

Corn response to starter and post-applied fertilizer, Carrington, 2020.

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A field study continued at the NDSU Carrington Research Extension Center, and supported by the ND Corn Utilization Council, to examine the performance of corn with starter P and Zn, foliar S and Zn, and post N. Experimental design was a randomized complete block with four replications. The trial was established on conventionally tilled, Heimdal-Emrick loam soil with 3.0% organic matter, 7.7 (0-6 inches) and 8.1 (6-24 inches) pH, 0.91 mmho/cm (0-6 inches) and 1.61 mmho/cm (6-24 inches) soluble salts, 29 lb nitrate-N/acre, 8 ppm (low) P, 180 ppm K and 0.65 ppm (low) Zn. Flax was the prior crop in 2019. Urea was preplant incorporated (PPI) at 70 lb N/acre on May 20. PPI treatments were applied May 21 and incorporated with a field cultivator plus harrow. DeKalb 'DKC32-12RIB' (82-day relative maturity) Roundup Ready corn was planted with a John Deere 71 4-row flex planter on May 21 in 30-inch rows, and included in-furrow (IF) and surface-dribbled fertilizer treatments. Rain totaled 0.4 inch on May 21-June 10 providing minimal incorporation of the surface-applied fertilizer. Foliar S and Zn were applied on June 23 at the V4 growth stage using a hand-boom sprayer. Trial area was soil sampled for the pre-side dress soil nitrate test (PSNT) and analysis was 102 lb nitrate-N/acre. UAN at 50 lb N/acre (18 gpa 28-0-0) was side-dressed by coulter injection on June 23 at the V4 stage to two of four trial replications, providing a total of about 150 lb N/acre (including residual soil nitrate-N, PPI urea and N provided by fertilizer treatments). NDAWN monthly rain (inches): May=1.18; June=1.23; July=5.00; August=1.06; September=0.13; and 5-month total=8.6. Grain was harvested with a plot combine on October 7.

Time from corn planting to plant emergence with fertilizer treatments ranged from 0 to 2 days prior to the untreated check (Table 1). Silk date was 1 to 6 days earlier with fertilizer treatments versus the untreated check. Early season plant stand (measured about a week after plant emergence) was similar among treatments, averaging 35,500 plants/acre. PPI fertilizer increased plant height (LSD 0.05) compared to the untreated checks.

Table 1. Corn response to in-furrow starter and foliar fertilizer, Carrington, 2020.

Treatment			Plant					Seed					
Fertilizer ¹	Rate	Application method	Emergence	Silk	Stand (6-Jun)	Height (cm)		Yield	Test weight	Harvest moisture	Protein	Oil	Starch
	gpa		DOY ²		plt/A	29-Jun	15-Jul	bu/A	lb/bu	%			
untreated check	x	x	153	214	35,027	35	114	115.2	49.7	11.3	9.3	3.8	69.3
TSP+AS+ZnS/10-34-0	170 + 20 + 5.6 lb/3	PPI /in-furrow	152	209	35,525	48	139	149.8	54.4	10.8	9.0	3.8	69.8
MESZ/10-34-0	200 lb/3	PPI/in-furrow	151	208	37,849	48	140	152.4	54.6	11.1	9.0	3.8	69.6
10-34-0	3	in-furrow	152	212	36,521	37	113	117.6	51.1	10.8	9.2	3.8	69.7
10-34-0	3	surface dribble	152	213	36,853	37	119	109.8	50.7	10.8	9.2	3.8	69.1
10-34-0 + Zn	2.75 + 0.25	in-furrow	153	212	34,197	39	124	127.6	51.4	10.5	9.2	3.7	69.4
RizeR + water	2.5 + 0.5	in-furrow	152	212	35,525	39	124	124.7	50.8	11.5	9.2	3.8	69.8
10-34-0/Zn	3/0.25	in-furrow/ foliar	153	211	33,201	41	126	126.9	52.0	10.0	9.2	3.8	69.7
10-34-0 + Zn/S	2.75 + 0.25/0.5	in-furrow/ foliar	153	211	35,525	46	127	138.2	51.9	10.9	9.2	3.7	69.0
mean			152	211	35,525	40	124	127.7	51.6	10.9	9.2	3.8	9.2
C.V. (%)			0.3	0.5	12.4	12.0	8.8	11.4	1.7	8.1	2.6	1.7	2.6
LSD (0.05)			1	2	NS	7	16	21.0	1.3	NS	NS	NS	NS
LSD (0.10)			1	1	NS	6	13	17.5	1.0	NS	0.3	NS	NS

¹TSP=triple superphosphate (0-46-0); AS=Ammonium sulfate (21-0-0-24); ZnS=zinc sulfate (35.5% Zn and 17.5% S); MESZ=Microessentials SZ (12-40-0 10S 1Zn); chelated Zn=Ammend (8% N and 9% Zn; West Central); RizeR (7% N, 17% P, 3% K, 0.95% Zn, 0.2% Fe, 0.06% Mn, and 0.07% Cu; Loveland); S=MAX-IN S (0-0-19-13; Winfield).

²Day of Year: 152=May 31; 211=July 29.

Grain yield increased (LSD 0.05) 17 to 24% with PPI fertilizer followed by IF 10-34-0, and IF 10-34-0 plus IF Zn followed by foliar S compared to the untreated check. Yield was similar with the addition of IF Zn to 10-34-0 compared to IF 10-34-0. Also, yield was similar with foliar Zn following IF 10-34-0 compared to 10-34-0 plus IF zinc. Yield was similar with foliar S following IF 10-34-0 plus Zn compared to IF 10-34-0 plus zinc. Test weight improved (LSD 0.05) with most fertilizer treatments except dribble-applied 10-34-0, and RizeR compared to the untreated check. Grain harvest moisture, protein, oil and starch generally were similar among treatments.

Grain yield, test weight and harvest moisture were similar with side-dressed N compared to untreated (Table 2). The PSNT analysis correctly predicted no yield response to the post N.

Table 2. Corn response to side-dressed N, Carrington, 2020.			
Treatment	Seed		
	Yield	Test weight	Harvest moisture
	bu/A	lb/bu	%
untreated check	129.1	52.3	10.4
post N ^a	126.3	50.9	11.3
mean	127.7	51.6	10.9
CV (%)	12.0	1.5	8.6
LSD (0.05)	NS	NS	NS
LSD (0.10)	NS	NS	*

^aPost N side-dressed applied as UAN (18 gpa 28-0-0) at 54 lb nitrate-N/acre at V4 stage.