nitrogen and tillage. One hundred pounds N, ePOST treatment (left) vs. no N, POST 2 (right), June 13, 2012.