Corn Response to Nitrogen and Timing of Weed Control, Carrington, 2009.
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Trial objective was to determine the combination of soil N and timing of weed control impacting corn yield and quality. The dryland field trial was established at the NDSU Carrington Research Extension Center on a Heimdal-Emrick loam soil. Experimental design was a randomized complete block with split plot arrangement [main plot = N (3 treatments targeted at 50, 100, 150 lb N/acre) and subplots = timing of weed control (4 treatments targeted at 2- to 4-inch weed height, 8- to 12-inch weed height, and weed-free and untreated checks)] with four replications. Spring soil analysis indicated 24 lb nitrate-N/A, 13 ppm phosphorus, 181 ppm potassium, 0.95 ppm zinc, 4.2% organic matter, and 5.9 pH. Nitrogen as urea (46-0-0) was surface applied on May 12 at 50 and 100 lb nitrate-N/A to medium- and high-N plots, respectively. Rainfall was delayed until 0.78 inches was received on May 25. DeKalb Roundup Ready 'DKC 38-19' (85-day relative maturity) was direct planted into barley stubble at 28,000 seeds/A in 30-inch row spacing on May 15. Nitrogen as liquid 28-0-0 (urea-ammonium nitrate) was surface applied with stream nozzles to 4-leaf corn on June 26 at 25 lb nitrate-N/A to all plots. Rainfall of 0.94 inches was received on June 26. Herbicides were applied using a CO_2–presurrized hand-boom sprayer with 8001 flat-fan nozzles delivering 12 gal/A at 35 psi. Glyphosate (Roundup PowerMax) at 0.75 lb ae/A + acetochlor & dichlormid safener (Surpass) at 2 lb ai/A + AMS (Cornbelt Amstik) at 64 fl oz/A was applied PRE on May 16 with 43° F and 45% RH to a moist soil surface. Corn emergence was May 31 to June 1. Glyphosate (Roundup PowerMax) at 1.12 lb ae/A + AMS (Cornbelt Amstik) at 64 fl oz/A was applied POST. POST1 was applied to the early POST plots on May 28 with 69° F and 43% RH. POST2 was applied to the late POST plots on June 20 with 77° F and 44% RH to 3-leaf corn. POST3 was applied to the weed-free check and early POST plots on June 29 with 64° F and 74% RH to 4-leaf corn and 1- to 4-inch tall weeds. POST4 was applied on the late POST plots on July 28 with 70° F and 42% RH to 8-leaf (25- to 30-inches tall) corn and 1- to 8-inch tall weeds. Table 1 lists weed species, size, and density during application of POST herbicides. The trial was harvested with a plot combine on November 23.

Table 1. Weed Species, Size, and Density During Application of POST Herbicides.

	POST1 (May 28)		POST2 (June 20)	
Weed Species	Size (inches in height)	Density (plt/ft2)	Size (inches in height)	Density (plt/ft2)
Quackgrass	6-12	1.4	x	0.3
Volunteer barley	3-4	1.9	12	x
Yellow foxtail	x	x	2-3	0.1
Biennial wormwood	x	x	3	x
Common lambsquarters	1-2	3.0	2-12	0.4
Field pennycress	1-2	0.4	x	x
Horseweed	x	x	2-10	2.5
Kochia	0.5-2	15.0	x	2.0
Redroot pigweed	x	x	1-2	x
Sheperdspurse	2-12	1.0	12-16	2.7
White whitlowwort	1-4	0.9	x	x
Yellow woodsorrel	2-4 (diameter)	3.9	8-9 (diameter)	1.7

Among N treatments, plant green color was higher with the high versus low N (Table 2). Basal stalk nitrate test indicated nitrate-N levels were deficient among all N treatments (marginal = 250 to 700 ppm), likely due to untimely rain for incorporating the preplant urea. The highest N level increased grain yield, moisture and protein compared to low N. Weed control generally increased plant height and green color, and reduced time from planting to silking. Nitrate-N levels indicated by the basal stalk test tended to be highest with the PRE/early POST weed control. Early weed control provided higher grain yield. Yield improved by 20 bu/A (24%) with PRE/early POST compared to yield with late POST application timing of herbicides. Also, test weight was higher and moisture lower with PRE/early POST versus late POST treatment. Grain protein was highest with delayed control of weeds. No statistically

significant interactions were present for corn response among N levels and application timings for control of weeds.

Table 2. Corn Response to N and Timing of Weed Control, Carrington, 2009.

Treatment	Plant[1]					Seed				
Factor	Height	Silk date	Green color (NDVI)		Basal stalk nitrate	Yield	Test weight	Moisture	Protein	Starch
	inches	Jday	16-Jul	30-Jul	ppm	bu/A	lb/bu	%		
soil N (lb/A)										
50	19	227	0.54	0.71	x	46.7	49.7	24.0	9.4	69.4
100	21	226	0.56	0.75	92	65.2	49.7	23.1	9.7	69.6
150	21	227	0.61	0.80	198	69.5	49.0	25.9	10.7	69.6
LSD (0.05)	NS	NS	0.05	0.05	87	10.0	NS	1.6	0.5	NS
Weed control[2]										
untreated check	15	231	0.51	0.67	x	27.1	48.3	26.6	9.9	69.4
PRE/early POST	23	225	0.64	0.80	229	80.2	50.2	22.3	9.8	69.6
early POST	23	225	0.58	0.79	100	74.5	50.0	23.4	9.4	69.8
late POST	19	226	0.56	0.76	107	60.1	49.3	24.9	10.7	69.3
LSD (0.05)	2	2	0.06	0.05	NS	11.5	0.9	1.9	0.6	NS
mean	20.0	227	0.57	0.75	60	60.5	49.5	24.3	9.9	69.5
CV (%)	13.4	0.9	11.9	7.7	81.0	23.3	2.1	9.3	6.6	1.3

[1]Height measurements taken on July 20; Green color readings taken with GreenSeeker; Basal stalk nitrate samples taken on October 22.

[2]Weed-free check = PRE/POST3; early POST weed control = POST1/POST3; late POST weed control = POST2/POST4.