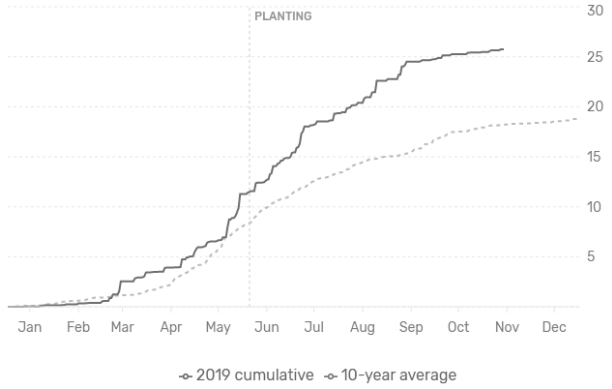
Pinto Bean Planting Population for Direct Harvested Dry Beans

Study ID: 0809123201902
County: Morrill
Soil Type: Valentine sandy loam 3-9% slopes
Planting Date: 6/4/19
Harvest Date: 9/13/19
Row Spacing (in): 20
Variety: Vibrant
Reps: 4
Previous Crop: Corn
Tillage: Ripper/disk; rolled after planting
Herbicides: ***Pre:*** 2 pt/ac Prowl®, 14 oz/ac Outlook®, 22 oz/ac Roundup PowerMAX® ***Post:*** 21 oz/ac Varisto®, 8 oz/ac Basagran®, and 7 oz/ac Outlook®
Desiccant: 2 oz/ac Sharpen® and 2 pt/ac Gramoxone® on 9/5/19
Seed Treatment: Maxim®, Apron®, Dynasty®, Cruiser®, and Vibrance®
Foliar Fungicides: 12 oz/ac Aproach®, 2 applications of Champ® (copper hydroxide)

Fertilizer: 20 ton/ac manure, 2 gal/ac 10-34-0, 4 gal/ac Riser® (7-17-3), 4 oz/ac Radiate® (indolebutric acid and cytokinin) in-furrow at planting; 4 qt/ac Awaken® at first bloom
Irrigation: Pivot, Total: 8"
Rainfall (in):



Soil Test (Nov. 2018) – 1 sample taken in the study area:

Soil	Soluble	Excess	Organic	Nitrate-N		Bray	Bray	Olsen	M-3	Zn	Mn	Fe	Cu	B	Ammonium Acetate ppm				CEC	% Base Saturation			
pH	Salts 1:1	Lime	Matter	0-8"	8-36"	P1	P2	P	Sulfate														
1:1	mmho/cm	Rating	LOI %	ppm	ppm	ppm	ppm	ppm	ppm S	ppm	ppm	ppm	ppm	ppm	K	Ca	Mg	Na	me/100g	K	Ca	Mg	Na
7.5	0.2	L	0.9	16	9	59	86	36	10	3.3	2	8	0.4	0.5	9.5	71.5	17.1	1.9	6.5	241	928	133	29

Introduction: The purpose of this study was to compare several planting rates of dry edible beans (Vibrant pinto variety) planted in 20" row spacing. Target populations were 60,000, 100,000, and 130,000 plants/ac; however, the planting equipment used resulted in seeding rates that differed from the intended rate. Actual populations were determined by early season stand counts and were 50,300, 81,820, and 102,942 plants/ac, respectively. To estimate the treatment seeding rate and subsequent seed costs, 10% was added to the stand count values; this resulted in treatment seeding rates of approximately 55,000, 90,000, and 113,000 seeds/ac, and assumes all treatments had similar emergence and germination. The plots were direct harvested on September 13 with a John Deere® S680 combine and MacDon® FD75S FlexDraper® 35-foot head. The temperature at harvest was 76°F with 31% relative humidity. There was no hail, very little disease, and very good weed control.

Samples from each plot were analyzed for bean quality parameters. Pod height measurements were taken to determine the percent of pods 2" or greater above the soil surface. Harvest loss estimates were determined by taking counts in one-square-foot frames randomly chosen in the harvested area, but equally representing the left side of header, center of header, and right side of header area behind the combine.

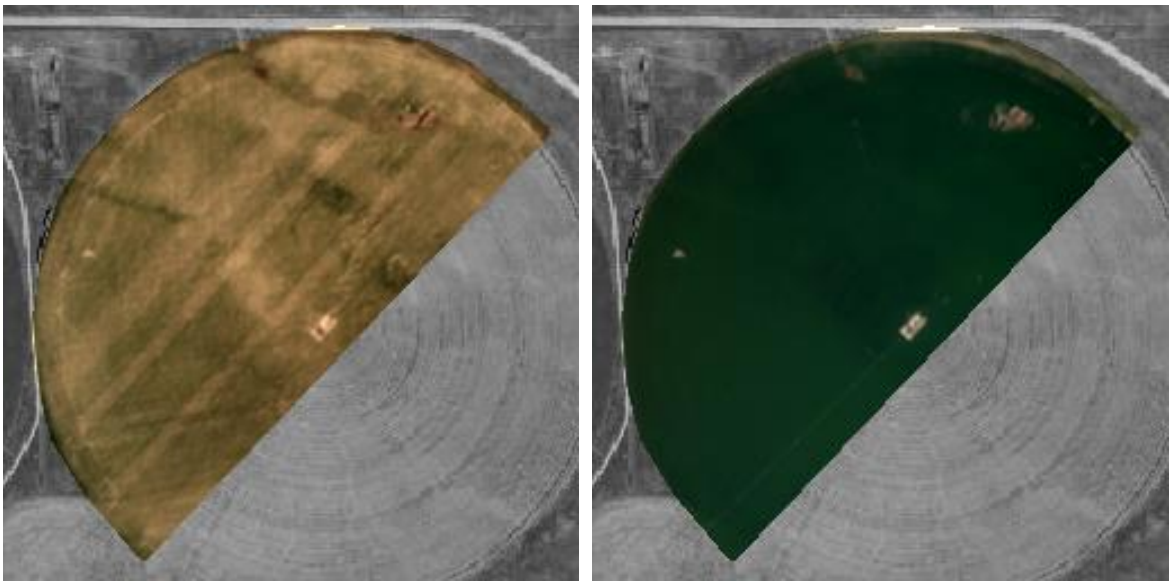


Figure 1. Reduced biomass for the lower population treatment is visible in aerial imagery from July 9 (left). By late July and early August treatment differences were no longer visible as evidenced in aerial imagery from August 5 (right).

Results:

Treatment (seeds/ac)	Stand Count (plants/ac)	Pods > 2" above-ground (%)	Harvest Loss (bu/ac)	Small (%)	Split (%)	Foreign Material (%)	Damaged (%)	Moisture (%)	Density (lbs/bu)	Seeds per lb	Yield (bu/ac)†	Marginal Net Return‡ ($/ac)
60,000	50,300 C*	81 B	2.5 A	2 B	1 A	0 A	0.7 A	13.4 A	59.7 A	1,233 A	62 A	893.89 A
100,000	81,820 B	89 A	2.0 A	5 A	1 A	1 A	0.8 A	13.4 A	61.8 A	1,215 A	60 A	836.80 A
130,000	102,941 A	90 A	2.2 A	4 A	1 A	1 A	1.0 A	13.4 A	62.1 A	1,213 A	62 A	843.22 A
P-Value	<0.0001	0.002	0.184	0.015	0.542	0.983	0.571	0.974	0.386	0.826	0.650	0.266

*Values with the same letter are not significantly different at a 90% confidence level.
†Bushels per acre adjusted to 14% moisture and adjusted for clean yield (% splits, % small, and % foreign material removed).
‡Marginal net return based on $25/cwt ($15/bu at 60lb/bu). Seed cost for the bean seed was $73/100,000 seeds. Seed costs for each treatment were adjusted to represent the estimated actual seeding rate based on stand counts: $40.15/ac for 60,000 seeds/ac, $65.85/ac for 100,000 seeds/ac, and $82.71/ac for 130,000 seeds/ac.

Summary:

- Reduced biomass for the lower population treatment was visible in early season imagery, but by late July and early August treatment differences were no longer visually apparent (Figure 1).
- The percent of pods greater than 2" above the soil was greater for the 100,000 and 130,000 seeds/ac treatment; however, the 60,000 seeds/ac treatment still had 81% of pods greater than 2" above the ground.
- The 60,000 seeds/ac treatment had a lower percentage of small seeds than the 100,000 and 130,000 seeds/ac treatments.
- There were no differences in harvest loss, percent split, percent foreign material, percent damage, moisture, density, and seeds per lb.
- There was no difference in yield or marginal net return among the three populations tested. It is interesting to note that the higher populations did not result in significantly higher yields.
- Damage was less than 3% so no price dockage occurred as it did in many other fields in the area.

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- The surrounding field was planted to Vibrant variety pintos and the overall average yield was 57 bu/ac.

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