Pinto bean response to starter and post-applied fertilizer, Carrington, 2019.
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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 2018 was soybean. The dryland experiment was established on a conventional-tilled loam soil with 3.8% organic matter, 7.3 pH (0- to 6-inch depth), 7 ppm (low) P, 156 ppm K and 0.22 ppm (low) Zn. Fungicide-treated 'ND Palomino' was planted with a 5-row JD Flex planter in 22-inch rows on May 31. The broadcast, preplant (PP) fertilizer treatment was applied May 31 and lightly incorporated. Starter fertilizer was in-furrow (IF) applied at planting. Post-emergence (POST) foliar fertilizer treatments were applied on July 22 at the R3-5 stages with a hand-boom sprayer delivering 14 gpa through 80015 flat-fan nozzles at 35 psi. Plants were hand-pulled for field drying on September 16 and seed harvested with a plot combine on September 17. Low incidence of white mold was present in the trial with essentially no impact on seed yield.

Days from planting to plant emergence, flowering, and maturity were similar among treatments (table). The trial's early season plant stand averaged 50,900 plants/acre and ranged from 45,580-60,670 plants/acre among treatments. Visually evaluated canopy closure during mid season generally was similar among treatments. Compared to the untreated, seed yield increased with IF 10-34-0 plus Zn followed by foliar S, likely due to high rainfall during Aug-Sept that may have leached S through the soil profile. Test weight and seed count were similar among treatments.

Table. Pinto bean response to in-furrow and post-applied fertilizer, Carrington, 2019.

	Plant[b]					Seed		
Fertilizer treatment[a]	Emergence	Stand (12-Jul)	Flower (R1)	Canopy closure (24-Jul)	Physiological maturity (R9)	Yield	Test weight	Count
	DOY	plt/A	DOY	%	DOY	lb/A	lb/bu	no./lb
untreated check	160	56,740	194	90	244	3748	60.9	1561
IF 10-34-0 at 3 gpa	160	49,200	195	94	245	3579	60.9	1566
IF 10-34-0 at 3 gpa + water at 3 gpa	160	42,860	195	86	244	3410	61.2	1565
IF 10-34-0 at 2.75 gpa + water at 0.25 gpa	160	49,200	195	88	243	3586	60.7	1591
IF Ammend Zn at 0.25 gpa + water at 2.75 gpa	160	53,420	195	82	243	3436	61.3	1613
IF 10-34-0 at 2.75 + Ammend Zn at 0.25 gpa	160	45,580	195	89	242	3507	60.8	1555
IF 10-34-0 at 2.75 + water at 0.25 gpa/POST Ammend Zn at 0.25 gpa	160	55,230	195	87	244	3506	61.2	1604
IF Redline at 2 gpa + water at 1 gpa	160	51,910	195	90	244	3590	60.9	1571
IF 10-34-0 at 2.75 gpa + Ammend Zn at 0.25 gpa/POST MAX-IN S at 0.5 gpa	160	53,120	195	91	244	4125	60.9	1544
IF RizeR at 1 gpa + Accomplish LM at 0.25 gpa + water at 1.75 gpa	160	60,670	195	91	243	3549	60.8	1564
IF 10-34-0 at 2.75 gpa/ POST Ascend at 6.4 fl oz + MAX-IN Ultra ZMB at 0.25 gpa	160	45,580	195	91	243	3676	60.6	1582
PP incorporated ZnS (2 lb Zn) + AmS (20 lb S)/ IF 10-34-0 3 gpa	160	46,780	195	88	244	3241	60.4	1618
mean	160	50,860	195	89	244	3579	60.9	1578
CV (%)	0.1	15.2	0.2	4.9	0.6	7.4	0.9	2.4
LSD (0.10)	NS	9230	NS	5	NS	317	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); MAX-IN Ultra ZMB: 3.6% S, 0.1% B, 3.0% Mn, 4.0% Zn (Winfield).

[b]DOY (day of year): 160=June 9; 195=July 14; 244=Sep 1.