

Summary of Dry Bean Planting Date Study at Powell – 2020

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Introduction and Methods

The study was designed using randomized complete split plots with planting date the main plot and cultivar the subplot with five replicates. One planting date was late May; the other two were in June. Six cultivars were included. Seeding rate was 100K per acre and row spacing was 22-inch. Plots were six rows wide and 28 feet long. The study was furrow irrigated. Flowering and maturity (buckskin-colored pod) dates were recorded at least twice weekly (reported as days after planting, dap).

On 8 Sept 2020, cold temperatures essentially terminated development of all plots (some had already matured). It was considered a killing frost. Due to the cold snap, maturity date was difficult to assess accurately for plots that still had green pods (which turned light green in mid-Sept and remained that way for weeks, and many pods failed to produce normal seed).

Seed yield was determined by uprooting mature plants from 10-feet of the two center rows during morning hours, placing them on the ground for about four hours in the sun, and threshing with a research plot combine. Several plots that were severely frost damaged were not harvested. Seed were cleaned with a Clipper Office Tester unit and weighed. One hundred seed were counted to determine average seed size (presented as average weight per seed in mg). Seed moisture was about 10% across all plots and no corrections were made for moisture.

Results

Yields were unaffected by the delaying the planting time until 10 June, compared to the early 27 May planting (Table 1). There was a non-significant trend for the two early-maturing cultivars (Poncho and Blackfoot) to yield higher when planted on 10 June vs. 27 May. When planting was delayed until 25 June, however, yield was cut in half across all six cultivars compared to earlier planting dates. No PD-by-cultivar interaction was detected for yield (despite appearing to be there).

Flowering dates (when calculated as days after planting) were unaffected by planting date when the first two plantings dates were compared (Table 2). For the late planting (25 June), flowering was hastened by five days compared to the two early planting dates. Obviously, when presented as calendar date, flowering occurred on later calendar dates as planting was delayed (Table 3).

Although it was difficult to assess maturity for the later-maturing types due to the 8 Sept frost, a significant PD-by-cultivar interaction was detected. For the two early-maturing types (Poncho and Blackfoot), early-planting hastened maturity by two days compared to the mid-planting date (Table 4). In contrast, the late-maturing La Paz, Monterrey, and Windbreaker had delayed maturity by 3 to 9 days (i.e., they matured more slowly) when planted early compared to the mid-planting date. Obviously, maturity occurred at a later calendar dates as planting was delayed (Table 5).

Seed size was affected by a PD-by-cultivar interaction (Table 6). Seed size of Monterrey dropped considerably (25%) from the first to the second planting and 33% from the first to the third planting. Compared to the other cultivars, the early-maturing Poncho showed a minimal drop in seed size (13% reduction) across the three planting dates. Likewise, seed size of Blackfoot dropped only 15% across planting dates. In contrast, seed size of La Paz, Sundance, and Windbreaker dropped 27%, 27%, and 36%, respectively, from the first to the last planting date.

Summary

With this study representing only one season of data and because of the 8 Sept frost, few sweeping conclusions can be made. However, the data support the idea that if planting late in the Bighorn Basin (during mid-June), an early-maturing cultivar might be more competitive than a late-maturing cultivar. Of course, this idea is expected but this is one of the first reports documenting this observation in the Bighorn Basin with these cultivars. Although we do not have an explanation, the slight changes in yield between the early and mid-planting paralleled the changes in seed size (Fig. 1) and this will be an interesting trait to observe in future planting date studies. Smaller seed sizes found in the late-maturing cultivars for the early-June planting and for all six cultivars for the late-June planting are likely below a given threshold and would obviously be a market concern for dry bean planted in mid-June or later.

Table 1. Yield per Acre of Six Dry Bean Cultivars Planted on Three Dates in Powell in 2020.

Cultivar	Planting Date			Mean
	27 May	10 June	25 June ¶	
	----- lbs per acre -----			
Blackfoot	1828	2101	1116	1682
La Paz	2207	1764 §	627	1533
Monterrey	2120	1890	1017	1676
Poncho	2518	2950	1731	2400
Sundance	1941	2005	1313	1753
Windbreaker	1615	1574	1022	1404
Mean †	2038	2047	1137	1741
LSD (0.05) ‡	----- 536 -----			310

† The LSD (0.05) for comparing the means for the three planting dates was 594.

‡ The LSD (0.05) of 536 pertains to the planting date-by-interaction means; the 310 at the end of this row is the LSD (0.05) for cultivar means averaged across planting dates. The overall CV was 22.6%.

§ Only 4 plots out of 5 were harvested for the La Paz 10 June planting. When not harvested, the plot was considered a missing value, not zero.

¶ Not all plots were harvested for the 25 June planting. This decision was based on visual assessment of all plots for presence/absence of normal seed in the pods in late September. Several plots had very few filled pods and thus, were not harvested. The number of plots harvested for the 25 June planting (out of a possible 5) were: Blackfoot (3); La Paz (1); Monterrey (1); Poncho (5); Sundance (5); Windbreaker (3). Unharvested plots were considered missing data, not zero.

Please note Tables and figures continue through page 5.

Table 2. Flowering dates (dap) for the six cultivars at three different planting dates. Calendar dates for flowering are presented in the next table.

Cultivar	Planting Date			Mean
	27 May	10 June	25 June	
	----- dap -----			
Blackfoot	50	48	44	47
La Paz	53	54	51	53
Monterrey	53	53	50	52
Poncho	47	45	39	44
Sundance	51	49	43	48
Windbreaker	50	49	44	48
Mean †	51	50	45	49
LSD (0.05) ‡	----- 2 -----			1

† The LSD (0.05) for comparing the means for the three planting dates was 3.

‡ The LSD (0.05) of 2 pertains to the planting date-by-interaction means; CV was 2.8%.

Table 3. Flowering dates (calendar) for the six cultivars at three different planting dates.

Cultivar	Planting Date			Mean
	27 May	10 June	25 June	
	----- dap -----			
Blackfoot	16 July	28 July	8 Aug	na
La Paz	19 July	3 Aug	15 Aug	na
Monterrey	19 July	2 Aug	14 Aug	na
Poncho	13 July	25 July	3 Aug	na
Sundance	16 July	29 July	7 Aug	na
Windbreaker	17 July	29 July	8 Aug	na
Mean	na	na	na	na
LSD (0.05)	----- na -----			na

Table 4. Maturity dates (dap) for the six cultivars at three different planting dates.

Cultivar	Planting Date			Mean
	27 May	10 June	25 June	
	----- dap -----			
Blackfoot	86	90	-	88
La Paz	103	94	-	98
Monterrey	97	94	-	95
Poncho	87	89	-	88
Sundance	93	93	-	93
Windbreaker	101	93	-	97
Mean †	94	92	-	93
LSD (0.05) ‡	----- 5 -----			3

† Planting date effect was not significant.

‡ The LSD of 5 pertains to the PD-by-Cultivar means and the LSD of 3 pertains to the cultivar means.
The CV was 4.6%.

Table 5. Maturity dates (calendar) for the six cultivars at three different planting dates.

Cultivar	Planting Date			Mean
	27 May	10 June	25 June	
	----- dap -----			
Blackfoot	21 Aug	8 Sept	-	na
La Paz	7 Sept	12 Sept	-	na
Monterrey	1 Sept	12 Sept	-	na
Poncho	22 Aug	7 Sept	-	na
Sundance	28 Aug	11 Sept	-	na
Windbreaker	5 Sept	11 Sept	-	na
Mean	na	na	-	na
LSD (0.05)	----- na -----			na

Table 6. Seed sizes for the six cultivars at three different planting dates.

Cultivar	Planting Date			Mean
	27 May	10 June	25 June	
	----- mg -----			
Blackfoot	333	341	281	318
La Paz	372	366	270	336
Monterrey	404	302	271	326
Poncho	382	393	333	369
Sundance	360	355	261	325
Windbreaker	426	353	271	350
Mean	379	352	281	337
LSD (0.05) †	----- 34 -----			20

† LSDs (0.05) listed in this row were for the PD-by-Cult interaction (34) and the Cultivar means (20). The CV was 7.8%. The LSD (0.05) for the three planting date means (379 mg vs. 352 mg vs. 281 mg) is 17 mg indicating that all three plantings differed. The PD-by-Cultivar interaction on seed size was highly significant ($P = 0.001$).

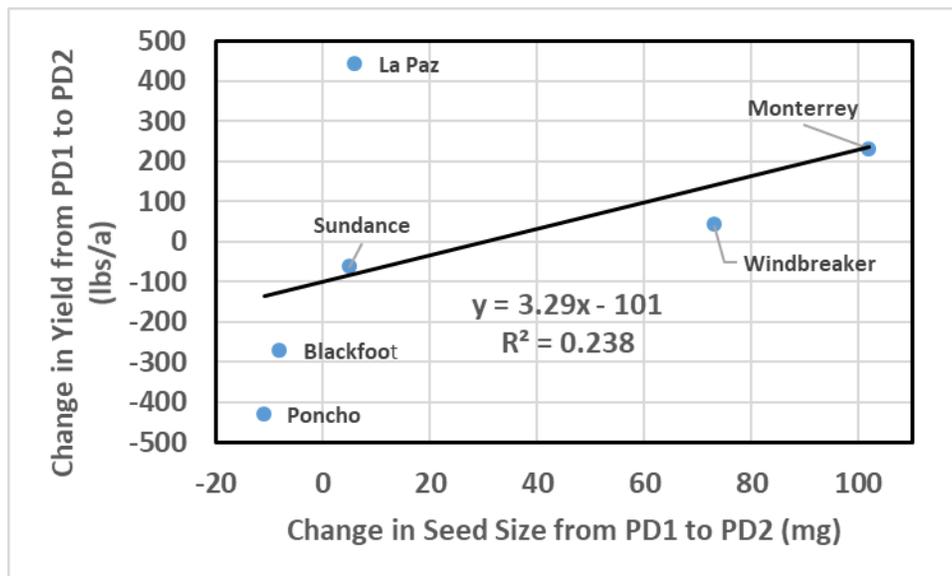


Figure 1. Plot of the [PD1 yield minus PD2 yield] vs. [PD1 seed size minus PD2 seed size]. A value on the graph less than zero indicates that the value increased from PD1 (27 May) to PD2 (10 June). Note that the negative numbers for the early-maturing Poncho and Blackfoot indicates that those values increased in yield and seed size with the PD2 as compared to PD1.