Pinto bean response to starter and foliar fertilizer, Carrington, 2020.
(Greg Endres and Mike Ostlie)

The field trial was conducted at the NDSU Carrington Research Extension Center with support from Northarvest Dry Bean Growers Association to examine the performance of pinto bean with selected treatments of phosphorus (P), zinc (Zn), and sulfur (S) starter and post-applied fertilizer. Experimental design was a randomized complete block with four replications. Previous crop in 2019 was corn. The dryland experiment was established on a conventional-tilled loam soil with 3.1% organic matter, 8.2 pH (0- to 6-inch depth), 5 ppm (Olsen - low) P, 157 ppm K and 0.54 ppm (low) Zn. The broadcast fertilizer treatment was preplant (PP) applied and shallow incorporated. Fungicide-treated 'ND Palomino' was planted with a 5-row JD Flex planter in 22-inch rows on June 5. Starter fertilizer was in-furrow (IF) applied at planting. Post-emergence (POST) foliar fertilizer treatments were applied on July 28 at the R2-3 growth stages with a hand-boom sprayer delivering 14 gpa through TeeJet 80015AR flat-fan nozzles at 35 psi. Plants were hand-pulled for field drying on September 14 and seed harvested with a plot combine on September 17.

Days from pinto bean planting to plant emergence (June 13; data not shown), flowering, and maturity were similar among treatments (Table). Early season plant stand about one month after emergence averaged 58,800 plants/acre across the trial. Compared to the untreated check (73,780 plants/A), most fertilizer treatments resulted in statistically significant reduced stands ranging from 19-33% less, except with IF 10-34-0 at 3 gpa; IF 10-34-0 at 2.75 plus Zn at 0.25 gpa; and IF RizeR plus Accomplish. Canopy closure (August 3; growth stage $\leq$R5) evaluation visually and with Canopeo was similar among treatments. White mold was not observed in the trial. Seed yield, protein and count were similar among treatments. Test weight generally increased with fertilizer treatments.

Table. Pinto bean response to in-furrow and post-applied fertilizer, Carrington, 2020.

	Plant					Seed			
			Canopy closure (3-Aug)						
	Stand (12-Jul)	Flower (R1)	visual	Canopeo	Physiological maturity (R9)	Yield	Test weight	Protein	Count
Fertilizer treatment[a]	plt/A	DOY	%		DOY	lb/A	lb/bu	%	no./lb
untreated check	73,777	205	82	84	252	2279	59.1	23.9	1390
IF 10-34-0 at 3 gpa	64,272	206	91	91	253	2239	59.0	23.4	1418
IF 10-34-0 at 3 gpa + water at 3 gpa	49,335	206	81	81	252	2349	59.7	23.5	1389
IF 10-34-0 at 2.75 gpa + water at 0.25 gpa	51,599	205	88	86	252	2475	59.8	23.8	1376
IF Ammend Zn at 0.25 gpa + water at 2.75 gpa	59,746	205	87	86	252	2451	59.8	24.4	1385
IF 10-34-0 at 2.75 + Ammend Zn at 0.25 gpa	65,177	205	87	88	252	2184	59.6	24.0	1363
IF 10-34-0 at 2.75 + water at 0.25 gpa/POST Ammend Zn at 0.25 gpa	52,504	205	88	89	252	2666	60.1	23.4	1388
IF Redline at 2 gpa + water at 1 gpa	52,504	205	81	83	252	2229	59.7	23.2	1361
IF 10-34-0 at 2.75 gpa + Ammend Zn at 0.25 gpa/POST MAX-IN S at 0.5 gpa	52,504	205	86	88	252	2340	59.5	23.8	1390
IF RizeR at 1 gpa + Accomplish LM at 0.25 gpa + water at 1.75 gpa	68,798	205	88	90	252	2428	59.9	23.3	1393
PP incorporated ZnS (2 lb Zn) + AmS (20 lb S)/IF 10-34-0 3 gpa	56,125	205	88	90	252	2482	59.8	23.3	1376
mean	58,801	205	86	86.8	252	2372	59.7	23.6	1385
CV (%)	16.1	0.3	6.3	6.1	0.1	11.5	0.6	5.1	2.6
LSD (0.10)	11,318	NS	NS	NS	NS	NS	0.5	NS	NS

[a]Ammend EDTA Zn 9: 8.0% N and 9.0% Zn chelate (West Central). Redline: 6% N, 12% P, 2% K, 1% Zn, 0.3% Fe, 0.04% MN, and 0.05% Cu (West Central). MAX-IN S= 0-0-19-13 (Winfield). RizeR: 7% N, 17% P, 3% K, 0.95% Zn, 0.2% Fe, 0.06% Mn, and 0.07% Cu; Accomplish LM: biochemical fertilizer catalyst (Loveland).

[b]DOY (day of year): 205=July 23; 252=Sep 8.