

Pinto bean response to row spacing and plant population, Carrington, 2021.
(Greg Endres and Mike Ostlie)

The field study continued in 2021 at the NDSU Carrington Research Extension Center with support from Northharvest Bean Growers Association to examine the response of pinto bean to row spacing and plant population. Experimental design was a randomized complete block with split plot arrangement (whole plot = row spacings; split plot = plant populations) with four replications. The dryland trial was established with durum wheat as the previous crop on conventionally tilled Heimdal-Emrick loam soil with 4.4% organic matter, 6.6 buffer pH, 0.29 dS/m soluble salt (0-6-inch depth), 19 ppm P, 369 ppm K, and 1.52 ppm Zn. 'ND Palomino' pinto bean was planted on May 26 (soil at 58 degrees F; NDAWN) in 28- and 21-inch rows, and 7-inch paired rows (centered at 28 inches) with planting rates of 60,000, 85,000 and 110,000 pure live seed (PLS)/acre (A) to establish targeted stands of 50,000, 70,000 and 90,000 plants/acre, respectively. NDAWN monthly rain (inches): May=1.4; June=1.8; July=0.1; August=2.6; September=2.0; October=3.7; and 6-month total=11.6. The trial received supplemental flood irrigation at a targeted rate of 0.9 inch/A on each of the following dates and bean growth stages: July 22, V5-R1; July 29, V5-R1; and August 13, V5-R2. The supplemental irrigation plus late-season rain (Aug 20 to Oct 20=7.86 inches) stimulated new plant growth and extended time to reach plant maturity. A killing frost occurred on October 20 (low of 25 degrees F). Seed was direct harvested with a plot combine on November 1.

Averaged across planting rates, plant stand was reduced with 21-inch rows compared to the other row spacings (Table; LSD 0.05)). Plant emergence, first flower and maturity were similar among rows. Canopy closure was similar between 21-inch and paired rows, and both greater than 28-inch rows. Seed yield was greater with 21-inch rows compared to other row spacings. Bean seed yield across the trial was poor, averaging 547 lb/A, due to dry soil and high temperatures during the first half of the growing season. White mold was not observed in the trial.

Table. Pinto bean response to row spacing and plant population, Carrington, 2021.

Treatment	Plant ¹						Seed			
	Emergence DOY	Stand (20-Jun) plt/A	Flower DOY	Canopy closure (14-Sept)		Physiological maturity DOY	Yield lb/A	Test weight lb/bu	Protein %	Count seeds/lb
				Visual	Canopeo					
Row spacing (inches):										
28	159	69,520	218	40	42	287	463	54.1	23.7	1,290
21	159	46,720	223	55	52	292	637	54.4	22.0	1,345
paired 7	159	66,790	226	64	55	293	540	53.3	22.9	1,305
LSD (0.05)	NS	9,610	NS	11	5	NS	87	NS	1.1	NS
LSD (0.10)	NS	7,630	NS	8	4	NS	69	NS	0.8	NS
CV (%)	0.4	15.8	5.0	20.1	10.9	3.2	15.9	3.0	4.6	14.2
Planting rate (PLS/A):										
60,000	160	47,050	222	47	44	291	464	53.8	23.0	1380
85,000	159	63,260	221	56	48	290	569	54.0	22.9	1280
110,000	159	72,710	222	56	58	291	606	54.1	22.7	1280
LSD (0.05)	NS	7,485	NS	5	5	NS	69	NS	NS	NS
LSD (0.10)	NS	6,180	NS	4	4	NS	57	NS	NS	NS
CV (%)	0.3	14.3	2.1	10.9	11.4	0.9	14.7	1.3	3.4	13.2

¹DOY (day of year): 159=8-Jun; 218=6-Aug; 287=14-Oct. Growth stage during evaluation: Emergence and stand=VC; Canopy closure=R4-8.

Averaged across row spacings, early season plant population was 47,050, 63,260 and 72,710 plants/A with low, medium and high planting rates, respectively. Ratio of established plants compared to planting rates: 78%=low, 74%=medium and 66%=high. The reduced percentage of established plants compared to PLS rate was partially due to

marginal topsoil moisture conditions following planting. Plant development was similar among plant stands. A slight advantage with canopy closure existed with the high vs. low plant densities. Seed yield was similar between the medium and high plant populations, and 105 to 142 lb/A (18-23%) greater than yield with the low population.

Test weight was the only agronomic factor with statistical significance with the interaction of row spacing and plant population: 21-inch rows at 85,000 and 110,000 PLS/A and 28-inch rows at 110,000 PLS/A provided the heaviest test weight (54.6-55.2 lb/bu).